

Anaesthesia in LMICs: Where are we now? Where are we going?

Ask anyone who is having an operation what frightens them the most, often the answer is the anaesthetic. In the West, with modern techniques, very high standards of training and advanced equipment, anaesthesia has never been safer.

But what about LMICs?

The situation there is so different. With 20 years' experience working in LMICs, and having worked in anaesthetics for many years prior to that in the British Healthcare system, our CEO has some serious reflections.

Essentially there are two types of anaesthetic machine: open (or drawover), and closed (or circle, where the patient rebreathes the anaesthetic gas).

Drawover systems are ideally suited to the vast majority of LMIC situations.

This is because the machines:

- Require minimal servicing, which does not require a specialist engineer.
- Don't require consumables.
- Function without external gas supply and can generate their own oxygen.
- Are straightforward to use.



- Can ventilate to small lung volumes, use neonatal circuits, and do PEEP.
- Function for a long time without power; some machines do not require any power at all and are very versatile.
- Are designed for the unique challenges of demanding LMIC environments; depending on the machine type they are very easy transport.
- Are value for money.

However, our data and experience shows most hospitals have poor quality, old (often donated) circle machines. Circle machines should not be used in the majority of LMIC environments as they require *everything* below for safe use.

- A high-quality machine.
- A comprehensive understanding of how to use the machine.
- Adequate monitoring, i.e. normal parameters plus CO₂ and anaesthetic agent monitoring, the latter is very rarely seen – both are vital.
- A reliable stock of soda lime, for frequent replacement – this very rarely happens, which is dangerous as this is what absorbs the patient's CO₂.
- A reliable supply of high-pressure gas. This includes emergency cylinders to connect to the machine as back up in the event of a main gas supply failure.
- A stock of consumable breathing circuits, as reusable ones are often not available.
- Provision made for yearly servicing; these are complex machines, even at their simplest. This includes both availability of engineers and budgeting for the service, as there are parts that need replacing each year. Often it is not possible to get spares for donated machines due to their age. Rarely, we see them serviced for a year or two, but then the yearly servicing stops.
- Appropriate, quality machines are much more expensive to buy, with the result being low quality machines are often purchased.

The vast majority of sites in LMICs will be unable to fulfil these criteria.

At Medical Aid International, we are seeing a concerning trend towards the use of circle machines, despite not being able to satisfy the above criteria. We believe using these is inadvisable in the majority of LMIC situations. Given this trend, we felt we should raise this concern, as for those of us working to support those delivering surgical solutions in these low resource environments with safe, sustainable equipment, we have a responsibility to deliver appropriate, effective, practical solutions.

Ultimately, the objective is to have a safely anaesthetised patient, and the simpler, less complicated drawover machines safely deliver this for the long term.

Want to understand more about anaesthetics? Then watch the two videos from our [biomedical engineering programme](#) on this subject [here](#). Our [LMIC Operating Room Equipment Survey report](#) also discusses anaesthetics and patient monitoring.

Do contact Tim Beacon, our CEO, at tim@medaid.co.uk to discuss your anaesthetic needs in more detail.