

An Introduction to Safe Anaesthesia Worldwide

Delivering safe anaesthesia to the world's poorest people

Dr. Ruth Mathieson started her presentation to the Rotary Club of Belleville by telling us that safe Anaesthesia Worldwide (SAWW) was founded in 2011 at the village pub in Marden, Kent and became a registered UK charity in 2012. Its formation was to address the 5 billion people that are without anaesthetic and surgical care worldwide.



The 2015 Lancet Commission on Global Surgery estimated that two thirds of the world's population lacked access to affordable surgical and anaesthesia care. This contributes to 17 million deaths each year. Mainly poor countries are affected.

SAWW's mission is to provide safe anaesthesia services to those in need in poor areas of the world, to save lives and prevent suffering while the objectives of the charity are to preserve and protect good health by providing:

- Equipment
- Training
- Research

Anaesthesia is needed for emergency Caesarean section, which is the most common major operation in Africa. Dr. Mathieson told us that when she first started going to Africa that Caesarean sections would be performed using a local only. Anaesthesia is also needed for surgical repair of birth defects such as cleft lip and palate, for surgical repair of Noma, a facial gangrene that affects poor children in Africa.

Anaesthesia is needed for surgical repair of serious burns, common due to open cooking fires in Africa and is needed for surgical treatment of hernias and goitres. Anaesthesia is needed for surgical treatment of traumas and injuries from road traffic accidents and is needed for surgical treatment of obstetric fistula, the result of prolonged obstructed labour without medical care, that leaves women doubly incontinent. Women affected are often outcast by their community.



Dr. Mathieson said, "Operations can be anything and everything, but C sections are the most common." "We operated with a very straight forward mindset; See one, do one, teach one."

Lack of hospitals in poor countries mean that many patients must travel long distances to receive



medical care, when they are seriously ill, and they often arrive in a critical condition. Lack of infrastructure, poor roads and inadequate transport make it difficult for patients and medical supplies to reach hospitals. People are not turned away if they cannot pay and some have settled their bills with a chicken.

Dr. Mathieson first volunteered in the developing world in Nigeria in 1981 at a Mission Hospital and described some of the conditions. "Consent for surgery for a woman, would often be the husband's thumb print, due to illiteracy and the Muslim faith. There was no running water, so a so called "Sterile scrub" was a regular nail brush and soap, and cold water poured over one's hands."

Dr. Mathieson described one case that was a particular challenge. "We then prayed over the patient. I have never prayed harder before or since! I never did not loose a patient."

"There was no cautery and no suction. Ether, (which is flammable) in oxygen was reserved for the children. After surgery everyone was put on 3 antibiotics, otherwise they would become septic."

"Pharmacies would give you whatever you wanted without a prescription. Chloramphenicol was available by the truck load. It had been banned in the 1st world, as they were cases of aplastic anaemia following its use (a death sentence)."

"Often electricity failed, so delivering an HIV + woman in the middle of the night was a real challenge. In fact, the clinic/ hospital in Matangwe did not get electricity until 2014, so deliveries in the middle of the night were by paraffin lamp! And most babies come at night!"

Medical oxygen is commonly supplied in cylinders that are expensive, difficult to transport and run out. Without adequate oxygen supplies, patients can die as a result. Electrical supplies are unreliable, and hospitals must cope with frequent power cuts and fluctuations in mains power that can damage sensitive electrical equipment.

Hospital equipment is often old and no longer fully functional.

- Medical supplies are extremely limited.
- Wards are often overcrowded and filled to more than 100% capacity, with patients sharing beds and sleeping on the floor

Poor countries have few doctors and trained healthcare staff. There is also a lack of technicians and engineers which makes it difficult to service and repair equipment. Challenges Poor countries have few doctors and trained healthcare staff. There is also a lack of technicians and engineers which makes it difficult to service and repair equipment.

Medical technology is designed for use in resource-rich hospitals and cannot function in the difficult conditions of a developing world hospital. Up to 70% of medical equipment sent to developing countries is unsuitable and fails to work (WHO estimate)

The Glostavent was developed by Dr. Roger Eltringham a classmate of Dr. Mathieson. Dr. Eltringham has a passion for meeting and helping people, which has led him to dedicate his life to improving global anaesthesia services, and to inventing an innovative anaesthesia machine for use in challenging, low-resource locations. Most of Dr. Eltringham's career was spent as a Consultant in Anaesthesia and Intensive Care at Gloucestershire Royal Hospital.

His main interest was the advancement of anaesthesia in developing countries, and he was responsible for initiating teaching programs and exchange rotations in overseas universities. He helped to develop curricula for anaesthesia education in overseas departments and provided guidance on selection and maintenance of anaesthesia equipment.



His hard work and willingness to travel led to him co-ordinating and teaching on 66 anaesthesia refresher courses in 44 countries across Africa, South Pacific and Asia. Quite a world tour! On his extensive travels, Dr. Eltringham was shocked to repeatedly find hospitals in developing countries using rusty, old-fashioned, and broken equipment, whilst having modern donated anaesthesia machines relegated to storerooms.

State-of-the art anaesthesia machines were being donated at great expense but were nearly useless in many locations without electricity, an oxygen source, and skilled biomedical engineers. To solve this problem, Dr. Eltringham invented the Glostavent anaesthesia machine, named after his beloved Gloucester Rugby Club.

The Glostavent took several years to develop but it is a superb example of ingenuity, persistence, and engineering skills. Dr. Eltringham devoted many late evenings and hundreds of unpaid hours working on the design and discussing the machine with anaesthetists, other clinicians, and engineers. The aim was to make it suitable for delivering safe and inexpensive anaesthesia in poor locations. Based on the principles of simplicity reliability and economy, the Glostavent was the first anaesthesia machine with a ventilator that could continue to function without interruption if supplies of oxygen and/or electricity failed.



SAWW supplies appropriate equipment that is:

- Designed to function in low-resource hospitals
- Reliable, effective, safe
- Affordable to run
- Simple to operate
- Easy to service and maintain

Oxygen concentrators generate 95% pure oxygen from room air – a free and inexhaustible source. These devices can ensure a reliable oxygen supply in hospitals, instead of relying solely on cylinders of compressed gas. SAWW has helped to ensure a reliable supply of affordable oxygen for patients in The Gambia, Uganda, Somaliland and many other countries.

Donated portable anaesthesia machines have been used to treat casualties in conflict zones Portable anaesthesia machines are used for outreach work to bring surgery to remote, rural communities.

Anaesthesia is usually administered by nurse anaesthetists. Tanzania has fewer than 30 physician anaesthetists to serve a population of 59 million people. Nurses are responsible for running anaesthetic services in remote hospitals often without support.

Training methods included case study discussions, simulations, skill stations, lectures and practice in hospital theatres. Participants on the refresher course from three rural hospitals did not have a fully functional anaesthesia machine. These were:

- NYAKAIGA Hospital
- NDOLAGE Hospital
- HURUMA Health Centre

These hospitals have no funds available to buy a new machine.

This simple portable anaesthesia machine will work anywhere. It needs no electricity and will function without oxygen and is inexpensive to run. Simple to use and easy to maintain, Dr. Mathison told us the Glostavent can be disassembled and fits into a small suitcase for easy transportation and can be setup in less than five minutes.



This oxygen concentrator generates oxygen gas from room air. It will never run out, unlike cylinders of oxygen. Inexpensive to run, simple to use and easy to maintain and can generate ten litres of 97% pure oxygen per minute.

Dr. Ruth was pleased to announce that three of these kits, made by Diamedica a small company in England, are on their way to Kagera. Upon arrival they will be taken to three hospitals to train staff in their use and maintenance.



It is hard to put a figure on the number of lives that have been saved by Dr. Eltringham's invention. Dr. Ruth estimates there must be millions of patients who otherwise would not receive anaesthesia for surgery in remote areas. Dr. Mathieson thanked the Rotary Club of Belleville for their generous contribution of \$4,200 towards this project.