Gazette Issue 08/18

The AUSTRALIAN AND NEW ZEALAND COLLEGE of PERFUSIONISTS GAZETTE

JUNE 2018

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ANZCP

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1. Trowbridge, et al. The Effects of Continuous Blood Gas Monitoring During Cardiopulmonary Bypass: A Prospective, Randomized Study – Part I. Journal of Extracorporeal Technology. 2000;32:120-128.
2. Trowbridge, et al. The Effects of Continuous Blood Gas Monitoring During Cardiopulmonary Bypass: A Prospective, Randomized Study – Part II. Journal of Extracorporeal Technology. 2000;32:129-137.
3. Data on file.

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Change of address, including both the old and new addresses of the member/subscription should be forwarded to the ANZCP Secretary at least one month in advance.

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Preparing material for publication: Preferred delivery method is by e-mail using document attachment in Microsoft Word to the editorial correspondence address. Authors who do not have access to e-mail please mail material. Correspondence should be on A4 paper type written with double-spaced lines. Please do not fold mail; use an A4 sized envelope. Please supply direct contact numbers and address for the corresponding author. Material should contain (1) Title, (2) Subject, (3) Author(s), (4) Co-author(s), and (5) Institution(s). British/Australian English is the preferred language.

This edition of the Gazette has been proudly supported by LivaNova.

A MESSAGE FROM THE PRESIDENT

by Mark Ambrose, *President, ANZCP*

I hope that this edition of the ANZCP Gazette finds you well. This year seems to be really flying past. I cannot believe that at the time of writing, it is already June!

I am happy to say that the new website is up and running. While it has taken longer than I would have liked for its completion, I am happy with the result. This website acts as a first point of contact for individuals, hospitals, and industry groups seeking Perfusion information in Australia and New Zealand.

It will also be the main method of communication between the Australian and New Zealand College of Perfusion, the Australasian Board of Cardiovascular Perfusion, and its members. The future addition of a members secure login section, more content and a registry will add to the website usability. We are also very thankful to those industry groups who have expressed interest in advertising on the ANZCP website. Please contact us with any suggestions or feedback that you may have concerning the website.

Southern hemisphere perfusion meetings are upon us! Perfusion Down Under, being held 9 – 11 August, 2018in Queenstown, New Zealand, is just around the corner. I am sure that this will be a great event. Well done to those people who made the registration, which I now believe is full!

The ANZCP Annual Scientific Meeting is fast approaching, with Adelaide hosting the 35th ASM. Please be sure to save the dates – 15-17 November, 2018. You will find the ASM page on the ANZCP website, allowing registration, and listing the preliminary program and accommodation options. This is a great opportunity to catch up with colleagues, hear some great speakers, attain CPD points and perhaps present on something interesting.

The first half of the year, the Executive has been working hard to lay a strong foundation for the ANZCP in the future. We are expecting our work to yield good results as we move a few steps closer to becoming full members of the National Alliance of Self Regulating Health Professionals (NASRHP). Many full members would have seen and responded to an invitation to comment on planned updates to the Continuing Professional Development (CPD) document. We thank you for your input, and will continue to communicate as this document progresses.

We are also working to increase our advocacy, communications and stakeholder engagement on behalf of the membership. We are also examining ways the Structured Course in Clinical Perfusion might be accredited (part of the NASRHP initiative), and to commence a review of the College Rules / Constitution, Guidelines and Scope of practice. The executive is also to working towards presenting an agreed mutual recognition of certification with Perfusion Societies, Colleges and accreditation bodies in other countries. We will keep the membership informed as events unfold.

I would like to thank the executive and the board for their continuing hard work to maintain and improve our College, and we look forward to catching up with everyone at the ASM in Adelaide in November.

Regards,

Mark Ambrose
President, ANZCP

ANZCP STRUCTURE

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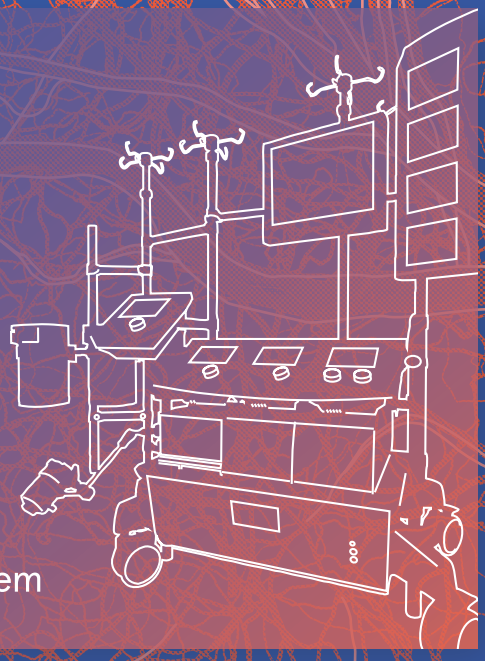

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1. Ranucci M, et al. Perfusion 2014;30(1):120-126.
2. Albes J, et al. J Thorac Cardiovasc Surg 2003;126(5):1504-12.

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BOARD REPORT

by L. Vincent Rajkumar

Hello to everyone on behalf of the Board…..

It's been a reasonable busy term for the board.

A pre certification exam workshop was held at Perfusion Services in Melbourne on the 10th of February to familiarise candidates with the viva examination process and to go through a number of trial questions. All candidates sitting February and September exams were invited to attend. Turnout was excellent with one participant travelling from New Zealand and two from Queensland. Thanks to Perfusion Services for hosting the event and the qualified perfusionists who contributed their valuable time to pass on the knowledge.

Certification exams were held on the 28th of February and the 1st of March at the Royal Children's Hospital, Melbourne. Seven candidates appeared, of which five (2 of these were overseas candidates) completed the Structured Course in Clinical Perfusion (SCiCP) successfully. Unfortunately a couple of students did not pass the short answer section of the final exams. Arrangements were made to re-sit this section for one of the candidates and he completed successfully on the 27th of April and the other candidate hasn't scheduled yet. The six that have completed the certification exam are now eligible for ANZCP Fellowship and can add the CCP post nominal to their title.

The next set of certification exams will be held in late September, the exact dates and location are still to be finalised. Clarke Thuys who mainly organises and conducts the exam does a fantastic job as always.

Jessica Cantrick is governing the autotransfusion course, the first cohort of 2018 saw 22 students who have successfully completed the course. Currently 30 students are enrolled in the May course, with another course in September. Student numbers this year have been steady.

Jessica is currently in the process of revamping the course by redesigning and restructuring the learning package delivery and updating the course content with up to date, relevant and evidence-based material. Anyone who is willing to work on the literature and evidence side of things are most welcome and please do not hesitate to contact Jessica.

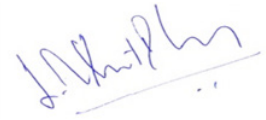
Hope you all provided your views on the new CPD document that was mailed to all the members on the 3rd of April. Thanks for your time and contribution. The Executive and the Board are committed to review every suggestion and will ratify the recertification document by upholding the vital aspects of our profession.

The Board welcomes Thomas Anderson at the Royal Hobart Hospital and Wellon Ng, Zoe Chong and Annie Ng at the Prince of Wales Hospital in Hong Kong to the SCiCP.

As you all know the website is live and you can visit at anzcp.org for the board updates.

Best Regards

Vincent Rajkumar
Chairman, ABCP



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PDU COMMS

ISSUE 2 - Mar 2018

INTERNATIONAL GUEST SPEAKERS 2018

The Wayne Pearson Keynote 2018

Prof Hilary Grocott MD FRCPC, Editor-in-Chief for the Canadian Journal of Anesthesia and Professor Department of Anesthesia & Perioperative Medicine and Surgery at University of Manitoba Lecture will deliver this years Wayne Pearson Keynote Address

Prof Timothy J. Gardner, M.D. is an internationally noted heart surgeon and leader in cardiovascular medicine. Tim is a past president of the American Heart Association, the American Association for Thoracic Surgery and was a director of the American Board of Thoracic Surgery. He is returning to the Cardiac Surgery program at the University of Pennsylvania as an adjunct Professor and senior mentor.

Kenneth Shann CCP is the current President of the American Society of Extracorporeal Technology and has been a Member of the Board of Directors since 2013. He has also been an Executive Committee Member of AmSECT's International Consortium for Evidence-Based Perfusion since 2006. Kenny's professional interests include quality improvement, safety and teamwork and leadership

this issue

PDU Inc. Committee

Timothy Willcox FANZCP CCP
Prof Robert A Baker PhD CCP
Michael McDonald FANZCP CCP

Conference Coordinator

Bernardette Tackney

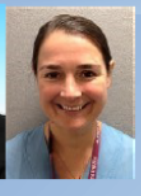
PDU ACCOMMODATION ALERT

NB the first release date for our limited number of rooms is **Monday 9th April 2018**
40% of all remaining unsold rooms will be released back for general sale to the public and so we strongly recommend that you secure your accommodation as soon as possible. (https://perfusiondownunder.com/?page_id=13274).
NB room charges will not be charged until departure.

Regional Faculty 2018

The Perfusion Downunder 2018 Winter Meeting planning is well underway and we have secured another excellent faculty with topics broaching challenges around emerging treatment options for cardiac surgery and support, leadership and teamwork, understanding the science and interpreting data and the regional data from the ANZCPR database. Sara-Jane Allen, David Sidebotham and Richard Newland return from last year and we are delighted to have Jayme Bennetts and Rob Young back on board the PDU faculty. Prof Alan Merry returns for his 14th consecutive year and will deliver the 2018 Prof Merry lecture.

Alan Merry



Sara-Jane Allen

Jayme Bennetts

David Sidebotham

Rob Young

Richard Newland

Rob Baker

Michael McDonald

Tim Willcox

PIRS News

ISSUE 07 April 2018

ANZCP
Australian and New Zealand College of Perfusionists

PIRS

New ANZCP Website

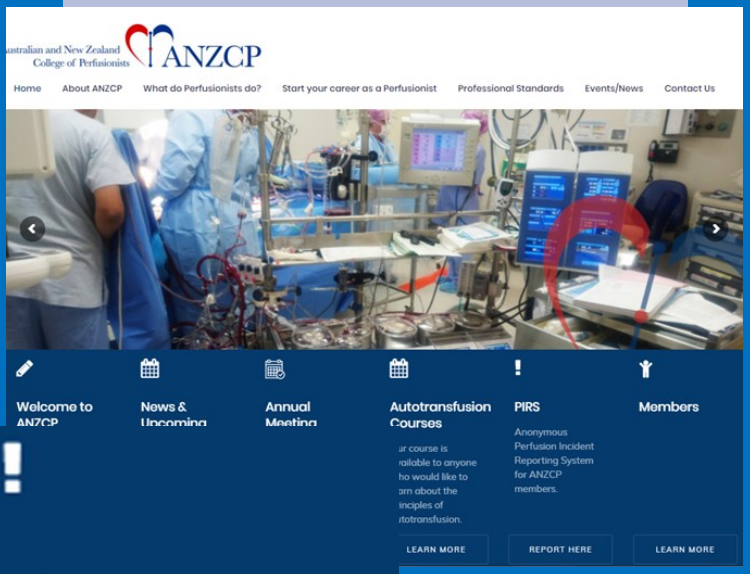
The new PIRS form is now available on the recently launched renewed ANZCP website.

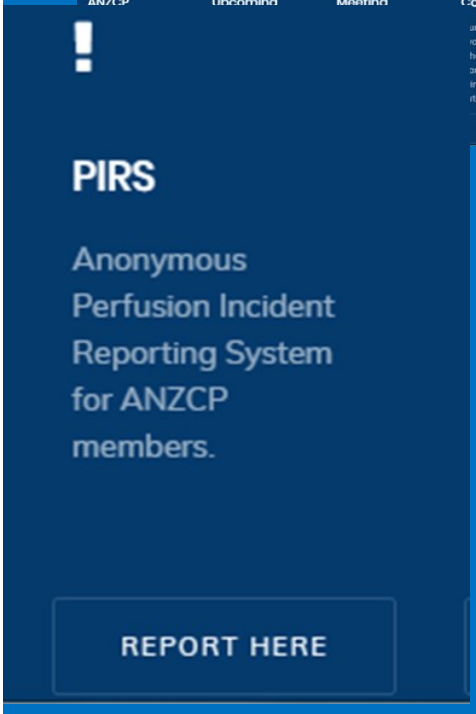
To file reports go to:

http://anzcp.org/

We encourage feedback and suggestions to PIRS@anzcp.org

this issue





NEW PIRS Submission Form.

Create a shortcut to you desktop or mobile device

http://anzcp.org/pirs/

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Updates to PIRS

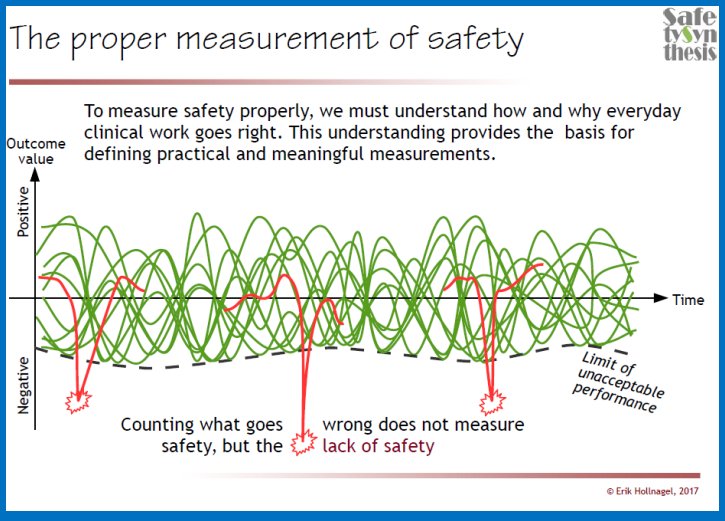
- We have added a free text box asking "*What could we have done better*?" This is a reflection on the immediate actions taken that may form part of a future preventive action plan and in addition to asking "*What went well*?" is part of the move to include Safety –II concepts .
- Summary reports by incident category for past years have been added under the PIRS Reports tab.

PIRS NEWS - The value incident reporting and the case for perfusion registries

Reporting incidents has value especially reporting near miss situations where compensating practice variations have prevented a worse outcome - the so called "*good catch*" or "what went well" to prevent further badness occurring. The ANZCP PIRS reports where permission to print is given provides many novel solutions to situations that we might well encounter. These are summarized by category on the PIRS web page Reports tab.

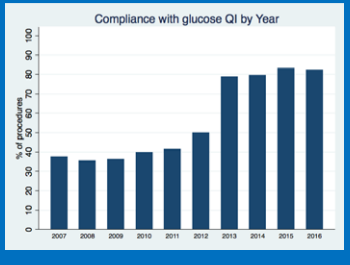
It is well established that incident reporting systems suffer from underreporting [1] and the PIRS estimates a capture of about 2% of incidents consistent with publications. Coupled with the option for reports to be published or not, the lessons from incident reporting are relatively few.

By comparison the ability to measure what goes right - the Safety II concept - provides infinitely more lessons for improvement as *what goes right* is constantly occurring or, in the words of Erik Hollnagel a dynamic non event (the green stuff on the slide).

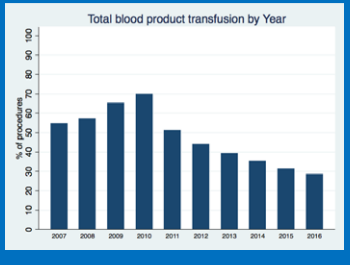


So how in perfusion does one measure dynamic non events—the stuff that goes right? One answer is registry databases. The ability of current perfusion data management systems to gather perfusion data in real time provides a powerful tool for amassing and analysing everyday clinical work that goes right. This provides the tools for benchmarking practice on centres and individuals with others and a basis for quality improvement.

The AMSECT PERForm registry and the Australia New Zealand Collaborative Perfusion Registry (ANZCPR— formerly the PDU research database) are examples of Safety II in action. The ANZCPR has demonstrated the value of this type of reporting in QA initiatives to reduce transfusion rates and improve glucose and temperature control.



From 2017 ANZCPR site data Report for Auckland City Hospital



[1] Hewitt TA, Chreim S. Fix and forget or fix and report: a qualitative study of tensions at the front line of incident reporting. BMJ Qual Saf. 2015;24(5):303-10.

PIRS 2018

Permission to print:	Yes
Incident type	No Harm Incident
Type of incident:	Equipment
Catagory	Electrical / electronic
Description:	Stockert S5 HLM using CP5 centrifugal pump driver. The CP5 had an adaptor plate to drive the Affinity CP. Whilst on CPB - upon cooling in anticipation of DHCA - the CP5 console came up with an internal? error message and ceased to operate the driver -i.e., there was no rpm generated. The perfusionist clamped both the arterial and venous lines - informed the surgeon of the situation - then turned off the console and turned it back on again (i.e., rebooted the system). The rebooted console was functional and remained so for the duration of the case. A down time at 28 deg Celsius was about a minute. An explanation provided the the company is that the adaptor plate - which is not supplied by them (being supplied by the company supplying the Affinity CP disposable) - was the cause of the error signal, whereby the expected rpm do not match the actual rpms measured in the driver unit.
Preventive actions	A colleague was alerted to bring in a Medtronic biopump and driver - that was positioned adjacent to the now functioning CP5 driver; allowing the affinity CP to be re-positioned into this new driver rapidly. During DHCA the adaptor plate was swapped with another one. A manual pump driver was already available to the primary perfusionist.
GOOD CATCH - what went	The centrifugal pump system can rapidly be rescued by a standalone Medtronic biopump and associated driver
Protocol issue	No
Rule issue	No
Skill issue	No
Team Issue	No
Violation	No
Manufacturer advised:	Yes
Discussed with team:	Yes
Hospital incident filed:	No
Ext Authority Advised	No
Procedure acuity:	Elective
Commentary	The use of centigugal pump adaptors to accommodate pump heads not compatible with the console is not uncommon, however the does introduce an added level of risk that may be difficult to defend in the event of a serious adverse event as a result of a pump failure. This report highlights the importance not only of a rescue plan that is practiced but also the importance of "N+1" perfusionists on site. PIRS Ed

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ECLS FAMILY DAY AT
LADY CILENTO CHILDREN'S HOSPITAL

by Govindasamy Maheshkumar and Anthony Black

Background:

Our ECLS service has developed significantly over the past 10 years.

The concept of ECLS family day is to reconnect with the parents/guardians and patients and to celebrate the lives of all the kids who were treated with ECLS. Also to give them a "behind the scenes look" at our ECLS services and answer any questions they may have.

The event:

The event was organised by Dr Adrian Mattke, PICU consultant and Ms Emma Haisz, ECLS co-ordinator at Lady Cilento Children's Hospital, Brisbane for the Queensland Neonatal and Paediatric ECLS service. It was advertised on the hospital Face Book link/page and invited all the patients who received ECLS care.

The event was well received and attended by 40 families including bereaved families (50 kids and 70 adults plus 21 Staff volunteers who helped run the day.

The programme had started off with Welcome and opening remarks, then the ECLS service update was shared. Family experience was shared by few emotional speakers, especially for those families who didn't survive the ECLS journey.

Following that there was an open Question and Answers forum where many questions were answered by our expert physicians with particular interest in how to make the ECLS time easier to deal with, the significant 'highs & lows' that the parents/guardians can expect.

A more in-depth hand-book, to include a glossary of terms, specific to ECLS, as much of the 'technological terms used might as well be in a different language'.

And identified the possible use of 'parent mentors', as a contact for new families. These are previous parents wishing to 'share and listen'.

We had an activity room for kids to keep themselves busy. Cookie decorating, Arts & Crafts, Captain Starlight and I had setup a Photo Booth for the families to take some memories with them.

As the event was conducted few days before Christmas, there was a surprise visit by Santa Clause!

A free lunch was provided to all the attendees. At the lobby, Posters of ECLS related research papers that have been presented or published were on display. Also, on display was ECLS and retrieval equipment, for the attendees to pretend to run the ECLS circuit or get ready for flight with helicopter safety!

The event ended with a very positive, constructive feedback and suggestions from the parents/guardians.

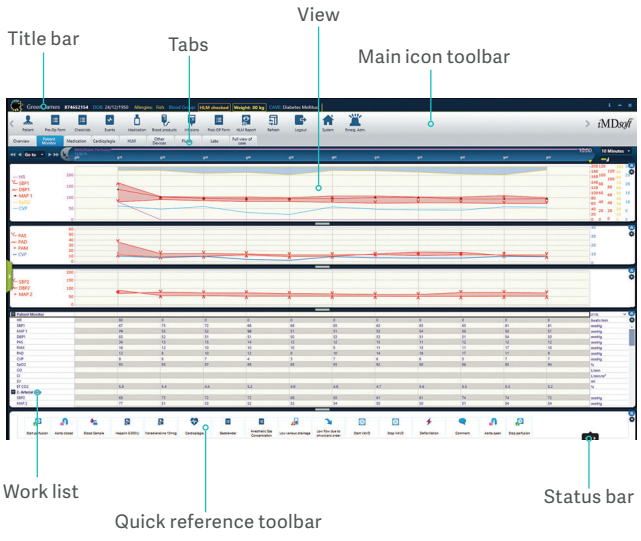






Improve Perfusionist Workflow

Patient safety, accurate documentation, increased efficiency



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Jens Viebke, President Acute Care Therapies

* MetaVision Perfusion is certified as a Class IIa device under MDD 92/43 EEC TGA Australia and Health Canada regulations and classified as a class I 510(k) exempt medical device by the FDA

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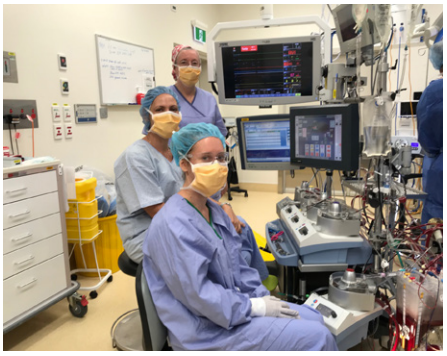
AROUND THE PUMP ROOM AT LADY CILENTO CHILDREN'S HOSPITAL BRISBANE

It's now 3 ½ years since the Mater Children's Hospital and The Royal Children's Hospital merged to form Lady Cilento Children's Hospital (LCCH) in Brisbane. The usual teething problems have been ironed out and LCCH is now preparing for a digital hospital rollout with an integrated electronic Medical Records system. Since moving to LCCH, the Queensland Paediatric Cardiac Service has continued to grow and we now perform 240-260 CPB cases and approximately 30 – 40 ECLS runs annually.

I began my traineeship at LCCH in July 2015 and completed ABCP certification exams in February of this year. To broaden my trainee experience I will shortly delve into the world of adult perfusion at The Townsville Hospital. Helen Scarrott has very kindly agreed to have me visit and pump cases under her supervision and I am eagerly anticipating this fantastic opportunity.

In March of this year Manel San Pablo, trainee from Wellington District Health, spent a week in our unit observing. This was a fantastic experience for all involved and we welcome other trainees to visit us. During her visit Manel also had the opportunity to attend the biannual Australian Paediatric ECMO Course at LCCH and undertake hands on ECMO training with our highly experienced team. I would encourage all trainees to visit as many hospitals as possible to gain a wider understanding and appreciation of the variety and complexity of cardiac perfusion.

Since the move to LCCH our tight-knit team has remained unchanged. Carla, Tony and Mahesh continue to form the highly experienced perfusion team at LCCH with myself as their trainee offsider; however, change is in the air. Carla is finishing up shortly to prepare for the arrival of her third child and we are in the process of recruiting a locum to cover her maternity leave. This is a very exciting time for our small team and we wish Carla well and look forward to having her back as Director of Perfusion at LCCH in 2019.



VISITING OTHER UNITS

by Manel San Pablo – Wakefield/Wellington NZ trainee

Coming from a nursing background where nursing staffing usually outnumber other personnel working in a hospital, the decision to shift and train to become a perfusionist working with a small team of people was part of a big transition.

First, trying to remember how to be a student again was a hard, and humbling experience but very rewarding. Second I was going to be constantly balancing being buried in books and on the job training with the occasional perfusion related conferences to attend thrown in. This year saw the opportunity this to get out of the confines of my unit and get to know other perfusionists while fulfilling the requirements of my training. It was an opportune moment as the college has arranged a pre-exam training session day in Melbourne at Perfusion Services office. To make this a more worthwhile trip, I decided to contact Clarke Thuys so I could visit the Royal Children's Hospital (RCH) in the three days leading up to the pre-exam training session to gather some paediatric exposure.

The RCH team was very welcoming, friendly and quite used to visiting trainees of different disciplines. They are not only generous with their time and knowledge, they also work like a well-oiled machine. In their non-clinical time, everyone in their team is either involved in a research project or getting organized for the next charity mission trip. It was inspiring to see. In three days, I managed to observe six paediatric cases, three patients on ECMO in which one had a decannulation done in ICU and two patients on heartware in which one had a change of Berlin excor implant.

I could not imagine a more productive three days for an overseas trip. In previous meetings, I mentioned to Carla Zaluzak that I was interested in visiting Lady Cilento Children's Hospital (LCCH) with the same intention of meeting other perfusionists and observe paediatric cases. At that time, their trainee Nicole Shrimpton, who is now qualified, had mentioned that LCCH is running an ECLS paediatric course in March. I was in Brisbane for a full week. I must say I have been lucky that all of these schedules have aligned perfectly.

Although the focus of the program is paediatric, I found it most helpful since it was being run for three days with the additional day for the nurses training to be ECMO specialists. We were a diverse group of trainee perfusionists, nurses, neonatologists, ICU registrars and a paediatric surgical fellow. The program consisted lectures of relevant concepts for ECMO with daily simulation breakout sessions dividing us into three groups. The first day was about indications and managing patients on ECMO. The second day was related to cannulation and issues around it. The third day was about mechanical emergencies and complications. In the afternoon, we had a high fidelity in-hospital ECPR scenario. Anthony Black was very much involved in the ECMO course for perfusion input, who also conducted a one-on-one ECMO teaching with me. One of the organizers of the program was ECMO nurse specialist Emma Haisz. On the days, that I was not on the ECMO course, I spent time in theatre observing paediatric cases. The LCCH team may be new and small but they are definitely enthusiastic and heavily involved in quality improvement activities in their hospital.

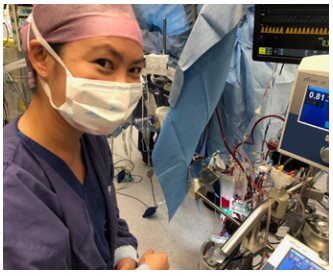
Perfusion practice does not have to feel insular and isolating. In fact, I would encourage any trainee to do the same to go out and see other units, preferably overseas. I believe it fosters better collegial recognition than just meeting them during conferences where the exchange can be brief.

Overall, it was a very worthwhile to visit other units and meet up with colleagues in their working environment, and how this differed from my working environment.

I would like to thank the RCH perfusion team, Clarke Thuys, Steve Bottrell, Martin Bennett, Alison Horton, Simon Augustin and Bradley Schultz. Unfortunately, Steve Horton was away when I visited. For the LCCH team, I would like to thank Carla Zaluzak, Anthony Black, Mahesh Kumar, and Nicole Shrimpton.







REMEMBER SUBMIT TO...

PIRS

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What is PIRS?

PIRS is a voluntary system for reporting perfusion related incidents and accidents, open to the international perfusion community. Confidentiality is assured by de-identification and anonymity. PIRS data will not be passed to any third party or regulatory body. For further information see www.anzcp.org.

TO SUBMIT TO PIRS VISIT

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...and hit the PIRS tab.

2ND ASAP AUSTRALASIAN SIMULATION AND PERFUSION MEETING
23-24TH MARCH, SYDNEY AUSTRALIA.

The second meeting of this workshop /meeting was held in a new venue for us.

Medtronic Australia very generously donated their APEC (Asia Pacific Experience Centre) facility in Sydney, for us to use for the workshop.

We had a number of rooms, as well as the use of their equipment to run the sessions.

The meeting was attended by both trainee /student perfusionists as well as certified / experience perfusionists, which based on feedback, was a great learning experience for all.

Richard Tallman, the CEO of Biomed Simulation was the guest for the meeting. Richard has developed the "Califia simulator", which is now being widely used around the world in simulation and education, as the Orpheus (which the ANZCP owns) is now not being manufactured .

Richard gave us an overview of the Califia, and then helped with the operation of the device during the simulations.

Each day we ran three sessions – 2 high fidelity and 1 low fidelity scenarios. Each session was didactic, as well as hands on with everyone having a chance of running the simulator.

The topics included

Perfusion trouble shooting – Unusual blood gases

Perfusion Challenge - IVC Bypass (Low Fidelity)

ECMO

Retrograde and Kinetic assisted priming techniques

Perfusion Challenge - Tavi (Low Fidelity)

Failure to wean from CPB – Options

Firstly a huge thankyou to Medtronic Australia, the major sponsor for this meeting. Not only for their generous support, in aiding the ANZCP to run this meeting, but also in allowing us to use this amazing venue, and providing support in organising and catering.

Secondly, Thank you to the faculty for their input , time and enthusiasm to make these sessions a success- Sarah Armarego, Ray Miraz, Monique Brouwer, Adam Rosnan, Arthur Preovolos and Richard Tallman. Also for St Vincents in Sydney and Andrew Dinale for the loan of their ecmo pump and circuit.

Simulation is a fairly daunting experience to most experienced perfusionists.

You could ask yourself why you would want to …..

"Sit in front of a machine- that is hooked to a physiological simulator, performing in front of onlookers, and caring for a patient in an environment, where everyone around you seems to be making things worse and any useful help has yet to arrive, is anything but easy."

So the concept of "Asap" is to provide a workshop we can all practice for that event that may only happen once in a perfusionist career. This includes the most senior Perfusionists to the new trainee.

No perfusionist has seen in all!

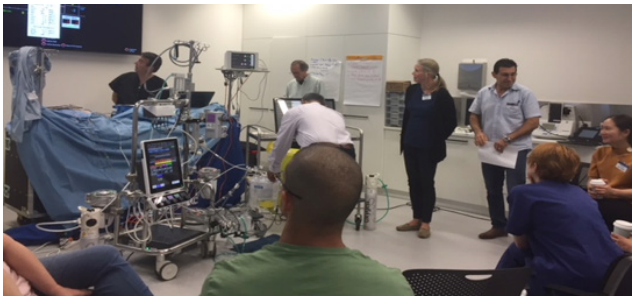
So we will have had some experience in dealing a rare crises situation.

The interaction between the group is also invaluable, we all leave the meeting (participants and faculty) with a new idea, or something that we can do to improve, do better or change- all to provide better care for our patients.

Look forward to seeing you in 2020.

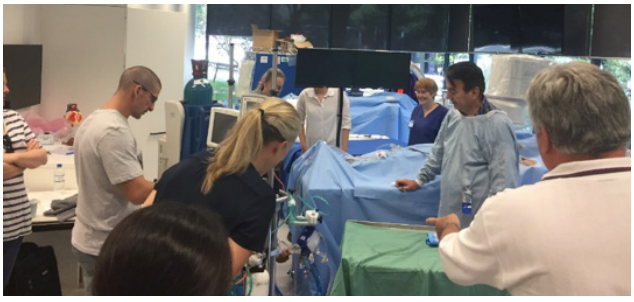
Jane Ottens, Darryl McMillan, Arthur Preovolos
Co Convenors/ organisers
ANZCP ASaP meeting.

The rooms we used also were set up as a Cath lab, which we could utilise in the low fidelity simulation for Tavi back up.



The "califia" simulator set up with the new Spectrum heart lung machine. Running through some unusual blood gas scenarios.

Low fidelity scenario to build a circuit from scratch for an emergency IVC case



Setting up an circuit in the cath lab for a TAVI that had "gone wrong"

All working through the "failure to wean scenarios.

Thank you to our major sponsor:

Medtronic
Further, Together

HYPOTENSION WITH THE USE OF LEUKOCYTE DEPLETING FILTERS

By Helen Scarrott

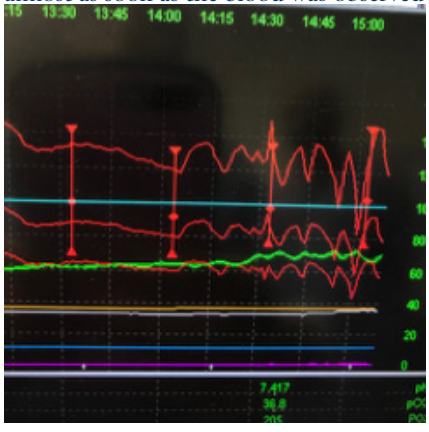
Caesarean sections and malignant disease had for many years been considered contra- indications for red blood cell salvage. The National Blood Authority now recommends the use of leukocyte depleting filters to make these procedures safe for transfusion of salvaged blood1. This practice has been introduced at The Townsville Hospital, in particular for radical prostatectomies and caesarean sections. Cell saver blood is administered at the discretion of the anaesthetist in discussion with the perfusionist.

The Sorin Xtra Cell Saver is used at the Townsville Hospital and Imugard III-3RC filters are mandatory for all malignant and obstetric cases. ACD-A from Terumo BCT is used for the anticoagulation.

In December 2017 the cell saver was requested for a 37 year old woman presenting with placenta accreta for caesarean section and hysterectomy. The Massive Transfusion Protocol was invoked due to substantial blood loss with corresponding labile blood pressure. Multiple units of allogenic red cells were transfused prior to cell saver blood transfusion. The blood pressure began to drop almost immediately after initiation of the salvaged blood infusion. The patient was being monitored with a transoesophageal echo and the anaesthetist commented that the clinical scenario appeared consistent with amniotic fluid embolism. The cell saver blood was discontinued with approximately 1000ml of blood discarded. The blood pressure recovered with the use of metaraminol. The surgeon did not attribute the hypotension to the salvaged blood. The patient recovery was uneventful.

A few weeks later we were approached by one of the anaesthetists involved to discuss the possibility of hypotension from autologous cell saver blood. She had found articles in the literature describing hypotension as a result of the leukocyte depleting filter.

In February 2018 the cell saver was requested for a 34 year old placenta accreta and hysterectomy patient. The previous patient was discussed with the anaesthetist. 632ml of salvaged blood was given to the patient. Up until this point the patient had been very stable. Both anaesthetist and perfusionist watched the blood entering the patient. The patient's blood pressure began to drop almost as soon as the blood was observed to reach the patient, as seen in the picture below.



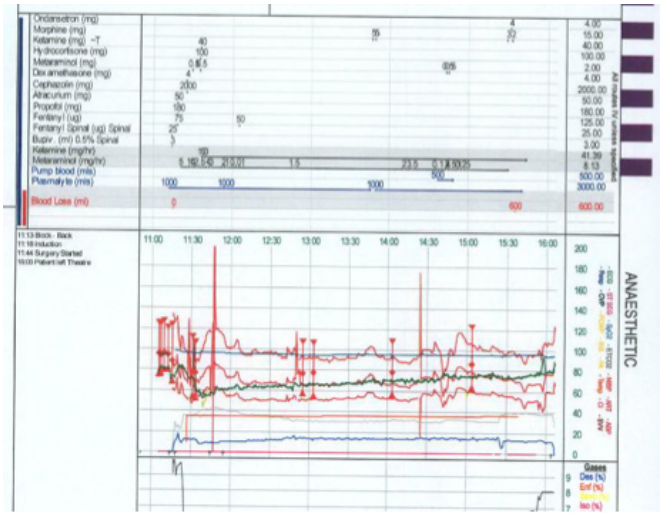
A small amount of metaraminol was given to the patient and the rest of the blood transfused. This patient had no allogenic blood products. The patient did well.

The use of leukocyte depleting filters has since become a point of interest and some research done. Terumo BCT was contacted. Our technique for use of the filters was confirmed as correct and the Terumo representative acknowledged that they know of hypotension with the use of the Imugard filter. Following this, the perfusionists have discussed the findings with the anaesthetists and observed the practice of the anaesthetists during the infusion of the autologous blood. The following table was from direct observation or retrospectively looking at the patient charts of cases since December 2017 where the Imugard III-RC filter was utilised.

Volume given	Hypotension	Operation
ABANDONED	YES	CAESAREAN
632ml	YES	CAESAREAN
127ml	NO	LOBECTOMY
406ml	YES	CAESAREAN
240ml	YES	PROSTATECTOMY
191ml	YES	PROSTATECTOMY
391ml	YES	PROSTATECTOMY

Six out of seven patients were observed to have hypotension directly at the time of salvaged blood transfusion. The patient that did not show hypotension was a VATS lobectomy that converted to open due to bleeding. All patients did well.

A look back randomly to a patient 12 months prior showed the following chart for a prostatectomy. It is obvious that the patient required metaraminol at the time of the transfusion of the salvaged blood. (In the attached anaesthetic record, salvaged blood is referred to as pump blood, which was infused at 14:30.)



Discussion

Prior to January this year, the perfusionist processed the salvaged blood, attached and primed the Imugard filter. The blood was given to anaesthetics without further observing the patient's hemodynamics and the subsequent response of the anaesthetists. It is likely that the anaesthetists had been treating hypotension without us noticing and without them attributing the hypotension to the salvaged blood.

In reviewing the literature the use of leukocyte depleting filters has been recommended by the FDA to be used pre-storage rather than at the bedside in order to avoid the hypotension from the filter2. The SHOT report 2000 describes hypotension in bedside leukodepletion to occur in 80 out of 20 million transfusions3. The patients transfused were often hypovolemic and so especially susceptible to the cytokines reinfused. Administration of vasopressors corrected the hypotension and no sequelae were noted.

Sreelakshimi and Eldridge described a 4000 fold increase in bradykinins in salvaged blood4. "Bradykinin, a vasoactive peptide, binds to receptors on the endothelium and causes hypotension. It has a plasma half-life of 15 s and about 95% is metabolised by plasma kinases I and II (the latter is also known as angiotensin converting enzyme (ACE) to inactive kinases during a single pulmonary passage. In patients with low intrinsic concentrations of ACE or on ACE inhibitor medications, metabolism of bradykinin is reduced. So bradykinin may accumulate and cause significant hypotension. We would agree that leucocyte depletion filters should be used during reinfusion of autologous cell salvaged blood in obstetric practice. However, we would recommend that should marked hypotension occur and the blood is required urgently, the filter is simply removed, as the washing process alone is very effective at removing fetal tissue. If the blood is not required urgently, the blood should be filtered, recollected in a citrated bag, stored for 60 min and then reinfused."4 However none of the patients observed in our unit were on ACE inhibitors. Catling et al in 2015, though, found no increase in bradykinin levels in the blood of 23 patients when passed through a negatively charged leukocyte depleting filter5.

According to Sreelakhimi, the high bradykinin levels were directly related to the negative charged filters and not in neutral or positively charged filters4. Terumo BCT has reported to our unit that the Imugard filter is positively charged.

The Natioinal Blood Authority has suggested that there is an interaction between the filter and the ACD-A anticoagulant1.

These cases have generated much discussion and have changed the behaviour of the perfusionists at The Townsville Hospital. We are now using Heparin in saline for our anticoagulant to see if this makes a difference. We also are now warning the anaesthetists of possible hypotension when administering the salvaged blood through a leukocyte depleting filter. The blood pressure is carefully monitored, and the anaesthetists' actions observed to determine whether vasopressors are required. We have created a database to record BP response to salvaged blood and to compare the response between the Imugard and LipiGuard SB filters (Haemonetics) which are currently used for other surgeries and the anticoagulant type. When using the Imugard filter, the blood will now be administered at a slower rate if possible, rather than being pumped through using the hand pump in the IV line and if there is time, titrated through the Immugard filter into another bag to be given later.

1. https://www.blood.gov.au/ics, appendices V & VI
2. https://www.fda.gov/downloads/BiologicsBloodVaccines/GuidanceComplianceRegulatoryInformation/Guidances/Blood/UCM320641.pdf
3. SHOT Report 2008, page 154
4. T. R. Sreelakshmi and J. Eldridge. CASE REPORT. Acute hypotension associated with leucocyte depletion filters during cell salvaged blood transfusion Anaesthesia, 2010, 65, pages 742–744
5. Catling SJ, Thornton CA, Russell IT, Anaesthesia. 2015 Sep;70(9):1066-72. doi: 10.1111/anae.13100. Epub 2015 Apr 29., Bradykinin and cysteinyl leukotriene concentrations in cell-salvaged blood before and after passage through negatively charged filters during clinical use in cancer patients: a pilot study.

AUSTRALASIAN BOARD OF CARDIOVASCULAR PERFUSION

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The ABCP invites all healthcare workers interested in Autotransfusion to enrol in the 2018 Autotransfusion Course.
The purpose of the course is to provide current and future autotransfusionists with the background information necessary to provide a safe and effective service.

The course runs for 10 weeks and is conducted three times per year at a total cost of $275.00 (free to ANZCP members).

We are currently registering students for 2018 course commencement dates:

12 February (applications close 5 Feb)
21 May (applications close 14 May)
27 August (applications close 20 Aug)

For additional information and enrolment details, please contact the course co-ordinator, Jessica Ozdirik at
jessica.ozdirik@health.nsw.gov.au

NIRS: THE GOOD, THE BAD AND THE INDIFFERENT A REVIEW

by Clarke Thuys, The Royal Children's Hospital, Melbourne

Purpose of Review

Near infrared spectroscopy (NIRS) provides non-invasive technology to measure relative changes in oxy- and deoxy-haemoglobin in a changing environment. This facilitates the determination of regional oxygen saturation (rSO_2) and is generally recorded such or as a Tissue Oxygenation Index (TOI) or cerebral tissue oxygenation saturation ($SctO_2$) depending on the monitoring device.

The rSO_2 trend tracks change in the microcirculatory oxygen supply balance of cerebral tissue in the path of the transmitted light. rSO_2 monitoring can aid in the determination of injurious oxygen imbalance; the nature of the imbalance which enables appropriate corrective action, and the response to intervention.

Despite the fact that cerebral oxygenation monitors are fairly commonly used in cardiac surgery and ICU there is still no clear consensus on its optimal utilisation. This can be explained by the absence of multiple, positive, large-sample, prospective randomized outcome studies. A review of literature will cover the range of opinion of the value of NIRS from the good to the bad and the indifferent.

Introduction

NIRS has been around for 60 years, but only since the late 90s has it been used for monitoring cerebral oxygenation. It is because most chemical and biochemical species exhibit unique absorption bands in the NIR spectral region that it can be used for both qualitative and quantitative purposes. Depending upon the wavelengths of light used NIRS has a multitude of applications across many industries. It is used in areas as diverse as waste management[1], analysis of vegetables[2], manufacture of pharmaceuticals and the forensic examination of black printer toner[3].

Figure 1 illustrates how light sources penetrate the skull. The photon paths depicted represent those used with spatially resolved spectroscopy. Using this technique, photons detected at the shallow and deep detectors are reflected by different regions of the cerebral cortical microcirculation.

Ratios developed from the intracranial measurements at different sites enable suppression of both extracranial reflection and interindividual variability in intracranial photon scatter.

The commercial alternative of differential spectroscopy locates the shallow detector much closer to the IR source. As a result, incident photons arriving at this detector have been reflected exclusively from extracortical tissues. The differential shallow vs. deep signal suppresses extracranial reflection. Additional wavelengths of infrared light are used in an attempt to suppress intracranial photon scatter variation

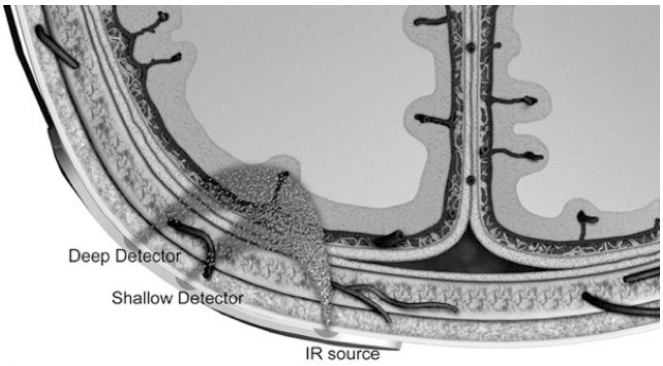

Fig. 1 The shaded parabolas illustrate the transcranial photon paths from a scalp-mounted infrared (IR) light source to adjacent proximal (shallow) and distal (deep) sensors.

The Bad:

NIRS generates numbers that are called different things.

- regional oxygen saturation (rSO_2)
- Tissue Oxygenation Index (TOI)
- cerebral tissue oxygenation saturation ($SctO_2$)
- Tissue oxygen saturation (StO_2)

Some of these are the same, some are not. There is no consensus of what to call the numbers.

First and foremost, there is no gold standard with which to compare these measurements. There is no way to directly measure the true oxygen saturation in the path of the sensor. Cerebral oximetry, at best, examines a very focal superficial area of the brain thought to reach a depth of about 1 to 1.5 cm.

Nemoto[4] and Kishi[5] found a wide variability in baseline measurements (15-89) and that rSO_2 can vary markedly depending on sensor location (lower values farther from midline; highest values if placed in centre of forehead). There was a significant negative correlation between rSO_2 and age and a positive correlation with haemoglobin concentration.

Another difficulty in validation of this monitor lies in the indeterminate aspect both of what is being measured and in what tissues. The algorithm used by the device may not be known to the user, and the assumption that path length remains constant through the tissue of interest may not be correct. One of the underlying assumptions of the technique is that a constant ratio of 25% arterial and 75% venous blood volume exists; however, this presumed constant ratio does not appear to be correct and is certainly not static. The Nonin algorithm assumes blood in the brain was 70% venous and 30% arterial, which is applicable under normocapnic conditions[6].

Watzman[7] studying 20 children undergoing cardiac catheterisation found a marked variability in rSO_2 ranging from 29 to 92. The average arterial-to-venous contribution was 16:84 but differed significantly among subjects (from 40:60 to 0:100). Yoshitani[8] showed that that cerebral oxygen saturation and its relative change may vary depending on the type of NIRS used because of the differences in measurement techniques and algorithms. This was confirmed by studies from Luengo[9], Hyttel-Sorensen[10] and Ferraris[11].

Germon et al[12] used a pneumatic scalp tourniquet model in healthy adult subjects and found that rSO_2 dropped from 72 to 59 with no other intervention. Kerz'[13] study of 11 adult neurointensive care patients showed no correlation between rSO_2 measured by NIRS, and invasively measured brain tissue pO_2 values. NIRS was unable to detect ischemic cerebral episodes, defined as a $PtiO_2$ value\15 mmHg. Gatto[14] showed little difference in brain oxygenation of dead compared to live subjects.

Although it appears that rSO_2 predominantly reflects cerebral saturation, there is still conjecture regarding the contribution from nonbrain sources. NIRS does not rely on pulsatility therefore it can be difficult to determine whether the probes are properly placed, or in fact even on the patient.

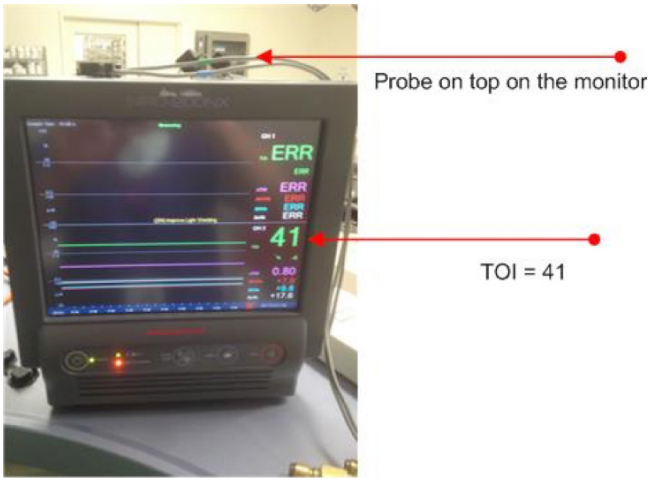

Fig 2 Reading the TOI of the monitor.

There appears to be no validation of NIRS versus jugular bulb oxygen saturation. Shaaban Ali[15] in his 2001 paper based on 17 CABG patients utilising bypass with pH stat at 34-37 degrees concluded spatially resolved spectroscopy (NIRO-300) does not agree with jugular bulb oxygen saturation in patients undergoing warm bypass surgery. He suggested several factors may contribute to the observed lack of agreement. "First, NIRS cerebral monitoring measures TOI in a small region of the cranial microvasculature, whereas SjO_2 reflects a more global measurement. Thus, any inhomogeneous distribution of blood or metabolic activity will reduce the agreement between the two methods. Second, the actual TOI signal is the average of arterial (25%), capillary (5%) and venous blood (70%). In addition, contamination from the extracranial tissues may be a contributing factor. Our results show that the two methods are not interchangeable. Which one is "right" remains a subject of controversy, since both methods probably measure different entities."

Wassenaar[16] showed a clear relationship between dark skin pigmentation and attenuation of the NIRS signal. Leading to signal loss. He concluded that in patients with dark skin NIRS signals should be interpreted with caution, because melatonin affects the quality of the returned signal. But this was 2005 and these issues have largely been resolved by the use of extra wavelengths allowing for compensation for tissue background optical properties such as variation in skin pigmentation or signal contamination from extracranial tissues.

Another issue is that there is no universal definition of $rSco_2$ desaturation. Subramanian et al[17]. The most widely reported definitions are generally based on older data obtained from patients undergoing carotid endarterectomy surgery. decreases in $rSco_2$ between 5% and 20% from baseline or values <50% ipsilateral to carotid artery cross-clamping were associated with changes including reductions in transcranial Doppler–measured cerebral blood flow velocity, electroencephalogram slowing, and alterations in somatosensory-evoked potentials.

The Indifferent:

Abdul Khaliqs18 animal study demonstrated NIRS-monitoring may identify critical periods with inadequate brain tissue oxygenation, particularly during DHCA. The neurological implications of the observed changes in NIRS oxygenation parameters, however, require further quantitative morphological evaluation of the brain in animals surviving a longer reperfusion and observation period.

Redlin's19 study concluded that the extent to which improved regional monitoring of oxygenation in neonates and small infants with CHD undergoing CPB can serve as a perioperative guidance tool to optimize cerebral perfusion, and improve clinical outcome, remains to be determined in future studies.

Moerman's20 opinion was that current evidence, based on small studies and case reports, shows that NIRS provides a quick representation of cerebral oxygen saturation and that it might identify changes that could not be predicted from standard hemodynamic monitoring. However, the evidence is too low to conclude that NIRS can optimize patient care during cardiological procedures.

Monthe-Sagans21 paper on NIRS to assess microvascular dysfunction after CPB stated that the combination of NIRS monitoring on the forearm with a vascular occlusion test (VOT) showed transient post-op changes in rSO_2 but failed to specifically identify the occurrence of microvascular dysfunction.

After completion of a baseline set of measurements for each patient, a rapid arterial occlusion of the upper limb was provoked by inflation of the pneumatic cuff at 50 mm Hg above the resting systolic arterial pressure, up to the rSO_2 value decreases to 40% or for a maximal period of 10 minutes, and measurements were repeated. The arterial cuff was then rapidly deflated to initiate reperfusion and measurements were repeated at the peak of the rSO_2 value. Finally, measurements were repeated after 10 minutes of reperfusion. At each step, heart rate, blood pressure, and SpO_2 were measured. Relevant NIRS parameters were baseline rSO_2, the peak value of rSO_2 during reperfusion, the rate of desaturation during ischemia ([rSO_2 basal – rSO_2 min]/time of ischemia), the rate of resaturation during reperfusion ([rSO_2 peak–rSO_2 min]/time of reperfusion) and the variation in rSO_2 during reperfusion (ΔrSO_2=rSO_2 peak–rSO_2 basal). See Fig 3.

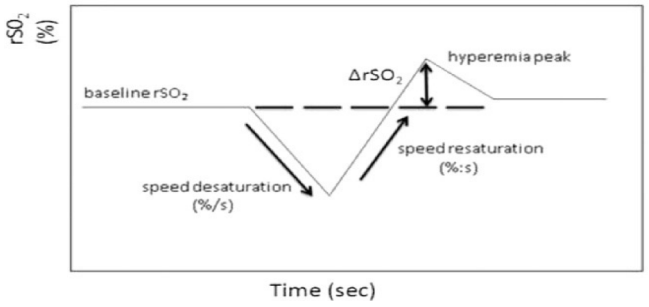

Fig 3 Relevant NIRS parameters in combination with a VOT.

Morel22 also saw transient changes in microcirculation in the thenar eminence but concluded results also illustrate the difficulties of assessing the microcirculation in cardiac surgery. Indeed, haemodilution, anaemia, haemodynamic alterations, the switch between halogenated gases and propofol, and use of vasoactive and ionotropic drugs are factors that, in addition to CPB, likely result in microcirculatory changes. NIRS-derived parameters seem to be of limited use in the cardiac surgery setting.

Ghosh's 2012 review23 of 80+ papers concluded there is some evidence that NIRS-guided brain protection protocols might lead to a reduction in perioperative neurologic complications after cardiac surgery. However, there are no data to support the wider application of NIRS during routine surgery under general anaesthesia, and its application in brain injury, where it might be expected to have a key monitoring role, is undefined. NIRS has many potential advantages over other neuromonitoring techniques, but further investigation and technological advances are necessary before it can be introduced more widely into clinical practice.

Bevan's 2015 review24 summarised that studies into the clinical efficacy of NIRS monitoring have thus far failed to definitively show that interventions to correct cerebral desaturations improve neurological outcomes, however it could be argued that the overall risk to benefit falls on the side of NIRS.

Zheng25 concluded in 2013 Reductions in $rSco_2$ during cardiac surgery may identify cardiopulmonary bypass cannula malposition, particularly during aortic surgery. Only low-level evidence links low $rSco_2$ during cardiac surgery to postoperative neurologic complications, and data are insufficient to conclude that interventions to improve $rSco_2$ desaturation prevent stroke or Post Operative Cognitive Dysfunction.

The Good:

Colak26 in his 2012 paper stated" If rSO_2 during the operation fell to more than 20% under the baseline, standardized interventions were undertaken to maintain rSO_2. These interventions (after checking head and perfusion cannulae position) included maximizing of cerebral oxygen delivery (increasing of oxygen concentration – FiO_2, arterial CO_2 partial pressure – PaCO2, mean arterial pressure, cardiac output or pump flow and hematocrit) or reduction in cerebral oxygen consumption (raising of anesthetic depth and reduction of temperature) . If systemic oxygen saturation fell we increased the fraction of inspired oxygen (FiO2). We try to maintain mean arterial pressure within 15% of baseline using vasopressors as required. Arterial CO2 partial pressure (PaCO2) has strong impact on cerebral blood flow. Hypocapnia causes decrease and hypercapnia increase in cerebral blood flow and rSO_2, so one of the common interventions was normalization of hypocapnia or increasing of PaCO2 to higher normal values. rSO_2 desaturation associated with hematocrit reduction to < 22% was the indication for transfusion. We undertook certain steps (preload and afterload management, inotropes) to increase cardiac output or to increase pump flow rate to correct rSO_2 desaturation. Despite those interventions, in some cases they observed inability to maintain rSO_2 above this threshold. They divided patients in two subgroups: 1. without prolonged rSO_2 desaturation; 2. with prolonged rSO_2 desaturation. Three patients in prolonged desaturation group and no one in another group had stroke, coma or stupor (p=0.03). We concluded that prolonged intraoperative rSO_2 desaturation is significantly associated with worse neurological outcome in patients – nonresponders to standardized interventions for prevention of rSO_2 desaturation."

Murkin's study27 showed monitoring cerebral rSO_2 in coronary artery bypass patients avoids profound cerebral desaturation and is associated with significantly fewer incidences of major organ dysfunction.

In Slaters28 study the rSO_2 was monitored intraoperatively in a cohort of 265 primary CABG patients. Patients were prospectively randomized to a blinded control group or an unblinded intervention group. Cognitive function was assessed preoperatively, postoperatively, and at 3 months using a battery of standardized neurocognitive tests. Cognitive decline was defined as a decrease of one standard deviation or more in performance on at least one neurocognitive measure. The rSO_2 desaturation score was calculated by multiplying rSO_2 below 50% by time (seconds).

Arenson29 demonstrated that a somewhat conservative threshold (of an absolute saturation of less than 50%) showed a far stronger relationship to adverse outcomes [such as acute kidney injury (AKI)] than any of the relative changes from baseline. Furthermore it was the non-neurologic outcomes that had substantive relationship to desaturation, with renal dysfunction demonstrating the strongest relationship.

Ruf30 found that continuous renal NIRS monitoring, starting intraoperatively and extending postoperatively, in infants after cardiac surgery may be a valuable and, importantly, very early parameter for predicting AKI. Ruf adapted an established cerebral NIRS scoring system to calculate the renal SO_2 score. The rSO_2 score = (baseline/preoperative rSO_2 – current rSO_2 (%)) × time (minutes).

Heringlake31 in his 2011 paper showed pre-operative ScO2 levels determined by near-infrared spectroscopy are related to objective measures of cardiopulmonary function and that low preoperative ScO2 concentrations are associated with an adverse perioperative course. A ScO2min-ox equal or less than 50% is an independent predictor of short- and longterm mortality in patients undergoing on-pump cardiac surgery. EuroSCORE is a method of calculating predicted operative mortality for patients undergoing cardiac surgery. In the Euroscore > 10 cohort the difference in survival is even more marked. The higher the score the greater the risk. So if you put NIRS on as soon as the patient is on the table you might have an indicator of long term outcome. See Fig 4

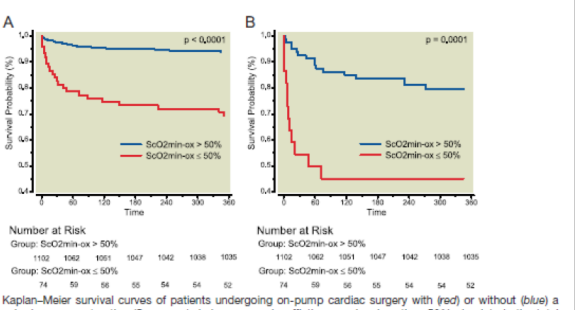

Fig. 4. One-yr Kaplan–Meier survival curves of patients undergoing on-pump cardiac surgery with (*red*) or without (*blue*) a preoperative cerebral oxygen saturation ($Sco_{2min-ox}$) during oxygen insufflation equal or less than 50% absolute in the total cohort of 1,178 patients (*A*) and in a subgroup of 102 patients with an additive EuroSCORE more than 10 (*B*). Log-rank test indicates that groups differ, both the total cohort and the subgroup with a EuroSCORE more than 10.

Lamb[32] documented in his 2017 paper that over 5 years and 91 patients ECMO survival rate was 42%, whereas survival in patients with limb ischemia was only 25%. He concluded that limb ischemia complications from ECMO may be decreased by prophylactic placement of an antegrade DPC. Without DPC, continuous monitoring using NIRS may identify limb Ischemia, which can be treated subsequently with DPC and or fasciotomy.

Kim33 in a similar study of 28 patients over 12 months demonstrated that NIRS monitoring is a useful and reliable method for the early detection of limb ischemia in patients undergoing peripheral VA-ECMO. Its application may allow timely correction of perfusion deficits and the prevention of compartment syndrome and limb complications.

Haydin34 in 2013 looking at cerebral perfusion during CPB in children, and correlations between NIRS, temperature, lactate, pump flow, and blood pressure concluded that despite shortcomings in the ability of NIRS technology to accurately reflect validated and directly measured parameters of systemic oxygen delivery and blood flow, NIRS can certainly assist in the detection of low-flow states; and that the probability of these low-flow states happening during CPB is higher than any other condition.

Conclusion:

The best way to conclude this is with a series of quotes from various sources:

- "The value of data from the system has not been demonstrated in specific disease states, under conditions of hemoglobinopathies, in clinical conditions that may affect blood volume, or under hypocapnic and hypercapnic conditions."

Nonin Instructions for Use. Model 8003CA Single-Patient Use, Non-Sterile, Disposable Regional Oximetry Sensor with EQUANOX™ Technology.

- "Other factors that may affect measurement accuracy include: myoglobin, hemoglobinopathies, anemia, pooled blood under the skin, interference from foreign objects in the Sensor path, Bilirubinemia, externally applied coloring (tattoos), and birthmarks."

Fore-Sight User Manual. P37. PN 21-22-3000 Rev 08. Cas Medical Systems 2017

- "Our understanding of how oximetry could impact patient outcomes has been limited by the variable endpoints outlined in multiple, but mostly small, observational studies. These outcomes have been so diverse that there is considerable uncertainty as to which ones could confidently be the focus in larger trials."

Hilary P. Grocott and Sophie N. Davie[35]

- "So, while there are a number of limitations associated with current cerebral oximetry devices, to date rScO2 monitoring has proven useful in diverse clinical settings and when used to guide therapy, has been associated with improved clinical outcomes during a variety of different surgical procedures"

John M. Murkin[36].

This review is divided into the bad, indifferent and good aspects of NIRS. There are no bad as long as you respect the limitations of the devices. The indifference is just an indication of the evidence, based on mostly observational studies and with variable endpoints. The good is that you are doing your patients no harm by using NIRS and that there is mounting evidence of its efficacy as a monitoring tool for cerebral and other tissue oxygen saturation.

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OUR RECENT EXPERIENCE WITH DEL NIDO CARDIOPLEGIA

By Emerson Sgammotta, Perfusion Services, Melbourne, Australia

Over the last six months at our centre, we have been using del Nido cardioplegia for minimally invasive valvular operations. As these surgeries are typically accessed through a right anterior thoracotomy, the coronary sinus is difficult to cannulate, making antegrade cardioplegia the only option. Del Nido cardioplegia gives us the advantage of longer redosing intervals, and ease of administration through the already established antegrade route.

Del Nido has been used from its early adoption in the 1990s by paediatric centres but has only recently begun to be implemented in adult cardiac surgery. A 2014 article by Kim et al from the Cleveland Clinic; use of del nido Cardioplegia for Adult Cardiac Surgery at the Cleveland Clinic: Perfusion Implications described their experience with preparing and using del Nido and is what we have based our approach on.

For standard cardiac cases, we are using St. Thomas cardioplegia solution, which is delivered 4:1 oxygenated blood to crystalloid at a temperature of 20oc. An induction dose is given upon application of the cross clamp, with maintenance doses given every 10-15 mins, and a hot shot composed of warm blood and 20mmol aspartate given for 2 mins prior to removal of cross clamp. In comparison, del Nido solution needs to be delivered at a ratio of 1:4 patient blood to crystalloid at a temperature of 4oc. An induction dose of 20ml/kg up to a maximum of 1000ml is required, while a maintenance dose isn't required up until 90 minutes, or sign of break through on the ECG, which a dose of 10ml/kg up to 500ml is then given. There is no hot shot needed prior to removal of cross clamp. In order for there to be satisfactory delivery of cardioplegia, the patient must have no diseased coronary systems and a competent aortic valve.

To make up the solution, the following is added to 1000ml of plasmalyte 148: 26mmol KCl, 13ml Lignocaine 1%, 16ml Mannitol 20%, 4ml Magnesium Sulphate 50% and 13ml Sodium Bicarbonate 8.4% and stored in the fridge until needed. Two bags are made up, with the second bag remaining in the fridge in case a second dose is required.

With our current heart lung pack set up for daily use of 4:1 St Thomas cardioplegia, we have simplified the process to accommodate del Nido into the circuit, as well as the ability to convert back to St Thomas Cardioplegia if need be. The line to the maintenance bag of St Thomas is disconnected and attached to a continuous arterial access port from the oxygenator (giving us the 1 part). The spike leading to our hot shot bag is disconnected and connected to the del Nido solution, with the blood access line leading to this being clamped (giving us the 4 parts). This conversion takes approximately 1 minute when the use of del Nido is confirmed.

If reconversion to St Thomas is needed, both the clamp to open the induction solution and the clamp on the blood access line are removed. This takes less than 10 seconds.

To date, we have completed 12 cases using del Nido solution with great results. Initially, a conservative ischemia time of 60 minutes was adhered to, which eventually stretched to 90 minutes, with the longest ischemia time being 94 minutes. All patients returned to sinus rhythm post cross clamp removal, with 2 patients needing reapplication of cross clamp for mitral valve repair modification, in which St Thomas Cardioplegia was used.

Del Nido has worked very well for us and will be something we will continue to use for minimally invasive surgery, as well as future use for single valve operations. As long as the patient has non-diseased coronaries and no aortic insufficiency, del Nido is a perfectly viable cardioplegia solution.

ASSISTED VENOUS DRAINAGE

By Monique Brouwer, Ray Miraziz

Assisted venous drainage (AVD) is a technique designed to enhance venous return to the cardiopulmonary bypass circuit. The standard bypass circuit places its venous reservoir below the height of the operating table. In this way the patient's blood drains by the passive forces of gravity. If, however, the operation is a redo or the chest is not entered through the sternum, the placement of venous drainage cannulas can become a challenge for the surgeon. Smaller diameter cannulas in more remote access sites can impair the forces of gravity and require intervention by the perfusionist to achieve adequate venous drainage. In addition, smaller patients or those with preoperative anaemia may benefit from shortened tubing lengths (raised venous reservoirs) and/or reduced tubing diameter. Reducing the volume of fluid required to fill the bypass circuit inevitably improves the haemoglobin levels on bypass, improving osmotic pressure and subsequently reducing interstitial oedema and improving organ function. Inadequate venous return can lead to blood traversing the pulmonary circulation rewarming the heart and distending the left ventricle.

At the Australasian Simulation and Perfusion course in 2016 vacuum assisted venous drainage (VAVD) was reviewed. This year we reviewed kinetic assisted venous drainage (KAVD). It is important to appreciate the benefits of each approach and the detractors.

Vacuum assisted venous drainage is relatively inexpensive and can be applied to a hard-shell reservoir at any time during bypass. All the ports to the reservoir are sealed and a negative pressure is applied via wall suction. The influence of the pressure within the reservoir is transmitted up the venous line to the patient venous cannula(s). As well, this pressure is transmitted through the arterial pump head, to the oxygenator itself. The positive pressure of the vent and sucker contribute to the overall pressure present within the reservoir. Careful management is required to ensure that the reservoir is not over-pressurised or that the negative pressure is not so strong that gas is pulled across the micro-porous membrane oxygenator. The management of VAVD takes care and attention.

Kinetic assisted venous drainage is more cumbersome and costly but can be used with hard or soft-shell venous reservoirs. A centrifugal pump head is cut into the venous drainage line and when activated the impellers create a negative pressure transmitted to the patient. It is very difficult to add a pump head once bypass has been commenced. KAVD must be anticipated and planned for. It does however, provide a very safe form of assisted drainage. The negative pressure generated by the centrifugal pump is not transmitted downstream. The venous reservoir is vented to air thereby protecting it and the oxygenator from the (potentially) deleterious influences of unregulated pressures. In addition, if a flow meter is incorporated into the venous line the perfusionist has an opportunity to balance the flow between the venous drainage and the forward arterial flow. It is easier to judge the optimal amount of negative pressure required to maximise venous return.

One factor influencing the amount of negative pressure applied during AVD is haemolysis. At pressures more than -100 mmHg red cells are shown to be destroyed.[1] As well, VAVD has tightly controlled pressure limits due to the potentially dangerous impact very high or very low pressures have on the reservoir and oxygenator. Generally, pressures during VAVD are kept between -20 to an upper limit of approximately -60 mmHg. KAVD can arguably be safely operated at -80 mmHg.

In both forms of assisted venous drainage, once the required volume return has been achieved, the major concern for the perfusionist is gaseous micro-emboli (GME.) GME has been shown to pass through both the oxygenator and arterial filter.2 It has long been associated with postoperative neurocognitive deficits.[3]

Adequate venous drainage requires reasonable blood volumes and the thoughtful placement of drainage cannulas and then, if needed, the use of negative pressure to facilitate return. If the cannula is up against the wall of a vessel (vena cava) or there is a hole/tear near the drainage site, assisted venous return is compromised. Increasing the negative pressure will not improve venous return in either circumstance. Increasing the negative pressure where there is air facilitates the entrainment of GME.[4]

With KAVD, the centrifugal pump traps small amounts of air reducing its effectiveness (a reduction in negative pressure generation.) Orientating the outlet of the centrifugal pump to a 12 o'clock position facilitates the removal of larger volumes of air. In this instance, slowing of the pump head (or temporarily stopping the pump head) allows the buoyancy of macro-emboli to float distally, towards the reservoir, clearing the device itself. The use of a bio-pump for KAVD has been shown to increase the amount of GME post arterial line filter when compared to VAVD.5

With VAVD, air is transmitted directly to the venous reservoir without any preamble. In an effort, to improve venous drainage, the perfusionist may attempt to increase negative pressures, inadvertently increasing the GME delivered to the patient. Unlike KAVD there is no flow meter guiding the amount of negative pressure required to maximise venous drainage. It is therefore important to carefully note reservoir volumes and patient central venous pressures (line chatter) to guide the amount of vacuum applied to the reservoir. Unlike KAVD, air coming down the venous line does not require the perfusionist's attention, to the same degree. It can be ignored to the detriment of the patient.

Experience using AVD provides insight into the many competing concerns surrounding its use during bypass. The perfusionist needs to focus on venous return in a diligent and dynamic manner. It is worthwhile to simulate these techniques not only to appreciate the influence of pressure and flow but to compare methods with other units within Australasia.

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WINTER MEETING
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2018

JUNE

13-16
ASAIO 65th Annual Conference
The Washington Hilton
Washington, DC USA
https://asaio.com/annual-conference/wash-2018-64th-annual-conference/

22-23
3rd MiECT Symposium
Bern, Switzerland
https://www.scps.org.uk/pdfs/3rd%20MiECT%20Symposium_Save_the_Date.pdf

27-30
The New Orleans Conference
New Orleans, Louisiana USA
New Orleans Marriot
http://www.TheNewOrleansConference.com

JULY

22-26
6th Scientific meeting of the World Society for Pediatric and Congenital Heart Surgery
Orlando, Florida USA
Walt Disney World
http://www.cvent.com/events/6th-scientific-meeting-of-the-world-society-for-pediatric-and-congenital-heart-surgery/event-summary-7f53a0c01ccd45cf86a739b3ac5d15db.aspx

AUGUST

9-11
Perfusion Down Under Winter Meeting
Queenstown, New Zealand
The Heritage Hotel
https://perfusiondownunder.com

SEPTEMBER

6-9
38th Annual Cardiothoracic Surgey Symposium (CREF 2018)
San Diego, California USA
Westin San Diego Gaslamp Quarter
https://www.crefmeeting.com

13-16
29th Annual ELSO Conference
Scottsdale, Arizona USA
The Westin Kierland Resort and Spa
http://www.cvent.com/d/dtqvlh

13-15
Case Reports in the Sun
Margaritaville Hollywood Beach Resort
Hollywood, Florida USA
http://floridaperfusion.org/latest-news/case-reports-in-the-sun-x/

OCTOBER

4-6
AmSECT Pediatric Perfusion Meeting
Miami, Florida USA
Miami EPIC Hotel

11-12
1st Latin American Perfusion Conference
Bogota, Columbia
https://www.asociacionalap.com

18-20
European Association for Cardio-Thoracic Surgery
Milan, Italy
http://www.eacts.org/educational-events/eacts-annual-meeting/

19-21
The Canadian Society of Clinical Perfusion National Meeting
Toronto, Ontario, Canada
http://www.cscp.ca/Professionals/Events/National-Meeting

NOVEMBER

15-17
35th Annual Scientific Meeting of the Australia and New Zealand College of Perfusionists
Glenelg, South Australia
Stamford Grand Hotel

JANUARY 2019

13-16
16th Annual Winter Park Perfusion Conference
Winter Park, Colorado USA
Vintage Hotel
http://www.hatravel.com/Page/WPPC2019MainPage

MEETING ANNOUNCEMENT

AUSTRALIAN & NEW ZEALAND COLLEGE OF PERFUSIONISTS 35TH ANNUAL SCIENTIFIC MEETING

FRIDAY 16TH NOVEMBER &
SATURDAY 17TH NOVEMBER 2018

Stamford Grand Hotel
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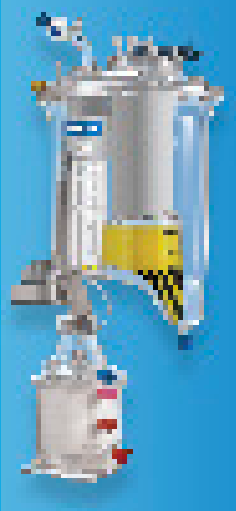

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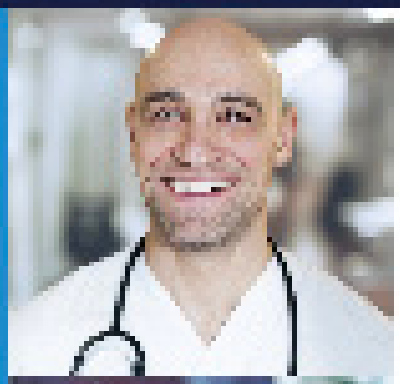

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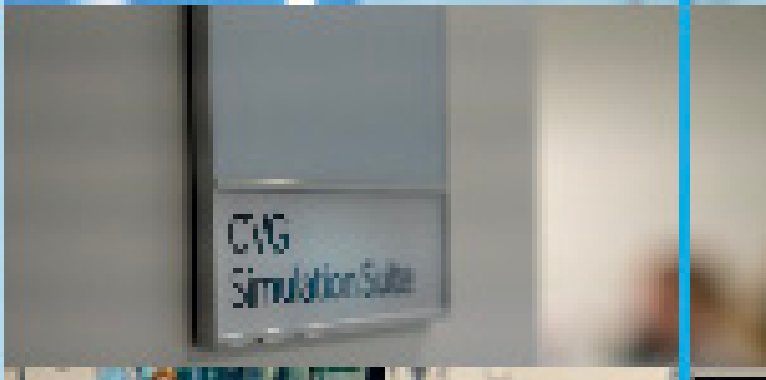

TRAINING CALENDAR

	DATE	PROGRAM
OCT	26 OCT 2018	[OPTIONAL] PHYSIOLOGY FLOW COURSE
	26-27 OCT 2018	SIMULATION TRAINING - PERFUSION TECHNIQUE
DEC	6 DEC 2018	[OPTIONAL] PHYSIOLOGY FLOW COURSE
	7-8 DEC 2018	SIMULATION TRAINING - CRISIS MANAGEMENT
MAR	26 MAR 2019	[OPTIONAL] PHYSIOLOGY FLOW COURSE
	26-30 MAR 2019	SIMULATION TRAINING - PERFUSION TECHNIQUE

HOW TO REGISTER

If you are interested in this program, please contact your local Medtronic representative to register your interest.

Places are strictly limited.

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