



**OXYGEN SUPPLY
COORDINATION
GROUP**

COVID-19 OXYGEN APPEAL FOR MALAWI

August 2021

Report from Malawi

Appeal 16th February 2021 to 28th February 2021

Amount Donated: £40,500.09

This report gives a summary of the decisions taken by the Scotland-Malawi Oxygen Supply Coordination Group on the spending of the £40,500.09 raised by the Scotland Malawi Partnership (SMP) to support emergency oxygen supply in Malawi. It was written by the Chair of the Group, Mr Alberto Gregori, while in Malawi (at his own cost) where he saw first-hand the impact of the equipment and support offered by Scotland.

Appendices:

- [Watch Alberto Gregori briefing the SMP's Covid Coordination meeting 14 \(4th August 2021\) on the appeal](#)
- [Open O2 Zomba report](#)
- [Open O2 SMP Sponsorship summary](#)



Report by:

Mr Alberto Gregori, Consultant Orthopaedic Surgeon

Chair of the Scotland-Malawi Oxygen Supply Coordination Group

MB ChB Glasgow, FRCS Ed, FRCS Eng, FRCS Ed (Orth), DFM
Glasgow

EXECUTIVE SUMMARY:

In February 2021 more than 300 individuals and organisations donated a total of £40,500.09 to an emergency appeal managed by the Scotland Malawi Partnership's Oxygen Supply Coordination Group.

In keeping with its [Partnership Principles](#), the SMP worked through volunteer Scottish healthcare professionals, who took time to listen to the needs and priorities of Malawians leading the fight against Covid. Through this process, it was quickly apparent that simply purchasing new oxygen concentrators was not the best use of the donated funds because the international delivery times for new hardware were extremely slow, such were the global supply issues. However, it was obvious that there was a significant quantity of existing hardware, already in Malawi, which was not currently operational but could be fixed relatively cheaply. This approach allowed far greater impact of the funds on the ground (over \$500,000 of hardware has been fixed so far, with funds for many months of operations still remaining) as well as being far more sustainable.

The SMP worked through a local NGO 'Open O2', which supported local volunteer engineers to travel across Malawi fixing and maintaining oxygen concentrators and identifying essential equipment and supplies that were lacking. Following these local priorities, the SMP also purchased 300kg of zeolite (essential for fixing oxygen concentrators in Malawi), 100 Oxygen Saturation Monitors (essential for the treatment of those with Covid-19), and 52 Bullnose regulator valves and 52 flowmeters (to allow usage of oxygen cylinders at district and central hospitals). The SMP advanced donations, such that as soon as the appeal was launched the funds were already being put to good in Malawi and 95% of all raised funds were allocated and transferred soon after the close of the appeal. The final 5% was donated to install local oxygen delivery piping at Kamuzu Central Hospital Emergency Covid-19 Treatment Unit in August 2021, following a visit to Malawi by the Coordination Group Chair, Mr Alberto Gregori, (at his own cost) assessing the impact of donations and listening to local priorities.

The SMP is keen to put on record its significant thanks to:

- All who donated to this hugely inspiring appeal
- Alberto Gregori, who has volunteered an incredible amount of time, energy and expertise since January to lead this effort
- All those who have been involved and support this appeal, in so many different ways, in Scotland and Malawi.

About the Oxygen Supply Coordination Group

The primary purpose of the Scotland-Malawi Oxygen Supply Coordination Group, was to help coordinate those involved in supporting the supply of oxygen in Malawian hospitals during the Covid pandemic.

Background:

At its [25th January Covid coordination meeting](#), with Malawi's Minister of Health, the Scottish Government's International Development Minister, the Malawi Cross Party Group (Scottish Parliament), the Malawi All-Party Parliamentary Group (UK Parliament) and 250 key stakeholders across Malawi and Scotland, the issue of oxygen supply was identified by many as a critical area in which further urgent support was needed.

The SMP offered to facilitate more detailed conversations in this area, with a meeting of specialists taking place on the 2nd February.

[CLICK HERE](#) for more information on this 2nd Feb meeting

[CLICK HERE](#) to watch the meeting (unfortunately missing first ten mins)

It was clear that there was real and immediate value in creating a space for sharing information about the oxygen supply issue between those involved: sharing updates about what equipment is lacking where, and who is doing what on the ground in response to this.

The SMP therefore established a time-limited Scotland-Malawi Oxygen Supply Coordination Group to continue this exchange of vital information and support collaboration.

Leadership

The [Scotland Malawi Partnership](#) (SMP) is a membership organisation and this is a member and partner-led initiative, with members and key stakeholders volunteering time and expertise to manage this group. Mr Alberto Gregori, a Consultant Orthopaedic Surgeon with several decades of experience working with Africa (and more recently Malawi) in this area, has kindly volunteered to Chair the Group, bringing essential expertise and capacity to this initiative.

Aims of Group

The Scotland-Malawi Oxygen Supply Coordination Group had three strategic objectives:

- 1) To facilitate the ongoing sharing of information between those involved in this area, to support a coordinated response in Malawi.
- 2) To highlight relevant existing fundraising appeals which are delivering real and immediate impact in this area, such that the SMP can recommend and promote these campaigns to members looking to donate now.
- 3) To explore the possibility of new collaborations between members and key partners: potentially harnessing expertise and experience from a range of key organisations, to offer time and cost-effective ways of increasing Malawi's oxygen generation in both the short and long term. If a new collaboration is deemed genuinely useful, appropriate and viable, and if there is broad support from the relevant Scottish and Malawian organisations involved, and the Government of Malawi, the SMP would be willing to approach the Scottish and UK governments, as well as potentially other donors, to seek urgent funding. However, we must emphasise that there is absolutely no guarantee that any additional funding would be forthcoming.

Limitations of SMP support

The SMP was able to promote, host and support Zoom meetings of the Group, and offer modest administrative support for the Group's Chair. But beyond this we were reliant on members with technical knowledge and expertise volunteering their time and input.

The SMP was clear from the outset that:

- The SMP does not itself have funding to support this or any other operational work: the Partnership is purely a coordination network with a small secretariat.
- The SMP does not itself have any technical expertise in this area and is only able to collate that of its members and partners.
- The SMP does not have sufficient staffing/capacity to manage a major appeal or itself coordinate the delivery of work.
- This initiative is therefore reliant on members, partners and stakeholders volunteering their time and expertise.

[CLICK HERE](#) for the full Terms of Reference of this Coordination Group.

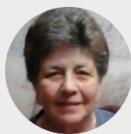
Scotland-Malawi Oxygen Coordination Group Members:



Alberto Gregori, FRCSEng FRCSEd FRCSEd(Orth) DFM

CHAIR

Consultant Orthopaedic Surgeon, Ross Hall Hospital
Glasgow Chair Elect World Orthopaedic Concern UK Trustee FlySpec Zambia



Revd Susan Flynn, BA. MTh

Founder of Chifundo UK and Chanasa Malawi www.chanasachifundomalawi.org Visited Malawi since 2005 and spend 8 weeks a year undertaking voluntary work there. In previous professional life have had experience for 14 years working for Liverpool and Cheshire liaising between Health and Social Services and the Voluntary Sector. Researched, networked and used my contacts.



Stanley Onjezani Kenani, ACCA, CIA

Lead Organiser, Covid Response Private Citizens, Malawi



Andrew G. Mtewa, PHD

Andrew G. Mtewa trained in Medicinal Chemistry for his PhD at the University of Dundee in Scotland and at the Mbarara University of Sc. & Tech. in Uganda and for his MSc in Applied Chemistry at Chancellor College. His work focuses on designing of drug agents against various disease targets and their synthesis contributing to drug discovery and development. He is a book author and editor in drug discovery. Currently, he teaches Chemistry at the Malawi University of Science and Technology. He is contributing to this team in any way he possibly can. @andrew_mtewa.



Mr Tom Hunt

Medic Malawi Executive Director



Professor Paul Garside, PhD, FRSB, FRSE

Dean for Global Engagement (Africa & Middle East)



Dr Arie Glas, MD, DTMIH.



Dr Antonia Ho, MBChB PhD

Clinical Senior Lecturer/Consultant in Infectious Diseases, MRC-University of Glasgow Centre for Virus Research, Institute of Infection, Immunity and Inflammation, College of Medical, Veterinary and Life Sciences, University of Glasgow.



Ann M. M. Phoya, PhD, PHN, RNM

Current Positions; Chair MaSP, Deputy Chief of Party, MSH/ ONSE USAID Health Activity, Deputy Chair, Special Law Commission for the Review of the Malawi Public Health Act, Adjunct Professor, Kamuzu College of Nursing, Community Health Nursing Science

Past Positions; Director, SWAP, Ministry of Health, President Association of Malawian Midwives, Full Bright Scholar in Residence & Adjunct Professor, Winston State Salem University, Northern Carolina, US



Gertrude Chirambo, MBA

Blantyre City Council Councillor, Chair Council Health Committee, Commissioner -Fast Track Cities Initiative, President Malawi Women Councillors, Steering Member, African Women Leaders Network.(AWLN) Malawi Chapter.



Dr Rachel Phillips

Rachel is a GP in Edinburgh and at the Fife Covid Assessment Centre with a first in International Health from UCL and experience with South Africa's Treatment Action Campaign during their governmental AIDS denialism. She maintains her passion for Malawi, the country of her birth, medical education and social justice.



Lucy C.K. Chitembeya, BS

Director Power Global Malawi Ltd.; Founder, CEO & Chairman of the Board, The Maravi Heritage Foundation - MHF, Founder, Malawi Congress Party Diaspora Network, MCPDN; Youth empowerment, politics, international human rights and civic engagements.



Ms. Habiba Osman

Currently, Executive Secretary of Malawi Human Rights Commission. Previously, Civil Liberties Committee and Norwegian Church Aid, UN Women Malawi office. Ms Osman has vast experience in the protection and promotion of human rights, political rights, civil rights and democracy. She is a well-versed professional in gender and human rights; and is a renowned human rights defender and activist in the country and globally.



Professor Wilson Lewis Mandala, PHD

Executive Dean of the Academy of Medical Sciences at MUST. Prof Mandala has a PhD in Malaria Immunology obtained from the Liverpool School of Tropical Medicine (LSTM), a Masters Degree in Molecular Biology and Biochemistry from Kings College, London and a Bachelors of Science degree in Chemistry from Chancellor College, University of Malawi.



Professor Mia Crampin MBChB, DTM&H, MSc, FFPHM

Director Malawi Epidemiology and Intervention Research Unit, Professor of Global Health Epidemiology at University of Glasgow and Professor of Epidemiology at London School of Hygiene and Tropical Medicine.



Professor Heather A Cubie, MBE, PhD, FRCPath, FRSE

Chair, Scotland Malawi Partnership and Senior Advisor, Global Health Academy University of Edinburgh.



Edith Parker

Edith Parker is the Founder and Executive Director of Waterloo Advisory Services, trustee and treasurer of The Marr Manning Trust, Executive member of Malawi- UK Business Group and founder of the Malawi International Covid-19 Response Group. She was also the founder of Big Issue Malawi, the 5th street paper in Africa. Her career has mostly focused on the non-profit and philanthropy sector. www.edithparkeraoma.com



Mr. Edgar Kapiza Bayani, MA Int. Dev.

Country Director, Community Energy Malawi



Professor Bryne Tendelo Ngwenya

Chair of Microbial Geochemistry, Visiting Professor, University of Newcastle



Mrs Jane Gebbie BVSc(Hons) MVSc CertLAS MRCVS

Secretary and Trustee, Kondanani UK (Registered charity England and Wales 1113426).



Nelson Nyoloka, BPharm(Hons), MSc Clinical Pharmacology(MedSci)-current student UofG Scotland.

Lecturer, College of Medicine-University of Malawi. Trustee of MalDent Student Aid.



Dr. Cathy Ratcliff

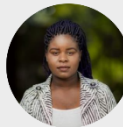
Director of International Programmes and CEO, EMMS International



Ron Nkomba

Board Chairman, Democracy Works Foundation (DWF)

Ambassador Ron Nkomba (Rtd), became the first Malawian Clerk to the Cabinet in August, 1969. He has had a distinguished career as a Malawian diplomat and Electoral Commissioner, and is currently involved in the establishment of the National Peace Architecture (NPA).



Brenda Mwale

The Malawi-Scotland Partnership, Youth Ambassador

About the Emergency Oxygen Appeal:

At the request of the Oxygen Coordination Group, a request was made of the Scottish and UK Governments to support emergency oxygen provision in Malawi. This was not forthcoming, so the SMP established a one-off, time limited public emergency oxygen appeal.

This was a very quick emergency appeal which took place in the last two weeks of February 2021, looking at what emergency support could be offered to support oxygen therapy in Malawi in the second wave of Covid.

The Chair of the Oxygen Coordination Group worked closely with Malawian healthcare professionals on a daily basis, listening to their changing operational needs and priorities, and making recommendations informed by this on exactly how funds should be spent.

Over 300 individuals and organisations donated to the appeal in the two weeks, raising £40,500.09.

We are extremely grateful for all the many kind donations and to Mr Alberto Gregori, and all in the Oxygen Coordination Group, for their tireless work in firstly raising these funds and secondly making them go so far, so quickly in Malawi.

Appeal Timeline:

12th January 2021

National Emergency declared by President L Chakwera as result of a 2nd Covid wave

25th January 2021

SMP, Scottish Parliament's Malawi Cross Party Group and Westminster's Malawi All-Party Parliamentary Group Joint Meeting highlighting the 2nd wave of Covid -19 and it's effect on Malawi

4th February 2021

Oxygen Coordination Group formed by SMP members to advise on appropriate response to Covid-19 crisis in Malawi

16th February 2021

Appeal Launched

28th February 2021

Appeal Closed

Feb-March 2021

£38,000 (95%) of appeal funds transferred and put to immediate operational use.

June-July 2021:

In-person visit to Malawi to by Chair of Coordination Group to see impact of donations and make recommendation for final £2k (5%) of appeal funds.

August 2021:

Final £2k (5%) of appeal funds donated, reports published and all donors thanked.

Summary of Oxygen coordination group recommendations over the course of appeal.

1. **Provision of 50 Oxygen Saturation Monitors** to assess patients with Covid-19 and their treatment. Supplied and airfreighted to Malawi by MedAid international on 23rd February 2021.

Cost: £10,000.00

2. **Support for a Malawian based charity, Open O2, to help repair and return to service at low cost the many Oxygen Concentrators** already in Malawian hospitals

- a. Helping with costs of transport, spare parts, equipment and accommodation of teams travelling to District Hospitals and Church hospitals throughout the country.

£10,000 funds remitted 8th March 2021



- b. Purchase of 300kg bulk Zeolite Chemical for Open O2, an essential component of Oxygen concentrators needing repaired.

£4,839.58 funds allocated and Zeolite received 18th March 2021

3. **Attendance at Ministry of Health Covid-19 taskforce Zoom Meetings and Oxygen Taskforce Meetings** to keep abreast of developments and needs [no cost]
4. **Purchase of 52 Bullnose regulator valves and 52 flowmeters** to allow usage of oxygen cylinders at district and central hospitals as a shortage evident as a result of 3. **£2,000**



5. **Purchase of a further 37 Oxygen saturation monitors** dispatched by airfreight along with the regulators and flowmeters.

£10,500 Dispatched 23rd March 2021

6. **Handling arranged pro bono in Lilongwe Kamuzu international Airport through MedAid International [no cost]**

7. **Shipment by Container from Dundee by Bananabox of 4 boxes containing PPE, Digital Oxygen sats monitors, Airway management and Anaesthetic equipment, tubing, ventilation bags, airways and masks and replacement parts** shipped to Mzuzu and Ekwendeni Hospitals for distribution in northern Region. These all donated by NHS Lanarkshire Hospitals and BMI Ross Hall Hospital, Glasgow. **[no cost from appeal funds]**



8. **Assessment on ground by SMP member to check appropriate use of donated equipment and any possible unmet needs that could be addressed with residual funds. See main body of report.**

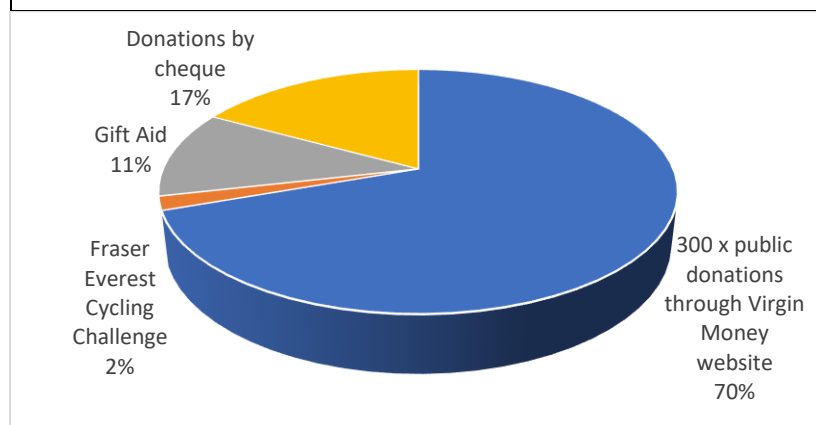
10th to 26th July 2021 **[no cost from appeal funds]**

9. **Contribution towards installation of local oxygen delivery piping at Kamuzu Central Hospital Emergency Covid-19 Treatment Unit. £2,008.09**

Financial Summary of Emergency Oxygen Appeal:

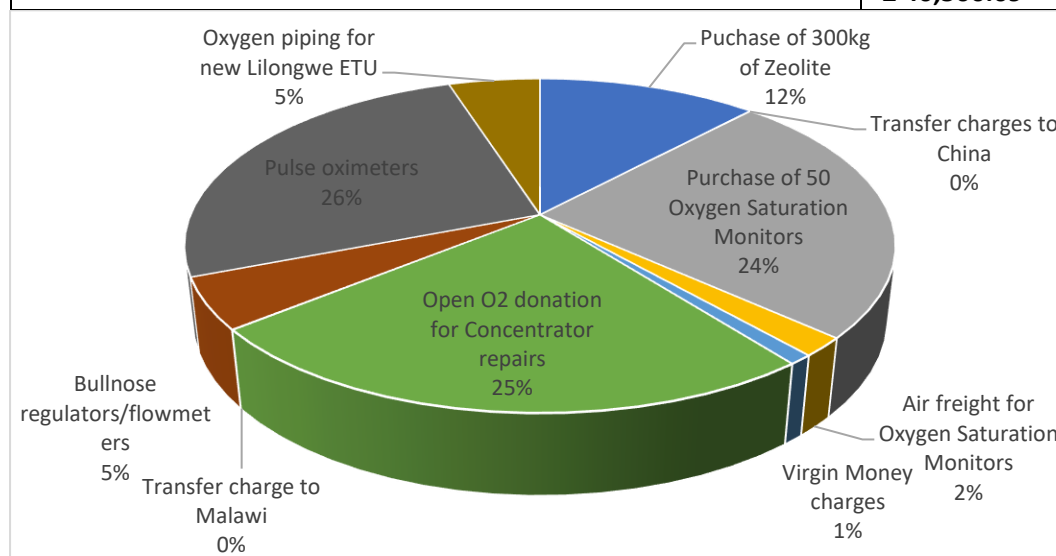
Incoming resources:

300 x public donations through Virgin Money website	£ 28,196.90
Fraser Everest Cycling Challenge	£ 737.50
Gift Aid	£ 4,675.69
Donations by cheque	£ 6,890.00
	£ 40,500.09



Resources expended:

Purchase of 300kg of Zeolite from China	£ 4,839.58
Transfer charges to China	£ 15.00
Purchase of 50 Oxygen Saturation Monitors	£ 10,000.00
Air freight for Oxygen Saturation Monitors	£ 738.61
Virgin Money charges	£ 383.05
Open O2 donation for Oxygen Concentrator repairs	£ 10,000.00
Transfer charge to Malawi	£ 15.00
Bullnose regulators/flowmeters	£ 2,000.00
Pulse oximeters	£ 10,500.00
Oxygen piping for new Lilongwe Emergency Treatment Unit	£ 2,008.85
	£ 40,500.09



Provided without cost to the appeal:

- Time of Alberto Gregori and all members of the Coordination Group
- Time and services of the SMP
- Handling of items sent in Lilongwe Kamuzu international Airport through MedAid International
- Shipment by Container from Dundee by SMP member Bananabox
- PPE, Digital Oxygen sats monitors, Airway management and Anaesthetic equipment, tubing, ventilation bags, airways and masks and replacement parts donated by NHS Lanarkshire Hospitals and BMI Ross Hall Hospital, Glasgow.
- Assessment on the ground in Malawi by Alberto Gregori to check appropriate use of donated equipment and any possible unmet needs that could be addressed with residual funds.

Coordination Group Chair's Report

Background:

When the Scotland Malawi Partnership launched its emergency appeal for Covid-19 assistance for Malawi in February 2021 we could not imagine how generous the Scottish public and other charities and organisations would be, the appeal raising an incredible £40,500.09

At that point we knew that there was a second wave of Covid-19 hitting the country, more brutal than the first. First-hand testimony was presented at the joint meeting with the SMP, the Scottish Parliament's Malawi Cross Party Group and Westminster's Malawi All-Party Parliamentary Group in January 2021 attesting to the severity of the second wave.

Since then, the nature of the Covid-19 pandemic has continued to challenge the world with further variants causing third and fourth waves throughout the world. This pattern has been repeated in Malawi, bringing many challenges to the country, especially given the lack of basic healthcare resources in this, one of the poorest countries in the world. Many governments and agencies rallied then, to the aid of the Malawian people including UNICEF, MSF as well as smaller NGOs. The initial response was to help provide everything from PPE to Oxygen cylinders to essential drugs. Concurrently the Malawian Ministry of Health set up Taskforces involving Ministry, Foreign Government agencies, donors and NGO expertise to try and coordinate needs, equipment, donations and resources in conjunction with practical solutions, a not insignificant challenge. The SMP were represented on two of these taskforces.

At the time the increased worldwide demand for PPE and Oxygen supply materials meant a significant increase in prices and a significant lag in delivery especially to a land locked country such as Malawi, quoted delivery times being in excess of 12 weeks using ordinary shipping methods. Experience was to show that lead times were often longer than quoted.

Covid-19 and Oxygen Supply:

Treatment for Covid-19 is based on using clinical guidelines, with clinical history and assessment and using an Oxygen saturation monitor to measure the patient's lung function, using achieved Oxygen saturation to determine the need for supplemental oxygen therapy and subsequently the patient's response to treatment. The Ministry of Health published ideal treatment guidelines based on WHO and UNICEF documents in the spring emphasising this approach. Traditionally in Malawi, costly and bulky Oxygen cylinders have provided the mainstay of oxygen therapy because of the high oxygen flow rates often required. In more developed countries such as the UK, piped oxygen is usually the mainstay of hospital oxygen therapy, reliant on large tanks being filled with liquid oxygen and the supply piped throughout the hospital. The ability even in the UK to keep up with oxygen demand has been seriously challenged in this Covid-19 pandemic and the challenge was significantly more acute in Malawi

Oxygen Concentrators are a standalone, electrically driven, Oxygen concentrating pump using room air and a technique known as Pressure Swing Adsorption over a Zeolite bed, providing up to 10 litres a minute of 95% pure oxygen. These were identified worldwide as a suitable resource for delivering much of the early oxygen therapy needs in the Covid-19 pandemic, releasing the valuable oxygen cylinder or piped Oxygen resource for the sickest of patients. The need to accurately measure patient oxygen levels before and during treatment has been recognised as vital to optimise both oxygen therapy and oxygen utilisation, patients should only get what oxygen supplementation they need and no more, safeguarding this precious and expensive resource.

Background facts:

- An oxygen cylinder costs about £75 to refill plus transport costs. One could easily be used in a day for the sickest of patients, especially if poorly monitored.
- An Emergency Treatment Unit in a district hospital may have access to only 4 or 5 cylinders at a time.
- The average income in rural Malawi is less than £1 a day.
- An Oxygen Concentrator costs about \$1,600 plus transport (significant because of their weight).
- Maintenance of Medical Equipment has been a longstanding challenge in most Low and Middle Income Countries (LMIC), expertise and the ability to purchase spare parts has remained a significant challenge for these countries.

The Appeal:

Scottish Malawi Partnership (SMP) was moved to help in this crisis and looked at how best to help the people of Malawi and to provide rapid support where needs are greatest. A short-term working group was established working in partnership with the Malawian Ministry of Health and its own Health Cluster and Oxygen Taskforce. In these meetings certain issues and needs became apparent and the following needs were identified as being a priority that could be addressed quickly and effectively whilst also providing a legacy effect for better healthcare in the future for Malawians. Larger scale projects such as new oxygen plants and hospital piping projects were outside the scope of what SMP could realistically provide in a rapid response appeal and remained the remit of major Donor Government and NGO Aid Projects. An Appeal was launched on 16th February 2021 to raise funds to help Malawi's Covid -19 response.

Recommendations:

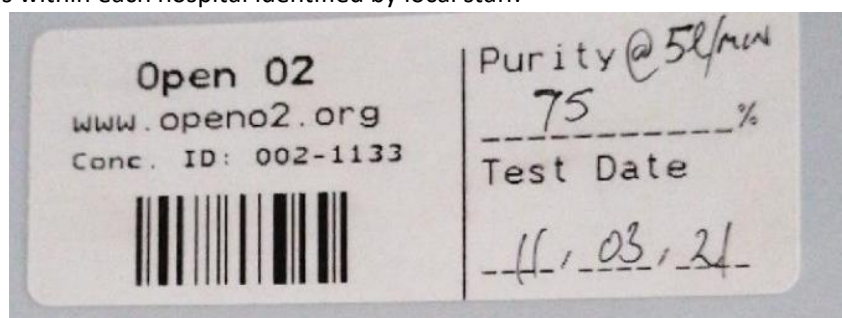
The following initial recommendations were made by the short-term working group:

1. SMP to provide assistance to help repair the numerous broken Oxygen Concentrators that were known to be onsite in Malawian Hospitals. A local Malawian Charity "Open O2" (www.openo2.org) had already started work on this project commencing in Lilongwe's Kamuzu Central Hospital with local engineers initially donating their time *pro bono*. Nationally, at least 550 Oxygen Concentrators needing repair had been identified. Initial experience suggested roughly half of these were relatively easy to repair.



Along with repairing as many of those clearly broken oxygen concentrators as possible, Open O2 had also taken each hospital visit as an opportunity to test and check those oxygen concentrators thought to be working. As expected from preliminary field work, there were many concentrators in use that did not effectively supply oxygen at a therapeutic concentration, despite making all the right noises! Open O2 now manufacture inhouse, an oxygen purity tester which they supply to each hospital visited, to try and overcome this issue.

A scout team attended each hospital before the main team, cataloguing and barcoding all the oxygen concentrators within each hospital identified by local staff.



Pre-emptive identification of models and types also allowed the team to bring appropriate spare parts if available. The work and experience gained allowed the OpenO2 team to know what issues to expect. The Open O2 philosophy of utilising generic spare parts allowed significant savings to be made in sourcing spares, often for obsolete models. Consequently, the mainstay of concentrators, the Zeolite Sieve bed can now be manufactured and filled at Open O2's Lilongwe base with Zeolite bought by SMP and a locally devised and manufactured replacement Zeolite cannister.

All of the Open O2 work was made possible by their using two locally acquired and modified minibuses, which are both personnel carriers and mobile workshops, fitted with compressors, generators and a workshop area. Many of the hospitals visited had no suitable area for the team to do their work. Experience also showed the need to have their own reliable electricity supply to overcome the frequent ESCOM load-sharing power cuts.

Initially Open O2 relied on volunteer staff but as their remit has expanded and teams are more fully committed, interns have been hired to work fulltime in the Open O2 repair program. Each hospital trip costs on average US\$900, depending on distance travelled, and has resulted in the repair of over 329 oxygen concentrators worth over US\$520,000. So far, with SMP and other donors support, they have visited 37 hospitals and health facilities from Mzuzu in the Northern Region to Phalombe in the South. They have repaired 329 concentrators (worth over US\$520,000), concentrating on the quickest to repair, and tagging those requiring more work or specific spare parts to be obtained. These were then addressed in planned return visits or, where there is in-house technical expertise, by the dispatch of the appropriate spares for tagged concentrators. It is estimated that there remain another 500+ concentrators needing repair in the country.

At the time of writing, Open O2 has only used half the funds donated by the SMP, so these appeal funds will continue to help fix oxygen concentrators for many months to come.

2. An essential part of the diagnosis and treatment of Covid-19 involves the ability to measure the amount of Oxygen in a patient's blood. It is normally measured in terms of the % of maximum carriage or saturation expected, and normally sits at over 95%. This assessment (using a simple oxygen saturation monitor) allows determination of the amount of Oxygen required to effectively treat the patient and monitor ongoing therapy and the patient's response. The same monitors are required as part of the normal safety monitoring of patients during surgery, childbirth and treatment of critical illness including childhood pneumonia and malarial crises. They are in very short supply throughout Malawi, and many of the original Lifeboxes provided by donors over the years no longer work needing replacement rechargeable batteries or probes.



A medical grade Oxygen saturation monitor with charger and probes costs over £250 and lasts for several years. Their provision would help in the assessment of Covid-19 patients and optimise the use of the available oxygen resource. In most Emergency Treatment Units established by the Ministry of Health throughout the country, Anaesthetic Clinical Officers were rostered into the units to provide their airway/breathing management expertise in the treatment of Covid-19 patients.

Our appeal aimed to help fund both of these initiatives, to provide immediate assistance and relief to Health Care providers throughout Malawi. We also expected this urgent intervention would also have the effect of enhancing future healthcare provision by providing a more widely available Oxygen resource and an ability to effectively monitor its provision.

Course of appeal

In line with the above recommendations, SMP sourced and funded the delivery of an initial consignment of 50 Desktop Oxygen Saturation monitors. These were provided “off the shelf” by MedAid International, a UK based community enterprise that specialises in the provision of healthcare needs to LMIC countries and which works closely with many charities as well as the UK government’s own Emergency Relief teams.

In view of the nature of the emergency, the units were dispatched by air freight and the handling was provided *pro bono* through the auspices of MedAid’s Tim Beacon. For this we are very grateful.

After customs clearance, (again at no cost), the units were picked up by OpenO2, and sent to Mzuzu Central Hospital where we utilised regional anaesthetic staff to distribute the Oxygen Saturation monitors to anaesthetic staff and Emergency Covid Treatment units in all of the Northern region where we could ensure as equitable rapid coverage as possible. Each of the 27 anaesthetic Clinical officers in the Northern Region received one unit for their work in the ETUs and the others were placed through the District Medical Officers into the Emergency Treatment Units and Assessment areas. We are grateful to Mr Frances Masoo, Senior ACO and Dr Judith Mkwaila from Mzuzu Central Hospital who made such an effort to do this as soon as the monitors arrived.

Cost £10738.61



Open O2 Background

Through the Ministry of Health Covid-19 and Oxygen Taskforces meetings we had become acquainted with the work of a Lilongwe based charity; Open O2, led by Dr Timothy Mtonga and Prof Gerry Douglas from the GHII in Lilongwe. Options that were being explored through the taskforces were buying Oxygen concentrators, cylinders and oxygen plants as well as other equipment. All of these options came with significant delays to actually taking delivery of the necessary equipment. In the early stages of the second wave it became clear that even with the best will in the world and unlimited resources it would be difficult to obtain either Oxygen Cylinders, Oxygen concentrators or Oxygen manufacturing plants at short notice. From our recent Trauma Audit in Northern Malawi funded by the Scottish Government, we were aware of a large number of broken Oxygen concentrators throughout Malawian Hospitals. One of the solutions being offered by Open O2 involved repairing and refurbishing those oxygen concentrators already in Malawian Hospitals.



This approach was clearly new but initial work by Open O2 in Lilongwe had already demonstrated the viability of the approach, the significant cost effectiveness and the positive ecological and sustainability aspects of their efforts.

A further, more in-depth, discussion with Open O2 made it clear that their approach was both practical, viable, sustainable and based upon local expertise supported by overseas partners. It made sense to support this approach as Open O2 were already in place and had already started working on the refurbishment and repair of oxygen concentrators in Lilongwe but needed funds to commit to undertaking work throughout the rest of Malawi.

A verbal initial commitment by SMP allowed the first trip to Zomba to proceed and the subsequent allocation of £10,000 allowed a rollout of the two mobile workshops along with interns to cover a significant part of the country so far (see Open O2 report).

It was agreed to fund their initial hospital trips outside of Lilongwe. As visits are planned in advance, covering the whole country's 28 district hospitals, along with the Central hospitals and larger Church

hospitals it became clear that the single converted minibus workshop wasn't sufficient to serve the needs of the country and a second one was obtained, converted and is now in use.

The visits have developed significantly from the first one in Zomba on 15th February 2021 funded by SMP. Whilst initially the concept was simply looking at Oxygen concentrator repair, they have extended their remit to checking the function of those concentrators still in use and labelling their tested efficiency. This allowed them to review units in future visits, undertaking preventative maintenance for the units where needed.

Teaching the use of techniques to increase oxygen output and supply by connecting concentrators in parallel also helps preserve cylinder supplies for more challenged patients. Church hospitals have also been proactive in bringing repairable units to a central point to make visits more effective for the Open O2 team.

The diary of visits has continued to expand with the aim to cover all District, Central and larger Church hospitals by late autumn 2021 along with return visits to bigger hospitals with significant remaining repairable units. The offer of help has been to all Health Care facilities treating Covid Patients and not solely Government hospitals

£10,000 Funds remitted 8th March 2021



On behalf of PAM RMU North and again on my own behalf would like to thank management of Open Oxygen Mobile Workshop for the initiative they engaged in to repair and service oxygen concentrators which were left idle and unattended due to lack of spare parts. These spare parts are not only expensive but also not found in our locality let alone the region. Attached is a photo of those concentrators repaired and ready to be dispatched back to their respective wards. This is no mean achievement!!!! I guess this is an ongoing exercise. Imagine, some of these concentrators were abandoned some 5 to 10 years ago and have been brought back to life! Most importantly, the initiative has preserved and saved our famous and long lasting brand the "DEVILBISS." My free advice to the PAM family is to assist our friends from Open Oxygen team to carry out their task effectively. Let us provide all what they need, be it space, quantification of equipment to be repaired. It is again worthy more to provide statistics



Continuous Feedback

Feedback from OpenO2's work through both the Taskforce meetings and also our contacts on the ground brought up other issues that we felt we could help address with our remaining funds from the appeal:

1. Purchase of Zeolite for refurbishing concentrators.

Zeolite is the core element that allows oxygen concentrators to work. Zeolite is a hydrated aluminosilicate mineral that has the ability to selectively adsorb nitrogen when it is exposed to compressed air, allowing oxygen to be left in the gaseous state and retrieved by the concentrator and delivered in a relatively highly purified state to the patient. Unfortunately, Zeolite can be degraded by exposure to moisture and other contaminants to a level that it no longer works as an effective nitrogen adsorber and needs to be replaced. Usually, this is supplied in a machine specific canister which is very expensive and needs supplied from the manufacturer of the concentrator. Open O2s work has enabled them to manufacture in-house newly filled Zeolite cannisters at a fraction of the cost of factory units. The main ingredient however needed ordered in bulk from suppliers in China as their previous small supplies ran out. SMP agreed to pay for a shipment of 300kg Zeolite direct from the suppliers in China. This arrived in Lilongwe and is still being used to recharge cannisters as they are needed.

£4,854.58 Funds allocated for Zeolite Purchase



2. Need for bullnose regulators and flowmeters.

Our feedback from our colleagues in the Northern Region and the Open O2 teams as they travelled the rest of the country alerted us to a lack of bullnose regulators and flowmeters to make full use of filled oxygen cylinders in the ETUs and also some theatres as well as a continuing need for Oxygen saturation monitors often in smaller hospitals. This is often because:

- Both the regulator which fits onto the Oxygen cylinder and essentially turns it on and the flowmeter which measures the flow being dispensed to the patient, suffer a high attrition rate.
- The regulators are often sent back on the empty cylinder by staff who may not realise that they are supposed to be removed, and are never returned from the filling plant.
- They are also liable to damage when cylinders are transported and, once removed, they are unprotected and easily damaged at their olive coupling, this causing leakage, and they are often misplaced.
- Flowmeters usually have a glass or plastic calibrated tube which is easily broken if not handled carefully. Like in the UK, during the Pandemic it has been all hands on deck and staff are not necessarily familiar with the delicate nature of these items.



The SMP was able to source a supply of 52 ex MOD surplus new Bullnose regulators and 52 ex MOD surplus new Oxygen flowmeters from GB Medical. Being military issue these units are high quality and relatively more robust than the usual items found in hospitals.

£2000 GB Medical for Bullnose and Flowmeters

£9,250 for 37 Oxygen Saturation Monitors

These were all dispatched together by MedAid who collected the regulators and flowmeters free of charge and arranged their customs clearance and release to Open O2. Again, Open O2 have facilitated the delivery of these, as required, when visiting units throughout the country and fulfilling unmet needs.

£1,250 for Airfreight above Dispatched 23rd March 2021



LATEST SITUATION REPORT AND APPEAL CLOSURE

Malawi closed its borders to all nonessential travellers and tourists in June 2021 as a result of a third Covid-19 wave sweeping the country, in an attempt to reduce imported cases.

As part of a Ministry of Health & Feet First Partnership Orthopaedic Surgical Team we were fortunate to be given special authorisation to enter the country through the land border at Mchinji on the 10th July.

We took this opportunity to see first-hand what the situation on the ground was and how the SMPs Appeal funds had been used so far.

We were able to visit hospitals in Mchinji and Mzimba and their respective Emergency Covid-19 treatment units and speak to staff. We met with staff from Mzuzu Central Hospital to be updated as to the current situation regards Covid -19. In Lilongwe we were also able to meet with the OpenO2 team and visit their workshop and base as well as reviewing their expenditure of SMP Appeal funds.

We have been part of the Malawian Ministry of Health's Covid response Taskforce and Oxygen Taskforce and have attended regular meetings on Zoom along with many other NGOs and partner organisations. This gave us a view from the centre and our extensive partnerships throughout Malawi also gave us a sense of what was happening on the ground.

Hospitals

In the third wave it was clear hospitals were better organised this time round. Each district hospital had a dedicated separate Emergency Covid-19 treatment unit known as an ETU. These were not always on the hospital campus. For example, in Mzimba the ETU was based in the old District Hospital building a couple of miles from the current District hospital, but in Mchinji it had been built with external funding from a donor Government on the hospital grounds but separated by a fence. In Lilongwe the National Bingu Stadium had been used during the second wave but had proved not ideal and, for the third wave, the ETU was located in the old Eye Hospital Pavilion building in the Kamuzu Central Hospital grounds which had been reprieved from demolition and been upgraded.

The size of each unit reflected the numbers of patients requiring hospital admission, with only those patients who were requiring oxygen therapy being admitted. Mzimba had 10 active beds with a spare ward to expand into. Kamuzu Central in Lilongwe had 3 wards with nearly 100 beds and were on the brink of opening another 20+ bedded ward.

Other hospitals had been similarly organised to make the best use of resource and physical layout.

Significant challenges remaining include:

1. Oxygen supplies in cylinders remained at a premium.
2. It was gratifying to see Oxygen concentrators were now being used more widely, though their use could be extended with a wider availability of rebreathing trauma-type masks.
3. Consumable supplies such as masks, tubing and laboratory reagents remained in short supply.
4. Some of the oxygen plants that were already in the country were still not fully functioning and were still awaiting repairs and maintenance. Other promised extra Oxygen manufacturing or concentration plants were still not delivered or commissioned.
5. Saturation monitor supplies were still patchy despite official tallies suggesting that there were enough, for example the ETU in Mzimba only had one small digital saturation monitor of poor quality and variable accuracy. Mchinji had only one Lifebox with a failing battery.

Positively, staff were now regularly rostered to work in the ETUs and then given time off and Covid tested thereafter prior to returning to normal clinical duties. The staff we spoke to felt better organised than in the previous waves. Testing and assessment of possible Covid patients was much better organised and structured. All patients entering Mzimba District Hospital for example were screened and limits on hospital attendance imposed to reduce risk of spread.

The SMP were able to supply these units with a total of 5 Oxygen Saturation monitors. In Mzimba we were also able to supply 2 additional Oxygen flowmeters and 2 bullnose regulators to allow more effective use of their cylinder supply as they only had one flowmeter and regulator for 4 cylinders.



One issue that became clear was that there was a significant shortage of suitable oxygen masks. Most patients were being treated with nasal prong cannulas which are very wasteful of oxygen and do not reach high therapeutic concentrations. Again, in Mzimba we were able to give them our team's last supply of Trauma rebreathing masks to allow effective use of oxygen and deliver high concentrations of administered oxygen at lower flow rates.



In each of the hospitals we visited we also took the opportunity of looking at the Oxygen concentrators we came across in theatres and on the surgical wards. Here we found more broken concentrators or ones that had not been checked nor made known to the Open O2 teams. These were highlighted to the Open O2 team for their return visits.

Final use of remaining SMP Appeal Funds:

It seems inevitable that in the current situation that we should prepare for and expect another Covid-19 wave, most likely with the rainy season. With the decision to relocate the Lilongwe Emergency Treatment Unit from the Bingu stadium to the Refurbished Eye Pavilion on the Kamuzu Central Hospital grounds, Open O2 have been onsite daily to facilitate the most effective provision of Oxygen for patients in the Covid -19 ETU.

Their work has shown that piping oxygen throughout the unit would facilitate effective oxygen delivery and usage. This would be done using a bank of Oxygen concentrators feeding a pressure vessel and manifold, with Oxygen cylinders used only as a backup in case of electricity supply problems. The remaining funds of the SMP Appeal, some £2000, have been donated to buy the needed piping and connectors to set up the local network in the Eye Pavilion to facilitate care of patients in the near future and maximise the effective utilisation of oxygen in the care of Covid -19 patients.



CONCLUSION

Through the generosity of the Scottish people the Scotland Malawi Partnership appeal has been able to effectively and positively impact the care of Malawians during the second and third Covid-19 Pandemic waves. Their support will also leave a legacy of better health care resource for the future to help better provide overall health care to Malawian patients.

Alberto Gregori FRCSEng, FRCSEd(Orth) Consultant Surgeon

Chair, SMP Oxygen Group

Appendices

- [Watch Alberto Gregori briefing the SMP's Covid Coordination meeting 14 \(4th August 2021\) on the appeal](#)
- [Open O2 Zomba report](#)
- [Open O2 SMP Sponsorship summary](#)