Welcome to ISICEM 2017!

With great pleasure, we welcome you to Brussels for the 37th edition of the International Symposium on Intensive Care and Emergency Medicine.

Within the coming days, we will welcome over 6,000 participants to share in the latest and greatest explorations of a wide array of topics, spread between lectures, tutorials, workshops, round tables, debates, ‘meet the expert’ sessions and beyond.

This morning’s opening session, held in the impressive Henry Le Bœuf auditorium, marks the only session at the conference where we can all join together in one room, before the expansive concurrent sessions begin. Thus I do hope to see you there as we dive straight in with a report from the Round Table conference on ECMO, presented by Daniel Brodie and Marco Ranieri, followed by five fascinating reports that will be published simultaneously in NEJM and JAMA.

And then there is so much more to come! Spanning 11 main rooms, there are literally hundreds of presentations to take-in each day at the congress, concentrating on the key issues important to all of us.

Finally, I would like to sincerely thank our sponsors for their continued support. Technological developments have always been a cornerstone in the advancement of intensive care and emergency practice, and as such we are honored to collaborate with our partners in industry once again.

I wish you an enlightening and stimulating meeting, and look forward to seeing you all during this evening’s cocktail session, held in the scientific exhibition area.

Jean-Louis Vincent
ISICEM Chairman
Professor of intensive care medicine
Dept of Intensive Care, Erasme University Hospital, Université Libre de Bruxelles
President of the World Federation of Societies of Intensive and Critical Care Medicine

A quest for better monitoring outside ICU ........... 4
The ICU is big business .................. 5
How many ICU doctors do we need? ............ 10
ECCO₂ removal: are we ready? .......... 14

The role of advanced hemodynamic monitoring in the ICU
Edwards Lunch Symposium
Tuesday, March 21 – 12.30-13.30 – Gold Hall

Pre-registration required on www.edwards.com/cu/ISICEM2017 or on Edwards booth

Edwards, Edwards Lifesciences and the stylized logo are trademarks of Edwards Lifesciences Corporation. © 2017 Edwards Lifesciences Corporation. All rights reserved. 1011738/02-17/CC
Edwards Lifesciences • Route de l’Etrat 70, 1260 Nyon, Switzerland • edwards.com
ECMO takes the spotlight on Tuesday

T his morning’s Opening session, held in the Henry Le Bœuf auditorium, will feature a Report of the Round Table conference on ECMO, delivered by Daniel Brodie and Marco Ranieri. An always-popular and fascinating account, the Report will be split between both speakers as they relay its highlights for the audience.

The Report will mark the first of a number of ECMO-centric talks throughout the Tuesday program, several of which will be presented by Dr Brodie (Associate Professor of Medicine at Columbia University Medical Center/New York-Presbyterian Hospital, New York, USA).

Speaking to ISICEM News about the pressing topics in ECMO, Dr Brodie talked primarily about his presentation on ECMO research, in which he will argue ‘a revolution is coming’. “The use of ECMO has grown exponentially in the last decade, and has surely outpaced the evidence for its use,” he said.

“While there is now an abundance of evidence being generated by investigators throughout the world, central questions of efficacy and risk-to-benefit ratio in a variety of settings have yet to be answered. Of course, the challenges to conducting research in ECMO are considerable. Not least because there is little standardization in the way ECMO is conducted, and device performance can be specific to the device used in any given center.”

As Dr Brodie detailed, the influenza A (H1N1) pandemic in 2009 was a seminal event spurring the interest in adult ECMO – firstly for respiratory failure, then bleeding into the cardiac ECMO arena as well. The CESAR trial was also crucial, which compared conventional ventilation and ECMO in a large patient population, and has since been recognized as a significant contributor to the increased utilization of ECMO in clinical practice.

“It was a tremendous undertaking,” said Dr Brodie. “Yet, as a pragmatic trial, the lack of standardization of mechanical ventilation practices in the control group, makes the results difficult to interpret. That said, at the very least, it suggests that ECMO (as practiced a decade ago) was relatively safe, and that patients may benefit from transfer to centers with expertise in managing severe acute respiratory failure.”

To effect ‘revolution’ in ECMO research, as alluded to in his presentation title, Dr Brodie emphasized the importance of creating top-quality evidence base for ECMO,” said Dr Brodie. “Even more importantly, the key to the future of ECMO research is collaboration among such centers,” he added.

Such collaboration is fostered intently by the International ECMO Network (ECMONet), an organization dedicated to supporting high-quality, high-impact research in the field. With a vision to address the fragmented research across centers, countries and continents, ECMONet aims to prioritize and facilitate specific studies and trials for the greater good of ECMO.

“ECMONet is currently engaged in multiple ongoing and upcoming studies, including several randomized controlled trials, in the hope of contributing meaningfully to the evidence base for ECMO.”

Daniel Brodie

“ECMONet is currently engaged in multiple ongoing and upcoming studies, including several randomized controlled trials, in the hope of contributing meaningfully to the evidence base for ECMO.”

Daniel Brodie

“Even more importantly, the key to the future of ECMO research is collaboration among such centers,” he added.

Such collaboration is fostered intently by the International ECMO Network (ECMONet), an organization dedicated to supporting high-quality, high-impact research in the field. With a vision to address the fragmented research across centers, countries and continents, ECMONet aims to prioritize and facilitate specific studies and trials for the greater good of ECMO.

“ECMONet is currently engaged in multiple ongoing and upcoming studies, including several randomized controlled trials, in the hope of contributing meaningfully to the evidence base for ECMO,” said Dr Brodie. “Other organizations will clearly contribute significantly as well, and collaboration and coordination between such organizations would create the ideal conditions for success in the coming years.”

Dr Brodie will present ‘Research in ECMO: A revolution is coming’ – as well ‘ECMO for severe ARDS … and less severe ARDS’ – during this afternoon’s ‘ECMO’ session, held at 13:45 in the Gold Hall.

References
New Therapeutic Options for Combined Pulmonary and Renal Failure

Theory and Practice

Tuesday 21 March 2017
12:30–13:30
Salle M, BOZAR

An increasing body of evidence points to a complex and deleterious overlap between pulmonary and renal failure in critically ill patients. At the symposium, experts will examine the mechanisms that underlie this inter-organ crosstalk and the rationale behind devices for extracorporeal CO₂ removal (ECCO₂R) – intended to limit the potential harmful effects of mechanical ventilation, and manage hypercapnia and respiratory acidosis. With a focus on how ECCO₂R may be coupled with continuous renal replacement therapy (CRRT) systems for specific lung-renal support, the experts will share their clinical experience, and provide practical guidance for setting up and running ECCO₂R on the Baxter Prismaflex system.

Co-Chairs:
Marco Ranieri, Italy
Arthur Slutsky, Canada

Programme:

Pulmonary-Renal Crosstalk: Incidence, Patho-Mechanisms and Therapeutic Options
Stefan John, Germany

Practical Aspects of Low-Flow ECCO₂R with a CRRT Platform
Alain Combes, France

Panel Discussion
We need better monitoring systems outside the ICU

This afternoon’s session on ICU admission looks at key elements in critical care resource utilization. Themes include capacity strain, triage, and mortality prediction models.

Frederic Michard (MiCo, Chemin de Chapallaz 4, Denens, Switzerland) will discuss the theme of monitoring systems outside the ICU. In an interview with ISICEM News ahead of the session, he set out his ideas.

Why monitoring patients outside the ICU?
Because recent studies have highlighted the fact that many patients die in the wards, in particular after surgery. In the large EUSOS study, 73% of patients who did not survive their hospital stay for major surgery died in the wards. It has been called ‘failure to rescue’ and, according to Ghaferi et al., may explain why hospitals with comparable postoperative morbidity rates may have very different mortality rates. When patients develop postoperative complications, the ability to detect clinical deterioration early is susceptible to make a difference. Many studies have shown that most patients start to deteriorate hours before rapid response teams or medical emergency teams are called for rescue or ICU transfer. Early detection with continuous monitoring gives us the opportunity to be more proactive.

Is there any evidence that monitoring patients in the wards is useful to improve outcome?
Yes, there are already several studies published and more are coming soon. Taenzer et al. continuously monitored SpO₂ and heart rate in 2,841 orthopedic patients (many of them receiving opioids) and decreased rescue events and ICU transfers. Brown et al. continuously monitored heart rate and respiratory rate in 2,314 medico-surgical patients and decreased the number of calls for cardiac arrest and hospital length of stay. Bellomo et al. monitored heart rate, respiratory rate, SpO₂, blood pressure, and temperature to calculate automatically an early warning score (EWS) in 8,688 floor patients, and decreased mortality in patients rescued by a rapid response team.

Why can’t we simply use the monitoring systems we are using today in the operating room and in ICUs?
First because these systems are bulky and expensive, and we need to monitor a large number of patients. Second because early mobilization is a priority after surgery, so we need mobile monitoring solutions for ambulatory patients. Third, because the nurse to patient ratio is much lower in the wards than in ICUs. It would be impossible for a nurse to deal with multiple variables and alarms from 10 or 20 patients at the same time.

What solutions can we envision?
Thanks to digital innovations, we can now monitor vital signs with wireless and wearable sensors. Thanks to computing power and smart algorithms, we can now filter artifacts and prevent alarm fatigue. Thanks to data fusion, we can now create and display automatically warning scores or wellness indexes able to inform nurses when a patient is deteriorating. Data fusion is not only the aggregation of several variables to create a new one, but the ability to take into account trends, which are often more informative than absolute values. For instance, knowing that the blood pressure is decreasing and the respiratory rate is increasing is useful, even if the absolute values or numbers are not yet outside normal ranges. The digital revolution is transforming medicine, and physiologic monitoring should dramatically benefit from these innovations.

Dr Michard presents during this afternoon’s session ‘ICU admission’, in the Lippens Room from 13:45.

References
Is intensive care becoming a business?

This afternoon’s ‘Quality of care’ session will explore a number of nuances in intensive care management, improvement and logistics, with speakers presenting their views on decision making, ‘human factors’, mechanical ventilation improvements, and interpretation of mortality rates and severity of illness scores.

Closing the session will be Andrew Shaw, Professor and Executive Vice Chair at the Department of Anesthesiology, Vanderbilt University Medical Center, Nashville, TN, USA, who will reason that intensive care delivery is becoming a business.

Professor Shaw, and colleague Adam Kingeter – Assistant Professor of Anesthesiology at Vanderbilt – shared their joint perspectives with ISICEM News ahead of the session, giving all in attendance a glimpse of the key business approaches that may be fundamental steps in improving the world of intensive care.

Calling upon lessons from the business world to effect change in the ICU has been proposed by several authors (e.g.1), with the underlying argument that business can lead in better understanding of quality improvement. Could you comment on the way the ICU has changed/is changing, and how important the ‘business’ aspect is?

Health care in the United States is big business and growing. In 2015 alone, approximately $3.2-trillion was spent on health care, accounting for 17.8% of the U.S. Gross Domestic Product. The steady increase in healthcare spending is widely recognized as being unsustainable, and consequently the U.S. is in the middle of significant reforms in how health care is delivered and financed.

Considerable attention is being given to the reforms taking place in the health insurance sector; however, concurrent reforms in how providers and hospitals are paid for providing care have the potential to shape health care delivery in even more dramatic fashion. Traditional fee-for-service reimbursement is being abandoned in favor of so-called ‘value-based’ reimbursement in which provider payment is tied to outcome and quality measures. Unlike the highly partisan debate surrounding health care insurance reform, the shift towards value-based reimbursement enjoys broad bipartisan support, and is likely to continue separate from other areas of reform.

Critical care in the United States is particularly expensive, and resource intensive, and represents a potential area of increased financial risk for institutions in the post fee-for-service era. Therefore, it is important for intensivists to make their voice heard and participate in the ongoing debate during this transition, lest we lose our seat at the table and appear on the menu.

Can you tell us more about the ‘Physician value-based payment modifier’ system to link reimbursement and care value?

Value-based health care reform represents a continuum in which financial risk to providers for the delivery of care is progressively increased as reimbursement moves further away from traditional fee-for-service. A great example of this is the Physician Quality Reporting System (PQRS) initiated by the Centers for Medicare and Medicaid Services (CMS) in 2006. Initially an incentive program in which providers were rewarded for voluntarily providing information to CMS on certain quality and process metrics, the program evolved into a mandatory reporting system in which providers were penalized if they did not report data to CMS. Initially providers were not held accountable for their performance on the reported metrics. However, in 2015 the physician value-based payment modifier system was created and CMS began tying provider payments to performance on the reported metrics. The progression of PQRS from a voluntary reporting system that incentivized better performance into a payment system that both rewarded high quality performers and penalized low quality performers is just one example of how value-based health care reform moves along the continuum.

Progression along this continuum requires providers to have a better understanding of risk management at the population level for the institution, and better data analytics such as outcome measurement and tracking.

Are technological advancements, ageing populations and better therapeutic access making ICU care delivery more complex?

The aging U.S. population combined with the increase in chronic medical conditions such as obesity and diabetes mean patients are, on average, getting more complex. In caring for these patients intensivists must choose from a perpetually expanding array of therapies, often with little evidence to guide their decision making. In the background of this increasingly complex clinical picture, significant reforms to how care is reimbursed add additional pressure on intensivists when deciding what to do for their patients.

It has been reported that U.S. spending in the ICU is in far excess of global norms, but without clear clinical benefit. Does this trigger alarms that something needs to be done? Are we learning more about when to intervene (and when to

“Health care in the United States is big business and growing. In 2015 alone, approximately $3.2-trillion was spent on health care, accounting for 17.8% of the U.S. Gross Domestic Product.”

Andrew Shaw and Adam Kingeter
Is intensive care becoming a business?

Continued from page 5

spend), and when to hold back?

As intensivists, we often find ourselves as the last line of defense for very complex patients in the health care system. Frequently we are asked to ‘do everything’ we can, and the increasing capability and availability of technology to support organ function gives us the opportunity to intervene in these patients like never before. The combination of increasingly complex patients and increasingly capable technology has blurred the line between therapeutic intervention and futile intervention.

This often leads intensivists who are faced with decreasing odds of a meaningful recovery to get caught in a downward spiral of providing increasingly expensive and invasive care that ultimately does not help. We as a specialty are beginning to appreciate the astronomical cost associated with this sort of care delivery, not just in terms of dollars spent, but in the emotional toll exacted on providers as evidenced by the high incidence of intensivist burn out.

How can a business model be applied to such heterogeneous patient populations as the ICU?

Many of the same principles that are key to successful manufacturing processes are able to be translated into ICU care delivery. For example, there is significant attention being paid to the standardization of practices for certain procedures and diagnoses with the use of clinical pathways or care bundles.

Proponents point to the potential of pathways to decrease unnecessary variance in care delivery and significantly curtail wasteful practices, while critics argue that patients are far too heterogeneous and complex for such endeavors to work.

One could suspect that the efficacy of these processes will vary according to the performance level of the institution implementing them; high-performing institutions likely already have fairly standardized and efficient practices and thus will derive little added benefit, however lower performing institutions may see significant improvement in outcome and process measures.

Do single-specialty ICU centers make better business sense than multi-specialty? It may be a simplified analogy, but single-product businesses can often out-bid their multi-product competitors?

There is evidence in the literature that in terms of mortality and ICU length of stay, general ICUs can often out-bid their multi-product counterparts. Of the opportunities to improve quality and control costs, are there strategies or ideas that might result in the most significant improvement, and therefore could be easier to try in the first instance? For example, is the ‘80/20’ rule from business relevant – i.e. that roughly 20% of actions could affect 80% of overall success?

We do believe the ‘80/20’ rule can be applied to the delivery of ICU care, as it has successfully been applied elsewhere in health care. Identification of these ‘vital few’ strategies requires significant investment on the part of institutions to identify outcomes to be affected, and then map in detail processes which lead to those outcomes.

The time-driven activity-based costing approach is one such method that has been successfully used to aid institutions in such endeavors. However, this leads to institution-specific solutions which may not be widely translatable. Given the complexity of modern health care delivery, this is not terribly surprising and may ultimately limit the broader application of institution specific value improvement initiatives.

One of the key facets of business is ensuring products are benchmarked favorably against others. How is this possible in the ICU?

From our perspective, this is most important question facing value-based healthcare reform: what defines quality? Patients and physicians often have different opinions as to what constitutes a ‘successful’ therapy. Under current value-based payment schemes, quality is defined according to metrics set forth by the payer or insurance company. Moving forward, we need to engage with our patients to determine what constitutes an acceptable quality metric when determining value.

An often overlooked component of improving ICU value is simply preventing patients from needing ICU care; too often patients are admitted to the ICU as a reactionary escalation of care after earlier opportunities to intervene have been missed. There is great potential in leveraging big data to develop predictive models that can identify not only which patients are high-risk, but also patients in the early stages of decompensation. Using such models would enable intensivists to provide critical care in a timely manner and potentially stave off or limit further escalations in care. In essence, this would allow intensivists to bring critical care out of the ICU and add significant value to the health care system.

With a more ‘business’-oriented approach, it is surely inevitable that revised regulation, targets and expectations from payers are enforced.

Agreed, and this gets back to what we were saying about how important it is for us as intensivists to stay involved and engage with our patients so that we are part of the dialogue moving forward.

References


Is early goal-directed therapy still alive?

Early goal-directed therapy (EGDT) for the treatment of septic shock was proposed for the first time in 2001 with the Emanuel Rivers (et al.) trial – a study of protocolized EGDT versus usual care in 263 septic patients.1 The results of the trial led to a very high adoption of EGDT in hospitals all over the world: “The Rivers trial came after a long period of negative RCTs in the field of critical care,” Daniel De Backer (CHIREC Hospitals [Université Libre de Bruxelles], Brussels, Belgium) told ISICEM News ahead of a presentation this afternoon that will ponder if EGDT is still worth pursuing.

“Basically, it surfed on the basic physiologic principles of shock (inadequacy of tissue perfusion to sustain basal O2 need in the tissues), suggesting that trying to sustain oxygen delivery at a high level could limit the development of tissue hypoperfusion and organ dysfunction. In the past, several trials have tried to augment oxygen delivery and consumption, but have failed, at least in part due to the goals (oxygen consumption in particular), means (especially sometimes very high doses of inotropic agents) and timing of intervention (too late).

“The Rivers trial had very strong positive results that may justify the enthusiasm for the concept. However, there were several criticisms.” said Professor De Backer.

Commenting on the challenges in any study for EGDT, Professor De Backer continued: “Admittedly it is very difficult to conduct such trials when the concept is known, potentially applicable by physicians, and when interventions are freely available.

“There are two intrinsic risks. First, there is a risk for selection bias – physicians randomizing only the less severe patients, and treating the most severe. Second, physicians may be practicing EGDT even without measuring the target variable (ScvO2), rather basing their practice on other variables that provide similar information (e.g. lactate, indices of perfusion). It is not a trial comparing a drug to a placebo, i.e where physicians do not have access to the drug, nor do not know whether or not the patient is receiving the drug.”

Taking this all into account, what can we say of the key question: is EGDT still alive? “The EGDT package, as presented in the Rivers trial, is far from perfect and has clear limitations,” said Professor De Backer.

Indeed, as he detailed in his recent paper with Jean-Louis Vincent5, the results of the Rivers trial have not been invalidated for patients with high disease severity and low ScvO2 (as they were not included in the recent randomized trials). Thus, for now, EGDT may still be beneficial in the most severely-ill patients, and may be of particular use in the hands of less-experienced staff, who may benefit most from simple, protocolized care.6

References
Study Investigates the Impact of Masimo Continuous SpHb® and PVI® on Anesthesia-related Mortality

Abstract presented at the American Society of Anesthesiologists’ (ASA) Annual Meeting in Chicago: In the study, researchers at Hôpital Dupuytren, part of the Centre Hospitalier Universitaire (CHU) of Limoges, France, investigated the clinical utility of noninvasive, continuous hemoglobin (SpHb®) and PVI® (a measure of the dynamic changes in perfusion index that occur during the respiratory cycle), two Masimo rainbow SET™ measurements. The researchers’ goal was to determine, at the scale of a whole hospital, improvement in mortality and transfusion needs.

In the prospective, single-center, observational study, Professor Nathalie Nathan and colleagues reviewed two sets of patients over two eleven-month periods, before (2013) and after (2014) implementation of a clinical algorithm to guide transfusion and fluid administration. Anesthesiologists, nurses, and residents were trained on the implementation of the clinical algorithm. Masimo Radical-7® Pulse CO-Oximeters® were installed in all operating rooms, recovery rooms, and intensive care units. The Radical-7s were connected to Masimo Patient SafetyNet™ for trend data collection. All surgical patients presenting to the hospital were accepted, with these exceptions: EMT, ophthalmology, odontology, radiology, neurosurgery, and patients less than 18 years of age.

The study included 18,867 patients (in the two groups), of whom 3450 underwent SpHb and PVI monitoring via Radical-7. The patients in the monitoring group received vascular filling with crystalloids or blood, according to the clinical algorithm. Demographic, anesthesia, surgical, and transfusion data were collected in electronic medical records. The researchers compared the percentage of patients in the monitored group who received transfusions within the first postoperative 48 hours to the percentage in the non-monitored group. They also compared mortality rates for each group at 30 days and 90 days following surgery.

Using the cox-proportional hazard model, the researchers found that the patients in the group monitored with SpHb and PVI had a 30% reduction in mortality at 30 days and a 25% reduction in mortality at 90 days. The proportion of patients receiving transfusions did not change significantly between the two groups (7.9% in 2013, 8.5% in 2014, \( p = 0.1323 \)), nor did the number of blood units transfused within 48 hours (3.4 ± 2.7 in 2013, 3.4 ± 2.0 in 2014, \( p \) less than 0.05). However, in non-cardiac surgery, patients were transfused sooner in the operative or recovery room (72.9% vs 56.1%, \( p = 0.0002 \)).

The researchers concluded that “Monitoring SpHb and PVI integrated in a vascular filling algorithm allowed earlier transfusion and reduces mortality at a scale of a whole hospital with different clinical practices (and practitioners) and unselected patients.”

“Access to continuous monitoring of Hb levels and fluid responsiveness has changed the way we address blood and fluid management. By lowering inadequate fluid filling at the beginning of anesthesia, we are able to avoid diluting patients inadequately and this data helps us to guide precisely the amount of fluids or blood that must be given to patients on a case by case basis,” stated Professor Nathan, Head of the Department of Anesthesiology at CHU Limoges. “Patients are transfused earlier when needed and hypovolemia is precisely treated with crystalloid. These two facts may explain the decrease in mortality at one and three months that we observed in this study. We strongly believe that surgeries of intermediate severity such as hip or knee replacement procedures as well as severe surgery will benefit from this technology. Because it is easy to use, quick to administer, provides continuous data,
and does not harm the patient in any way, it is more applicable to common clinical practice.”

Joe Kiani, Founder and CEO of Masimo, commented, “We have created technologies that have been shown to save babies’ eyesight, screen for CCHD in newborns, and reliably monitor patients in post-surgical wards, but this is the first time a study has shown that one of our technologies has such a big impact on mortality. Needless to say, we are excited and thank Dr. Nathan for her and her colleagues’ research. We look forward to more studies like this that investigate the impact of SpHb and PVI on other patients at other hospitals, and hope to see similar results.”

SpHb monitoring may provide additional insight to the directional trend of hemoglobin between invasive blood samplings – when the SpHb trend is stable and the clinician may otherwise think hemoglobin is decreasing; when the SpHb trend is rising and the clinician may otherwise think hemoglobin is not rising fast enough; or when the SpHb trend is decreasing and the clinician may otherwise think hemoglobin is stable. SpHb monitoring, accompanied by laboratory diagnostic testing, may thus help clinicians make more timely and informed decisions, and has been shown to help clinicians provide more timely blood transfusions and help reduce blood transfusions in cases such as neurosurgery and orthopedic surgery.

*The use of the trademark SafetyNet is under license from University HealthSystem Consortium.

**Clinical decisions regarding red blood cell transfusions should be based on the clinician’s judgment considering, among other factors: patient condition, continuous SpHb monitoring, and laboratory diagnostic tests using blood samples.

References
The number of patients cared for by a single intensivist is not standardized, but new data suggests variations in patient-to-intensivist ratio (PIR) can have a profound effect on patient outcomes, delegates will hear tomorrow afternoon in a session that ponders the key ways to improve ICU teams.

“We have learned a lot over the years about caring for patients who need intensive care,” Hannah Wunsch (University of Toronto, Canada) told ISICEM News. “From a staffing perspective, we know that having an intensivist care for patients seems to improve outcomes, as does having multidisciplinary rounds.

“However, there is also a lot we don’t know about how best to staff ICUs. One of those questions is whether there is an optimal number of patients for one intensivist to care for. If you ask most intensivists, they have an answer based on their own experience, and there are a few surveys from the U.S. that have looked at this question. But no one had really addressed using patient-level data whether the number of patients cared for by one intensivist might impact outcomes.”

To that end, Dr Wunsch and colleagues examined the PIR for 49,686 adult patients in 94 United-Kingdom ICUs between 2010-2013 – publishing their results in a recent paper.1 As Dr Wunsch pointed out, finding data that includes all of the necessary information to answer this question is challenging, and this was one of the main reasons behind choosing the UK:

“First, they already have individual patient data from almost all of the ICUs in England, Wales and Northern Ireland (Scotland data are separate), information about the number of ICU beds, and very good measures of severity of illness on their patients.

“Second, almost all of their ICUs are staffed by intensivists – something that is not the case in the U.S. Third, we were able to easily contact each ICU to ask them about their staffing by intensivists, so that we could link that information to the patient data for our study.”

Crucially, the results of the study determined that a PIR of 7.5 was the optimal ratio, with significantly increased ICU and hospital mortality above and below this value.2 Commenting on the result, Dr Wunsch continued: “We can, of course, only speculate on what the main drivers of the optimal PIR were. We think that at lower numbers, there may be a volume-outcome effect (or ‘proficiency’) that is an issue. Like many things in healthcare, the individual physician (and the ICU) need to care for enough patients on a regular basis to feel comfortable with all aspects of care.”

Hannah Wunsch

“At lower [PIR] numbers, there may be a volume-outcome effect (or ‘proficiency’) that is an issue. Like many things in healthcare, the individual physician (and the ICU) need to care for enough patients on a regular basis to feel comfortable with all aspects of care.”

Hannah Wunsch

“At higher PIRs, we think that there may be a cognitive load problem, as well as a very real limit in terms of the time an individual physician can spend focused on any one patient. The PIR we found of 7.5 is a bit lower than many physicians – particularly those in the U.S. – seem to expect. We think this may be because ICU beds are a more limited resource in the UK.

“That means that the average severity of illness of each patient may be higher than in some other countries. One could imagine that taking care of 7-8 patients who are all mechanically ventilated may be the maximum each intensivist can handle, but that if many patients are there for observation only, then perhaps that number would increase, as the average severity of illness goes down and the time required to safely care for each patient may decrease.”

Commenting on the variability of this ‘optimal’ PIR value, Dr Wunsch stressed that in order to perform the study, variability was essential across centers. While much of healthcare is about reducing variability, she added, for the purposes of research, variability can be a good thing. Indeed, the absolute PIR ranged from 1 to 24, but there was an expected modifier based on the size of the unit (i.e. number of ICU beds) and the PIR.

“It’s hard to disentangle these two issues,” said Dr Wunsch.

“However, the really big units often had more than one intensivist caring for patients at the same time, and we did not include these ICUs in our primary analysis because we couldn’t be sure how many patients each intensivist saw. We did do a secondary analysis where we assumed they saw equal numbers of patients (which allowed us to include these really big units) and found similar results.

“It is important to note that one of the major limitations of this work was that we did not have a lot of other information on physicians in training or non-intensivists involved in care. We’d love to incorporate that information into our models as it is very likely that the optimal PIR will shift depending on the makeup of the rest of the ICU team.”

Continuing on the theme of further study, Dr Wunsch is very keen to expand the analyses to other countries, but to do so will mean circumventing the most significant obstacle – that of data collection.
That being said, if the information can be gathered effectively, she is confident that the makeup of ICU teams will vary enough to impact on the optimal PIR in that country. “In addition, we speculate that places with different overall severity of illness of patients may have different PIRs,” she added.

“We’d love to do this study in the U.S. where we would expect that the PIR might be higher due to the overall lower severity of illness of patients admitted to ICUs.”

Offering her concluding remarks, Dr Wunsch commented on what to expect should an ICU deviate above or below the PIR. “I think having ‘too many’ doctors in the ICU is a rare event. The bigger concern, at least in the U.S. where ICUs are constantly expanding, is that an individual intensivist is being asked to cover too many ICU patients. As well as concern for patient safety, this may also create increased burnout among clinicians.

“It’s certainly too soon to suggest people make changes based on a single study, but as we amass more data on the topic we hope that it will help ICUs and hospitals make informed decisions about appropriate staffing in ICUs.”

**References**


**Innovation with human touch**

The new Eleganza 5 bed with an active mattress is here to change the demanding work of healthcare professionals. Being a nurse can be a beautiful and safe profession.

Meet us at ISICEM Booth 1.30, Hall 1
Does dilutional anemia really exist?

During tomorrow morning’s transfusion session, Azriel Perel, Professor of Anesthesiology and Intensive Care at the Sheba Medical Center, Tel Aviv University, Israel, will take to the podium to discuss the topic of anemia that is caused by excessive fluid administration (‘dilutional anemia’) and its potential impact on blood transfusions, with particular emphasis on novel modalities that could make the development of such dilution visible in real-time.

Hemoglobin (Hb) concentration is affected by diurnal changes in plasma volume and by changing from supine to standing (‘postural pseudoanemia’). Similarly, increasing plasma volume by intravenous administration of crystalloid and colloid solutions may also cause a relative reduction in Hb concentration and the need to identify patient populations in whom such restrictive policy may be detrimental. However, the issues surrounding the use of specific Hb or Hct levels as transfusion triggers are often not considered by clinicians when making important clinical decisions like ordering blood transfusions.

“Dilutional anemia may increase blood transfusions because the Hb level that is considered as a ‘transfusion trigger’ may be reached by excessive dilution rather than actual bleeding. Hence dilutional anemia may cause physicians to administer more blood transfusions than might be necessary.

“In a number of studies on periparative goal-directed therapy, the groups of patients that received more fluids also received more blood transfusions. This phenomenon also occurs during the aggressive fluid resuscitation of patients in septic shock. This observation has not been adequately recognized until now, and I consider it to be extremely important.”

In order to assess the development of dilutional anemia, non-invasive continuous monitoring of Hb (‘SpHb’) could be the answer. Developed by Masimo (USA), and available on their new generation pulse oximeters, the tool offers real-time visibility of changes in Hb levels. “During fluid administration, a gradual decline in SpHb in the absence of active bleeding, which is preferably associated with other parameters that show that the actual blood volume is increasing (e.g., a decrease in the plethysmographic variability index, PVI), is a unique real-time novel marker of dilutional anemia,” said Professor Perel.

“Detection of dilutional anemia by non-invasive monitoring of SpHb is a promising development, which could potentially minimize the occurrence of fluid overload, and prevent unnecessary blood transfusions. So far, the recognized value of monitoring of SpHb has been in the identification of real absolute anemia and not dilutional anemia.”

Furthermore, the monitoring of SpHb may also be useful in monitoring the degree of hemococoncentration (increase in Hb) which occurs following fluid removal during dialysis and in patients with acute heart failure.

Another potential, yet not clinically tested, parameter that may reflect the development of dilutional anemia is methemoglobin (MetHb), a form of Hb with reduced ability for oxygen binding. In a series of experimental studies, researchers from the University of Toronto, have shown that dilutional anemia may lead to up-regulation of perivascular nitric oxide synthase (NOS) and increase NOS-derived nitric oxide (NO) leading to local vasodilation and oxidation of Hb to MetHb. A negative correlation was also observed between the change in Hb and MetHb in patients undergoing cardiac surgery. MetHb can also be measured continuously and non-invasively with the new generation of pulse oximeters, and may potentially serve as a biomarker of ‘anemic stress’ associated with reduced tissue perfusion during acute hemodilution.

As Professor Perel concluded, we need more studies in order to establish the clinical utility of this novel parameter.

Professor Perel will delve into dilutional anemia in more detail during his presentation ‘Does dilutional anemia really exist?’, held at 09:15 on Wednesday morning in the 100 Hall.

References
1. Ince C. Critical Care 2015; 19:58.

Disclaimer
The comments within represent that of Professor Perel only. Professor Perel serves as a consultant and speaker for Masimo.
The Future of Critical Care - A Brainstorming Meeting

Lisbon, Portugal, May 14-17, 2017

Coordinator
Jean-Louis Vincent (Brussels, Belgium)

The 10 experts
Jacques Crestre (Brussels, Belgium)  
Claudia Dos Santos (Toronto, Canada)  
Ricardo Ferrer (Barcelona, Spain)  
Armand Girbes (Amsterdam, Netherlands)  
Anthony Gordon (London, UK)  
Mitchell Levy (Providence, USA)  
Aïn Mercat (Angers, France)  
Zsolt Molnar (Szeged, Hungary)  
José A Paiva (Porto, Portugal)  
Jean-Louis Vincent (Brussels, Belgium)

Université libre de Bruxelles  
Erasme Hospital  
Department of Intensive Care  
Route de Lennik 808, B-1070 Brussels  
www.intensive.org
ECCO² removal: are we ready?

Extracorporeal CO₂ removal (ECCO²R) forms one potential solution to the issues of hypercapnia and respiratory acidosis in protective ventilation. Data are being gathered at present to demonstrate whether or not the benefits of such systems outweigh their risks.

These issues will be discussed this afternoon by Alain Combes (Institute of Cardiometabolism and Nutrition, Groupe Hospitalier Pitie-Salpêtrière, Pierre Marie Curie University, Paris, France) as he presents on the use of ECCO²R with ultraprotective ventilation in severe acute respiratory distress syndrome (ARDS). Tomorrow, Marco Maggiorini (Medical Intensive Care Unit, University Hospital of Zurich, Switzerland) will explore different ECCO²R systems including combined systems that, he suggests, represent the future. The two spoke to ISICEM News to discuss their work.

Understanding of the impact of positive pressure mechanical ventilation has gathered over the past two decades, with lung injury and its effects leading to the development of a protective approach involving limited tidal volume, plateau pressure, and respiratory rate.¹ Ultraprotective strategies seek to further decrease the intensity of mechanical ventilation by further reducing target volume and pressure. Driving pressure has recently been evidenced as a better reflection of optimal mechanical lung ventilation.² Decreasing the intensity of mechanical ventilation in this way will however induce hypercapnia and respiratory acidosis, which might be controlled using extracorporeal gas exchange. “You might decrease the CO₂ clearance of the mechanical ventilator by 30-50%, and replace that with the ECCO²R machine.”³

Dr Maggiorini noted: “There are two perspectives that we have to consider. One is the risk due to the device itself, and the other is the risk associated with hypercapnia.”⁴

ECCO²R encompasses a broad range of devices varying in characteristics. The principle of CO₂ removal remains the same, however variations in gas flow, blood CO₂ and hemoglobin content, and gas exchange membrane efficiency can affect removal rate. Arteriovenous systems comprise separate arterial and venous access cannulae, which comes with risks of arterial injury and ischemia. Venovenous systems involve double lumen cannulae with the same set of complications as any central venous cannula.⁵

“You might decrease the CO₂ clearance of the mechanical ventilator by 30-50%, and replace that with the ECCO²R machine.”

Alain Combes

“There are two perspectives that we have to consider. One is the risk due to the device itself, and the other is the risk associated with hypercapnia.”

Marco Maggiorini

“Until today we have used the ProLUNG system (Estor, Italy), and since three years at least we have more than 50 patients in our records,” said Dr Maggiorini. “We have just published our experience in the first 20 patients⁶, and we are getting our first experiences with the combined system from the Baxter company, where you can remove CO₂ and do renal replacement therapy (RRT).”⁷

“Explaining the rationale of such combined systems, Dr Maggiorini continued: “If you have a multi-functional device, you can do RRT, CO₂ removal, and plasmapheresis separately or combined. This will be the future.”

The question remains, however, as to whether the use of ECCO²R in any of its forms is feasible and safe. “This is the question now,” agreed Dr Combes, who was co-author of the 2014 position paper on the organization of extracorporeal membrane oxygenation programs for acute respiratory failure in adult patients. “That is why we need a trial, and ultimately a RCT, to test the concept in real life.”

Dr Combes and colleagues investigated the safety and feasibility of low-flow ECCO²R using the Hemolung Respiratory Assist System (ALung Technologies, USA) in patients with moderate ARDS.⁸ These encouraging results are now being built upon with the SUPERNOVA trial, of which Dr Combes is co-principle investigator along with Marco Ranieri (University of Sapienza University of Rome, Italy). The SUPERNOVA pilot trial primary outcome measure is the achievement of tidal volume reduction to 4 mL/kg, while maintaining pH and PaCO₂ to ± 20% of baseline values obtained at a tidal volume of 6 mL/kg. The study will enroll 100 patients, with an estimated primary completion date of May 2017.⁹

Dr Maggiorini and colleagues recently published a small study investigating the hypothesis that low flow veno-venous ECCO²R enables maintenance of a lung protective

Continued on page 16
HAVE A 10 MINUTE BREAK?
Visit Orion Pharma booth to participate the daily peer-to-peer discussions with colleagues experienced in handling typical challenges related to sedation and acute heart failure.

PEER-TO-PEER
CLINICAL XCHANGE
New program through 21st – 24th

OBTAIN YOUR FULL PROGRAM AT ORION PHARMA EXHIBITION BOOTH
This program is only aimed for medical doctors as per the Regulations of the Federal Agency for Medicines and Health Products in Belgium.
ECCO₂ removal: are we ready?

Continued from page 14

A ventilation strategy or awake spontaneous ventilation despite severe hypercapnic respiratory failure (HRF). Results from a cohort of 20 patients supported the hypothesis, and the authors suggested the possibility of the use of ECCO₂R to avoid mechanical ventilation altogether in selected awake patients with acute HRF. He and colleagues will also shortly be publishing a comparative study of available technologies.

"Whether these efforts lead to an improvement of the outcome for our patients remains an open question," concluded Dr Maggiorini. "But the idea, and what we observe in our patients, is that we really can reduce driving pressure and the potential damage to the lung thanks to the removal of CO₂. Physiologically, it makes sense, and in individual patients it makes sense. Whether it can be shown in a large-scale study to improve outcome remains to be seen."

Dr Combes will present ‘For ultraprotective mechanical ventilation in severe ARDS’ during this afternoon’s session ‘Extracorporeal CO₂ removal’ taking place in Gold Hall from 16:00.

Tomorrow, Dr Maggiorini presents ‘The place of low flow ECCO₂-removal’ during ‘ECMO: Practical aspects’ in Salle M (Bozar) from 8:00.

References


Accumulating data have emerged over recent years on the safety and efficacy of albumin in different subsets of the critically ill rather than the undifferentiated ICU population. These will be discussed this afternoon in a session dedicated to the fluid.

Albumin’s importance under optimal physiological conditions have been documented; these include its function within the intraluminal vascular endothelial barrier layer, its binding to various ligands and reactive oxygen and nitrogen species, and its transportation of endogenous and exogenous substances, as summarized by Vincent et al.1

"The safety of albumin is not a real problem,” commented Jean-Paul Mira (Groupe Hospitalier Paris Centre- Cochin University Hospital, France) to ISICEM News. Dr Mira will be presenting current indications for the use of albumin in the ICU.

"There is no problem with infection, because there has never been a report of it. It is not a problem for renal problem, because all the recent studies haven’t shown any severe side effects with the use of albumin. The real issue of albumin is the price, as compared to the other fluids that we can use in ICU."

While many open questions remain in general with regards to albumin indications in the ICU setting, robust evidence supports its use in treating or preventing complications of cirrhosis: “The societies and all the reviews accept that the use of albumin is for patients with acute or chronic liver failure,” continued Dr Mira. “It is not just an effect linked with volume expansion – it is more than that. Because of this, it is really well-accepted, and the cost-benefit is clearly in its favor.”

Reduced albumin production, as well as the

Continued on page 18
Update on “Monitoring in the acutely ill patient: an integrated approach”

Rome, Italy, December 10-13, 2017

Chairman: Jean-Louis Vincent
Management & coordination:
Véronique De Vlaeminck
Erasme University Hospital
Route de Lennik 808 – B-1070 Brussels
Email: veronique.de.vlaeminck@intensive.org
www.intensive.org
A closer look at albumin

Continued from page 16

incidence of damaged isoforms, forms the known biological basis for its efficacy in liver failure, with a number of common indications in this setting: “The first indication is albumin infusion in patients undergoing large-volume paracentesis,” explained Dr Mira. “Clearly, albumin decreases the risk for hypotension in these patients. It clearly decreases the shock that may arise. And you have a clear tendency to decrease mortality if you use albumin in contrast to other fluids in these patients.”

“The second indication in cirrhosis patients is those with spontaneous bacterial peritonitis. In these patients, if you add albumin to antibiotics, you will decrease the mortality rate. All studies show the same.”

“Something newer is the question: as albumin decreases mortality in spontaneous bacterial peritonitis in cirrhosis, what does it do in patients with other kinds of infection? A study that has been published last year showed that in patients with bacterial infection other than spontaneous bacteri- rial peritonitis, albumin doesn’t do anything. So we cannot recommend the use of albumin in these patients with, for example, pneumonia.”

When it comes to burns patients, continued Dr Mira, it is surprisingly very difficult to find good studies that have been carried out in recent years. Two meta-analyses were published last year on the topic, which have indicated a neutral or positive effect.1,2

There were however numerous issues regarding these meta-analyses and indeed their constituent studies: “Some of the studies are very, very old – from 1975, 1978, 1983 – meaning that in the last 30 years nothing has really been done with albumin in these patients. It is very surprising! There has been study since showing benefit of albumin, but in my opinion these are too old to be sure that it is a clear effect. And you have some newer small studies showing benefit, but these are not randomized.”

One crucial thing that can be drawn from these meta-analyses, stressed Dr Mira, is that there is a need for a robust, high-powered study in this field.

In the general ICU patient, Dr Mira noted that no studies have been able to demonstrate the superiority of albumin over other fluids. The use of albumin in sepsis, which will be covered in more detail by Simon Finfer during this session, was recently explored by Vincent et al., who set out the reasoning underpinning the potential clinical benefit of albumin infusion to preserve renal function.3

“When you look at septic patients, which is a well-defined population in which albumin has been tested, we have a few studies showing that we have a clear tendency of benefit of albumin in these patients,” commented Dr Mira.

Vincent et al. (2016) looked at several meta-analyses and a pooled analysis of volume therapy with albumin in sepsis, providing evidence in support of reduced mortality in patients with severe sepsis or septic shock; the authors concluded that these studies serve to confirm the 2012 Surviving Sepsis Campaign guideline recommendations, namely in favor of albumin administration in patients with sepsis when crystalloids alone are insufficient.4

“I would say that, based on the fact that albumin is safe, the tendency for decreased mortality in these patients, the fact that we don’t have any other colloids (we cannot use all the other artificial colloids as they are potentially harmful), and based on the fact that we need to give less fluid to the patient (more fluid being associated with a higher mortality rate) – I guess during the first part of the resuscitation of these kinds of patients (what Jean-Louis Vincent called the ‘optimization phase’) we have a real place for albumin after the first fluid challenge with crystalloid.

“What I will recommend is to use crystalloids first to maintain the blood pressure. The volume of crystalloid which is very difficult to define; probably 40-50 ml/kg in the first day, and if we need more for day 2 and 3, we should discuss infusion of albumin. This would be my recommendation based on the literature.”

Dr Mira joins others to take ‘A closer look at albumin’ this afternoon in 400 Hall from 16:00.

References
International Course

Echocardiography for Hemodynamic Monitoring 2017

with video-transmissions of live cases from the ICU

Brussels, November 14-16, 2017

Course directors:
Daniel De Backer (Brussels, Belgium)
Michel Slama (Amiens, France)
Antoine Vieillard-Baron (Boulogne-Billancourt, France)
Paul Mayo (New York, USA)
Anthony McLean (Sydney, Australia)

Host Faculty:
Jacques Creteur (Brussels, Belgium)
Antoine Herpian (Brussels, Belgium)
Fabio Taccone (Brussels, Belgium)

Organized by:
The Department of Intensive Care Medicine of Erasme Hospital.

Aim:
To promote the use of echocardiography in the hemodynamic evaluation of critically ill patients.

General description:
The course will be interactive, with a lot of time devoted to questions, hands-on sessions, and discussions of live video-transmissions.
The first day will be devoted to revising the basics of echocardiography; the second and third days will describe how to use this technique to evaluate the hemodynamic status of critically ill patients.
You are Cordially Invited to Our Scientific Symposium at the 37th ISICEM in Brussels

Caring for the Critically Ill Patient: Novel Strategies Optimizing Blood, Oxygen and Fluids

**Location:** Copper Hall, Brussels Meeting Center (SQUARE)

**Date and Time:** Tuesday March 21st • 12:30 - 13:30
Lunch will be provided

**Chairperson:** Prof. Thomas W.L. Scheeren, MD, PhD

Please register at [www.masimo.com/ICUFuture](http://www.masimo.com/ICUFuture)

**Presenters**

**Effect of Conservative vs Conventional Oxygen Therapy on Mortality Among Patients in an Intensive Care Unit - The Oxygen-ICU Randomized Clinical Trial**

**Massimo Girardi, MD**
Professor of Anesthesiology and Intensive Care, Head of the Department of Anesthesiology and Intensive Care Unit University Hospital of Modena Modena, Italy

**The Evolving Role of Cardiorespiratory Monitoring: Importance of Oxygen Delivery in Acutely Ill Patients**

**Jean-Louis Vincent, MD, PhD**
Professor of Intensive Care Medicine (Université Libre de Bruxelles) Department of Intensive Care, Erasme University Hospital Brussels, Belgium President, World Federation of Intensive and Critical Care Societies (WFICCM)

**Latest Hemodynamic Strategies - Blood, Oxygen and Fluids: Friends or Foes?**

**Aryeh Shander, MD, FCCM, FCCP**
Chief Department of Anesthesiology Pain Management and Hyperbaric Medicine Englewood Hospital and Medical Center Clinical Professor of Anesthesiology Mount Sinai School of Medicine Mount Sinai Hospital, New York

**The Noninvasive Multi-Parametric Evaluation of The Critically Ill Patient**

**Azriel Perel, MD**
Professor of Anesthesiology and Intensive Care Sheba Medical Center, Tel Aviv University Tel Aviv, Israel

Interactive Session, please ask any questions to our Faculty now! For more information, please stop by Masimo, Stand #2.23. Register and ask your questions at [www.masimo.com/ICUFuture](http://www.masimo.com/ICUFuture)