

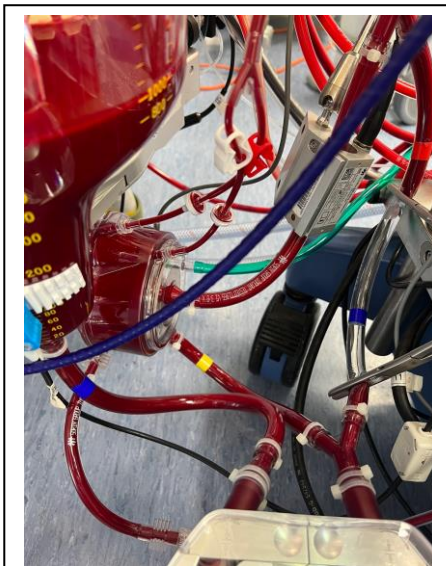
2023 Oxygenator (reversed flow)

Permission to print:	Yes
Category	Oxygenator
Incident type	Good Catch No Harm Incident
Duration of incident:	minutes
Description:	<p>Recently, new PRONTO packs were introduced to our unit incorporating the circuit to use the PRONTO method for an oxygenator changeout if needed. Perfusionist A used an overnight setup built by perfusionist B over the previous weekend. The weekend had been very busy with multiple acute cases and long hours worked by the on call team who required the following Monday off to recover. The patient was a standard MVR (61-year-old, 180cm, 109kg) using an inspire 6 oxygenator with an integrated arterial filter. Went on bypass with good colour change between arterial and venous lines and good venous saturations (80 -85%) with Spectrum monitoring. A blood gas was taken as routine practice after a few minutes of being on bypass. Blood gas results showed low pO₂ (7kpa) and high pCO₂ (7.97kpa). The gas flow, FiO₂ and blood flow rate were increased. A repeat gas was taken a couple of minutes later which showed a lower pO₂ (6.4 kpa) but decreased pCO₂ (7.35kpa) with continued good color change between arterial and venous lines and good venous saturations (80-85%). The Spectrum pO₂ and pCO₂ were recalibrate to the lab values. The perfusion coordinator was called, and communication was made to the surgeon and anaesthetist about the concern. The perfusionist coordinator, primary anaesthetists, and perfusion A checked over the circuit, confirming gas flow to the oxygenator and all gas line connections intact and anaesthetic and muscle relaxant drugs were reviewed as appropriate. On further inspection of the valve, the surgeon commented that the valve looked infected, and a query was raised whether the patient was very septic, and hence the requirement for the high gas flow requirements. Gas flow and blood flow were further increased and FiO₂ was increased to 100%. A decision was made to cool the patient further to 32C (was at 34C); and the PO₂ improved by little (no problem with cooling). A venous blood gas was taken from the bypass machine, which showed a SvO₂ of 96%. Eventually, it was noticed by a different perfusionist colleague (who had come to help), that the inlet line to the oxygenator was connected the wrong way (to the outflow) – [i.e. blood flow through the oxygenator was reversed]. This was not picked up by the perfusion coordinator (who had not used the PRONTO pack before), and perfusionist B (who had only used the PRONTO pack once a long time ago when it was on trial), and the anaesthetist (who was not aware about the new PRONTO pack). The surgeon was informed. The oxygenator changeout box was brought into the room, and other perfusion colleagues helped to do the change out while the sutures were still going into the valve (on bypass). At this point, an arterial blood gas was taken from the patient showing a pCO₂ of 4.06kpa, and a pO₂ of 65.7kpa. Although in theory, we could have continued to use the same oxygenator to come off bypass; a cut had already been made between the arterial and venous bridge, and we decided to continue with changing the oxygenator. There were also no clear guidelines on whether the safety of continuing use of an oxygenator with reversed flow. There was also the concern of increased GME with reduced filtration [with retrograde flow through an integrated filter], and whether rewarming would be a problem (although cooling was not a problem). The oxygenator changeout went smoothly using the PRONTO line with no interruption to CPB. Repeated blood gases after the oxygenator changeout showed values all within normal ranges. This was communicated to the team. The patient was rewarmed and was weaned off bypass with no concerns . Subsequent interrogation of the electronic perfusion record showed HLM arterial SaO₂ was 100% throughout CPB.</p>

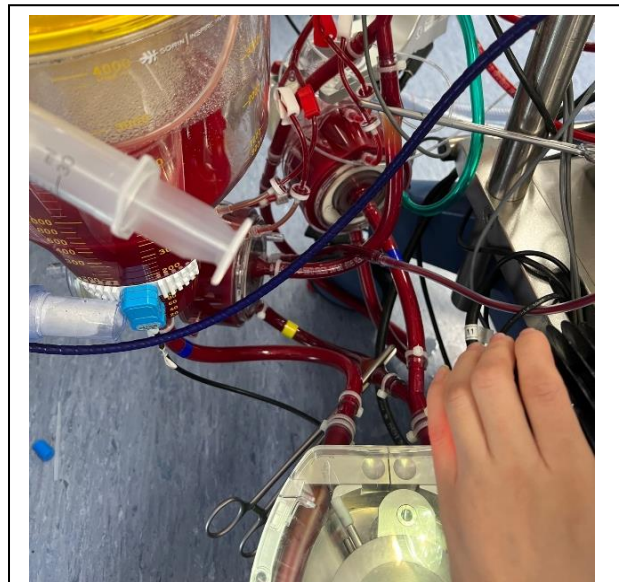
GOOD CATCH - what went well

Early recognition and open discussion with surgical and anaesthetic team on concerns. Calling for help early to another colleague.

What could we do better	Better team inservice of the new pack design, and being more vigilant about checking the circuit – the checklist has a “Correct in/out Membrane”.In hindsight, I would take an early arterial blood gas from the patient.
Preventive actions	This incident was discussed during the team meeting, and a revision made to the checklist using colour coding to visually indicate the right inflow going to the oxygenator. All staff were familiarised with the circuit change and checklist revision
Type of incident:	Management
Hospital incident filed:	Yes
Ext Authority Advised	No
Discussed with team:	Yes
Knowledge issue	Yes
Protocol issue	Yes
Skill issue	Yes
Team Issue	Yes
Patient outcome variance f	Nil
Commentary	There have been a number of anecdotal reports of reversed flow to non-integrated membrane oxygenators where CPB was continued with adequate gas exchange and temperature control, however this is the first in an oxygenator with integrated filter. This incident is multifactorial with a combination of change of the CPB circuit introduced without adequate in-service coupled with fatigue and failure to check. However the problem was managed with cohesive team work and the ability to changeout without interruption to CPB facilitated the safest option. PIRS Ed



Reversed flow connection



Parallel inserted oxygenator inflow corrected