

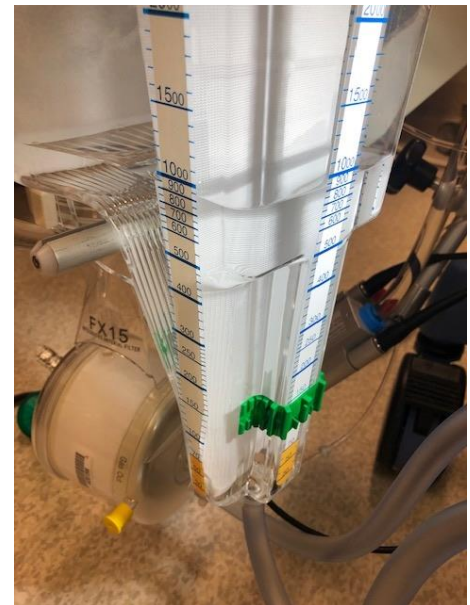
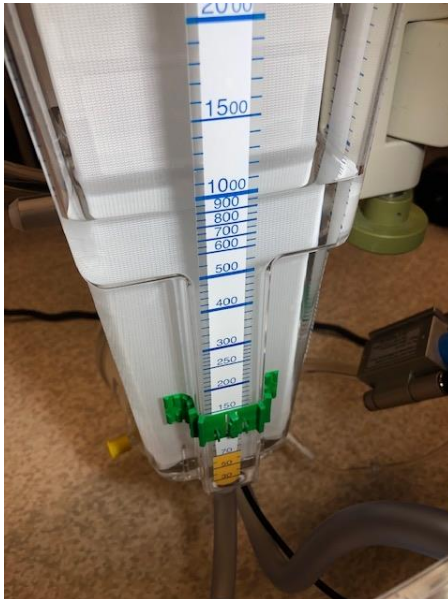
2022 Air entrainment intra op

Permission to print:	Yes
Category	Air in circuit
Incident type	Good Catch No Harm Incident
Duration of incident:	minutes
Description:	<p>Using a S5 pump with a Terumo Fx 15/30 Advance Oxygenator. Whilst weaning from bypass AVR / MVR on a 61kg, air was noted to have found its way into the pump boot (3/8) silastic. Level control and level function was active and operating correctly. Level was placed on the rear of the reservoir just beneath the "lip" of polycarbonate around 140mls. Bypass was weaned from 4.0 lpm to 2.0 lpm and the heart filled, (we were sitting at 2.0lpm half flow for around 30s, with blood level close to level sensor waiting for the anaesthetist to get the pressure up), the blood level was approaching the level of level sensor. Heart was vented via the aortic root cannula at 300mls/min and cardiotomy at ~200ml/min. At this point air was noted entering the pump boot. Venous line was clamped and the patient filled by adding extra volume to the reservoir and slowly transfusing ensuring air was maintained in the vertical aspect of the pump boot pre Oxygenator. The root vent was reduced to minimum to prevent any exsanguination. Once the patient was adequately filled and no air was noted in the heart via TOE, the arterial line was clamped and the oxygenator and pump boot where reprimed via the recirculation line. Once the circuit was air free as seen by no microbubbles on the bubble detector [set at medium], the pump was stopped and the recirculation clamped. Arterial line was then unclamped. The level sensor was placed on the front of the reservoir at the 140 mls height with no further issues. During the bypass the oxygenator shunt line(CDi) and sample ports were open. Although the level sensor was functioning correctly,[it was apparent] due to the blood flow returning via the cardiotomy suction (root and suckers), a streaming of blood over the [rear of reservoir placed] level sensor was believed to be the reason it did not alarm and stop the pump. This scenario was recreated [in-vitro] using saline with the cardiotomy flows from 900-250ml/min [where the rear of reservoir placed level alarm did not activate], thus proving the cardiotomy streaming theory. The manufacturer does not stipulate where the level should be placed, only that it is above minimum operating level. I had previously contacted the Manufacturer about placement of the level sensor and was informed that it was common practice to put it on the rear, This pump was set up by a colleague who has placed it in this position for many years!</p>
GOOD CATCH - what went well	<p>The trainee who was perfusing the case was well positioned (sometimes difficult to see pump boot particularly when TOE is happening) and alert to raise the issue of air very quickly. The supervising perfusionist was able to finish weaning from bypass whilst the trainee ensured the air stayed within the pump boot. The surgical team was made aware of the issue so that it was possible to wean from bypass instantaneously, thus reducing the chance of any air reaching the patient. Importance of "wet labs" should not be undervalued.</p>
What could we do better	<p>The position of the level sensor and the level of blood cannot be seen at the same time from the position we run the pump however it is difficult to fix the sensor on the front of the reservoir</p>
Preventive actions	<p>Level sensor will be placed on the front of reservoir, so that it is visible, but also so that it is not affected by steaming from any cardiotomy suction. Extra volume to be maintained in the reservoir when excessive cardiotomy suction is used.</p>
Type of incident:	Management
Hospital incident filed:	Yes

Ext Authority Advised	No
Discussed with team:	Yes
Rule issue	No
Skill issue	No
Knowledge issue	No
Protocol issue	No
Patient outcome variance f	Nil

Commentary

This incident is potentially wide ranging in that it is quite common for level sensors to be placed on the rear of these reservoirs with the possibility, as demonstrated both in the incident itself and subsequent simulation, of cardiotomy return blood flow obscuring level detection by the level sensor. The apparent difficulty in affixing some level sensors to the front of this reservoir is a compounding factor. This report emphasises the importance of observational attention to blood level and a salient reminder of the fallibility of alarms. PIRS Ed



Level sensor on front, because of the 90 angles the sensor is difficult to maintain metal contact.



Pump inlet /outlet showing the vertical element, used as a dynamic bubble trap