

Original Research Article

Anaesthesia services in Ghana- a descriptive study**T. Anabah MD, MSc^{1,4*}, D. Dordunoo PhD, RN², S. Kampo MPhil^{1,4}, E. Appiah-Denkyira MBChB³, S. Kaba MD, PhD³**¹Department of Anaesthesia, School of Medicine and Health Science, University for Development Studies, Tamale, Ghana²Organizational Systems & Adult Health, University of Maryland School of Nursing, USA³Ghana Health Service, Head Quarters, Accra, Ghana⁴Tamale Teaching Hospital, Ghana***Corresponding author**

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Abstract: While resource availability for the provision of standard anaesthesia in high-resource countries is easily accessible, very little is known about the state of resourcefulness of anaesthesia in Ghana. The availability of such a data serves as a valuable tool to guide investment in the specialty. Our objective was to determine the challenges faced in delivery of safe anaesthesia to patients in Ghana from the perspectives of the anaesthesia staff. This descriptive study was conducted among Ghanaian anaesthetists. A total of 120 self-reporting questionnaires were distributed among participants who attended a National Conference in October 2013. Of these, 114 questionnaires were fully completed and returned. Main outcomes measures included personnel, infrastructure, procedures, equipment and supplies. Findings of the study indicate majority of anaesthesia providers in Ghana (92.9%) were nurse anaesthetist. Seventy-five (70.7%) nurse anaesthetists practice without supervision from consultant anaesthetists. In relations to general hospital conditions, 64% and 68% had reliable electricity and running water respectively. Obstetric anaesthesia is the most common procedure performed with 67.6% performing more than 20 cases a month. All participants had equipment to monitor blood pressure, while 86% were able to monitor SPO₂. The availability of drugs to manage preeclampsia was poor. On the other hand, drugs to manage maternal hemorrhage were better, although ergometrin and oxytocin were always available to 61.4% and 85.1% respectively. In conclusion, Ghana depends heavily on nurse anaesthetists in the provision of anaesthesia services. Obstetric anaesthesia remains the most common procedure anaesthetists perform and this is faced with challenges such as unreliable supply of intravenous fluids, blood and drugs to manage complications.

Keywords: anaesthesia, resources, Ghana, quality of care, maternal mortality.

INTRODUCTION

The global health disparities in the provision of life-saving critical care to people in low resource countries like Ghana is fueled by lack of infrastructure to deliver care in general, critical care in particular and pre-morbid conditions of patients and patterns of presentation [1]. These effects are most evident in specialties like anaesthesia, which play a vital role in the management of the critically ill patients particularly in the perioperative period [2-5]. The last decade has seen advances in technology; production of refined anaesthesia equipment and drugs, coupled with focus on education and training which has led to improved safety and quality improvement in anaesthesia. The implementation of such advancements requires significant resources [6-8]. The World Federation of Societies of Anesthesiologists (WFSA) adopted the International Standards for the Safe Practice of Anaesthesia in 1992. The WFSA updated the standards

in 2008 and again in 2010 [9]. The standards relate to the professional status of the anaesthetist and standards for peri-anaesthetic care and monitoring. These standards are developed and endorsed with the sole purpose of making anaesthesia safe. Ghana has yet to achieve these international standards and improve patient safety in the delivery of anaesthesia. A recent needs assessment reveal a large number of hospitals in Ghana provide anaesthesia without pulse oximetry (Lifebox, 2013), which is considered by World Health Organization (WHO) as a basic and mandatory equipment for perioperative anaesthesia care [10]. The results of this survey led to the donation of 320 LifeBox pulse oximeters to the Ghana Health Service in October 2013 [11]. Information gathered from nurse anaesthetists working in rural Ghana indicate other basic equipment standards are unmet suggesting that countless number of people do not have access to safe anaesthesia and adequate pain relief during surgery and childbirth, a

basic human right. There are no national estimates of this problem although it is likely that the quality of care has regional variations requiring different solutions; ranging from local systems improvement to national capital expenditure. Thus the purpose of this study is to describe the problems faced by anesthetists in Ghana in order to define priorities and identify possible solutions.

Method

Utilizing a questionnaire designed by a group of anesthesiologists and anesthetists drawn from rural and teaching facilities in Ghana, 120 of the 161 participants who attended the 10th Biennial National Conference of Ghana Association of Nurse Anesthetists (GANA) at Koforidua in October 2013 were invited to complete the survey. The study was approved by the Ghana Health Service Ethical Review Committee. The event was sponsored by the Ghana Health Service (GHS) in partnership with LifeBox Foundation [11]. To assure equal representation of the facilities in attendance each health institution completed one questionnaire irrespective of the number of representatives at the conference. The questionnaire included details of the setting in which the anesthetist worked, their training and access to continuing professional development (CPD), anesthesia textbooks and journals; supervision by physician anesthetists, possibility to provide safe general anesthesia for all patients and safe anesthesia for obstetrics. Participants were asked to make suggestions to help improve safe anesthesia service in Ghana. Anesthetists were also asked to provide information on general facilities in the operating theatres and hospital, the availability of drugs and equipment as well as the maintenance of equipment. The respondents were asked to rate some of these areas on a Likert scale from always available to never available. The questionnaires were completed during one session. Six questionnaires were omitted because the data were incomplete.

Data analysis/calculations

Data was analyzed using Statistical Package for the Social Sciences (SPSS) version 20.0. The descriptive data were categorical and are summarized as frequencies and percentages according to Personnel Infrastructure Procedures Equipment Supplies (PIPES) framework.

RESULTS

Of 120 eligible participants, 114 (95%) completed questionnaires had sufficient data for analysis. All respondents in the study were considered anaesthetist either by on the job training or formal training as they were providing anaesthesia care.

Personnel

Table-1 provides general information about the respondents. Of 114 respondents, 106 (92.9%) were nurse anaesthetists and all had varying levels of training. Among the 8 physician anaesthesiologists, two

(2) had no formal qualifications (trained on the job) whilst the nurse anaesthetists, 94 (82.5%) completed their formal training in 18 months. Of note, 2 respondents did not provide an answer about formal training. With regards to the opportunity to seek further education through refresher courses; 106 (93%) respondents had post-training refresher course within the past 12 months. Similarly, 105 (92.1%) have access to reference anaesthesia material (i.e. anaesthesia textbooks). Majority of the respondents (50.8%) worked in government district hospitals while 28.9% and 19.3% worked in non-governmental and national/regional hospitals respectively. Majority (92.9%) of the anesthesia providers in Ghana are nurse anesthetists and while the Ghanaian policy requires nurse anesthetists to practice under physician anesthesiology supervision, the findings indicate 75 (70.7%) practice without supervision. This issue is further impacted by the fact that overall the anesthesia workforce in Ghana is fairly young; forty-two percent of the respondents had less than five years of practice and a disproportion of physician anesthesiologists and nurse anesthetists.

Infrastructure

Operating room

Respondents were asked whether they had the needed resources to provide safe spinal anaesthesia, anaesthesia for adults, children and for caesarean section. Majority of respondents confirmed the existence of safe operating room standards for anaesthesia procedures to be undertaken; 98.2% affirmed the existence of safe conditions to provide spinal anaesthesia, 96.5% for adult anaesthesia, 86.4% for paediatric procedures and 93.8% for obstetric anaesthesia (Table-2).

General hospital facilities for the delivery of anesthesia services

All respondents indicated reliable supply of electricity because they have access to both main and generator sources however only 64% had reliable electricity from main source. With regards to running water, only 68% of respondents always have running water, while 92% always with disinfectant available. Access to the laboratory was poor: only 50% and 52% of anesthetists are always able to analyze blood glucose and hemoglobin respectively.

Procedures

The study attempted to ascertain the caseload of the respondents with respect to key anaesthetic procedures. These procedures include laparotomy, caesarean session and anaesthesia for children under five. The results of the caseloads for these procedures had wide variation thus the results were recoded to place respondents within pre-determined ranges of cases performed. Based on this, obstetric anaesthesia was the most common procedure performed with 67.6% performing more than 20 cases a month (Table-3). The least type of cases performed was paediatric

anaesthesia; 86% provide anaesthesia to 20 or less cases for children under five per month.

Equipment

All respondents indicated they always had the equipment to monitor blood, 86% were always able to monitor SpO₂ and 55% were always able to monitor temperature. With regards to ECG and end tidal carbon dioxide monitoring, 21% and 63% were not able to monitor these parameters respectively.

Equipment Maintenance

Fifty-one percent of the respondents work in facilities where there were trained professionals to repair equipment. However, 67% of respondents indicate oxygen concentrators cannot be repaired in their facilities while 42% indicate the same for suction machines. In the cases where hospitals cannot fix broken equipment 81.6% of the respondents indicated their facilities invite trained technicians from outside.

Supplies

Supplies of sterile and clean gloves were always available to 96% and 87% of the respondents respectively. Bleach and brush for cleaning tracheal tubes were always available to 91% and 51% of the sample respectively.

Availability of basic Anaesthesia drugs

The success of anesthesia also depends on the availability of drugs thus we assessed the availability of basic anesthesia drugs and other adjuvant mainly for resuscitation and managing obstetric patients (Table-4). Majority of the anesthetists indicated they always have

ketamine (92.1%) and thiopental (83.3%) available. With regards to muscle relaxants, 81.6% always have suxamethonium however only 53.5% always have a non-depolarising relaxant with 15.8% with no access to a non-depolarizing muscle relaxant. Halothane is the main volatile agent, which is always available to 78.1%, while ether is always available to 14.9%. Access to analgesia such as Pentidine was suboptimal with constant availability to 70.2%. Access to Naloxone was poor; constant availability to only 28% compared to atropine, which was always available to 87.7%. Availability of adjuvant drugs was generally poor; about 10% of anesthetists work with unreliable supply of intravenous fluid while blood for transfusion has constant availability to 45.6%. The availability of drugs to manage preeclampsia namely hydralazine, magnesium sulphate and labetalol were poor with constant availability ranging from 29.8% to 48.2%. Access to drugs to manage maternal hemorrhage was better than preeclampsia although ergometrin and oxytocin were always available to 61.4% and 85.1% respectively.

Suggestions to improve anesthesia delivery in Ghana

The respondents were also asked to give suggestion about how the delivery of anesthesia could be improved in the country. The categories for improvement in order of importance were equipment (50%), increase the anesthesia workforce (34.5%), improve availability of drugs (20.7%) and provide a career pathway for nurse anesthetist (13.8%). Anesthetists were least concern about salaries (3.4%), supervision (6%) and supply of anesthesia gases (6%).

Table-1: Personnel - characteristics of anesthesia providers in Ghana, N=114

Characteristics	n	%
Employment location		
National/regional referred hospital	22	19.3
Government district hospital	58	50.7
Military hospital	1	0.8
Non-government or mission hospital	33	28.9
Length of training/education		
1.5 yrs	94	
2 yrs	4	
3 yrs	5	
4 yrs	5	
Work under supervision by a physician anesthetist at your facility		
Yes	31	27.2
No	83	72.8*
Years of practice_ years		
0-5	56	42.1
6-10	29	33.3
11-15	17	14.1
16-20	5	4.4
21-25	5	4.4
>25	2	1.8

* Includes 8 physician anesthesiologists with 75 nurse anesthetists; yr year yrs years

Table-2: Infrastructure

	Always N (%)	Sometime N (%)	Never N (%)	Don't know N (%)
Electricity_main	72 (63.2)	41 (36)		
Electricity_generator	52 (45.6)	60 (52.6)	1 (0.9)	
Running water	77 (67.5)	35 (30.7)	1 (0.9)	
Disinfectants	104 (91.2)	9 (7.9)		
Sterile gloves	109 (95.6)	4 (3.5)		
Non-gloves	98 (86)	10 (8.8)	5 (4.4)	
Bleach	103 (90.4)	9 (7.9)	1 (0.9)	
Brushes for ETT	57 (50)	24 (21.1)	30 (26.3)	1(0.9)
Hemoglobin measurement	59 (51.8)	29 (25.4)	25 (21.9)	
Glucose	57 (50)	44 (38.6)	12 (10.5)	

Table-3: Procedures

Caseload	0-20 n (%)	21-40 n(%)	>40 n (%)
Laparotomies	93(81.6)	15(13.2)	6(5.3)
Anesthesia for children <5	98 (86.0)	11 (9.6)	5 (4.4)
Caesarian session	37 (32.5)	36 (31.6)	41 (36.0)

**Caseload estimates

Table-4: Drugs and adjuvant

Drugs know	Always n (%)	Sometimes n (%)	Never n (%)	Don't n (%)
Ketamine	105 (92.1)	7 (6.1)	1 (0.9)	
Thiopental	95 (83.3)	15 (13.2)	2 (1.8)	
Suxamethium	93 (81.6)	18 (15.8)	2 (1.8)	
Non-depolarising relaxant	61 (53.5)	34 (29.8)	18 (15.8)	
Halothane	89 (78.1)	10 (8.8)	14 (12.3)	
Ether	17 (14.9)	7 (6.1)	85 (74.6)	1 (0.9)
Pentidine	80 (70.2)	27 (23.7)	5 (4.4)	
Morphine	29 (25.4)	44 (38.6)	40 (35.1)	
Naloxone	32 (28.1)	43 (37.7)	38 (33.3)	
Atropine	100 (87.7)	9 (7.9)	4 (3.5)	
Adrenaline	95 (83.3)	17 (14.9)	1 (0.9)	
Ephedrine/metaraminol/phenylephrine	96 (84.2)	15 (13.2)	2 (1.8)	
Spinal local anesthetic	105 (92.1)	7 (6.1)	1 (0.9)	
Local anesthetics for blocks	82 (71.9)	21 (18.4)	10 (8.8)	
Magnesium	40 (35.1)	45 (39.5)	26 (22.8)	1 (0.9)
Hydralazine	55 (48.2)	43 (37.7)	15 (13.2)	
Diazepam	89 (78.1)	15 (13.2)	7 (6.1)	
Labetalol	34 (29.8)	37 (32.5)	40 (35.1)	
Oxytocin	97 (85.1)	7 (6.1)	7 (6.1)	
Ergometrine	70 (61.4)	31 (27.2)	10 (8.8)	
Oxygen	103 (90.4)	7 (6.1)	1 (0.9)	
Intravenous (crystalloids) fluids	100 (87.7)	5 (4.4)	6 (5.3)	
Nitrous oxide	30 (26.3)	22 (19.3)	59 (51.8)	
Blood for transfusion	31 (27.3)	22 (19.3)	58 (50.9)	

DISCUSSIONS

This study aimed to describe the delivery of anesthesia in Ghana focusing on personnel, infrastructure, procedures and equipment. The findings of this study indicate problems within each area. The most concerning relates to equipment and supplies. The most common procedure performed by the anesthetists was obstetric anesthesia however the availability of the

drugs to manage complications such as bleeding and preeclampsia were poor. The results also indicate supplies such as disinfectants were not always available for the anesthesia service. This proves to be problematic because re-use of tracheal tubes and other equipment is normal in many parts of rural areas, highlighting significant problem with infection control. The equipment assessed were considered basic and

mandatory to provided anaesthesia for any emergency or elective cases of American Society of Anaesthesiologists (ASA) class III and below. These equipment (pulse oximeter, NIBP apparatus, thermometer, ECG and capnography) inexpensive and do not require advanced skills and knowledge for use. With country-wide maternal mortality rates (MMR) of 380 per 100 000 births [12], from complications such as hemorrhage, hypertension and sepsis, this appears to be an area of highest priority for anesthesia services in Ghana. Further research into institutional and/or regional MMR is needed to further elucidate the main causes of maternal deaths to help prioritized equipment, supplies and drugs procurement.

This study found a disproportion between physician and nurse anesthetists who overall had less than five years of experience with high caseload; performing 20-40 caesarean sections alone per month. Ghana with a population of 25.9 million [12] has approximately 50 physician anesthetists and 550 nurse anesthetists. This puts the burden of the work on the nurse anesthetists who have less experience to manage difficult cases and are often practicing in the rural areas with no supervision. Lack of experience coupled with lack of supervision and high caseload can lead to sub-standards anaesthesia care. Although, these findings are no different from those reported from Uganda [13] it does highlight the difficulties in providing anesthesia in Ghana which has never been assessed. Moreover, despite the existence of international standards, Ghana does not have written standards for the provision of anesthesia which makes it more difficult to plan for future development of the human resource. To this end, we recommend that the Ghana Anaesthesia Society develop standards and guidelines for adoption and implementation by the ministry of health.

Results from this study indicate that after training, nurse anesthetists were posted to regional and district hospitals without any form of supervision from physician anesthetists. Reasons for this can be attributed to small number of physician anesthetists. Although supervision was not a concern for anaesthetists, the introduction of a three (3) years bachelor of science in (BSc) Nurse anaesthesia programme in the country instead of the 18 months training programmes, gives hope for a more skilful and knowledgeable nurse anaesthetists who can practice within their current clinical infrastructures [14]. The limitations of this study are that the level of equipment in government and non-government facilities and individual institutional MMR were not collected. Also the study relied on participants' estimation of caseload among other parameters.

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Conflict of interest

None

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