



## A new partnership for anesthesia training in Zambia: reflections on the first year

## Un nouveau partenariat pour la formation en anesthésie en Zambie: réflexions après la première année

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### Abstract

**Purpose** A new postgraduate anesthesiology residency program has been founded as a North-South partnership between the United Kingdom (UK) and Zambia. The project aims to train physician anesthesiologists in Lusaka in an attempt to address the high perioperative mortality associated with anesthesia as well as to provide better professional support for clinical officer anesthesiologists.

**Principle findings** We present a detailed description of our experiences in establishing a new global health partnership and reflect on the outcomes of the first year of the training program. The formal healthcare partnership between the UK and Zambian governments began in 2009. Funded by the UK Department for International Development and managed by the Tropical Health and

Education Trust, a four-year postgraduate Masters in Medicine (Anesthesia) degree was offered beginning in 2011. A volunteer faculty of consultant anesthesiologists from the United Kingdom and Canada has provided teaching support. There are plans to improve continuity by using senior UK trainees in Out Of Program attachments. To date, eight postgraduate Zambian doctors have successfully completed the first year of training and progress into their second year.

**Conclusion** On reflection, some of the lessons learned were very specific to local circumstances and could have been appreciated only after starting the program – flexibility and responsiveness early in the program have been very necessary. Nonetheless, our findings enhance existing knowledge about establishing and conducting global health partnerships in anesthesia.

**Author contributions** John A. Kinnear conceived the idea for the article and helped prepare the manuscript. M. Dylan Bould, Feruza Ismailova, and Emily Measures contributed to and helped prepare the manuscript.

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## Résumé

**Objectif** *Un nouveau programme postdoctoral de résidence en anesthésiologie a été fondé dans le cadre d'un partenariat Nord-Sud entre le Royaume-Uni (R.-U.) et la Zambie. Le projet a pour objectif de former des médecins anesthésiologistes à Lusaka afin d'essayer de régler le problème de mortalité périopératoire élevée associée à l'anesthésie ainsi que de fournir un meilleur soutien professionnel aux anesthésiologistes cliniciens.*

**Constatations principales** *Nous présentons une description détaillée de nos expériences lors de la mise en place d'un nouveau partenariat de santé mondial et passons en revue les résultats de la première année du programme de formation. Le partenariat formel en soins de santé entre les gouvernements britannique et zambien a commencé en 2009. Financé par le Département britannique pour le développement international (Department for International Development) et géré par le Fonds pour la santé et l'éducation sous les tropiques (Tropical Health and Education Trust), un diplôme postdoctoral de quatre ans de maîtrise en médecine (anesthésie) a été proposé dès 2011. Un corps professoral bénévole composé d'anesthésiologistes consultants provenant du Royaume-Uni et du Canada a offert un soutien pédagogique. Des projets pour améliorer la continuité en s'appuyant sur des stagiaires britanniques en fin de résidence dans des missions 'hors programme' (Out Of Program) sont en place. À ce jour, huit médecins zambiens postgradués ont réussi la première année de formation et sont en deuxième année.*

**Conclusion** *Réflexion faite, certaines des leçons tirées étaient spécifiques aux réalités locales et ne pouvaient être anticipées avant le début du programme – c'est pourquoi la flexibilité et la réactivité ont été très nécessaires dès les débuts du programme. Ceci étant dit, nos observations s'ajoutent aux connaissances existantes concernant la mise en place et la gestion de partenariats de santé mondiaux en anesthésie.*

Partnerships between institutions in the developed and developing world can be a successful model for supporting anesthesiology education in low-resource environments.<sup>1</sup> Although these partnerships can present significant challenges, they can be of mutual benefit. With a long-term commitment by both partners, new anesthesia training programs can become self-sustaining.<sup>2</sup> There is an imperative for collaborations to disseminate knowledge gained from their experiences so as to contribute to the *scholarship of application* and result in more apt education models for such challenging circumstances.<sup>3</sup>

Despite the several existing international partnerships for anesthesia residency programs, there remains a paucity of literature to inform educators embarking on new programs.<sup>4</sup>

The most extensively described initiatives are the Nepalese and Rwandan programs, both of which are affiliated with the Canadian Anesthesiology Society International Education Foundation.<sup>2,5-11</sup> Nevertheless, there also exist relatively unpublicized North-South partnerships such as those in Malawi, Kenya, Ethiopia, Madagascar, and Uganda. Each residency program differs in its detail as each responds to a dissimilar national situation and functions at a different point in its development;<sup>12</sup> nonetheless, the programs generally share the same fundamental issues of functioning in under-resourced environments that lack postgraduate educational infrastructure and have a geographically dispersed faculty. We present details of a new anesthesiology residency (Master of Medicine) program in Lusaka, Zambia which is now in its second year. By sharing lessons learned in the first year of the program, we aim to contribute to the existing knowledge and to assist anesthesia educators embarking on similar collaborations.

## Why train physician-anesthesiologists for Zambia?

Zambia has a population of approximately 13 million, and based on its gross national income per capita (i.e., \$1,370 compared with \$36,580 in the UK), it is classified by the World Bank as a lower middle income country.<sup>13</sup> According to the Human Development Index, which considers the three domains of health, education, and income, Zambia is ranked 164 out of 187 countries.<sup>13</sup> Table 1 compares some key healthcare statistics between Zambia and Canada. A particular problem is the inadequate number of healthcare workers due to both lack of capacity for training and attrition due to “brain drain” and death.<sup>14</sup> This situation is exacerbated by a maldistribution of health resources between rural and urban areas.

There are several arguments for focusing on training non-physician healthcare workers to meet the healthcare needs of Sub-Saharan Africa. These arguments include the region's disproportionate burden of disease, low density of healthcare workers, and poor retention of trained physicians.<sup>15</sup> Evidence on “task shifting” suggests that outcomes are similar for physicians and non-physicians performing Cesarean deliveries;<sup>16</sup> however, this research fails to address outcomes that are more challenging to measure, such as the long-term effects of an unsupported and professionally isolated non-physician workforce that lacks any opportunity for continuing professional development. The counterargument to a reliance on non-physician anesthesiologists is that the value of doctors is derived not only from their technical competence but also from their leadership and capacity to advocate for professional development and improved quality of practice.

**Table 1** Demographic comparison between Canada and Zambia

|   | Zambia | Canada   |
|---|--------|----------|
| Life expectancy at birth (yr)                   | 48.5   | 80.8     |
| Health expenditure per capita (current US\$)    | 72.90  | 5,222.10 |
| Nurses and midwives per 1,000 people            | 0.7    | 10       |
| Physicians per 1,000 people                     | 0.055  | 1.9      |
| Neonatal mortality rate per 1,000 live births   | 30     | 4        |
| Infant mortality rate per 1,000 live births     | 68.9   | 5.2      |
| Maternal mortality rate per 100,000 live births | 440    | 12       |

Reference - <http://data.worldbank.org/>

The University Teaching Hospital (UTH) is the largest hospital and main referral centre in Zambia. It has 1,655 beds and serves the city of Lusaka with a catchment area of around 2 million people.<sup>17</sup> The University Teaching Hospital is the main training institution in Zambia for doctors, nurses, clinical officers, and other health professionals,<sup>18</sup> however, with no postgraduate training program for physician anesthesiologists in Zambia, anesthetic services relied heavily on non-physician clinical officer anesthesiologists (COA)<sup>19,20</sup> who train for three years to become general clinical officers and then for a further two years in anesthesia before they are qualified.<sup>21</sup> The UTH is also served by a small group of expatriate physician anesthesiologists who were trained outside Zambia, but this is atypical of other hospitals in Zambia. Across the country, there is less than one physician anesthesiologist per million people. The anesthesia specialty is underdeveloped and under-resourced, with practice largely confined to the immediate intraoperative period. Anesthesiologists have very little involvement in critical care medicine and pain management, and there is a perennial problem of an unreliable supply of essential drugs and equipment.<sup>19,22</sup> The last reliable data of perioperative outcomes from 1987<sup>19</sup> reported an overall mortality rate of 7.55 per 1,000 operations with the avoidable mortality rate (AMR) of 3.3 per 1,000 operations, accounting for 44% of all deaths. Anesthetic AMR was reported to be 0.52 per 1,000, and half of those were attributable to poor airway control and aspiration. Over 50% of avoidable deaths occurred in the younger than 30 age group, perhaps unsurprisingly, as almost half the population is younger than age 16.

### Historical context

The first described externally supported anesthetic training program in Zambia was the Overseas Teaching Program (OTP) established in 1991 and sponsored by the American Society of Anesthesiologists (now the ASA Global Humanitarian Outreach).<sup>22-25</sup> Rather than teach in westernized

environments, the driving philosophy of the OTP was to teach anesthesia in Africa for Africa while emphasizing relevance to local conditions. It affiliated only with existing training programs and provided volunteers to serve “simply and solely as teachers” with no primary responsibility for patient care.<sup>22</sup> The UTH was selected because of its large number of medical students and the presence of strong support from key stakeholders at UTH and the University of Zambia (UNZA). Unfortunately, support was withdrawn in 1993, only three years into the program. The reasons for failure were cited as a loss of formal leadership (previously provided by expatriate support), a lack of indigenous leadership to fill the gap, the loss of local teaching with complete reliance placed on visiting faculty, and a subsequent deterioration of practice standards.<sup>24</sup> Since 1994, there has been a complete absence of postgraduate anesthesiology training in Zambia. After three years, the net result of the OTP resulted in the education of two anesthesia residents, 50 clinical officer students, and 100 undergraduate students, but it should be highlighted that one of the visiting faculty of our current program was a product of the OTP, indicating some tangible legacy of this relatively short-lived project.

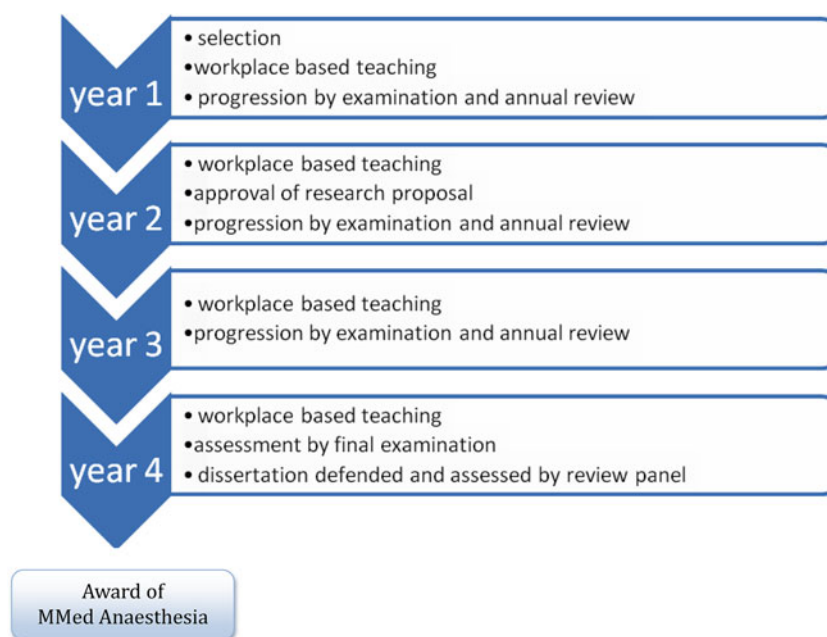
### Master of Medicine (MMed) anesthesia training program

#### Needs assessment

The preparatory work for the current program started in August 2009 and is the result of a formal healthcare partnership between the United Kingdom (UK) and Zambian governments. The Zambian Ministry of Health (MoH) was asked to identify priority areas for development, and anesthesia was proposed as one. In particular, the necessity for physician anesthesiologists was identified locally with the idea that postgraduate physician anesthesiologists would support the existing cadre of non-physician practitioners.

The UK Department for International Development has funded the program, and the responsibility for managing the project was handed to the Tropical Health and Education Trust (THET), an international development organization with expertise in strengthening healthcare services in Africa and Asia. After an initial scoping exercise by a senior representative of the Association of Anaesthetists of Great Britain and Ireland (AAGBI), a strategy was formulated whereby a specialist anesthesiologist with expertise in curricular development would commit to three years of in-country program development. Nevertheless, it became apparent that this model was unrealistic owing to a lack of clinicians with a combined

**Fig. 1** The structure of the University of Zambia anesthesia residency program



educational and clinical expertise as well as the ability to commit to such an extended period overseas. The strategy then changed to a program that would be delivered by multiple short faculty visits and overseen by a UK Head of Program who would work closely with the head of the Department of Anesthesia at UTH. A call for volunteers via an article in the AAGBI press attracted consultants from the UK and Canada.

Since postgraduate training in anesthesia had not existed in Zambia for over a decade, it was decided to conduct a needs assessment on which to base a curriculum fit for local circumstances. Although the needs assessment was led by THET, it included Zambian representation from the University of Zambia, School of Medicine (UNZASoM), the UTH, the Zambian MoH, and several other local stakeholders. On completion, a curriculum was formulated using current educational principles.

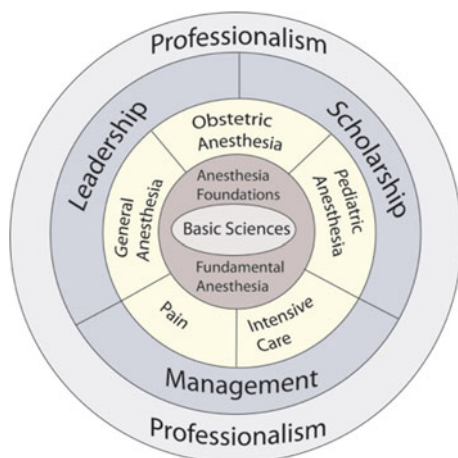
#### Anesthesia residency curriculum

The model for the residency program is a four-year postgraduate training program ending with the award of a MMed (Anesthesia) degree, with defence of a dissertation in the final year (Fig. 1). A “spiral curriculum” model was adopted for teaching delivery<sup>26,27</sup> with the key modules of General Anesthesia, Pediatrics, Obstetrics, Pain Management, and Intensive Care Medicine presented over an academic year and with each module revisited in increasing depth over the four-year duration of the program (Fig. 2, Table 2). We considered the best way to develop novices into competent practitioners within a short space of time was by delivering the entire syllabus to subsequent years

simultaneously and allowing the more senior students to participate actively as teachers of their more junior peers. We defined statements of appropriate levels of competence for different levels of experience along the spiral curriculum (Table 2).<sup>28</sup> The actual teaching would be a combination of clinical supervision and didactic teaching delivered by the visiting consultant faculty. To ensure that different visiting faculty were consistent in their delivery of the different elements of the curriculum over successive years, the aim was for continual development of context-appropriate teaching resources.

Teaching was delivered over all the anticipated modules by 11 consultant anesthesiologists from the UK and Canada as well as by supervised UK trainees. The trainees were included as visiting faculty as a trial to assess how they might usefully contribute to future teaching. The General Anesthesia module consisted of an introduction to anesthesia and the basic sciences (pharmacology, physiology, anatomy, and physics) over the first three months, and the other modules focused on a broad introduction to the subject area. Teaching methods were left to the discretion of the individual faculty and included a range of techniques from didactic teacher-led tutorials to more interactive tutorials, screen-based simulations, low-fidelity mannequin simulation, planned case-based tutorials, *ad hoc* problem-based discussions, and shared online and electronic resources. The assessment framework consisted of an initial assessment of competency at three months, which was to be followed by regular workplace-based assessments throughout the year. Nevertheless, use of the various workplace-based assessment tools was not sufficiently understood by local faculty, and the lack of continuity of





**Fig. 2** A model of the competency framework for the University of Zambia anesthesia residency program (taken from Zambia MMed Anaesthesia Course Handbook 2012/2013). Anesthesia Foundations refers to the key clinical skills required to give safe anesthesia in a low resource setting, including preoperative, intraoperative and postoperative care. Fundamental Anesthesia refers to key knowledge and skills relating to airway management and critical incident management. Reproduced with the permission of the author (John Kinnear)

visiting faculty did not allow the assessments to be conducted consistently enough to be useful. An end-of-year summative assessment consisted of a multiple-choice true/false exam paper and a structured oral exam modelled on the UK Royal College of Anaesthetists' primary examination. The MMed program completed its first academic year in June 2012 with all eight students progressing to the second year.

Scholarship has always been planned as an essential pillar of the MMed program. Technical competence in anesthesia will result in immediate improvement in patient care, but will not necessarily sustain it. The students who graduate from the MMed program will need to become the teachers and leaders who advance the specialty in the future. To emphasize the importance of this activity, a research lead was appointed concurrently with the clinical module leads, and there are currently several research projects in progress. The students also develop projects for their dissertations, and it is hoped that the research generated will contribute to solving local and regional problems.

#### Faculty development

Cohesion of the widely dispersed faculty is encouraged by holding a faculty development day in the UK prior to commencement of the program. There are also annual UK-based faculty development meetings to keep informed of progress and share experiences. Faculty members were also encouraged to share their experiences by writing a "Letter from Lusaka" report at the end of their placements, and this exercise

has now evolved into a more structured report. Communication between faculty is mainly by E-mail and voice over Internet Protocol (Skype<sup>TM</sup>),<sup>A</sup> and dissemination of educational materials and information is facilitated by use of an online shared drive (Dropbox).<sup>B</sup> Efforts have also been made to collaborate with synergistic programs locally, including Lifebox<sup>29</sup> and Out to Africa pain programs at UTH.

Local physician anesthesia staff members have become training faculty by default by providing clinical supervision to the students in the workplace, and attempts have been made to integrate them into the formal teaching program by inviting them to participate in the didactic teaching sessions. Thus far, there has been limited interest, probably as a result of intrusion on normal duties, little incentive to provide teaching, and a potential conflict of interest since there is a fear that the students may soon be trained to a higher level of practice. To help address these fears, all local staff will be invited to future "master class" teaching events, such as the Primary Trauma Course, and potentially will be recruited to become official faculty members. Nevertheless, it is likely that future indigenous teachers will almost certainly derive from the students themselves.

#### Challenges so far

Not unexpectedly, all participants have faced challenges in the MMed program during the first year of delivery. These are broadly discussed as those faced by visiting faculty and those faced by local stakeholders.

#### Visiting faculty

A qualitative study is currently underway to look specifically at the challenges faced by visiting and local faculty. These findings will be reported separately, although preliminary themes are already evident. Similar to other programs,<sup>10</sup> there is an absence of a recognizable clinical governance framework to guide local practice, which is associated with an overwhelming service need. Many factors central to modern anesthesia practice are either underdeveloped or absent, including advocacy, risk management, patient safety, informed consent, and patient autonomy, which frequently gave rise to moral and ethical dilemmas.

For example, it was not uncommon at first for an anesthesiologist to encounter a complex pediatric patient having major surgery in the operating theatre where she was expected to proceed with anesthesia without question

<sup>A</sup> Skype. Available from URL: <http://www.skype.com/> (accessed January 2013).

<sup>B</sup> Dropbox. Available from URL: <https://www.dropbox.com/> (accessed January 2013).

**Table 2** Competence statements for the different levels of experience in the Master of Medicine program

|         | Stage of training | Competency statement  |
|---------|-------------------|---|
| Level 1 | 0-6 months        | Has knowledge of, describes...                                      |
| Level 2 | 6-12 months       | Performs, manages, demonstrates under supervision                   |
| Level 3 | 12-24 months      | Performs, manages, demonstrates independently                       |
| Level 4 | 24-48 months      | Teaches or supervises others in performing, managing, demonstrating |

and without preparation of adequate drugs or equipment. Other problems included unfamiliarity with the environment and an unpredictable supply or lack of equipment and drugs. Some social isolation was also experienced owing to an inability to “debrief” and discuss the daily personal challenges with peers while in Lusaka.

We quickly realized that an emphasis on patient safety and systems issues needs to be a key part of the residency program, and preparation of visiting faculty must include familiarization with these complex issues. Additionally, a non-physician management trainee is due to be attached to the anesthetic department to assist in developing robust processes to support growth of the department and to provide leadership and management training.

#### Local stakeholders

Despite the best intentions of visiting faculty, there is no doubt that their presence is an intrusion on normal practices locally. The greatest pressures were experienced by the UTH head of department who had to promote the program and support the visiting faculty while enduring their frequent criticism of local standards of practice. This situation has required an immense capacity for tolerance and patience. On occasion, there has also been a feeling of loss of ownership of practice improvements, with misplaced credit being claimed by visiting faculty.

Several episodes of conflict occurred between visiting faculty and local surgeons because the surgeons were unaccustomed to being challenged by anesthesia staff. Surgeons were also initially reluctant to accept slow list turnover caused by teaching as well as unfamiliar requests for additional patient preparation and monitoring. Even so, despite discontent expressed by surgeons early in the program, they have appreciated the enhanced presence of anesthetic personnel about the hospital who were able to provide better and more consistent cover for their procedures. On reflection, efforts to involve surgical colleagues in the planning stages of the program might have averted many of the tensions experienced, a caveat for any program that has explicit interaction with other disciplines.

As the MMed students have progressed and attained a higher level of competence, there has been an inevitable change in local staff dynamics, sometimes resulting in

tensions between students and clinical officers. There has been a sense that the MMed students have enjoyed focused attention on their educational needs, which sometimes may have been at the expense of COA learning opportunities. Designing the MMed training program in relative isolation of the COA program has introduced an unintended imbalance that perhaps could have been averted by more integration at the start. In future, explicit role modelling of a supportive learning relationship between the MMed students and COAs by visiting faculty may help to instil partnership values and attitudes that will be sustained. In terms of local physician anesthesia staff, some have not “bought into” the program and have remained non-participatory; however, none have been obstructive or overtly negative.

Some faculty visits were only two weeks in duration, and these short visits had a noticeable impact on continuity of service. Familiarization with the environment and local processes took time with each new arrival. It is anticipated that this problem will be ameliorated with subsequent visits by the same faculty, and faculty members who are prepared to stay longer will have prioritized choice in the schedule of visits. The issue of continuity will also be addressed by adopting an innovative hybrid model whereby short-visit consultant faculty will be supported by a longer-visit (six-month placement) senior UK trainee. This placement is recognized by the (UK) Royal College of Anaesthetists to count towards training, and these trainees will all have completed their Royal College examinations before the trip. These senior trainees will not only provide much needed continuity to the teaching program, but they will also develop audit, research, and quality improvement projects to enhance local clinical governance structures.

The most frequent concern expressed by the students relates to their future career prospects and the transferability of the MMed qualification. This should cause some concern for the sponsors and supporters of the program whose objective to retain skills locally may be threatened. Examples of “brain drain” have been experienced by similar programs in the region (personal communication, Dr. Alison Froese, Queen’s University), and unless the graduates can expect secure jobs with decent earnings and satisfying working conditions, it is unlikely they will remain in Zambia. It is even less likely they will decide to

work outside of Lusaka where conditions are significantly worse.<sup>18</sup> Nevertheless, within the last year, there has been a significant increase in the salary of Zambian postgraduate trainee doctors in an attempt to redress the problem, and it is hoped that the improved profile of anesthesia resulting from the MMed program will have a “pull” effect on working conditions. There has been no attempt by the government to limit professional autonomy at this time by insisting on service “payback” after qualification.

## Conclusions

There have been important lessons learned in the first academic year of our program. Early involvement of all stakeholders, including surgical and nursing colleagues, may have prevented some of the challenges we met. We now have increasing collaboration with other similar programs in the region and share invaluable experiences and resources. It may have been helpful to obtain more input from similar programs at an earlier stage of planning, and it would be helpful in the future to establish formal links between programs or a forum for discussion. On reflection, some of the lessons learned were very specific to local circumstances and could have been appreciated only after starting the program – flexibility and responsiveness early in the program were especially necessary.

At the individual clinician-educator level, visiting faculty have had to revise their taken-for-granted assumptions regarding patient safety, autonomy, and risk management that were at odds with local practices, and they have had to develop personal approaches that allowed them to deliver supervision within the bounds of their own principles. At a program level, the summative assessment framework has had to evolve as a compromise between what was achievable by visiting faculty on the one hand and what was required by UNZASoM on the other. Having rigid views on these and other curricular issues from the start would have presented insurmountable obstacles to advancing the program.

A major contributor to anesthesia-related morbidity has stemmed from the lack of knowledge and skills to use the available resources appropriately rather than from an absolute lack of resources. Still, lack of resources remains a significant problem to both patient care and the ability to teach valuable techniques. Whereas the financial constraints faced by the program will not be overcome in the short term, a priority wish-list would include readily achievable solutions, such as having pulse oximeters in all recovery areas; ensuring a constant supply of local anesthetic agents for peripheral nerve blocks; having a predictable stock of basic airway equipment, such as pediatric laryngoscopes, laryngeal mask airway devices (LMADs), and facemasks; and perhaps some specific equipment for difficult airway

management, such as reusable video laryngoscopes. Possible means of achieving these goals include targeted donations by visiting faculty and linking with synergistic projects such as Lifebox.<sup>29</sup>

Despite the many challenges, much progress has been made in the first academic year. The entire cohort of students has progressed to their second year of study. The first intake of students will be expected to teach, lead, and act as role models for their novice peers, and so begin to lay foundations for an independent department and profession of the future. We hope that the call by Heywood *et al.* for more medically qualified anesthesiologists to train, supervise, and support COAs has begun to be answered more than 20 years after their description of the alarming anesthetic-related mortality figures at UTH.<sup>19</sup> Apparently, their prediction that the existence of an academic department with better staffing levels would attract more Zambian medical graduates into the specialty is being proved correct as there are seven new applicants for the next academic year.

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**Conflicts of interest** None declared.

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