



Automated Anaesthesia: Easing the Cognitive Load

Liverpool Heart & Chest Hospital



Customer

Liverpool Heart & Chest Hospital

Location

Liverpool, UK

Solution

A9 Anaesthesia System

Customer Profile

Liverpool Heart & Chest Hospital (LHCH) has one of the busiest cardiac surgery units in the UK, treating just under 2,000 patients per year. It provides specialist services in cardiothoracic surgery, cardiology, respiratory medicine including adult cystic fibrosis and diagnostic imaging.

As the UK faces an increasing prevalence of cardiovascular disease, higher levels of heart failure, hypertension, coronary artery disease, and an ageing population, LHCH is increasingly receiving referrals from outside its catchment area - which includes 2.8 million people - for highly specialised services such as aortics.

Introduction

Liverpool Heart & Chest Hospital has installed a fleet of A9 Anaesthesia Systems to enhance patient care, staff safety, and operational efficiency. The advanced safety features of the A9, such as smart automation, FlowPause, and AnaSight, have significantly reduced the cognitive load on anaesthetists while ensuring safer anaesthesia delivery. The digital integration and sustainability features also contribute to the Trust's goals of improved patient safety, staff efficiency, and a reduced carbon footprint.

Challenges

- **Mental Load:** Complex patients often require more manual interventions, increasing the anaesthetists' cognitive load and the risk of delays or missed interventions, especially in emergencies
- **Enhanced Safety:** The team needed an anaesthesia system that ensures accurate and safe anaesthesia levels, with adequate safety features. They also wanted to reduce radiation exposure while working in the Cath Labs.
- **Sustainability:** Operating Theatres account for more than 50% of the NHS' carbon footprint.¹ LHCH were looking for features, such as agent capture, low flow anaesthesia and minimal agent usage to support sustainability goals.
- **All-in-one:** LHCH needed an anaesthesia system that could support a broad range of anaesthesia and ventilation techniques such as TIVA, gas delivery anaesthesia, trans-nasal humidified rapid-insufflation ventilatory exchange (THRIVE) and High-Flow Nasal Canula (HFNC).

“ There are lots of features on the A9 that make a big difference for patient safety while helping alleviate some of the cognitive load for anaesthetists. A useful feature for our practice is Flowpause which allows us to safely stop ventilation during surgery and automatically restart after an adjustable period. In the past that was done manually with the risk of the machine being left off and the alarms staying silent. This tool provides an essential safety measure for patients requiring surgery and intermittent ventilation. ”

Omar Al-Rawi, Clinical Lead for Anaesthesia





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The automation of the ACA and low flow provides seamless accurate titration of depth of anaesthesia at low flow without the need to manually adjust the gas flow, volatile agent and oxygen level to reach the target level.

We're expecting to see reduced consumption of anaesthetic gases from this and plan to use the Mindray M-IoT system to track inventory and usage going forward. This will then deliver both an environmental and financial benefit.

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Omar Al Rawi, Clinical Lead for Anaesthesia

The Solution

- **Smart Automation:** Features such as Automatic Control Anaesthesia can help reduce the number of manual interventions. Protective ventilation tools like Driving Pressure and Mechanical Power also provide real-time calculations to inform ventilation settings and reduce the risk of Ventilator Induced Lung Injury.
- **FlowPause:** ensures the anaesthesia machine and alarms are turned back on after 60 seconds if ventilation needs to be paused.
- **AnaeSight:** enables remote control of anaesthesia machines, including control of TIVA pumps, and a centralised view of live patient data from multiple devices for a clearer picture of patient status in one place.
- **Integration:** As part of the evaluation process and trial period, Mindray's Digital Health team successfully integrated the A9 into the LHCH anaesthesia charting process so EPRs would be automatically updated.
- **Accountability:** Mindray's M-IoT Dashboard will help the team track and manage anaesthesia inventory across the hospital, including evaluating anaesthetic usage. The ACA and low flow provides seamless accurate titration of depth of anaesthesia at low flow without the need to manually adjust the gas flow, volatile agent and oxygen level to reach the target level.

Conclusion

The A9 Automated Anaesthesia System at Liverpool Heart & Chest Hospital (LHCH) has improved patient care and operational efficiency. Its advanced features reduce the cognitive load on anaesthetists, ensuring safer anaesthesia delivery. The system's integration into digital charting and sustainability features align with LHCH's goals, enhancing patient safety, staff efficiency, and reducing the hospital's carbon footprint.

Outcomes

- **Heightened Safety:** smart tools can reduce the number of manual interventions, reduce waste, improve efficiency while also providing an additional indicator of patient status in real-time to enhance safety.
- **Less Exposure:** In the cardiology catheter lab the A9 display can be connected to a remote monitor to provide clear patient anaesthesia data at the workstation in the lead proof zone, reducing radiation exposure. The remote-control function of the A9 anaesthetic machines will be fully rolled out once approval is obtained from the regulatory bodies.
- **Accurate Records:** The A9 has successfully been integrated into the digital charting project so data is automatically taken from the anaesthesia machine and patient monitors to create an accurate anaesthesia record.
- **Smaller carbon footprint:** LHCH expect that the automation tools on the A9, such as ACA, will help reduce consumption of anaesthetic gases producing both an environmental and financial benefit. They will verify this by tracking inventory, consumption and A9 device usage data on Mindray's M-IoT solution.

References:

1. Guetter CR, Williams BJ, Sliama E, et al. Greening the operating room. Am J Surg. 2018;216:683-8. Yates EF, Bowder AN, Roa L, et al. Empowering surgeons, anesthesiologists, and obstetricians to incorporate environmental sustainability in the operating room. Ann Surg. 2021;273:1108-14.