2024 Electical-Electronic (HLM)

Permission to print:	Yes
Category	Electrical / electronic
Category 2	HLM
Severity	Good Catch No Harm Incident
Duration of incident:	minutes
Description:	HLM powersupply burnout incident and recovery Incident date: Time of Incident: 22:35 Equipment Details: Sorin S5, Inspire 6F + Liva Nova tubing pack Procedure: Emergency after hours type A aortic dissection repair. Routine perfusion setup, priming, and initiation of CPB. Routine aortic cross-clamping and cardioplegia delivery, vooling to 24 degrees C. Approximately 40 minutes into CPB (nasopharyngeal temperature approximately 25 degrees Celsius), I detected a distinct burning smell. Despite my inquiry, no other team members around me noticed the smell. Concerned, I knelt down and opened the HLM EP pack lid, confirming a strong smell of burning and visible smoke. I promptly alerted the surgeon, anaesthetist, and theatre staff, requesting the backup perfusionist's immediate presence. Within moments, an alarm on the HLM indicated a malfunction: "UPS is defective." I suggested transferring the existing circuit to a second HLM but the surgeon decided the faster option transferring the patient to the available primed HLM. After briefing the team, we decided to continue the bypass and crash cool the patient, preparing for a potential HLM failure. As I began rapid cooling, a primed HLM and circuit was brought into the theatre. We meticulously planned the change-out multiple times (complete HLM and circuit change-out), assigning roles to two anaesthetic technicians and a theatre nurse, detailing their tasks. During the cooling process, the HLM arterial pump suddenly ceased (patient nasopharyngeal temperature 19 degrees Celsius). We initiated patient circulatory arrest, isolated the patient, and swiftly executed the HLM and circuit replacement. The backup perfusionist managed power, gas, and network connections, while I carried out the circuit replacement with support from the technicians and nursing team. This was achieved by doing the following in a sterile manner at the HLM end: •The sterile bypass tubing loop on the new circuit was clamped and cut off leaving only the arterial and venous lines. •The cardioplegia, vents, and sucker lines on the old circuit were clamped and disconnected from the old circuit (the anaesthetic techs and nursing staff held a clamp/tubing in each hand) •The arterial and venous lines on the old circuit were prepped, clamped and cut off. •The new circuit was then connected (venous + arterial lines, cardioplegia, vents and suckers). The change-out proceeded smoothly, taking approximately 6 minutes, with circulatory arrest lasting about 20 minutes. Throughout, both left and right NIRS readings remained above 50. Resuming bypass safely, we perfused the patient, corrected blood gases, administered additional cardioplegia, and initiated another circulatory arrest to complete the surgery. The subsequent warming and weaning off bypass were uneventful, ensuring a successful procedure conclusion. The patient was discharged from hospital with no complications. Subsequent investigation by the biomed engineers found a burnt out power supply that took out the switching mechanism to the HLM UPS – hence total power failure.
GOOD CATCH - what went well	As above and we routinely have both one dry circuit and one wet circuit setup available at all times.
What could we do better	We could have only changed out the machine rather than the entire CPB

	circuit. Subsequent discussion with the team confirmed that our policy is that for more than an isolated oxy changeout using the PRONTO line, changing to a new primed HLM set up is the preferred option as it is quicker.
Preventive actions	An in-hospital incident form was submitted. A full investigation took place. The HLM in question (~11 years old) has subsequently been decommissioned.
Type of incident:	Equipment
Timing of incident:	CPBhypothermic
Hospital incident filed	Yes
Ext Authority Advised	No
Discussed with team:	Yes
Manufacturer advise	Yes
Patient outcome variance	Nil
Commentary	Total power loss of the HLM which is unable to be restored has not been reported to PIRS in the last 2 decades, likely due to recent generation HLMS incorporating uninterrupted power supply (UPS). Such reports in the literature precede HLMs with UPS. While this report describes precise communication and teamwork that skilfully avoided patient harm where there was total power loss to the HLM, there was time to “meticulously plan the change-out multiple times”. Such a window of opportunity may not be available. The safety of current technology dictates such potential disasters are very rare, highlighting the need for critical event checklists and prioritising scheduling simulation of critical CPB failures involving the complete cardiac surgical team. Realistic team simulation of critical events must trump production pressure. PIRS Ed