

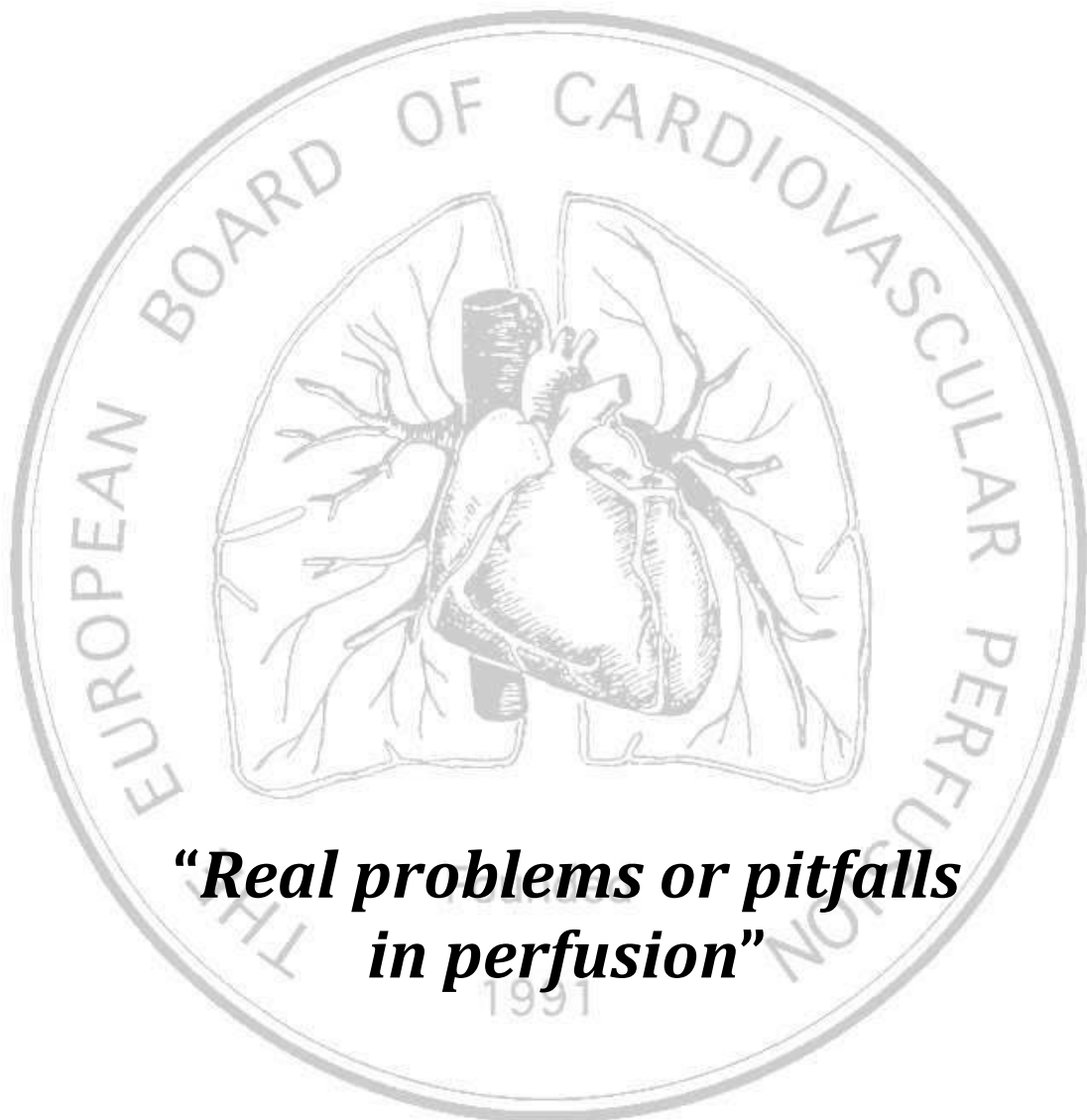
PRELIMINARY PROGRAMME

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**14<sup>th</sup> European Conference  
on  
Perfusion Education and Training**

**Saturday, 11<sup>th</sup> October 2014  
09:00 to 17:15  
Milan, Italy**

**MiCO Milan Congress Centre  
Brown Room 3, level 2**



***“Real problems or pitfalls  
in perfusion”***

## ***The European Board of Cardiovascular Perfusion***

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Darren Best  
Clinical Perfusion Specialist & Senior Academic Lecturer  
NESCOT, Surrey, UK  
EBCP Delegate

**09:00-09:10**

**“Welcome to Milan”**

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**Speaker:** Marco Ranucci M.D.  
Head Cardiothoracic & Vascular Anesthesia & ICU Dept,  
Policlinico San Donato, Milan

**0910-1050 Scientific Presentations**

Moderators Alexander Wahba MD, Erminia Mascitelli

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**10.50-11:20 Coffee break**

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**11:20-13:00 Scientific Presentations**

Moderators Tomas Gudbjartsson MD, Inês Figuera

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**13:00-14:00 Lunch**

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**14:00-14:40 Poster presentations**

Moderators Carole Hamilton, James Ferguson

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**14.40-15:45 Scientific Presentations**

Moderators Adrian Bauer, Dalibor Zovko

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**15:45-16:15 Coffee break**

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**16:15-17:05 Scientific presentations**

Moderators Frank Merkle, Darren Best

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**17:05-17:15 Closing speech** Frank Merkle

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Time	Speaker/title	Page
09:10-0930	<b>Marco Ranucci</b> Hemodilution, pressure, and flow: CPB factors impacting the outcome	
09:30-09:50	<b>Paul Murphy</b> Personalized Transfusion Management in Cardiac Surgery A Multidisciplinary Approach	
09:50-10:10	<b>Christa Boer</b> Protamine dosing: A Real problem	
10:10-10:30	<b>CJ Preusse</b> Alleged Risk of Low-Na-Cardioplegia	
10:30-10:50	<b>Koen Kairet</b> Tepid antegrade intermittent blood cardioplegia versus intermittent cross-clamping with Lidoflazine in CABG	
11:20-11:40	<b>Marco Stehouwer</b> Influence of design of oxygenator with integrated arterial filter on gaseous microemboli handling: A clinical comparison	
11.40-12:00	<b>Seanne Azzolina</b> Evaluation of air handling capability in the new A.L.ONE oxygenator with integrated cascade arterial filter	
12:00.12:20	<b>Marx Runge</b> Clinical Evaluation of Terumo FX05 with regard to gaseous micro-emboli handling	
12.20-12:40	<b>James Ferguson</b> Inflammatory response and mini-bypass circuits	
12:40-1300	<b>Adrian Bauer</b> Miniaturized extracorporeal circulation-current perspectives and future developments	
14:00-14:40	<b>Poster session powerpoint presentations</b>	
14:40-15:00	<b>Robert Groom</b> Addressing the Quality Problem- The Role of a Perfusion Registry and a patient Specific Care Plan	
15:00-15:15	<b>Luc Puis</b> International Survey on Perfusion Practice	
15:15-15:30	<b>Leen Vercaemst</b> Roles & Responsibilities of European Perfusionists in ECLS & EuroELSO	
15:30-15.45	<b>Frank Merkle</b> Roadmap to European Recognition of the Perfusionist Profession	
16:15-16:35	<b>André Rüffer</b> Individual solutions for individual situations: extracorporeal life support with the delstream® DP3 diagonal pump	
16:35-16:50	<b>Kurt Staessens</b> Patient tailored oxygen delivery: which determinants to consider	
16:50-17:05	<b>Mathias Allegaert</b> When do we need to change a membrane oxygenator in veno-venous ECMO?	

Time	POSTER PRESENTATION Speaker/title	Page
14:00-14:05	<b>Dominique Hella</b> <i>In vitro</i> comparison of 3 oxygenators during the priming procedure using pulsatile flow	
14:05-14:10	<b>J.W.H. van Hees</b> Digital data recording during CPB, an indispensable tool for the perfusionist	
14:10-14:15	<b>Anna Semenova</b> Neural Networks Models- The possible way to control the safety of perfusion	
14:15-14:20	<b>Laima Raliene</b> The influence of mean arterial pressure during CPB on the rate of post-operative acute kidney injury in elderly diabetic patients after CABG surgery	
14:20-14:25	<b>Felipe Pinto</b> Successful use of a miniaturized pediatric ECMO system for LF-VV.ECCO <sub>2</sub> R in a patient with an acute exacerbation of COPD failing non-invasive ventilation	
14:25-14:30	<b>Paul Murphy</b> High Cost and High Acuity: Improving Outcomes and the Budgetary impact of ECMO with a unique Data management system	
14:30-14:35	<b>Josh Blessing</b> Quality Improvement: Prescriptive CPB circuit selection	
14:35-14:40	<b>Faisal Shehzad</b> Use of blood microplegia technique and inclusion of Lidocaine in cardioplegic solution in adult patients undergoing coronary revascularization: an audit of 200 consecutive cases	

**09:10-09:30**

**Invited speaker**

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**Speaker:** Marco Ranucci MD  
Chief of Anesthesia  
San Donato, Milan  
cardioanestesia@virgilio.it

**“Hemodilution, pressure, and flow: CPB factors impacting the outcome”**

**Speaker:** Paul Murphy CPC, CCP  
University Health Network  
Toronto, Ontario, Canada  
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**« Personalized Transfusion Management in Cardiac Surgery : A Multidisciplinary Approach »**

*Cyril Serrick MSc, CPC, CCP*

**Introduction:** In 2012 the Cardiac Surgery Program at the University Health Network had the unenviable record of having the highest transfusion rate among the 10 centres in the province of Ontario, Canada. The effects transfusions have on patient outcomes are well known and a decision was made to review current practice and to institute a multidisciplinary effort to address this issue. Blood Conservation Guidelines published in 2011 by the Society of Thoracic Surgeons and the Society of Cardiovascular Anesthetists provide a Class 1 A recommendation on the management of blood resources stating a 'multidisciplinary approach involving multiple stakeholders, institutional support, enforceable transfusion algorithms supplemented with point of care testing'. We therefore created a multidisciplinary approach to management of blood product transfusions based upon personalized algorithms, restrictive protocols, and objective measurements of bleeding along with point of care testing

**Methods:** In January 2013, a point of care testing algorithm was created based upon platelet function (Platelet Works, Helena Laboratories) and thromboelastometry (ROTEM). The institution of a personalized transfusion practice was adopted by all disciplines Perfusion, Surgery and Anesthesia with regular audits. The practice consisted of point of care testing, objective measure of bleeding, restrictive red cell transfusion protocol during and after CPB with very restricted starch usage. Specifically, blood was drawn approximately 15 minutes before termination of CPB when the patient's temperature is at least 36 degrees. Once off CPB and the patient is stabilized an objective measurement of bleeding is assessed. When the patient is objectively categorized as bleeding a 3 step transfusion algorithm is initiated based upon the point of care results. 1312 patients in 2012 (Preprogram) were compared to 1167 patients in 2013 (Post program) with regards to transfusion of blood products.

**Results:** The results demonstrate substantial risk reductions of all blood products. Specifically, RBC transfusions were reduced by 28%, plasma transfusions by 63%, and platelet transfusions by 41%. There was also a risk reduction in adverse events such as re-exploration by 55%, kidney injury by 43% and major blood transfusion by 58%.

**Conclusion:** The optimal blood conservation practice involves a multidisciplinary approach with multiple interventions and enforceable transfusion algorithms supplemented with point of care testing.



**Speaker:** Christa Boer MSc, PhD  
Associate Professor in Anesthesiology  
Depts Anesthesiology & Cardio-thoracic Surgery  
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**« Protamine overdosing : A real problem »**

*Michael I Meesters, Dennis Veerhoek, Laurentius J.M van Barneveld, Fellery de Lange, Jacob-Willem de Vries, Johannes W.A Romijn, Alexander B.A Vonk*

**Objective:** Guidelines for perioperative blood management advise to titrate protamine doses after cardiopulmonary bypass (CPB) to preserve patient hemostasis, but compliance to these guidelines is low. The present study investigated whether the use of a lower protamine-to-heparin dosing ratio is indeed superior to a high dosing ratio with respect to postoperative hemostasis.

**Methods:** In this multicenter investigation, patients undergoing coronary artery bypass graft surgery were randomized into a low (0.8; n=35) or high protamine-to-heparin (1.3; n=27) dosing group based on total heparin administration. Patient hemostasis was monitored using rotational thromboelastometry before and 3 and 30 minutes after CPB.

**Results:** CPB time estimated 91±29 vs. 93±40 minutes (n.s.) in the low and high dosing groups, respectively. There were no differences in total heparin dosing (430±129 vs. 421±92 mg; P=0.75), while protamine administration was lower in the 0.8 (346±105 mg) than in the 1.3 group (548±122; P<0.001). ACT values following protamine administration were similar between groups. Clotting times for the INTEM (294±75 vs. 247±40 s; P=0.004) and HEPTM (285±62 vs. 243±44 s; P=0.005) were prolonged at 3 minutes following protamine administration in the high dosing group, but this normalized 30 minutes later. 24-hour blood loss tended to be increased in the high dosing group (623±409 vs. 511±241 ml; P=0.08).

**Conclusions:** A protamine-to-heparin dosing ratio of 1.3 is associated with a temporary prolongation of postoperative clotting times when compared to a lower dosing strategy. Our preliminary data tend to suggest that this hemostatic disturbance is associated with increased 24-hour blood loss.

**Speaker:** C.J. Preusse MD, PhD  
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« **Alleged Risk of Low-Na-Cardioplegia** »

*Birtel S, Lueck S*

**Objective:** Worldwide either high-Na cardioplegia („extracellular type“) or crystalloid low-Na-cardioplegia („intracellular type“) are used in adult and pediatric cardiac surgery. Particularly in neonates low-Na- cardioplegia is sometimes held responsible for postoperative neurological seizures. However, cardioplegic solutions with low Na content contribute to an optimized myocardial protection due to low calcium content and high buffering capacity.

**Methods:** Postoperative systemic Na concentrations of 40 adults undergoing valve surgery were analyzed retrospectively. Patients were randomly selected. Blood analyses were taken directly after surgery and on the first, third and fifth postoperative day (POD). In all patients HTK solution was routinely administered and not sucked off, so that the total volume ran into the body circuit.

Additionally, in neonates and infants (n=24) coronary venous samples were taken during 7-minute-cardioplegic-perfusion with HTK solution to measure Na, K and acid-base status. Contrary to the adult group in the pediatric group the cardioplegic solution was completely sucked off.

**Results:** Preoperatively, average blood Na content was 139mM/L, while immediately after operation Na content was  $145 \pm 3$ mM/L (mean $\pm$ SD). On POD1 the appropriate data (mean value) was 146mM/L, on POD3 141mM/L and on POD5 140mM/L. Mean ischemic time lasted for 82 min without cardioplegic reperfusions. In the pediatric group it could be demonstrated that the coronary venous Na content started to plateau after 3–5 min of cardioplegic perfusion. Neurological seizures never occurred.

**Conclusions:** Our results demonstrate that the systemic blood Na level never fell below the “critical” limit of 130mM/L. Since all low-Na cardioplegic solutions are isotonic, high-risk hyponatremia **with** hypoosmolarity cannot happen.

**Speaker:** Koen Kairet  
Medical Student  
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**« Tepid antegrade intermittent blood cardioplegia versus intermittent cross-clamping with Lidflazine in CABG »**

*Dina De Bock, Inez Rodrigus*

*Dept Cardiac Surgery, Antwerp University Hospital, Antwerp, Belgium*

**Background:** This study evaluated the myocardial protective effects of tepid antegrade intermittent blood cardioplegia (BCP) versus intermittent cross-clamping with Lidoflazine (ICC) in isolated coronary bypass surgeries. Until now, intermittent crossclamping with Lidoflazine, has proven to deliver good cardioprotection in our center.

**Methods:** Over a 24-month period, all patients with LVEF  $\geq 50\%$ , EuroSCORE II  $< 10\%$  and no severe systemic disease undergoing elective or urgent on-pump coronary artery bypass surgery were prospectively consecutive randomized to receive either tepid blood cardioplegia or intermittent cross-clamping with Lidoflazine.

**Results:** Altogether, 445 patients were included (ICC = 265, BCP = 180). The groups were comparable in all demographic variables, operative risk and distal anastomoses. Operation, CPB and cross-clamp time were significant longer in the BCP-group, due to the single clamping. The need for defibrillation after aortic declamping was higher in the ICP-group (ICC  $0.109 \pm 0.0192$  vs. BCP  $0.039 \pm 0.0145$ ;  $p=0.007$ ). cTnI levels were significantly lower in the BCP-group (ICC  $3.63 \pm 0.27 \mu\text{g/L}$  vs. BCP  $7.75 \pm 1.11 \mu\text{g/L}$ ;  $p < 0.001$ ). No statistically significant differences were seen concerning postoperative angina, myocardial infarction, stroke, mortality or non-fatal cardiac arrhythmias. There were significant more cases of new arrhythmias in the ICC-group ( $p=0.020$ ), as well as cardiac decompensation ( $p=0.037$ ).

**Conclusion:** Our results indicate that blood cardioplegia affords better myocardial protection than intermittent cross-clamping with Lidoflazine in low-risk patients undergoing isolated CABG.

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**10:50-11:20**  
**Coffee break**

**Speaker:** Marco C. Stehouwer, BSc, ECCP  
Department of Extracorporeal Circulation  
St Antonius Hospital,  
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**“Influence of design of oxygenator with integrated arterial filter on gaseous microemboli handling: A clinical comparison”**

**Preliminary results.**

*Roel de Vroege PhD.*

**Abstract**

The development of hollow fiber membrane oxygenators with integrated arterial filters enables reduction in membrane surface area and reduces priming volume.

Four contemporary oxygenators with an integrated filter concept are all designed differently. Besides difference in the design of the oxygenator module, also the concepts of the integrated filters vary strongly. The Affinity<sup>®</sup> Fusion oxygenator may be considered as a 25 µm filter because of the proprietary fiber winding process with an interlaced pattern removing particles and air. The Capiox<sup>®</sup> FX25 oxygenator is developed with a 32 µm screen filter surrounding the fibers of the oxygenator, capturing air and particles. The integrated arterial filter of the Inspire<sup>®</sup> M8F consists of a 38 µm screen filter and the housing is constructed around the oxygenator. The Quadrox<sup>®</sup> i Adult with integrated filter is constructed with a 40 µm screen filter housed on the outflow of the oxygenator. The effect of different design of oxygenators with integrated arterial filter on gaseous microemboli (GME) handling is unknown.

This study aims to demonstrate whether a difference in design of the oxygenators with integrated arterial filter influences the GME handling. Also detailed GME removal will be assessed, which may show difference in fractionation and distribution of GME size and there reduction.

Eighty patients scheduled for elective cardiac surgery are randomly assigned to be perfused with one of the four oxygenators with integrated arterial filter. The quantity and volume of GME will be accurately measured before and after the devices.

The data are currently being collected and the preliminary results will be presented.

**Speaker:** Seanne Azzolina MS, ECCP  
Department of Cardiovascular Surgery  
Maria Beatrice Hospital  
Florence, Italy  
GVM Care & Research  
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**“Evaluation of air handling capability in the new A.L.ONE oxygenator with integrated cascade arterial filter”**

*Andrea Cavalucci ECCP, Maria Cecilia Hospital Cotignola (RA), Italy. GVM Care & Research*

**Objective:** Oxygenator devices have evolved since their introduction into clinical practice more than fifty years ago. The standard A.L.ONE oxygenator, manufactured by Eurosets S.r.l. (Medolla, MO, Italy) was introduced in 2007, and is nowadays totally renewed with the innovative ‘Integrated Cascade Arterial Filter’. The purpose of this trial was to evaluate the air handling capability.

Gas Microemboli filtration performance was evaluated through air handling capability tests, as required by ISO 15675 and FDA guidelines.

**Methods:** Laboratory tests were conducted on 5 A.L.ONE oxygenators with Integrated Cascade Arterial Filter, setting a dedicated circuit. The circuit was primed with saline solution. The test was carried out with heparinized bovine blood with haemoglobin  $12 \pm 0,2$  g/L. Blood temperature was maintained at 24°C. Backpressure set, as per ISO15675 at 26,6 kPa (3,9psi)  $\pm 5$  % with maximum flow rate of 7 l/min. 30ml air-bolus was injected upstream the oxygenator in 30 seconds (flowrate=1ml/sec). Bubble counter clinical (GAMPT BCC200) was connected downstream the oxygenator to measure air bubbles over a period of 5 minutes from bolus injection. The test was repeated at blood flow rates of 2,31 l/min and 4,62 l/min (representing the 33%, the 66% the specified maximum rated flow rate) and, at maximum blood flow 7l/min. Results are expressed as a percentage efficiency of gross air removal. The test was repeated three times on each oxygenator and compared with 2 predicate devices.

**Results:** The A.L.One AF oxygenator showed the following results: 99,8% air reduction at 2,32 l/min; 99,5% air reduction at 4,62 l/min; 99,0% air reduction at 7,00 l/min.

The predicate device #1 showed the following results: 99,9% air reduction at 2,32 l/min; 99,8% air reduction at 4,62 l/min; 99,5% air reduction at 7,00 l/min.

The predicate device #2 showed the following results: 99,9% air reduction at 2,32 l/min; 99,8% air reduction at 4,62 l/min; 99,6% air reduction at 7,00 l/min.

**Conclusions:** The new A.L.ONE oxygenator, totally PC coated, with Integrated Cascade Arterial Filter demonstrated excellent capability to reduce gas microemboli (GME). Besides, performance regarding gas transfer, heat exchanger, membrane pressure gradient priming volume, remain unchanged. Further clinical experience needs to be evaluated.

**Speaker:** Marx Runge CCP, EBCP  
Chief perfusionist  
Paediatric Perfusion Division  
Skånes University Hospital in Lund, Sweden  
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**“Clinical Evaluation of Terumo FX05 with regard to Gaseous Micro-emboli Handling”**

*Ann-Katrin Krokström, Thomas Hansson*

**Objective:** Despite development of safer surgical, anaesthetic and perfusion techniques adverse neurological events still occur in up to 50% in the paediatric population referred to cardiac surgery. There are many contributing factors and the source is not fully described. Gaseous micro emboli (GME) are frequently described as a contributing factor in reduced neurological outcome. GME may originate from the components in the cardiopulmonary bypass circuit, perfusionist actions, from surgical manipulation or can be introduced by anaesthetic agents. We wanted to make a clinical evaluation of the Terumo FX05 oxygenator with integrated arterial filter with regard to GME handling, mainly to create a local model for further investigation in comparing different components.

**Methods:** 20 consecutive patients referred to first time cardiac surgery, were used in this evaluation, both cyanotic and acyanotic. All patients weighed below 8 kg. The Gampt BCC200 (Germany) micro bubble counter was used to detect the amount of GME, both numbers and volume were recorded. The measurements were done before and after the oxygenator (with integrated arterial line filter), the oxygenator purge-line was open at all times.

**Results:** We demonstrated a mean relative GME number reduction of 87, 9 %, (SD ±7, 2) and a mean relative GME volume reduction of 99, 8 % (SD ±0, 12)

**Conclusion:** The issue of GME is of utmost importance in the perfusion community, we demonstrated a vast reduction in both GME number and volume. When comparing with other studies this reduction is regarded as excellent.

**Speaker:** James Ferguson BS, MT (ASCP), CCP  
Chief Perfusionist  
Phoenix Perfusion Services, USA  
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### “Inflammatory response and mini-bypass circuits”

**Abstract:** Cardiopulmonary bypass has long been the gold standard for coronary artery bypass graft (CABG) surgery but it is known to cause deleterious effects resulting from an acute inflammatory response. These processes are both cellular and humoral in nature and are very unpredictable between patients, yet they significantly increase the morbidity. The pathways involved in this process are complex and very diverse but can be summarized as being contact activation leading to a whole body inflammatory response.

**Objective:** To reduce the associated inflammatory response seen during conventional extracorporeal circulation (CECC) several mini-extracorporeal circuits (MECC) have been developed by different manufacturers. The present study aimed at evaluating the inflammatory markers in both MECC's and CECC's.

**Method:** Tumor Necrosis Factor alpha (TNF- $\alpha$ ) and Complement C3a were sampled at baseline, post heparin administration, 15 minutes on cardiopulmonary bypass (CPB), and 15 min post protamine administration. Twenty patients were prospectively randomized to either the Conventional Extracorporeal Circuit (CECC) (n = 10) or the Resting Heart Mini-extracorporeal Circuit (MECC) (n = 10). All patients were similar with regards to pre- and intra-operative characteristics.

**Results:** Our results showed higher levels of TNF- $\alpha$  for post heparin and 15 minutes on CPB time points but no statistical difference resulted between the two groups. There was a statistical significant reduction of C3a (p = .02) in the use of the MECC system compared to the CECC system at 15 minutes on CPB.

**Conclusion:** The results indicate a level of protection with using the MECC compared to the conventional circuit with respect to the inflammatory response that is initiated by the CPB circuit.



**Speaker:** Adrian Bauer MS, ECCP  
Chief Perfusionist  
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**“Miniaturized extracorporeal circulation-current perspectives and future developments”**

*Bauer Adrian<sup>1</sup>, Schaarschmidt Jan<sup>1</sup>, Polychronis Antonitsis<sup>2</sup>, Erich Gygax<sup>3</sup>, Anastasiadis Kyraikos<sup>2</sup>, Carrel Thierry<sup>3</sup>, Hausmann Harald<sup>4</sup>*

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<sup>2</sup>AHEPA University Hospital, Thessaloniki, Greece, Dept Cardiothoracic Surgery

<sup>3</sup>University Hospital Bern, Switzerland, Dept Cardiothoracic Surgery

<sup>4</sup>MediClin Heart Center Coswig, Germany, Dept Cardiovascular Surgery

MiECC systems are closed ECC (Extracorporeal Circulation) systems including reduced amounts of priming and a biocompatible surface coating. Several studies analysed minimized ECC systems during the recent years (1-3). Within the last five years a couple of meta-analyses and literature reviews are published in which the overall consensus suggest that MiECC provides an advantage by 1) reducing the occurrence of postoperative arrhythmia (atrial fibrillation) and overall blood loss, 2) decreasing the transfusion threshold, and 3) decreasing the neurologic damage and mortality (4-7). The authors found several reasons and explanations for these findings: 1) reduced haemodilution, 2) less bleeding, 3) lower transfusion requirement, 4) shorter stay on ICU, 5) better renal function, 6) less neurological complications, and 7) a reduced inflammatory response. Despite these publications, MiECC has not yet found its way into contemporary clinical practice so far. Possible reasons for this situation could be manifold. Firstly, even at the early times of MiECC, this procedures were widely considered to be unsafe. After refinements of the technique and the implementation of safety features, minimized systems itself became as safe as conventional ECC systems (8). The second point contributing to the niche status of minimized systems is the lack of the scientific community in understanding and identifying from where the potential advantages and the better results could arise.

The scientific community has to formulate key questions and has to implement scientific multicentre projects in order to gain a better understanding of this new technology. A group of perfusionists and physicians took the initiative to organize in Thessaloniki, June 2014 the 1<sup>st</sup> International Symposium on Minimal invasive Extracorporeal Circulation Technologies in an attempt to create an international forum to stimulate the exchange of ideas and progresses in clinical application and research in this field ([www.miecc.org](http://www.miecc.org)). During this first congress an international Society (MiECTiS) was founded. This is an initial step to bring together, under a scientific interdisciplinary association, cardiothoracic surgeons, anaesthesiologists, clinical perfusionists and researchers. A consensus paper will be prepared, Founding Members and experts on the MiECC aiming to standardize the definition of MiECC technology and provide clinical practice guidelines for its use.

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**13:00-14:00**  
**LUNCH**



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**1400 – 14.30**

**Poster powerpoint presentations**

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**Speaker:** Dominique Hella, ECCP  
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**“*In vitro* comparison of 3 oxygenators during the priming procedure using pulsatile flow”**

D. Hella<sup>1</sup>, M.G. Lagny<sup>1</sup>, T. Amand<sup>1</sup>, F. Blaffart<sup>1</sup>, T. Desaive<sup>2</sup>, D. Frenay<sup>3</sup>, J.O. Defraigne<sup>4</sup>

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<sup>3</sup>Dept Biotechnology, University Hospital Liège, Belgium

<sup>4</sup>MD, PhD, Chief Dept Cardiovascular & Thoracic Surgery, University Hospital Liège, Belgium

**Keywords:** Cardiopulmonary bypass, pulsatile flow, pressure drop, gaseous microemboli, priming protocol.

**Objective:** Pulsatile flow is used routinely during cardiopulmonary bypass (CPB) in our department. The priming procedure is also performed under pulsatile flow in order to stress the material as much as possible before CPB. Unanswered questions remain about the risk of gaseous micro-emboli (GME) during pulsatile flow. Because of the occurrence of four undesirable events of bubbles development during the priming procedure we decided to test our practice with three different oxygenators used in our department.

**Methods:** Three oxygenators were investigated during priming with Plasmalyte in pulsatile flow: GME were counted by means of a GAMPT BCC200 bubble counter. We recorded different data: Pressure drop ( $\Delta P$ ), occurrence of negative pressure, spontaneous production of GME in the arterial line or GME production depending on different circumstances: negative pressure, bolus of air, high peak of flow and pressure.

**Results:** No GME was recorded with the three oxygenators, the Quadrox I, the Fusion and the Inspire during normal priming procedure. Only the stressed situations showed occurrence of air.

**Conclusions:** Pulsatile flow to prime a circuit is fast, safe and efficient. However our investigations showed that each oxygenator needs to be tested individually to evaluate its limitations.

**Speaker:** J.W.H. van Hees  
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**“Digital data recording during CPB, an indispensable tool for the perfusionist”**

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**Keyword: Data registration, Perfusion, Cardiac Surgery, Anaesthesiology**

During cardiac surgery procedures the use of a heart lung machine preserves oxygenation and circulation of blood, while allowing surgery on a non-beating bloodless heart. To control a heart lung machine the clinical perfusionist acts on a high medical and technical level to maintain cellular homeostasis of the patient in order to prevent organ dysfunction associated with extra-corporeal circulatory support. As such, the perfusionist forms together with the cardiac surgeon and anaesthesiologist, the vital collaboration triangle that importantly affects outcome after cardiac surgery. Each member of this triangle contains its own field of expertise, while optimal teamwork is warranted to ensure optimal results.

In our opinion, awareness of the impact of perfusion management on patient outcome can be increased using a digital data recording system of both patient and heart-lung machine related parameters. The recorded data can be used for incident case reporting, cardiac surgery team safety measures, periodical reporting on perfusion quality parameters and evaluation of perfusion guidelines and protocols.

In the Catharina hospital we have a 10-year experience with digital data recording. The last 10 months we are using the new Connect™ digital perfusion data recording system of Sorin Group. The transition has lead to implement perfusion data in the cardiac surgery process and made the department of extra-corporeal circulation visible in the hospital organization. Subsequently, it has lead to collective awareness of potential risks of using perfusion technology in cardiac patient treatment. Proper safety measures could be taken to improve the process of cardiac patient treatment, based on true data.

We can conclude that in various aspects of the cardiac surgery process the online and offline data management system has proven its value in the cardiac surgery process at the Catharina hospital.

**Speaker:** Anna Semenova MD  
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**“Neural Networks Models- The possible way to control the safety of perfusion”**  
*V. Agapov, V. Dolishniy, A. Zhukov, M. Shigaev*

**Objective:** The levels of CPB associated complications even after CABG still are not about zero. The rate of such complications as acute heart failure, renal failure, acute myocardial infarction, atrial fibrillation, respiratory and mental disorders is shown by different authors to be up to 30%. The aim of the work was to assess the neural network models ability to predict the CBP-associated post-op organ disorders.

**Methods:** The data of 267 patients from two independent cardiac surgery centers were used retrospectively to work out the neural network simulation. The patients were men and women from 42 to 73 years old ( $58,4 \pm 8,5$ ) with EuroSCORE risk =  $2,3 \pm 1,8\%$ . They all underwent the on-pump CABG. The neural network method was used for simulation. The data of routinely intra-operative monitoring parameters (blood gases, lactate concentration, arterial pressure and hematocrit) were used to train the neural network to predict the complications occurrence.

**Results:** The model was chosen as the best of more than 10.000 artificial neural networks (AUC = 0,986;  $p < 0,001$ ). The predictive validity of this network was assessed on the test sample of 90 patients prospectively and found out to be good with AUC = 0,839;  $p < 0,001$ .

**Conclusion:** The artificial neural network shown to have good predictive ability using during the CBP, the poor prognosis then can require changes in perfusion parameters.

**Speaker:** Laima Raliene MD  
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**“The Influence of mean arterial blood pressure during CPB on the rate of post-operative acute kidney injury in elderly diabetic patients after CABG surgery”**

*Edmundas Sirvinskas, Milda Svagzdiene, Judita Andrejaitiene*

**Objective:** Acute kidney injury (AKI) is a common and serious complication of cardiac surgery. Elderly patients with diabetes mellitus represent a population that is at additional risk. The aim of study was to investigate the influence of mean arterial blood pressure (MABP) during cardiopulmonary bypass (CPB) on the rate of postoperative AKI in elderly diabetic patients and to find out if relatively low MABP may impair renal function.

**Methods:** 60 CABG patients aged 70 years and elder with diabetes mellitus and normal preoperative renal function were randomly divided into two groups: in group I MABP was maintained lower than 60 mmHg ( $n=26$ ), in group II MABP was 63 mmHg and higher ( $n=34$ ). Patients' clinical data were evaluated during 48 hours after the surgery.

**Results:** In the group I MABP was 50.6-58.9 mmHg in the II group – 63.7-93.6 mmHg. Serum creatinine concentration did not differ between groups ( $124.2\pm 25.11$   $\mu\text{mol/l}$  vs.  $127.7\pm 50.66$   $\mu\text{mol/l}$  respectively,  $p=0.9024$ ). The mean urine output was slightly lower in group I during the first postoperative day ( $1439\pm 388$  ml vs.  $1931\pm 592$  ml,  $p=0.0412$ ) but there were no significant differences between the groups during the second postoperative day ( $2347\pm 933$  ml vs.  $2251\pm 795$  ml,  $p=0.8521$ ). The volume balance, serum potassium level and the need for diuretics did not differ between the groups. There were not any cases of AKI during the study period.

**Conclusion:** MABP of 50–60 mmHg during CPB is save enough and is not related to postoperative renal dysfunction in elderly diabetic patients after CABG surgery.

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**“Successful Use of a Miniaturized Pediatric ECMO System for LF-VV-ECCO<sub>2</sub>R in a Patient with an Acute Exacerbation of COPD failing NIV”**

*Salomé Castelo-Branco<sup>1</sup>, Nuno Costa<sup>1</sup>, Aida Neves<sup>2</sup>, Roberto Roncon-Albuquerque Jr<sup>2</sup>, Teresa Oliveira<sup>2</sup>, José-Artur Paiva<sup>2</sup>*

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**Introduction:** Low-flow venovenous extracorporeal CO<sub>2</sub> removal (LF-VV-ECCO<sub>2</sub>R) is an emerging therapeutic option for acute respiratory acidosis. In the present report, we describe the successful adaptation of a miniaturized pediatric ECMO system for LF-VV-ECCO<sub>2</sub>R in a patient with an acute exacerbation of chronic obstructive pulmonary disease (COPD) failing non-invasive ventilation (NIV).

**Case report:** A 67-year-old heavy smoker male patient with COPD (GOLD 4) was admitted to the Mixed General Critical Care Unit (Centro Hospitalar S.João, Portugal) under NIV for an acute exacerbation of COPD. On Day-2 tracheal intubation was performed due to persistent severe respiratory acidosis. On Day-3 weaning from IMV was not possible and LF-VV-ECCO<sub>2</sub>R was then initiated. Internal jugular vein cannulation was performed (19-Fr double-lumen cannula; Avalon Elite®) using the Seldinger technique. The LF-VV-ECCO<sub>2</sub>R circuit consisted in a standard pediatric heparin-coated ECMO circuit with a centrifugal pump (Rotaflow; Maquet-CP-AG) and a polymethylpentene oxygenator (Quadrox-iD Pediatric; Maquet-CP-AG). Circuit blood and sweep gas flows (pure oxygen) were kept between 0.7-0.9 and 0.5-5.0 lpm, respectively. Maximal ECCO<sub>2</sub>R was 156.7 ml/min. Systemic anticoagulation was maintained using unfractionated heparin to an APTT 1.5 normal. No circuit-related complications were observed. Active physical therapy and patient mobilization out of bed were possible during LF-VV- ECCO<sub>2</sub>R. Patient extubation, system removal, ICU discharge and hospital discharge occurred on Day-4, 7, 9 and 14, respectively.

**Conclusions:** Standard miniaturized pediatric ECMO systems can be used for LF- VV- ECCO<sub>2</sub>R in adult patients. This could be relevant given the wider availability of these systems compared with that of LF-VV-ECCO<sub>2</sub>R dedicated systems



**Speaker:** Paul Murphy  
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**« High Cost and High Acuity : Improving Outcomes and the Budgetary impact of ECMO with a unique Data management system »**

Extra Corporeal Membrane Oxygenation is being accepted as a viable option for some patients in respiratory failure. ECMO is costly in terms of human, equipment and financial resources.

A survey of ECMO coordinators in the United States showed that most data collection is done manually with paper records or excel worksheets. Paper records are routinely lost or not filled out and excel worksheets require transcribing information from the paper record.

A comprehensive database has been created to meet a variety of ECMO team needs. The solution is web based and easily accessed by an iPad or other hand held device as well as a desk-top computer. Basic patient information is collected, changes to support are recorded as they are made, the results of daily rounds are recorded and care plans saved. The equipment and disposables used are captured in the patient record. Staff patient contact events are noted to allow an estimate of direct costs. Teaching and instructional videos and manuals are accessible from the help tab.

Administrators have access to the dashboard to view the numbers and current condition of patients on ECMO. Customized reports can be created and used to satisfy reporting requirements. The solution can be customized to meet the needs of each individual program and clinic.

Accurate and timely information can result in better patient outcomes and financial control.

**Speaker:** Josh Blessing CCP  
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**“Quality Improvement: Prescriptive Cardiopulmonary Bypass Circuit Selection”**

**Purpose:** The purpose of this quality improvement initiative was to individually prescribe cardiopulmonary bypass circuits with the intent to reduce prime volumes, thereby reducing hemodilution, raising nadir hemoglobin levels and decreasing allogeneic blood transfusion exposures.

**Methods:** The effects of transitioning from one-size-fits-all to right-sized oxygenators and arterio-venous tubing loops were evaluated through a retrospective review of more than 5,000 perfusion records. A sizing algorithm and chart were derived from manufacturers' recommendations to create individualized “right-sized” extracorporeal circuits based on patient target blood flows. Target blood flows were calculated using body surface area, adjusted for body mass index ( $\approx 30 \text{ kg/m}^2$ ), and target cardiac indices were employed.

**Results:** Patients with similar body surface areas were supported with smaller circuits after the use of the right-sized algorithm and body mass index adjusted perfusion indices. Utilization of the algorithm and chart led to an increase in the percent of smaller oxygenators and arterio-venous tubing loops used ( $p = 0.01$ ). As a result, decreased priming volumes helped to increase hemoglobin nadirs ( $p = 0.01$ ) leading to decreases in donor exposures ( $p = 0.048$ ). Gaseous embolic loads remained low as circuit volumes and blood flow rates decreased.

**Conclusions:** Despite the generally higher costs of smaller circuits, savings in donor blood use and decreased exposure risks justify the use of right-sized circuits and blood flow rates. The use of the right-sized circuit algorithm by perfusionists can safely elevate hemoglobin nadirs during cardiopulmonary bypass, resulting in decreased allogeneic blood transfusions.

**Speaker:** Faisal Shehzad CCP (PAK)  
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**“Use of Blood Microplegia Technique and inclusion of Lidocaine in Cardioplegic Solution in adult patients undergoing coronary revascularization: an audit of 200 consecutive cases”**

*M.A.K Nuri MD (USA), M. Mubashir Mumtaz MD (USA), M.A.Mumtaz MD (USA), Ijazullah Khan ( Spain), A.U.Manan MS (PAK)*

**Key Words:** Microplegia; Cardioplegia; Lidocaine; Myocardial protection; Morbidity; Mortality

**Background:** Myocardial protection is of paramount concern during coronary revascularization. The use of systemic hypothermia, ventricular unloading and the use of cardioplegia can reduce basal metabolic consumption during electromechanical arrest by ninety percent. The composition, temperature, route of administration of cardioplegia is subject to considerable variation. Since the classical description of Buckberg, cold blood cardioplegia in a 4:1 dilution has become the standard in the United States. Interest in warm cardioplegia (37 C) was renewed due to its superior ability to reduce myocardial lactate production and early restoration of cardiac rhythm. However, investigators (Martin et al) noted an increasing incidence of neurologic events in the warm cardioplegia group which led to the impetus of tepid (28 C) cardioplegia by Hayashida N et al. Theoretically, combination of tepid cardioplegia and minimal dilution cardioplegia (mini cardioplegia as described by Calafiore et al) offers minimal dilution and maximal oxygen delivery. Inclusion of Lidocaine in Cardioplegic solution provides additional Myocardial protection. As it can directly influence cardiac electric and mechanical activities.

**Methods:** A total of 500 consecutive patients undergoing coronary revascularization at Tahir Heart Institute, Chenab Nagar were studied from January 2011 to December 2013. All patients received minimally diluted blood cardioplegia with lidocaine 2mg/kg (temp. 04-28 C) using antegrade and retrograde administration, with selective graft perfusion.

**Results:** The early mortality (hospital discharge) was 3% and IABP was required in 5% of patient with prolonged inotropic support. There was no incidence of any neurological event or renal insufficiency requiring dialysis.

**Conclusions:** These results demonstrate that the use of microplegia and lidocaine as an additive to microplegia is safe in adult patients who are undergoing coronary revascularization and significantly reduces the incidence of ventricular fibrillation after aortic unclamping and results in good in-hospital morbidity and mortality

**Speaker:** Robert Groom, MS, CCP  
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**“Addressing the Quality Problem- The Role of a Perfusion Registry and a patient Specific Care Plan”**

*for the Northern new England Cardiovascular Disease Study Group*

**Objective:** Research has shown that in medicine, as well as other industries, that quality improvement is effective and durable when it is focused at the front line where care is provided or goods and services are provided. The aim of this lecture is to demonstrate how a perfusion registry may be used to guide improvement efforts and how a specific perfusion care plan may be used to improve the delivery of care so that it more consistent and evidence based.

**Methods:** A regional perfusion registry was established in New England 1996. Approximately 70 process and outcome variables are collected on patients undergoing cardiac surgery with cardiopulmonary bypass. Registry data is collected locally by perfusionists, reports are disseminated and quarterly multidisciplinary quality improvement meetings are conducted to allow discussion of findings. A perfusion care plan was developed that uses patient characteristics to guide care to the patient. The care plan is consistent with AmSECT’s 2013 Perfusion Standards and Guidelines.

**Results:** Since its inception in 1996, the NNE Perfusion registry has enrolled 58,371 patients. The registry has been the foundation for understanding the association between perfusion processes and patient outcomes. Registry data has been used to evaluate regional adherence to published standards and to promote more consistent delivery of care that is based on the patient’s characteristics.

**Conclusions:** The conduct of CPB can be effectively improved by providing front line providers with perfusion registry data for assessing current practice and guiding improvement work. A perfusion care plan facilitates delivery of consistent evidence based care to the patient.

**Speaker:** Luc Puis ECCP  
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**“International Survey on Perfusion Practice”**

*Ian Johnson, Tim Jones*

**Objective:** The European Perfusion Registry is an international quality improvement organisation that is linked to the EACTS QUIP initiative. In order to detect variability in adult perfusion practice, to enable us to compose a comprehensive dataset for a registry, and to create awareness, we conducted an online, international perfusion practice survey.

**Methods:** A questionnaire of 54 questions was presented online. 274 Perfusionists from around the globe have participated, although only 182 finished the survey until the end. Participants mainly were more than 20 years active in perfusion, came mainly from Europe, UK and North-America, were almost all certified and performed between 100 and 200 cases per year.

**Results:** Perfusionists could answer to a range of questions, dealing with topics on perfusion practice. Topics were divided into the pre-, peri-, and postoperative period and also about participation in databases and quality improvement projects. The answers provided by the participants allowed us to fine-tune a dataset that is developed to create an international perfusion registry in order to support the quality improvement program. It will allow us to create improvement tools on different subjects such as blood transfusion, patient-tailored perfusion, glucose management, cerebral and myocardial protection, and the impact of perfusion on specific patients.

**Conclusions:** The conduct of an international perfusion practice survey is an instrument that allowed us to detect variability in perfusion practice and will create awareness around a quality improvement program. The questionnaire will be repeated in order to gain more insights.

**Speaker:** Leen Vercaemst ECCP  
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### **“Roles and Responsibilities of European Perfusionists in ECLS & EuroELSO”**

Since its first clinical use in the 1950s, the set-up and management of cardiopulmonary bypass (CPB) during cardiac surgery has been the responsibility of the perfusionist. In contrast, when this technology left the operating room from the 1970s onwards to provide longer term support (ECLS), there was no longer worldwide uniformity or consensus concerning clinical roles or responsibilities.

To provide support to institutions delivering ECLS, the Extracorporeal Life Support Organization (ELSO) was founded in USA in 1989. ELSO established an observational registry, offers a platform supporting education, training & research, provides practice guidelines and organizes international ECMO meetings. Broad multidisciplinary participation was always strongly encouraged by ELSO, but perfusionists' involvement has been limited in USA, illustrated by little academic input in research, publications and meetings as well as local 'ECMO specialists' or 'ECMO coordinators' being more commonly nurses or respiratory therapists.

For a longtime, there were only small numbers of ELSO registered centers across Europe. Therefore, in 2011, a European chapter of ELSO –EuroELSO - was founded, trying to offer more relevant support and a platform for European ECMO centers. Similar as in the North American ELSO, a perfusionist liaison position was established in 2014 to defend the vision and ambition of European perfusionists and to guard and ensure their desired level of involvement.

As it was unclear how intensely perfusionists around Europe are or aspire to be involved in ECLS, a survey was sent to all cardiac surgery centers within Europe. This survey inquired about the roles and responsibilities of perfusionists in the local ECMO programs, as well as their interest and ambition to participate in EuroELSO.

Preliminary analysis of this survey reveals that European perfusionists generally play an important role in local ECLS programs, but also that many ECLS programs still lack involvement but not interest in EuroELSO. The main reason for this limited involvement seems to be the lack of information about EuroELSO and its registry, as well as a lack of awareness concerning its value in their daily practice.

It's clear that European perfusionists should be informed more about the benefits of such organization and realize its registry is an important tool to build up evidence and experience, also permitting us to benchmark our outcomes and if necessary redirect and improve our practice.

Especially now, with the booming applications of ECLS, efforts should be done to upgrade the quality of existing and new ECLS programs and it's the responsibility for all those actively involved in these programs to screen and encourage the possible initiatives to achieve this.

#### *References*

[www.else.org](http://www.else.org)

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### **“Roadmap to European Recognition of the Perfusionist Profession”**

Since 1991, the *European Board of Cardiovascular Perfusion* (EBCP) is concerned with establishing common criteria for perfusionists' accreditation and certification in Europe. Today, more than 2.000 perfusionists are certified by EBCP and close to 20 perfusion schools are accredited. EBCP is the only institution in Europe concerned with monitoring standards of the training process for cardiovascular perfusionists.

In 2005, the EU-Directive 2005/36/EC on the recognition of professional qualifications was adopted, establishing the automatic recognition in some selected professions. All other professional qualifications fell into the 'General System', which worked by comparing the level of a professional's attainment with the level required by the host Member State and by imposing appropriate compensation measures, such as adaptation periods and aptitude tests. In 2011, the EU Commission proposed a modernisation. Directive 2013/55/EU introduces solutions facilitating recognition of professional qualifications between Member States, as well as provides a basis for the review of barriers of access to professions in Member States. The key features of the modernised Professional Qualifications Directive are: Common training principles; Creation of the European Professional Card; Modernisation of the definition for harmonised minimum training requirements; Language skills; Training abroad; Alert mechanism.

EBCP will in the near future follow a strategy including elaboration of a report on the present situation of the perfusionist profession in Europe; contacting National Coordinators for the recognition of professional qualifications; visiting the EU Commission; setting up a common training framework and a common training test. With this plan of action, EBCP hopes that the Perfusionist profession can be established and recognized officially within the EU.



**15:45-16:15**  
**Coffee Break**

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**16:15-16:35**

**Medos sponsored session**

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**Speaker:** Dr André Ruffer  
Erlangen, Germany

**“Individual solutions for individual situations: extracorporeal life support with the deltastream® DP3 diagonal pump »**

**Speaker:** Kurt Staessens  
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University Hospital Brussels  
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kstaesse@me.com

**“Patient tailored oxygen delivery: which determinants to consider”**

*Kurt Staessens, Luc Puis, Tine Ghysens, Kenny Van Zwam, Mark La Meir*

**Introduction:** Adequate oxygen delivery to the organs and tissues of the cardiovascular patient is the primary principle of conducting patients on cardiopulmonary bypass (CPB). The ‘golden standard’ for calculation of flow is 2,4 l/min/m<sup>2</sup> BSA. The calculation of BSA is based on a one-hundred-year-old formula of Dubois and Dubois<sup>1</sup>, thereby neglecting the different factors that determine adequate flow (adipose tissue, haemoglobin, temperature, anaesthesia ...).

Hypo-perfusion and the resulting hyperlactatemia are well described and quantified, as well as their consequences.<sup>2,3</sup>

**Speaker:** Mathias Allegaert RN  
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**“When do we need to change a membrane oxygenator in veno-venous ECMO?”**  
*Vlaeminck R, Wouters J, De Wolf J, Rodrigus I*

**Objective:** Extracorporeal membrane oxygenation (ECMO) is a well-established method for long-term support in respiratory insufficient patients. Current literature always focuses on clinical results and outcome parameters, and merely emphasizes on the technical evolution of the membrane oxygenator over time. We wanted to evaluate our current practice for oxygenator change-outs.

**Methods:** We performed a retrospective study of all patients supported with veno-venous ECMO for respiratory failure between January 2008 and June 2013. Technical data from the circuitry and components were collected to analyze the evolution over time.

**Results:** Thirty four patients were supported with VV ECMO. In those patients we used 66 membrane oxygenators (MO), with a mean of two oxygenators per patient. The mean lifetime of an MO was ten days (SD 5 days). The outlet oxygen tension of the MO decreased with a daily factor of 3.03 mmHg ( $y = -3.03 * x + 421.43$ ). The total oxygen delivery decreased 7.15 ml/min per day ( $y = -7.15 * x + 857.68$ ). The carbon dioxide removal diminished with an index of 0.01 each day ( $y = -0.01 * x + 1.07$ ). The resistance increased daily with 0.12 mmHg/l ( $y = 0.12 * x + 6.38$ ).

**Conclusion:** The impact of long-term support on the components of an ECMO is determined by multiple factors, which makes it difficult to recommend an oxygenator change-out for decreased performance. The only clear cut-off to advice a change-out is an acute increase of the resistance over the membrane.

## **Notes, Phone Numbers and Email Addresses**

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(Alphabetical order)

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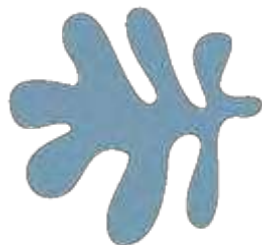
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