Anaesthesia 2018, 73, 284–294 doi:10.1111/anae.14116

# Original Article

## A mixed-methods evaluation of the Association of Anaesthetists of Great Britain and Ireland Uganda Fellowship Scheme

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### Summary

The Association of Anaesthetists of Great Britain and Ireland and the then Uganda Society of Anaesthesia established the Uganda Fellowship Scheme in 2006, to provide scholarships to encourage doctors to train in anaesthesia in Uganda. We conducted an evaluation of this programme using online questionnaires and face-to-face semi-structured interviews with trainees who received scholarships, as well as with senior surgeons and anaesthetists. Focus group discussions were held to assess changes in attitudes towards anaesthesia over the last 10 years. Interviews were recorded, transcribed and analysed using the constant comparative method. A total of 54 Ugandan doctors have received anaesthesia scholarships since 2006 (median funding per trainee (IQR [range]) £5520 (£5520–£6750 [£765–£9000]). There has been a four-fold increase in the number of physician anaesthetists in Uganda during this time. All those who received funding remain in the region. The speciality of anaesthesia is undergoing a dramatic transformation led by this group of motivated young anaesthetists. There is increased access to intensive care, and this has allowed surgical specialities to develop. There is greater understanding and visibility of anaesthesia, and the quality of education in anaesthesia throughout the country has improved. The Uganda Fellowship Scheme provided a relatively small financial incentive to encourage doctors to train as anaesthetists. Evaluation of the project shows a wide-ranging impact that extends beyond the initial goal of simply improving human resource capacity. Financial incentives combined with strong 'north-south' links between professional organisations can play an important role in tackling the shortage of anaesthesia providers in a low-income country and in improving access to safe surgery and anaesthesia.

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*Accepted: 1 October 2017*
*Keywords: low-income country; quality improvement; training; workforce*
*This article is accompanied by an editorial by Biccard and Green-Thompson, Anaesthesia 2018; 73: 271–4.*

## Introduction

Five billion people lack access to safe, affordable surgery and anaesthesia when needed. This affects up to 93% of the population in the poorest parts of the world, including many countries in sub-Saharan Africa [1]. A shortage of skilled anaesthesia providers is a major contributing factor to poor access; low-income and low-middle-income countries have 48% of the global population, but only 15% of the global physician anaesthetist workforce [2]. Uganda is a low-income country in East Africa, ranked 163 out of 188 in the United Nations Human Development Index [3]. In 2006, there were 13 physician anaesthetists and approximately 350 non-physician anaesthetists (anaesthetic officers) looking after a population of 29 million [4, 5]. This equates to 0.05 anaesthetists per 100,000 population, compared with 17.85 per 100,000 currently working in the UK [6].

In 2006, the AAGBI and senior anaesthetists in Uganda recognised that there was a critical shortage of anaesthetists in the country [4]. Physician anaesthetists were restricted to providing care in the operating theatre, with minimal involvement in pre-operative and postoperative care, and no capacity to develop subspeciality interests. Unlike in the UK, doctors training in anaesthesia in Uganda do not automatically receive a salary, and are also required to do a postgraduate university degree (MMed), with no formal recognition of their contribution to service provision. The cost of postgraduate tuition fees and living expenses was identified as a major barrier preventing young doctors from applying to train in anaesthesia. Physicians were needed for the long-term development of the specialty, but non-physician anaesthetic officers were critical for service delivery countrywide, so both cadres of provider needed to be supported. The AAGBI had an existing relationship with the Uganda Society of Anaesthesia (later the Association of Anesthesiologists of Uganda (AAU)), and decided to make a commitment to a long-term project in Uganda. This was based on the 'principles of partnership' described in 2005 by the Tropical Health Education Trust (THET) [7, 8], that is, to build capacity, respond to local requests, interprofessional, supported by an organisation, long term, aligned with national strategies and with an evaluation of impact.

**Table 1** Outcomes of the Uganda Fellowship Scheme envisaged by the AAGBI at its start in 2006.

1. To increase the number of trained anaesthetists in Uganda to 50 from an initial starting point of 13
2. To retain two-thirds of Fellowship alumni as consultants/trainers in Uganda in order to build a lasting legacy and infrastructure (avoiding 'brain drain')
3. To make an impact on the way anaesthesia is delivered throughout the country – a service delivery model which can be applied in rural as well as city locations
4. To raise the standards of training for anaesthetic officers as well as for physician anaesthetists
5. To improve obstetric care by combination of training and increased availability of pulse oximeters
6. To ensure sustainability by supporting/training Ugandan faculty who will deliver anaesthetic training in future through 'train the trainer' courses
7. To raise the profile of anaesthesia in Uganda within the medical profession and at government level
8. To attract funding and build partnerships for future sustainability

The 'Uganda Fellowship Scheme' was set up to provide scholarships for living costs and tuition fees for physician anaesthesia trainees. The scheme's primary aim was to encourage doctors to train in anaesthesia, and so to increase the number of physician anaesthetists in the country from 13 to 50 over a period of 10 years. Additional aims are listed in Table 1, and included supporting non-physician anaesthesia training, improving obstetric care and raising the profile of anaesthesia in Uganda. The scheme was managed by the AAGBI, and funded by the AAGBI and other partners in the UK (listed in Table 2), and was co-ordinated by a UK consultant (IW). A consultant in Uganda acted as the in-country project coordinator (ST), and actively recruited postgraduate trainees for the scholarships, and ensured that the project complemented but did not overlap with other donor projects. The maximum value of the scholarship was agreed at

**Table 2** Funding sources for the AAGBI Uganda Fellowship Scheme

1. Association of Anaesthetists of Great Britain & Ireland
2. Royal College of Anaesthetists
3. Difficult Airway Society
4. Obstetric Anaesthesia Association
5. World Anaesthesia Society
6. Individual donors

£3000 per trainee per year (to cover tuition and local living costs), and was varied according to funding available for the trainee. For instance, if the trainee obtained a scholarship from another source, or was appointed to a formal 'medical officer' post or lecturer post, the stipend was reduced proportionately. The AAGBI paid stipends by direct bank transfer to the individual trainee to ensure the funds were used for their intended purpose. As part of a phased withdrawal, the last sponsored fellows have now begun their three-year MMed degree.

In 2011, as the partnership matured, the AAGBI decided to pilot two further projects in Uganda; the first, Safer Anaesthesia from Education (SAFE), was to deliver structured training in obstetric and paediatric anaesthesia for anaesthetic officers. The second was the first large-scale donation of Lifebox pulse oximeters in partnership with the Lifebox Foundation. This report is a formal evaluation of the impact of the AAGBI Uganda Fellowship Scheme on anaesthesia in Uganda between 2006 and 2016.

## Methods

Institutional review board approval was obtained locally in Uganda from Mbale Regional Referral Hospital Research and Ethics Committee, and nationally at the Uganda National Council for Science and Technology. Verbal consent was obtained from all those who agreed to be interviewed, including permission to record the interviews. A unique identifier (e.g. Int01) was assigned for each interviewee to ensure anonymity and protect confidentiality.

We planned a mixed-methods evaluation, with descriptive quantitative data obtained from the AAGBI and through online questionnaires, and qualitative analysis of interview transcripts with project stakeholders in Uganda. We drew on the evaluative frameworks used by other agencies involved in international aid and development. The overall scope and format of the review followed the principles of a strategic 'output to purpose' review described by the UK Department for International Development (DfID, available as Supporting Information) [9]. This is designed to assess whether the purpose and goals of the programme have been met, identify key strategic issues and, if applicable, examine unintended programme impacts. We also drew on the monitoring and evaluation framework developed by THET. This provides a matrix for establishing indicators for evaluation, identifying data sources for verification and planning the practicalities of evaluation (available as Supporting Information) [10].

An AAGBI task group was set up in January 2016 to co-ordinate the evaluation of the Uganda Fellowship Scheme, using a participatory evaluation approach (as recommended by DfID) [9]. A research fellowship post was created by the AAGBI under the guidance of a steering group based in the UK. The fellow (AH-S) worked closely with a local partner (FB) to conduct the evaluation, but was not part of the Fellowship Programme itself. This method was chosen to further strengthen the partnership and develop local knowledge and evaluation expertise within Uganda.

All trainees who had received an AAGBI scholarship ('the Uganda Fellows') and who had come to the end of their training were sent a link to an online questionnaire in December 2016. Data were exported to, and analysed in Microsoft Excel. In addition, we conducted interviews between January and March 2017 with key stakeholders involved in anaesthesia and surgery in Uganda (Table 3). Interviewees were purposively selected and included a representative sample of the Uganda fellows, most of the senior anaesthetists, and some senior surgeons who were practicing in Uganda before the project began in 2006. All interviewees approached agreed to be interviewed. Focus group discussions were held with junior doctors (non-anaesthetists) and medical students. A semi-structured interview guide with open-ended questions, developed before data collection, was used during the interviews (see Supporting Information, Fig. S1).

All interviews were conducted, audio recorded and transcribed by either AH-S or FB; a qualitative

**Table 3** Details of interviewees.

| Role | Number |
|---|---|
| Senior* anaesthetists | 6 |
| Senior* surgeons | 3 |
| Senior* anaesthetic officer involved in training | 1 |
| AAGBI Uganda Fellows | 3 |
| Junior anaesthetist | 1 |
| Focus group discussions with medical students and junior doctors | 3 |

*Senior represents a clinician with > 15 years of experience.

data analysis and research software program was used to support analysis of the transcripts. Each interview was coded independently by either AH-S or FB. Coding in qualitative research is the process of combing the data for themes, ideas and categories. Similar passages of text from different interviews were marked with a label so that they could be retrieved at a later stage for further comparison and analysis. A random sample of interviews underwent double coding as a cross-check on theme identification [11, 12]. Data were simultaneously coded and analysed in order to develop the concepts explored in detail below. This is a key feature of qualitative work, and allows researchers the freedom to pursue interesting and relevant lines of enquiry as initial themes of interest emerge from the data. This has been termed the 'constant comparative method' [13].

This study was designed, analysed and reported in accordance with the Consolidated Criteria for Reporting Qualitative Studies (COREQ) (interviews and focus groups) [14]. Individual quotations from interviewees have been selected for inclusion in this paper to illustrate and support the themes identified in the data.

## Results

A total of 54 Uganda Fellows have received scholarship funding since 2006; 43 had completed their fellowship by December 2016, and the remainder are still in training. The results relate to the 43 fellows who have completed training (Fig. 1).

The AAGBI and its partners have provided funding of £245,385 to support the 43 fellows. The total median (IQR [range]) scholarship funding received by each fellow over three years of training was £5520 (£5520–£6750 [£765–£9000]). Figure 2 illustrates the investment on a year-by-year basis. Of the 43 fellows enrolled in the scheme up to 2016, 40 (93%) have successfully completed their MMed degree. Two withdrew from the training programme, and one has not yet submitted their research project, and as a result has not yet formally graduated. Thirty-six out of 40 (90%) of eligible trainees responded to the online survey. In addition, we conducted 14 interviews and three focus group discussions between January and March 2017. The median (IQR [range]) length of the interviews

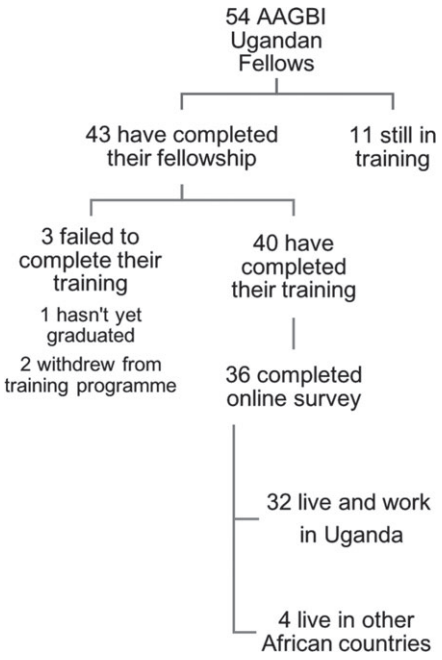


**Figure 1** Fellows completing their training and working in Uganda.

was 26 (17–29 [12–42]) min. All those approached agreed to be interviewed.

Thirty-two (89%) respondents currently live and work in Uganda. Out of the 32 who are working in Uganda, 11 (34%) are working in a teaching role; (eight (25%) in a public university and three (9%) in a private university). Nine (28%) spend at least part of their time working in a voluntary capacity, mainly in government health facilities, for example, the National Referral Hospital. Four (11%) work outside Uganda, one in Lesotho, one in Swaziland and two in Kenya. Other international partners (WFSA, University of British Columbia, McMaster University, the Magdi Yacoub Foundation and the University of Cape Town) have supported trainees to travel overseas to complete fellowships in subspecialist areas of anaesthesia such as obstetrics, intensive care, paediatrics, cardiac and regional anaesthesia. None of the trainees who completed the fellowship have moved to work outside Africa. Thirty-two (89%) have received formal training as a medical educator through the SAFE project and teach medical students, anaesthetic officers and anaesthesia residents. Twenty-nine (81%) have taught on at least one of the AAGBI SAFE

 

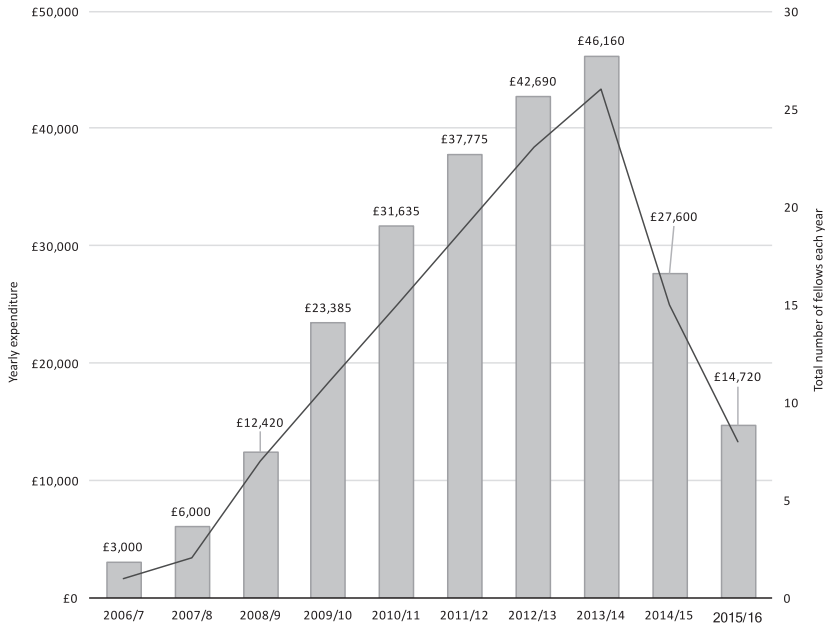


**Figure 2** Annual expenditure by AAGBI and partners during the first 10 years of the Uganda Fellowship Scheme.

obstetric or paediatric anaesthesia courses in Uganda. Several have also taught on and provided a leadership role for SAFE courses elsewhere in East and Central Africa (Kenya, Malawi, Zimbabwe and Swaziland).

### *What impact has the programme had on standards of training in anaesthesia?*

> *It was a stipend, it is money. I was able to get through on that. So it meant I spent more time at school and less time looking for work, looking for money.*
>
> —(Int01, Uganda Fellow)

Specialty trainees in Uganda work long hours in a demanding environment; they do not receive a salary, and on top of that they have to pay tuition fees and provide for their families. It is very common practice to 'moonlight' (work additional shifts whenever possible to earn money), and anaesthesia is no different. In fact, anaesthesia was considered one of the hardest specialties in terms of the work-load. The AAGBI Uganda Fellowship Programme changed that. It allowed students to focus on their training without being distracted by the constant pressure of providing money. As time went on it also provided trainers to teach new trainees.

> *It used to be so hit and miss, they'd call you and say could you come and do some tutorials because someone else hasn't done them and ask you to cover these topics. So it wasn't as regimented and controlled, I felt really sorry for them because it was so random, as much because there weren't enough staff, there weren't many trainees but there also weren't many staff.*
>
> —(Int11, Senior Anaesthetist)

When the first Uganda Fellow started in 2006, there were only two members of faculty at Makerere University. Students, although small in number, struggled to get the supervision and the support they needed. The same department now has 10 faculty members. Residents used to spend the majority of their time learning only about general and spinal anaesthesia. Today, the university departments have faculty who have completed fellowships overseas in anaesthesia subspecialties, and students spend time rotating through intensive care, the Uganda Heart Institute, and gain experience in complex neurosurgical and paediatric cases.

The quality of training has improved for other cadres of medical professionals in Kampala. Increased numbers of anaesthesia trainees have allowed them to become involved as trainers for other specialties, for example, intensive care for surgeons.

The fellows have also contributed greatly to formal training for non-physician anaesthetists in Uganda. Following the SAFE pilot in 2011, there was a national rollout of SAFE obstetric training to increase the clinical skills of the whole anaesthesia workforce in Uganda. A total of 614 anaesthesia providers have been trained in Uganda since 2011, most recently without external faculty support. The Uganda faculty has since travelled to support the delivery of SAFE courses in other East and Central African countries, including Kenya, Swaziland and Zimbabwe.

### *Has the Uganda Fellowship Scheme had an impact on patient care?*

> *I have been in surgery, particularly paediatric surgery, where I have noted tremendous improvement in patient care particularly safety, patient assessment, intra-operative care and postoperative care. And this compared to what used to happen is a great improvement.*
>
> —(Int12, Senior Surgeon)

Patient care within surgery and anaesthesia has improved over the last 10 years. The AAGBI's first anaesthesia fellow explained that in 2006, anaesthesia techniques were limited to a general anaesthetic with either ketamine or rapid sequence induction with thiopentone, suxamethonium and ether. Increased numbers of physician anaesthetists mean there are now services available to patients in Uganda that were previously only available abroad. Examples include complex neurosurgery and open-heart surgery that both take place on a regular basis. Larger numbers of physician anaesthetists have led to a greater involvement in the entire peri-operative pathway, interacting with the surgeons much earlier in the patient's care. This early interaction leads to better planning as physician anaesthetists advocate for their patients. Immediate postoperative care has also improved. In most centres, recovery facilities did not previously exist. Patients would be pushed into recovery and the anaesthesia providers would wait for the patient to wake up, hoping that they would be okay. Now, patients that require intensive care can usually be taken there, although there are limited bed numbers available.

Increased numbers of physician anaesthetists led to the formation of the Association of Anesthesiologists of Uganda in 2015 as an active professional association for physician anaesthetists to drive changes in anaesthesia. Coupled with strong leadership from senior colleagues in the specialty in Uganda, ideas and aspirations are becoming a reality. Minimum standards of monitoring are now also attained much more widely throughout the country, using pulse oximeters supplied by the Lifebox Foundation. The Uganda Fellows led the training and distribution of a total of 633 pulse oximeters.

The Fellowship scheme has had an effect throughout Uganda, but has mainly impacted care in the urban areas. There are more physician anaesthetists getting involved in safety and quality improvement, and equipment has also improved. In 2014, the Ugandan Government supplied more advanced continuous-flow anaesthesia machines to all government health facilities undertaking surgery in the rural areas, but in most locations, the machines are still not being used and are still covered up.

> *. . .it has definitely changed, not everywhere and not everywhere uniformly, certainly the training centres like Mbarara and Kampala it has definitely changed. Ten years ago you wouldn't have had a Whatsapp group, an AAU group discussing, putting on papers, putting on references, discussing issues. There is stuff happening, discussing cases and people working across different hospitals. So that is amazing and that has changed but of course it is not uniform across the country.*
>
> —(Int11, Senior Anaesthetist)

> *The areas closer to where the centre for change has happened, will be the first beneficiaries. For example, we have had excellent trainees leave and they have joined other places for example Mbale. Mbale in itself doesn't know it yet, but it is starting to become. . .that desire for change, that desire for excellence has reached Mbale. It is in Mbarara, it*

 

*has gone into the army because we have two former trainees in the army and they are trying to do phenomenal stuff there, it has reached to Gulu at the Lacor hospital so I think it has to do with the trainees leaving the programme and going to those upcountry facilities and taking with them the desire for quality improvement and excellence.*

—(Int02, Uganda Fellow)

Patient care is improving much more slowly in hospitals outside the training institutions in Kampala and Mbarara. Interviewees reported that change appears to be dependent on the presence of physician anaesthetists, and that the likelihood of them working outside the two main training centres is heavily influenced both by the availability of jobs and by the complex socio-economic environment in Uganda. In almost all the smaller regional referral hospitals, the facilities available do not match the training and skills of an anaesthetist. Intensive care units (ICU) are rare, and equipment and consumables to support more specialised areas such as regional anaesthesia are not available. Figure 3 illustrates the distribution of Uganda fellows throughout the country.

### *A sustainable change in anaesthesia in Uganda*

*. . .changes in anaesthesia! You could actually evaluate them when you look at changes in the whole surgical field. Anaesthesia was so limited in terms of personnel and equipment and everything. When I look at the scope of surgery that is being done today in the country compared to the scope of surgery in the 2000s, its totally different. And definitely that's where it comes from. Those days, you could hear surgeons telling you 'blood is becoming black'. But these days, at least we don't get to that level because we have monitors ranging from exotic monitors to simple pulse oximeters. But I think definitely there is a lot that has happened in terms of human resource and equipment which has enabled a lot of things to happen.*

—(Int14, Senior Anaesthetist)

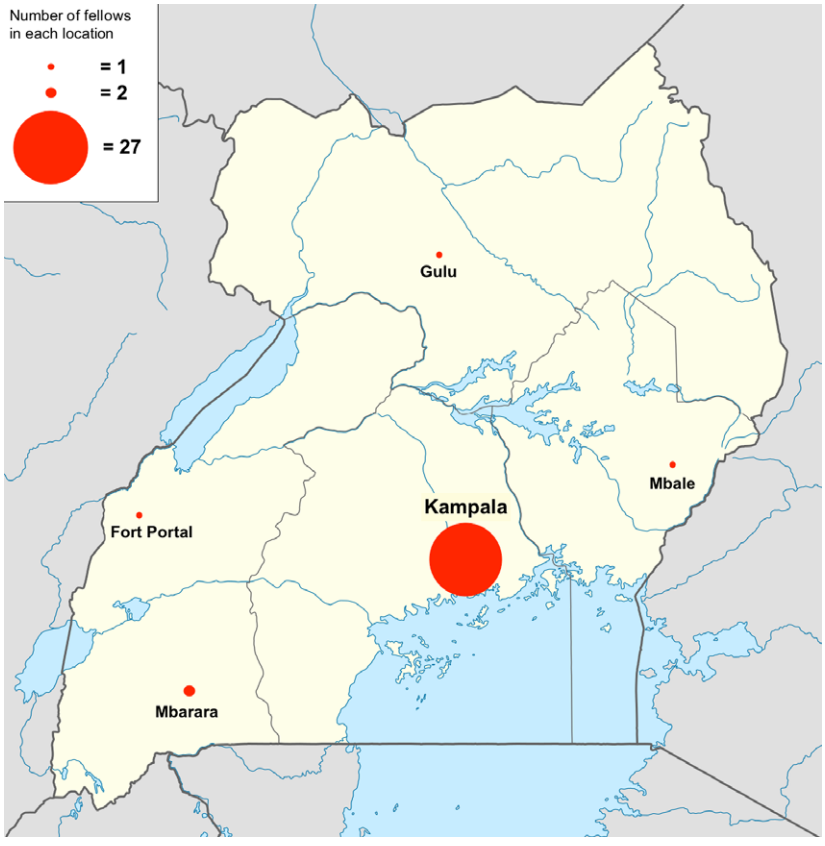


**Figure 3** Distribution of fellows throughout Uganda. The circle size reflects the number of fellows.

Minimally invasive surgery, complex neurosurgery, open-heart surgery and advanced paediatric surgery are now all performed routinely in Uganda, and senior surgeons report that complex procedures are possible because the anaesthetic support is now available. Outside Mulago Hospital (the national referral hospital), there used to only be one ICU. Today the majority of private hospitals in Kampala, and some of the larger government and not-for-profit hospitals in the country have ICUs. These are run almost exclusively by physician anaesthetists.

At the centre of this transformation in anaesthesia in Uganda over the last 10 years is a group of young, motivated anaesthetists.

> *If you consider the human resources, there has been an exponential increase in the number of anaesthetists being trained in Uganda*
>
> —(Int08, Senior Anaesthetist)

In 2006, there were two postgraduate trainees in the training programmes at Mbarara University of Science and Technology and Makerere College of Health Sciences. There are now 25. Out of the 52 physician anaesthetists who are currently practicing in Uganda, 36 have been supported by the AAGBI. Although financial support was not the only factor drawing more people into the specialty, it had a major impact. Partnerships between Uganda and other organisations in the USA, Canada and Europe have definitely contributed, but the AAGBI has played a central role in building this human resource capacity. Anaesthesia residents did not have to 'moonlight' to try to make money to support themselves; they knew that they had funding so they were able to concentrate on their training.

Within the healthcare system of Uganda, this has created a group of people who carry more weight when they speak. The external partnerships have meant that many of the young trainees have been exposed to anaesthesia at an international level, either from visiting colleagues from the UK, USA or Canada, or during time they have spent abroad. Aware that standards of care could be improved, they started not to accept things, realising they could push to make changes. They have used this experience and knowledge to their advantage.

### *Changing attitudes towards anaesthesia*

> *. . .I told my Mum I want to do anaesthesia and she said why? Why do you want to study to do nothing, to sit in theatre and watch someone else do the work?*
>
> —(FGD01, Focused Group Discussion)

It is a common misconception in Uganda that anaesthesia providers only work in theatres. It is only now that the numbers of anaesthetists have increased, that the specialty is becoming more visible. With this rise in visibility, a distinction between the physician anaesthetist and non-physician anaesthetic officer is becoming clearer. Surgeons now appreciate when it is important to have physician anaesthesia support for their patients, especially for the complex cases who require pre-operative assessment and preparation, or more advanced levels of postoperative care.

> *We are getting more comfortable working with an anaesthesiologist rather than an anaesthetic officer*
>
> —(Int10, Senior Surgeon)

Attracting medical students and junior doctors into anaesthesia relies on exposure to the specialty during their training. This experience influences an individual's perception of anaesthesia, and can have either a negative or positive impact on their likelihood of choosing that field of medicine as a career pathway.

### *The role of other partners and the Ugandan Government*

Over the last 10 years, a number of international partners have made significant contributions to the development of anaesthesia in Uganda. THET/UK Aid contributed to the SAFE anaesthesia initiative by providing funding for courses to train anaesthetic officers in rural areas. Global Partners in Anesthesia and Surgery (GPAS) funded year-long positions to allow MMed graduates in anaesthesia and surgery to undertake research and educational projects until they could obtain permanent job opportunities. Global Partners in Anesthesia and Surgery supported nine students with tuition fees between 2009 and 2011. Five of these received a reduced stipend support from the AAGBI. Two fellows also received tuition fee support from the

 

Belgian Technical Co-ordination. The WFSA, University of British Columbia, McMaster University, the Magdi Yacoub Foundation and the University of Cape Town funded senior fellowships for MMed graduates to train in subspecialities including in intensive care, obstetric, regional, paediatric and cardiac anaesthesia. Graduates have also been supported to attend international conferences in the USA, UK, South Africa and the WFSA World Congresses. Local advocacy helped secure tuition fee support from the Ministry of Health for 19 of the AAGBI fellows.

## Discussion

The AAGBI Uganda Fellowship scheme was started in 2006 when there were only two doctors training in anaesthesia. Lack of funding for the doctors was identified as a key barrier. The Fellowship Scheme provided scholarship funding for training, and has supported a total of 53 trainees at a relatively small cost per trainee. There has been a four-fold increase in the number of physician anaesthetists in Uganda and all trainees who have completed training remain in the region. Qualitative interviews of trainees, senior anaesthetists and surgeons have described a dramatic change in the speciality of anaesthesia over the last 10 years. Graduates have been able to develop subspeciality interests, and have been leading training for anaesthetic officers throughout Uganda, and more widely in the region. Most of the benefits have been felt in the urban centres. A number of other professional organisations have also made important contributions to these outcomes, with interventions coordinated by the local partner in Uganda.

Anaesthesia outcomes have improved in many parts of the world over the past few decades, but these improvements have not always been mirrored in low-income countries [15]. Workforce capacity and training has been identified as a critical issue, with significant investment in human resources required to improve access to surgery and anaesthesia in low- and middle-income countries (LMIC) [16]. One of the barriers to doctors entering anaesthesia training in Uganda has been the need for trainees to pay university fees to train, rather than receiving a salary in recognition of service provided. This study provides support for the notion that a relatively small financial incentive may be sufficient to encourage young physicians to take up postgraduate training positions. Anaesthesia was previously seen as a failing speciality in Uganda, but there is now an assertive group of young anaesthetists in the country who are providing a critical mass to generate improvements in patient care far beyond the scope of the initial project. These graduates are having a direct impact on the quality and standards of patient care, on training in the specialty and on the availability of equipment, drugs and services related to anaesthesia and intensive care, and the development of professional partnerships.

There is limited literature describing international partnerships and programmes to improve anaesthesia capacity in low-income countries, but 'north–south' partnerships have been recognised as an important way to support anaesthesia delivery in low-resource settings [17]. Lack of scholarships for training has previously been described as a barrier to training in Uganda [5]. Ulisubisya described the origin and conduct of a health partnership in anaesthesia and intensive care between institutions in Tanzania and Sweden [18]. At the beginning of the 2014–2015 academic year, there were 13 residents in anaesthesia, compared with only three over the previous three years. The reasons leading to this increase are not described in detail, but include advocacy for anaesthesia and intensive care at a Ministry of Health level and one scholarship for training.

There are a number of programmes with a focus on anaesthesia and surgery delivery in Uganda, which has the potential to be challenging in terms of local coordination [5]. Early on in the Fellowship programme, a trainee was sponsored by both the AAGBI and GPAS, which led to recognition of the importance of international partners working together, with all interventions coordinated by the local in-country partner. The AAGBI and AAU link was recently evaluated by THET, which described the success of the partnership as one based on deep trust and mutual respect. This, in combination with the strength of vision for change held by the Uganda project lead has resulted in much greater than anticipated success in achieving project goals [7]. The two organisations have piloted two major international initiatives together, the SAFE anaesthesia courses, and the successful model for training and distribution of pulse oximeters for the Lifebox

 

Foundation [19–21]. The AAGBI volunteers and Uganda fellows were a key part of shaping these initiatives, and have since led SAFE and Lifebox training in a number of countries in East and Central Africa and South-East Asia.

Gosselin describes the many challenges facing surgery in the developing world, including insufficient human resources. Brain drain from developing to developed countries makes an additional significant contribution to this problem [22]. The Uganda Fellowship Scheme faced a major risk that newly qualified anaesthetists would move overseas to work in return for better remuneration and living conditions. The reality is that 89% of physician anaesthetists sponsored by the AAGBI still live and work in Uganda, and 100% continue to live and work in Africa. Although the data did not capture reasons for this, they are likely to be multifactorial. It is possible that access to several opportunities for funded, senior subspecialty fellowships in anaesthesia and intensive care and a supportive peer group have both played an important role. The number of fellows supported by the AAGBI has decreased since 2014 as part of a planned, phased exit strategy, to encourage a locally sustainable solution to anaesthesia training. The investment for the programme came from donor scholarship funding, although a more sustainable approach could be for students to receive appropriate remuneration in return for service provision. The Ministry of Health continues to provide tuition fee support for some anaesthesia residents, and this plays a critical role in the sustainability of the project. The Ugandan physician anaesthetists are improving patient outcomes, developing subspeciality interests and gaining new respect. Hopefully, attitudes towards the specialty will continue to improve, and they will not allow the advances that have been made in the specialty to be lost. Ideally, this group of young, motivated physician anaesthetists will be appointed to permanent posts and will be incentivised to stay in Uganda for the remainder of their careers.

We chose a mixed-methods approach to our study to allow us to go beyond simple baseline characteristics and also, through qualitative analysis of interview transcripts, to explore the opinions and perspectives of stakeholders and understand the dynamics of the project, its successes and problems. A potential weakness of this study is that of 'interviewer bias', a limitation facing all qualitative researchers. One of our interviewers was a UK-based anaesthesia trainee working as a long-term volunteer in Uganda who had not been involved in the programme, and the other a Ugandan anaesthetist who had benefited from an AAGBI fellowship during his training. This in itself provided two complementary perspectives on the emerging data, which were further refined by independently 'double coding' a random sample of interviews. We also used a semi-structured interview guide designed to avoid leading questions and piloted to ensure fitness for purpose. A second potential problem is the relatively small number of interviews conducted. Although we reached theoretical saturation when analysing the data, it is possible that further material might have been uncovered if more interviews had been conducted. Two of the interviewees played a critical role in the initial conception of the AAGBI Uganda Fellowship Scheme; however, by ensuring that all data were used in forming the themes, we aimed to reduce the influence any one individual might have exerted on the data.

This structured evaluation of the AAGBI Uganda Fellowship Scheme describes the successful outcome of a long-term health partnership between two professional organisations based on the provision of scholarship funding. Together with complementary and co-ordinated partnerships with other external organisations, there has been a profound change in the specialty of anaesthesia in the country that extends beyond the initial goal of simply improving human resource capacity in Uganda. The impacts include greater access to surgery, anaesthesia and intensive care, and improved standards of patient care and enhanced quality of training both for physician and non-physician anaesthesia providers. The challenge is now for this new generation of physician anaesthetists to work with the Ministry of Health to ensure that improvements are sustained and developed so that universal access to safe anaesthesia and surgery can be a reality for all in Uganda.

## Acknowledgements

We acknowledge the following organisations who provided financial support for the AAGBI Uganda Fellowship Scheme and this evaluation project: Difficult

 

Airway Society; Obstetric Anaesthesia Association; Donors to the Overseas Anaesthesia Fund; Royal College of Anaesthetists; and World Anaesthesia Society. We thank Iain Wilson and Stephen Ttendo who devised the Uganda Fellowship Scheme in 2005.

For the duration of this research project, AH-S was awarded the AAGBI International Evaluation Research Fellowship. This provided a stipend to support living allowances when working overseas in Uganda.

FB received a stipend from the AAGBI to support his involvement in data collection and analysis. He also received a stipend from the AAGBI during his anaesthesia training in Uganda.

## References

1. Meara JG, Leather A, Hagander L, Alkire BC. Global Surgery 2030: evidence and solutions for achieving health, welfare, and economic development. *Lancet* 2015; **386**: 569–624.
2. Holmer H, Lantz A, Kunjumen T, et al. Global distribution of surgeons, anaesthesiologists, and obstetricians. *Lancet Global Health* 2015; **3**: S9–11.
3. United Nations Development Programme. Human development indicators: Uganda. 2016. http://hdr.undp.org/en/countries/profiles/UGA (accessed 01/08/2017).
4. Hodges SC, Mijumbi C, Okello M, McCormick BA, Walker IA, Wilson IH. Anaesthesia services in developing countries: defining the problems. *Anaesthesia* 2007; **62**: 4–11.
5. Lipnick M, Mijumbi C, Dubowitz G, et al. Surgery and anesthesia capacity-building in resource-poor settings: description of an ongoing academic partnership in Uganda. *World Journal of Surgery* 2013; **37**: 488–97.
6. World Federation of Societies of Anesthesiologists. WFSA Workforce Map. 2017. http://www.wfsahq.org/workforce-map (accessed 30/05/2017).
7. Tropical Health Education Trust. Evaluation of an established international health partnership using theory of change. 2016. http://www.thet.org/health-partnership-evaluation-theory-of-change-edwards-for-thet-2016/view (accessed 01/08/2017).
8. Tropical Health Education Trust. Principles of links. 2005. http://www.thet.org/resource-library/health-links-manual (accessed 02/08/2017).
9. Dearden P, Jones S, Sartorius R. Tools for development: a handbook for those engaged in development activity. 2003. http://webarchive.nationalarchives.gov.uk/+/http:/www.dfid.gov.uk/Documents/publications/toolsfordevelopment.pdf (accessed 16/07/2017).
10. Tropical Health Education Trust. Monitoring & evaluation plan. 2015. http://www.thet.org/health-partnership-scheme/resources/tools-guidance/monitoring-evaluation-plan (accessed 12/07/2017).
11. Shelton CL, Smith AF, Mort M. Opening up the black box: an introduction to qualitative research methods in anaesthesia. *Anaesthesia* 2014; **69**: 270–80.
12. Mort M, Smith A. Beyond information: intimate relations in sociotechnical practice. *Sociology* 2009; **43**: 215–31.
13. Miles MB, Huberman AM. *Qualitative data analysis: an expanded sourcebook*, 2nd edn. California: Thousand Oaks, 1994.
14. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care* 2007; **19**: 349–57.
15. Bainbridge D, Martin J, Arango M, Cheng D. Perioperative and anaesthetic-related mortality in developed and developing countries: a systematic review and meta-analysis. *Lancet* 2012; **380**: 1075–81.
16. Ng-Kamstra JS, Greenberg SLM, Abdullah F, et al. Global Surgery 2030: a roadmap for high income country actors. *BMJ Global Health* 2016; **1**: e000011.
17. Dohlman LE. Providing anesthesia in resource-limited settings. *Current Opinion in Anaesthesiology* 2017; **30**: 496–500.
18. Ulisubisya M, Jörnvall H, Irestedt L, Baker T. Establishing an anaesthesia and intensive care partnership and aiming for national impact in Tanzania. *Globalisation and Health* 2016; **12**: 7.
19. Enright A, Grady K, Evans F. A new approach to teaching obstetric anaesthesia in low-resource areas. *Journal of Obstetrics and Gynaecology Canada* 2015; **37**: 880–4.
20. Livingston P, Evans F, Nsereko E, et al. Safer obstetric anesthesia through education and mentorship: a model for knowledge translation in Rwanda. *Canadian Journal of Anesthesia* 2014; **61**: 1028–39.
21. Finch LC, Kim RY, Ttendo S, et al. Evaluation of a large-scale donation of Lifebox pulse oximeters to non-physician anaesthetists in Uganda. *Anaesthesia* 2014; **69**: 445–51.
22. Gosselin RA, Gyamfi Y-A, Contini S. Challenges of meeting surgical needs in the developing world. *World Journal of Surgery* 2011; **35**: 258–61.

## Supporting Information

Additional Supporting Information may be found in the online version of this article:

**Figure S1.** Semi-structured interview guide.

**Data S1.** DFID - Tools for development: a handbook for those engaged in development activity.

**Data S2.** Tropical Health Education Trust: Monitoring and Evaluation Plan

 