

Anaesthesia services in developing countries: defining the problems

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Summary

We describe the use of a questionnaire to define the difficulties in providing anaesthesia in Uganda. The results show that 23% of anaesthetists have the facilities to deliver safe anaesthesia to an adult, 13% to deliver safe anaesthesia to a child and 6% to deliver safe anaesthesia for a Caesarean section. The questionnaire identified shortages of personnel, drugs, equipment and training that have not been quantified or accurately described before. The method used provides an easy and effective way to gain essential data for any country or national anaesthesia society wishing to investigate anaesthesia services in its hospitals. Solutions require improvements in local management, finance and logistics, and action to ensure that the importance of anaesthesia within acute sector healthcare is fully recognised. Major investment in terms of personnel and equipment is required to modernise and improve the safety of anaesthesia for patients in Uganda.

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In many developing countries, especially sub-Saharan Africa, there is a critical shortage of healthcare workers and very limited resources. Health systems are stretched by diseases such as HIV/AIDS and malaria, the loss of trained staff to the developed world, and the insecurities and economic effects of long-term conflict [1]. Anaesthesia services are particularly vulnerable to development pressures. There are often few physician anaesthetists, so services are particularly affected by medical migration. Anaesthesia is most frequently delivered by non-physicians; it is seen as a low priority and lacks the voice to demand access to resources.

The major improvements in quality and safety in anaesthesia over the last 30 years have resulted from advances in technology, refinements in anaesthesia equipment and drugs, and a focus on education and training. These all require significant resources [2–4]. International standards for the safe practice of anaesthesia have been defined, and were adopted by the World Federation of Societies of Anaesthesiologists (WFSA) in 1992 [4]. The standards relate to the professional status of the anaes-

thetist and standards for peri-anaesthetic care and monitoring. Equipment requirements are categorised as basic, intermediate and advanced. Experience has shown that, more than a decade later, even the basic equipment standards are far from being achieved, especially in rural areas in Africa.

The poor state of anaesthesia services in certain areas of a few sub-Saharan countries has been described by anaesthetists working in the countries [5, 6] and in overseas medical missions [7]. It is probable that even in the 21st century, millions of people in developing countries do not have access to resources that should be considered a basic human right: access to safe anaesthesia and pain relief during surgery and childbirth. However, the extent of the problem remains largely unquantified both nationally and internationally. There is currently no strategic way of assessing anaesthesia service provision, particularly in rural areas. It is likely that different countries face different problems and require different solutions; some need local systems improvement, others need national capital expenditure.

We have therefore developed and piloted a questionnaire: a first step to quantifying and describing the problems faced by anaesthetists in developing countries, and one that can be used by national anaesthesia societies and governments in developing countries to improve management and planning of anaesthesia services, target education and enable limited resources to be used effectively. In addition, it could help define priorities for support by overseas organisations such as WFSA and aid from donor countries and international agencies.

Methods

We consulted a number of expert anaesthetists currently working or with recent experience of working in sub-Saharan Africa, and defined some minimal requirements for the provision of safe general anaesthesia for an adult or child, for spinal anaesthesia and for obstetric anaesthesia using either spinal or general anaesthesia. Essential requirements as shown in Table 1 were similar to those described by the WFSA as 'basic' equipment requirements, with the addition of the pulse oximeter (defined in 1992 as an intermediate requirement), and drugs required for obstetric anaesthesia (not included in the WFSA standards).

A questionnaire was prepared and piloted in groups of anaesthetists and anaesthetic officers in Uganda, Malawi and Zambia. The questionnaire included details of the setting in which the anaesthetist worked; their training and access to continuing professional development (CPD) and anaesthesia textbooks and CPD journals; an estimate of their monthly workload with reference to the index cases (anaesthesia for a laparotomy in an adult, anaesthesia for a child aged < 5 years and Caesarean section) and their current ability to provide safe anaesthesia with reference to these index cases. Anaesthetists were also asked to provide information on general facilities in the operating theatres and hospital, the availability of drugs and the provision made for the maintenance of equipment. Free

text comments were allowed. Ambiguous questions were modified in the light of comments and after reviewing answers to the questions.

The revised questionnaires were distributed during a workshop at the national refresher course at Mukono University, on 2–4 May 2006, organised and funded by the Ugandan Society of Anaesthesia in conjunction with the Association of Anaesthetists of Great Britain and Ireland (AAGBI) and the WFSA. Questionnaires were completed by delegates during one of the afternoon workshops. Responses were analysed manually to assess the work involved in collating information. The responses from individual anaesthetists are described and also analysed according to the type of hospital in which they worked.

Safe anaesthesia for index cases was defined as being provided when anaesthetists had access to all the minimum facilities required for that particular group of patients. For Caesarean section, the requirement was to be able safely to provide adult general anaesthesia and spinal anaesthesia, and to have access to blood transfusion and drugs for the treatment of common obstetric problems such as haemorrhage, pre-eclampsia and eclampsia.

Results

Questionnaires were distributed to 97 anaesthesia providers (termed 'anaesthetists' in this paper) attending the course workshop, and completed forms were received from all 97 anaesthetists, giving a response rate of 100%. The anaesthetists represented just under one-third of the approximately 350 anaesthetists in Uganda.

Responses from anaesthetists working in government and non-government mission hospitals were analysed. Responses from three anaesthetists working in private hospitals were thought to be unrepresentative and were excluded. Two questionnaires were omitted as respondents indicated that the hospitals were newly built and the

Table 1 Definitions of minimal requirements for safe anaesthesia as used in the questionnaire.

A	B	C	D
Adult general anaesthesia	Paediatric general anaesthesia	Spinal anaesthesia	Obstetric anaesthesia
Oxygen supply Facemask Laryngoscope Tracheal tube Suction apparatus Pulse oximeter Tilting table	As for A, plus: Paediatric facemasks Paediatric laryngoscope Paediatric tracheal tubes Paediatric oropharyngeal airways Paediatric breathing circuit Paediatric intravenous cannulae	As for A, plus: Local anaesthetic drugs Sterile spinal needles Sterile syringes Disinfectant to clean skin Sterile gloves Blood pressure monitor	As for A and C, plus: Access to blood for transfusion Oxytocin or ergometrine Hydralazine or labetalol Magnesium sulphate

Table 2 Estimated caseload by hospital category. Values are number or median [range].

	Government hospitals				
	National and regional referral hospitals	Government district hospitals	Health Centre Grade IV	Military Hospitals	Non-government or mission hospitals
No. of hospitals in Uganda [8]	12	42	140	3	44
No. of hospitals represented by questionnaire respondents	9	23	27	1	17
No. of respondents	20	25	27	1	18
No. of laparotomies performed per hospital per month	50 [20–270]	10 [2–80]	0 [0–15]	10	20 [0–90]
No. of children aged < 5 years anaesthetised per hospital per month	20 [10–120]	10 [0–50]	0 [0–5]	5	8 [3–70]
No. of Caesarean sections performed per hospital per month	90 [25–440]	20 [6–60]	10 [0–30]	15	30 [0–170]
Total No. of index cases performed per month	2041	1567	186	30	1514
Annualised index caseload	24492	18804	2232	360	18168
Annualised index caseload for all hospitals			64056		

theatres were not yet fully operational. One questionnaire was incomplete and did not contain sufficient data to analyse. A total of 91 questionnaires from anaesthetists working in 77 different hospitals were analysed: 33 of the 57 government hospitals, 27 of the 140 government Health Centres Grade IV (the smallest rural units capable of surgical intervention), and 17 of the 44 non-government mission hospitals [8]. Questionnaires from 48% of the hospitals in Uganda were therefore analysed. Estimated caseloads are shown in Table 2. Where there was more than one anaesthetist from any hospital, the results were pooled and the mean of their estimates has been quoted.

Training and access to CPD

There was only one physician anaesthetist among the 91 anaesthesia providers. The majority of the remaining non-physician anaesthetists had attended a training course or were currently training; only one anaesthetist had no formal qualification ('trained on job'). Sixty-three per cent of respondents had completed their training in the last 5 years, almost all attending courses of 1–2 years' duration (Table 3). All of the anaesthetists were attending

Table 3 Nature and duration of training and ownership of anaesthesia textbooks.

Duration of training	No. of anaesthetists
5 years (medical postgraduate program)	1
3 years	11
2 years	28
18 months	19
1 years	27
Trained on the job, i.e. no formal training	1
Personally own anaesthesia textbook	44

a refresher course, but less than half (48%) had access to an anaesthesia textbook of their own.

General anaesthesia for adults

Only 23% of anaesthetists had the minimum requirements for the safe provision of anaesthesia to an adult. The items most frequently unavailable were a pulse oximeter (74% of anaesthetists), a tilting operating table (23%), an oxygen source (22%) and appropriately sized tracheal tubes (21%). Other findings were that running water was not always present for 44% of respondents, electricity was not always present for 80%, and intravenous fluids were not always available for 30%. Sixteen per cent of government hospitals and 50% of mission hospitals were able to deliver safe anaesthesia for adults (Table 4). Comments made by the anaesthetists revealed the extent of equipment problems (Table 5).

Table 4 Provision of safe anaesthesia as defined in the questionnaire. Values are number (per cent).

	Government hospitals	Mission hospitals	Total
No. of hospitals	60	17	77
No. of anaesthetists	73	18	91
No. of anaesthetists able to provide safe general anaesthesia for an adult	12 (16%)	9 (50%)	21 (23%)
No. of anaesthetists able to provide safe general anaesthesia for a child	4 (5%)	8 (44%)	12 (13%)
No. of anaesthetists able to provide safe spinal anaesthesia	15 (21%)	11 (61%)	26 (28%)
No. of anaesthetists able to provide safe anaesthesia for Caesarean section	3 (4%)	2 (11%)	5 (6%)

Table 5 Comments from anaesthetists about the availability of anaesthetic equipment.

Comments
'There are 4 operating theatres but only two laryngoscopes that are in a functional state, one vaporiser is stuck so the other is moved from room to room'
'Though we have some of the equipment above, I rarely intubate due to lack of airway equipment and the irregular supply of oxygen'
'We usually send the family to buy cannulae from pharmacies in town before the operation day. We recycle the tracheal tubes.'
'We only have one oxygen concentrator which is also used in the paediatric ward.'
'The draw over apparatus is lying unrepaired for the last 10 years'
'The EMO vaporiser has not been serviced for 20 years. The inflating bellows are broken. We no longer intubate and ventilate patients except by use of Ambu bag. Oxygen is not available.'

General anaesthesia for children aged ≤ 5 years

Only 13% of anaesthetists were able to provide safe anaesthesia to children. The hospitals unable to provide safe anaesthesia to children had an estimated annual caseload of 7896 cases. Anaesthesia for children appears to be largely ketamine-based due to a lack of disposable airway equipment such as tracheal tubes, facemasks and breathing circuits.

Provision of spinal anaesthesia

With regards to spinal anaesthesia, 59% of anaesthetists had no spinal anaesthetic solution at least some of the time. In addition, comments included: 'the surgeons do not like the technique' and 'there is no spinal anaesthesia performed since there are no spinal needles. The district cannot afford to buy such needles'.

Anaesthesia for Caesarean section

Only 6% of anaesthetists were able to provide a safe anaesthesia service for Caesarean section by both general and spinal anaesthesia. The hospitals unable to provide safe anaesthesia for Caesarean section had an estimated annual caseload of 32 784 cases. Seventy-eight per cent of anaesthetists worked in hospitals where magnesium

sulphate was unavailable for at least some of the time. For half of these, it was never available. Thirteen per cent of anaesthetists worked without oxytocin or ergometrine for some of the time.

General theatre and hospital facilities (Table 6)

Electricity supplies were unreliable in many hospitals: 41% of anaesthetists stated that they had neither mains electricity nor a generator always available. This is of critical importance when oxygen supplies are provided by an oxygen concentrator. General facilities for infection control were poor: running water was always available to 56% of anaesthetists, gloves always available to 80%, disinfectant always available to 69%. Bleach and a brush for cleaning tracheal tubes were always available to 53% and 23% of anaesthetists, respectively, even though re-use of tracheal tubes is normal practice. Access to bedside or laboratory investigations was poor: 57% of anaesthetists were always able to estimate the patient's haemoglobin, 32% the blood glucose.

Drug availability (Tables 7 and 8)

Anaesthesia is largely ketamine-based (always available to 92% of anaesthetists), with ether the main volatile agent (always available to 68% of anaesthetists, compared to

Table 7 Availability of anaesthetic drugs. Values are number (per cent) of anaesthetists.

n = 91	Always available	Sometimes available	Never available	Don't know
Ketamine	84 (92%)	3 (3%)	4 (4%)	0
Thiopental	54 (59%)	22 (24%)	14 (15%)	1
Suxamethonium	50 (54%)	21 (23%)	18 (19%)	2
Non-depolarising relaxant	14 (15%)	11 (12%)	63 (69%)	3
Neostigmine	15 (16%)	6 (6%)	63 (69%)	7
Halothane	35 (38%)	15 (16%)	36 (39%)	5
Ether	62 (68%)	19 (20%)	9 (9%)	1
Pethidine/morphine	41 (45%)	28 (30%)	20 (21%)	2
Naloxone	9 (9%)	15 (16%)	55 (60%)	12
Atropine	77 (84%)	6 (6%)	6 (6%)	2

Table 6 General and hospital facilities for the delivery of anaesthesia services. Values are number (per cent) of anaesthetists.

n = 91	Always available	Sometimes available	Never available	Don't know
Electricity	18 (19%)	60 (65%)	13 (14%)	0
Generator	45 (49%)	34 (37%)	9 (9%)	3
Running water	51 (56%)	32 (35%)	8 (8%)	0
Disinfectant	63 (69%)	21 (23%)	6 (6%)	1
Sterile gloves	73 (80%)	18 (19%)	0 (0%)	0
Non-sterile gloves	66 (72%)	25 (27%)	0 (0%)	0
Bleach	49 (53%)	30 (32%)	9 (9%)	3
Brush for cleaning tracheal tube	21 (23%)	13 (14%)	51 (56%)	6
Haemoglobin measurement	52 (57%)	20 (21%)	17 (18%)	2
Glucose measurement	30 (32%)	27 (29%)	27 (29%)	7

<i>n</i> = 91	Always	Sometimes	Never	Don't know
Adrenaline	68 (74%)	17 (18%)	3 (3%)	3
Ephedrine/metaraminol/ phenylephrine	41 (45%)	20 (21%)	26 (28%)	4
Spinal local anaesthetic	36 (39%)	26 (28%)	28 (30%)	1
Local anaesthetics for blocks	64 (70%)	17 (18%)	7 (7%)	3
Magnesium	18 (19%)	35 (38%)	36 (39%)	2
Hydralazine	28 (30%)	31 (34%)	28 (30%)	4
Diazepam	74 (81%)	16 (17%)	0 (0%)	1
Labetalol	27 (29%)	27 (29%)	28 (30%)	9
Oxytocin	52 (57%)	29 (31%)	7 (7%)	3
Ergometrine	74 (81%)	13 (14%)	1 (1%)	3
Oxygen	58 (63%)	23 (25%)	10 (10%)	0
Intravenous fluid	62 (68%)	25 (27%)	2 (2%)	0
Nitrous oxide	0 (0%)	3 (3%)	84 (92%)	4
Blood for transfusion	21 (23%)	54 (59%)	15 (16%)	1

Table 8 Availability of other essential drugs. Values are number (per cent) of anaesthetists.

halothane, which was always available to 38% of anaesthetists). Supplies of suxamethonium were unreliable (always available to only 54% of anaesthetists) and non-depolarising neuromuscular blocking drugs were not commonly used (never available to 69% of anaesthetists). Apart from ketamine, access to analgesia was poor: pethidine or morphine was always available to only 45% of anaesthetists. Intravenous fluids were always available to 68% of anaesthetists and blood for transfusion to only 23%. Ten per cent of anaesthetists always worked without an oxygen supply; 25% sometimes worked without an oxygen supply.

Maintenance of equipment (Table 9)

Only 36% of anaesthetists worked in a setting where there were individuals trained to repair equipment. It was uncommon to be able to repair oxygen concentrators or suction machines locally; equipment was transferred out of the hospital to a regional centre for repair without substitution (49% of anaesthetists).

Anaesthetists were asked to make free text comments about ways in which anaesthesia could be improved in their hospital (Table 10). The main categories were

Table 9 Maintenance of equipment. Values are number (per cent) of anaesthetists.

	Yes	No
Can oxygen concentrators be repaired locally?	21 (23%)	70 (77%)
Can suction machines be repaired locally?	35 (38%)	56 (62%)
Are trained staff available to repair equipment?	33 (36%)	58 (64%)
If equipment cannot be repaired locally, what happens?	Equipment sent to regional hospital 45 (49%)	A trained technician visits 12 (13%)

Table 10 Anaesthetists' suggestions for making anaesthesia safer. Values are numbers.

Category	No. of anaesthetists
Better availability of anaesthetic equipment	86
Better availability of anaesthetic drugs	46
A reliable source of oxygen	33
Adequate monitoring	33
More anaesthetists	28
Reliable electricity	15
Training to allow equipment repair	18
Better salary	12
Better supervision for anaesthetists	11
Access to recovery facilities	11
Postgraduate education	9
Access to intensive care facilities	3

improvements in equipment, availability of anaesthesia drugs, access to reliable oxygen supplies and monitoring, and more trained anaesthetists.

Discussion

Uganda is one of the poorest countries in the world and has considerable problems in the provision of healthcare. Access to even the most basic of facilities such as clean drinking water remains a serious issue. Local healthcare resources and international aid are consumed by conditions such as HIV, malaria and malnutrition. The financial resources allocated to health are meagre (Table 11). Medical migration has resulted in many Ugandan doctors emigrating to wealthier countries such as the UK, resulting in a serious shortage of doctors [9]. These factors impede the provision and development of medical care across all specialities, including anaesthesia.

Uganda is profoundly under-resourced in terms of trained anaesthetists. In the UK, approximately 15% of

Table 11 Comparison of economic and health status in the United Kingdom and Uganda.

	UK	Uganda
Gross domestic product per capita; US dollars	\$31 308	\$270
Proportion of population living on < \$1 per day; %	0%	85%
Expenditure on health per capita per year; US dollars	\$2853	\$20
Doctors per 100 000 population; <i>n</i>	220	8
Medical Anaesthetists per 100 000 population; <i>n</i>	20	0.02
Anaesthesia providers per 100 000 population; <i>n</i>	20	0.6
Maternal mortality per 100 000; <i>n</i>	13	880
Lifetime risk of maternal death	1 : 3800	1 : 13

Sources: www.unicef.org; www.who.int and <https://www.cia.gov/cia/publications/factbook/index.html>

hospital consultants are anaesthetists and anaesthesia is a popular career choice. For a UK population of 60 million, there are approximately 12 000 medical anaesthetists of all grades, whereas in Uganda, for a population of 27 million, there are only 13 physician anaesthetists and 330 non-physician anaesthesia providers. In the UK, per capita spending on healthcare is 10 times greater than the per capita Gross Domestic Product (GDP) in Uganda. Competition exists for funding in all hospitals, especially when resources are scarce, so it is not surprising that shortages of drugs, basic supplies and equipment are common. The many difficulties in the provision of anaesthesia in the developing world have been acknowledged anecdotally, but there has been no structured approach to assessing the scale of the problem within an entire country, nor the specific deficiencies within regions or individual hospitals. Internationally described standards for anaesthesia are unattainable, and there are no published minimum standards that deal specifically with resource-poor environments in which basic drugs and facilities remain a problem. Local anaesthetists need to develop effective and accepted reporting mechanisms to describe their deficiencies to local management, who must also have clear guidance as to what is required. In addition, national societies must have an effective way of presenting their situation to central agencies in order to lobby for better resources. None of the drugs in this questionnaire would be considered expensive, but most are life-saving. However, equipment is usually a significant capital investment for a small hospital.

The questionnaire developed during this project provides a standardised method of assessing anaesthesia facilities in different units. Completion during a 'questionnaire workshop' during the national refresher course, with a moderator to clarify any ambiguous questions,

resulted in a high return rate and accuracy in completion. The questionnaire was completed by 97 anaesthetists, just under one third of the anaesthetists in Uganda, during a national refresher course which was open to all anaesthetists, who were funded to travel and stay at the course. Almost 50% of the hospitals in Uganda were represented, including 33 of the 57 large government national, regional and district hospitals, and a small number of Health Centres. The questionnaire took around an hour to complete and proved an efficient mechanism for anaesthetists to report details of their working conditions to the Uganda Society of Anaesthesiologists. Alternative strategies have been described, such as visiting individual hospitals within a district [6], but are considerably more expensive and time-consuming to undertake. We do not think that accurate, reliable data would be obtained by posting questionnaires to different units, as the response rate would decrease dramatically. Analysis of the 91 questionnaires by hand was a laborious and time-consuming process. Future questionnaires should be analysed by entry into an appropriate database, as this would also allow easy compilation and comparison of data from different countries.

The WFSA published international standards for the safe practice of anaesthesia in 1992, in part as a future goal for anaesthetists in developing countries. We based our criteria for safe anaesthesia on a consensus of the opinions of anaesthetists with experience of working in developing countries, and related them to common clinical situations. For instance, when defining requirements for the safe provision of obstetric anaesthesia, we attempted to take into account the frequency of complicated cases seen in Africa, including pre-eclampsia, eclampsia and haemorrhage. The equipment and drugs required were all basic and relatively inexpensive. General hospital facilities do not form part of the WFSA standards but we thought that they were important enough to be included in this questionnaire. For instance, a reliable electricity supply is mandatory when using an oxygen concentrator or when performing emergency procedures at night. Our criteria for 'safe anaesthesia' are equivalent to the WFSA 'basic' requirements for equipment and were only been met by 23% of anaesthetists for adult practice, and by 13% and 6% of anaesthetists for paediatric and obstetric practice, respectively. We did not specifically enquire about intermediate and advanced requirements, e.g. compressed gases, capnography, electrocardiogram or oxygen analyser. It is highly likely that these items remain aspirational for the majority of anaesthetists, but they could be included in future versions of the questionnaire.

The questionnaire probably underestimates some of the challenges to providing safe anaesthesia, as we did not focus on the age and condition of equipment available in

the different units, choosing to concentrate instead on whether functioning equipment was available. It is likely that many items in everyday use need replacement. The questionnaire also highlighted certain aspects of the settings in which healthcare is delivered. Secondary healthcare in Uganda takes place in a number of settings, including government hospitals or non-government mission hospitals. The government hospitals in the study include 34 of the 57 national, regional or district hospitals and 27 of 140 more recently established 'Health Centre Grade IV' rurally located centres placed to deliver mainly obstetric care to isolated populations. These latter units have not all been staffed with medical staff and are not all functional. The questionnaire demonstrates the challenges of managing obstetric services for isolated rural units with small numbers of cases. The results of this questionnaire suggest that non-government mission hospitals are better equipped than government hospitals. The reasons are unclear but may be due to larger budgets allied to more efficient management systems.

Pulse oximetry has transformed the safety of anaesthesia in UK [2] and has been considered essential anaesthesia monitoring for many years. In Uganda, oximeters are rarely available and anaesthesia is provided on a daily basis for many patients, including for obstetric patients, without oxygen and with no monitoring of oxygen saturation. There is a great need for a major international initiative to improve this situation with robust basic oximeters that can work in the austere environment of developing countries. The fact that 94% of anaesthetists did not have access to the correct range of drugs and equipment that would allow them to provide safe anaesthesia for patients undergoing Caesarean sections is alarming. This must be a demoralising experience for all staff involved, not to mention the greater tragedy of unnecessary suffering and loss of life. We did not collect morbidity and mortality data in our study, but our findings suggest that obstetric anaesthesia cannot be considered safe, and this must be a contributory factor, along with others, to the high overall maternal mortality.

The replies to this questionnaire describe the typical anaesthesia services for 27 million Ugandans and probably many more millions in neighbouring countries [5, 6]. The lack of even basic theatre facilities such as reliable electricity, running water and oxygen, and the shortages of drugs, equipment and personnel, demonstrate the severe difficulties in running a basic healthcare system in many of the locations included in the questionnaire. However, the fact that some units were able to stock many of the items suggested in the questionnaire probably indicates that they are available within the country, but that logistical difficulties in ordering, finance and trans-

port are common. Anaesthesia in rural Uganda is largely ketamine-based, particularly in paediatric practice. Ether and halothane are the only volatile agents available. There have been persisting rumours that the profitability of these agents is questionable and that manufacturers may be tempted to stop making these drugs. Although this may make commercial business sense, these drugs sustain anaesthesia services for many millions of patients in the developing world, and their continued existence is vital.

The morbidity or mortality associated with different methods of anaesthesia in developing countries is not known, and the optimum equipment and drugs for providing a service have not been defined: these will vary according to the facilities available locally. In the absence of a reliable oxygen supply, ketamine and ether have many positive features, and any recommendations for changes in existing drugs, techniques and equipment must take account of all features of running a service in the local environment. For isolated practitioners, regular CPD is particularly important, and Uganda is to be congratulated for holding regular refresher courses. However, with only 44% of anaesthetists owning a textbook, we have a long way to go in terms of the provision of educational material. At this refresher course, an anaesthesia handbook was donated to each participant by the AAGBI.

The format of this questionnaire and its method of administration at a national refresher course proved to be an efficient and effective way of gaining a snapshot of anaesthesia services within a developing country. Problems have been identified and possible solutions can start to be formulated. Improvements required can be identified at all levels: increasing political awareness of the issues at both a local and national level; increasing numbers of trained personnel; defining local and national standards of care; improving logistical arrangements for the supply of equipment and drugs; consideration of the design of healthcare systems and the need for capital investment in pulse oximetry. We believe that this simple assessment tool should be used in other countries where anaesthesia services are a concern.

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The questionnaire may be downloaded from http://www.aagbi.org/aboutaagbi/committees/international_relations.htm

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