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### Close Monitoring of ECMO Patients with a Patient Dedicated Blood Gas Analyser

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## In-Line Bedside Blood Gas Analysis Enables Rapid Results For Respiratory Support Management

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Extracorporeal membrane oxygenation (ECMO) is an acute support system used to aid heart and lung function in patients with severe respiratory or cardiac failure. Having its origins in the operating theatre, the use of ECMO has now migrated into the ICU. Since the mortality risk of ICU patients with ECMO, such as those with acute respiratory distress syndrome (ARDS) is extremely high, close monitoring of these patients is essential to assess the state of their lungs and to prevent further damage.

Various devices are available to monitor pressures, flow, and temperature of the ECMO blood and gas circuits, as well as physiological variables in the patient. However, there are current limitations in measuring blood gases, which are required frequently in order to effectively monitor the adequacy of gas exchange support.

#### The need for results immediacy

The primary purpose of measuring blood gases (as opposed to online saturation) is to determine both inlet and outlet  $p\text{CO}_2$  to evaluate membrane lung function, as well as blood pH for metabolic status determination. Should  $\text{CO}_2$  elimination remain inadequate, this can result in severe respiratory acidosis [1]. Consequently, immediate return of blood gas results and frequent measurements are essential in the management of patients with ECMO. Such results are also just as essential when weaning patients from ECMO.

Current methods of blood gas analysis require arterial blood sampling from an appropriately located catheter or the circuit, which can: only be undertaken intermittently, meaning that there may be delay in response to changes in the patient's physiological status; have a significant turnaround time, as blood samples are transferred to a central analyser; expose the health-care professionals to the patient's blood; and result in iatrogenic blood loss [2].

A monitoring system that addresses all of the aforementioned limitations has recently been developed by Sphere Medical (Cambridge UK). Uniquely, the Proxima miniaturised in-line analyser enables the rapid and frequent delivery of blood gas results directly at a patient's bedside. This then aids early decision-making and ensures closer control of therapy, including ECMO. When a blood gas measurement is required, blood is withdrawn from the patient directly into the Proxima Sensor without the need to take a sample and walk away for analysis. Results are then displayed at the patient's bedside monitor within three minutes.

#### Conserving blood

Bleeding is the most common complication during ECMO due to systemic anticoagulation, thrombocytopenia, and thrombocytopathia [1]. Patients on ECMO require frequent transfusions, which can in turn modify coagulation status and require further titration for coagulation management. The use of greater amounts of RBC among patients supported with ECMO for non-cardiac indications are independently associated with significant morbidity [3].

Therefore, minimisation of blood loss and avoidance of subsequent red blood cell transfusions is important in these patients. With diagnostic testing being a significant factor in cumulative blood loss, the use of a patient dedicated arterial blood gas analyser would ensure blood conservation [4].

Proxima uses a closed sampler device which allows return of the discard volume to the circulation whilst maintaining a closed system. Once the sample has been analysed directly by the in-line Proxima Sensor, all blood is returned to the patient resulting in zero blood loss. This is not only key to avoidance of iatrogenic blood loss, but also to enabling unlimited blood gas sampling.

#### Minimising infection risk

ECMO is an intervention that may carry the risk of infection, particularly if ECMO is used in immunocompromised patients. Since frequent arterial blood sampling is necessary, a key aspect of infection prevention and control with such patients is the stringent management of their blood samples, particularly during collection and transportation for analysis.

As a patient-dedicated, closed system, Proxima keeps infection control simple and effective, whilst also minimising the number of openings of the arterial line for sampling. This protects both the patient's blood from exposure to blood stream infections, as well as the caregiver by limiting exposure to blood borne pathogens during the course of routine patient care. Furthermore, by avoiding transfer of blood to a central blood gas analyser, Proxima also reduces blood handling and therefore cuts risk of infection transmission. Additionally, as all blood is returned safely to the patient, this avoids the need for waste management of potentially infected blood specimens and syringes.

For more information on how Proxima enables fast response, proactive critical care, such as for patients on ECMO, by delivering rapid results for blood gas exchange, please visit [www.spheremedical.com](http://www.spheremedical.com)

#### Advertorial

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