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ORIGINAL RESEARCH

Anaesthesia facility evaluation: a Whatsapp survey of hospitals in Burundi

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Background: Data regarding the capacity to provide safe anaesthesia is lacking in many low-income countries. With the increasing popularity of WhatsApp for both personal and professional communication in Africa, we sought to test the feasibility of using this platform to administer a brief survey of anaesthesia equipment availability in Burundi. The aims of the study were to survey a subset of anaesthesia equipment availability in Burundi and to assess the suitability of using a WhatsApp chat group to administer such a survey.
Methods: The survey was distributed via WhatsApp by ATSARPS (Agora des Techniciens Supérieurs Anesthésistes Réanimateurs pour la Promotion de la Santé), an association of anaesthesia providers in Burundi. The questions focused on the presence of five pieces of anaesthesia equipment recommended by the World Health Organization – World Federation of Societies of Anesthesiologists (WHO–WFSA) International Standards for a Safe Practice of Anesthesia, namely a Lifebox pulse oximeter, anaesthesia machine, capnograph, ECG and defibrillator. Questions were sent as free text, and responses were received as a reply or as a personal message to the president of ATSARPS who sent the survey.
Results: Responses received represented data from 55 (85%) of the 65 hospitals that offer anaesthesia care across Burundi. Eighty-nine per cent of hospitals had a Lifebox pulse oximeter, 91% had an anaesthesia machine, 16% had capnography, 24% had an ECG and 14% had a defibrillator. Among hospitals which responded to our survey, only 60% reported performing general endotracheal anaesthesia on a monthly basis.
Conclusion: Data collection in low- and middle-income countries (LMICs) can be challenging; therefore, simple, low-cost methods of data collection need to be developed. We have demonstrated the feasibility of using a WhatsApp chat group among a national society of anaesthesia providers in Burundi to perform an initial abbreviated audit of anaesthesia facilities. We have also identified significant deficits in anaesthesia equipment in Burundi.

Keywords: WhatsApp, anaesthesia facility, anaesthesia equipment, Burundi

Introduction

Burundi is a small country in east Africa with a population of 11.8 million people.[1] Burundi has the lowest surgeon density in east, central and southern Africa at 0.18 surgeons per 100 000 people.[2] There are currently six physician anaesthesia providers working in the country (0.05 per 100 000 population) and 328 non-physician anaesthesia providers (2.78 per 100 000 population),[3] lower than any of its east African neighbours.[4]

In recent years, communication across much of Africa, including Burundi, has been transformed by expanded cellular coverage, Internet accessibility and availability of smartphones. Collectively these infrastructure changes have resulted in rapidly expanded utilisation of WhatsApp (WhatsApp Inc, Facebook Inc, California, USA). WhatsApp is an instant messaging application, currently accessed by 1.6 billion people worldwide each month.[5] Since its launch in 2009, WhatsApp has become the most popular instant messaging platform across much of Africa.[6] The use of WhatsApp as a tool for telemedicine has been described previously, including for use in paediatric burn care, obstetric care and dermatology.[7-10]

In Burundi, WhatsApp chat groups have recently been used as the primary communication tool for professional societies to communicate with their members. One such society is Agora des Techniciens Supérieurs Anesthésistes Réanimateurs pour la Promotion de la Santé (ATSARPS), an association of physician and non-physician anaesthesia providers across Burundi. ATSARPS is a corresponding member of the World Federation of Societies of Anesthesiologists (WFSA), as well as a member of the International Federation of Nurse Anaesthetists (IFNA) and is working to raise the quality and safety of anaesthesia in Burundi through ongoing training and research.

Burundi has a total of 65 hospitals (57 public and eight private) which provide anaesthesia services. Data published by the Burundian Ministry of Health report that in 2018 there were 10 680 general anaesthetics and 16 697 spinal anaesthetics performed with a trained anaesthesia provider. An additional 1 293 surgeries were reported to have been performed without an anaesthesia provider,[11] being performed either by a non-trained anaesthesia provider or by using only local anaesthesia administered by the surgeon.

In 2018, the World Health Organization (WHO) in conjunction with the WFSA published the International Standards for a Safe Practice of Anesthesia,[12] including "highly recommended" equipment such as pulse oximeters, end-tidal carbon dioxide detectors and defibrillators. Given the many obstacles to collecting data in low-resource settings, we attempted to use the ATSARPS WhatsApp chat group as a platform to deliver an abbreviated questionnaire regarding the presence of several pieces of recommended or highly recommended equipment

across Burundi. The purpose of this survey was to pilot the feasibility of collecting a small subset of specific facility data rapidly via WhatsApp and to obtain a cross-sectional snapshot of anaesthesia care across the country.

Methods

This study was approved by the Kibuye Hope Hospital Institutional Review Board (IRB) (KHH2019:000004). Given the nature of the questionnaire, the IRB committee waived the requirement for written informed consent, however, respondents were informed that their participation was voluntary. On 1 October 2019 and 13 November 2019, the president of ATSARPS (GR) sent an initial questionnaire (part 1) then a follow-up questionnaire (part 2) to assess a subset of anaesthesia equipment availability and facility capacity (Table I) by WhatsApp to 224 participants (98.7% of the 227 official and non-official members) in the ATSARPS chat group. Non-official members are those who are active in ATSARPS activities but do not pay annual dues. The survey questions were sent as free text in the WhatsApp chat group (Figure 1) and responses were received either as a reply on the WhatsApp chat group, or directly (via a WhatsApp personal message) to the president of ATSARPS (GR), who sent the original message. Although the questions were of the yes/no type (or indicating a numerical response) some anaesthesia providers responded with additional information, which we have tried to incorporate into the results. On 7 October 2019, the ATSARPS director of programmes called anaesthesia providers from 11 hospitals who had not responded via WhatsApp but who subsequently voluntarily responded to the questionnaire over the telephone. This was not part of the original study design and was not performed for the follow-up questionnaire.

The questionnaire was initially developed to gather information about the distribution of Lifebox pulse oximeters across Burundi, however, the authors decided to expand this questionnaire in order to simultaneously collect additional information about other anaesthesia equipment and facilities, as well as the monthly performance of general endotracheal anaesthesia. The goal was to obtain responses from anaesthesia providers working at 80% of the 65 public and private health facilities providing surgical services in Burundi. If two respondents reported conflicting data on the same facility or if a response was left empty, this was considered an indeterminate response. No attempt was made to reconcile indeterminate responses. Data were manually transcribed from WhatsApp into an Excel spreadsheet (Microsoft, Seattle, WA, USA) and descriptive statistics reported. Given the potential for errors in manual data transcription from WhatsApp to Excel, two study authors (GS, GR) confirmed accuracy of the data in the database by cross referencing with the original WhatsApp transcripts.

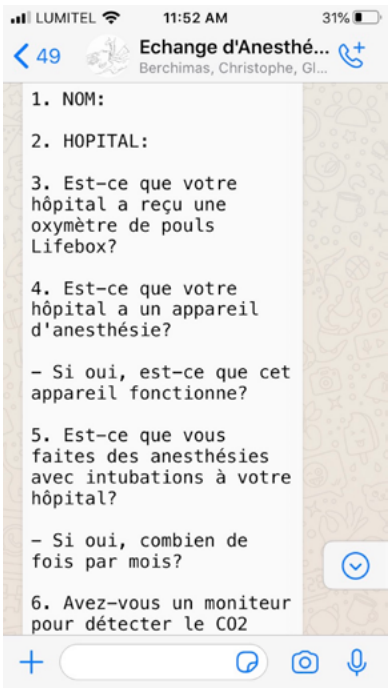

Figure 1: Screenshot of original questionnaire sent on WhatsApp chat group

Table I: Questionnaires regarding anaesthesia equipment in the operating room (translated from French to English)

Part 1
1. Name 2. Hospital 3. Has your hospital received a Lifebox pulse oximeter? 4. Does your hospital have an anaesthesia machine? If yes, is it functional? 5. Does your hospital perform general endotracheal anaesthetics? If yes, how many times per month? 6. Do you have a monitor to detect end-tidal CO2? 7. Do you have a monitor capable of performing ECG?
Part 2
1. Do you have defibrillators in your operating room? 2. How many?

Table II: Responses received and number of hospitals represented

	WhatsApp	Phone call	Total responses
Responses received for part 1 of questionnaire (*N*)*	50/224	11/224	61/224 (27%)
Responses received for part 2 of questionnaire (*N*)	56/224	0	56/224 (25%)
Total number of hospitals represented (*N* and percentage)**		55/65 (85%) – part 1 56/65 (86%) – part 2	
Hospital categories represented from survey results***			
District hospitals		42/55	
Regional hospitals		3/55	
National hospitals		3/55	
Private/clinic hospitals		7/55 (part 1) – 8/56 (part 2)	

*Number of responses received out of the total number of ATSARPS members (227) who are listed on the ATSARPS WhatsApp chat group (224)
**There is a total of 65 public and private hospitals in Burundi which offer anaesthesia services
***Responses received represent data from 55 hospitals for part 1 of the survey and 56 hospitals for part 2 of the survey

Table III: Numbers of hospitals with essential equipment for administering anaesthesia, expressed as number of hospitals (percentage)

	Yes	No	Field indeterminate**
Lifebox pulse oximeter	49 (89%)	4 (7%)	2 (4%)***
Anaesthesia machine	50 (91%)	5 (9%)	0
Monthly performance of general endotracheal anaesthesia	33 (60%)	17 (31%)	5 (9%)
Capnography	9 (16%)	44 (80%)	2 (4%)
ECG	13 (24%)	38 (69%)	4 (7%)
Defibrillator*	8 (14%)	48 (86%)	0

*61 respondents provided data for 55 out of 65 hospitals for Lifebox pulse oximetry, anaesthesia machine, monthly general anaesthesia, capnography, and ECG; 56 respondents provided data for 56 out of 65 hospitals for defibrillators
**Indeterminate responses were those for which either the response was empty or conflicting responses were received from more than one provider from the same hospital or for which the respondent reported that the equipment was available but non-functional
*** Two respondents replied that they had a pulse oximeter but that it was not a Lifebox pulse oximeter

Results

With regards to part one of the questionnaire, 50 responses out of 224 participants (22%) were received via WhatsApp and 11 via direct phone call, representing data from 55 (85%) of 65 hospitals (Table II). Of the 55 hospitals for which we received responses, the data represent 42 district hospitals, three regional hospitals, three national hospitals and seven private hospitals and/or clinics. These responses were all received within a period of eight days from the time the questionnaire was disseminated. Regarding part two of the questionnaire, 56 responses were received via WhatsApp, representing data from 56 (86%) out of 65 hospitals. None of the responses was obtained through direct telephone contact. All hospitals represented in the first questionnaire were also represented in the second questionnaire with the addition of one private hospital.

The questionnaire asked specifically about the presence of Lifebox pulse oximeters. Respondents at 49/55 (89%) hospitals surveyed reported the presence of Lifebox pulse oximeters, and 4/55 (7%) hospitals reported no Lifebox pulse oximeters (Table III). Respondents from two hospitals responded that they had pulse oximeters but specified they were not Lifebox oximeters, which was considered as an indeterminate response.

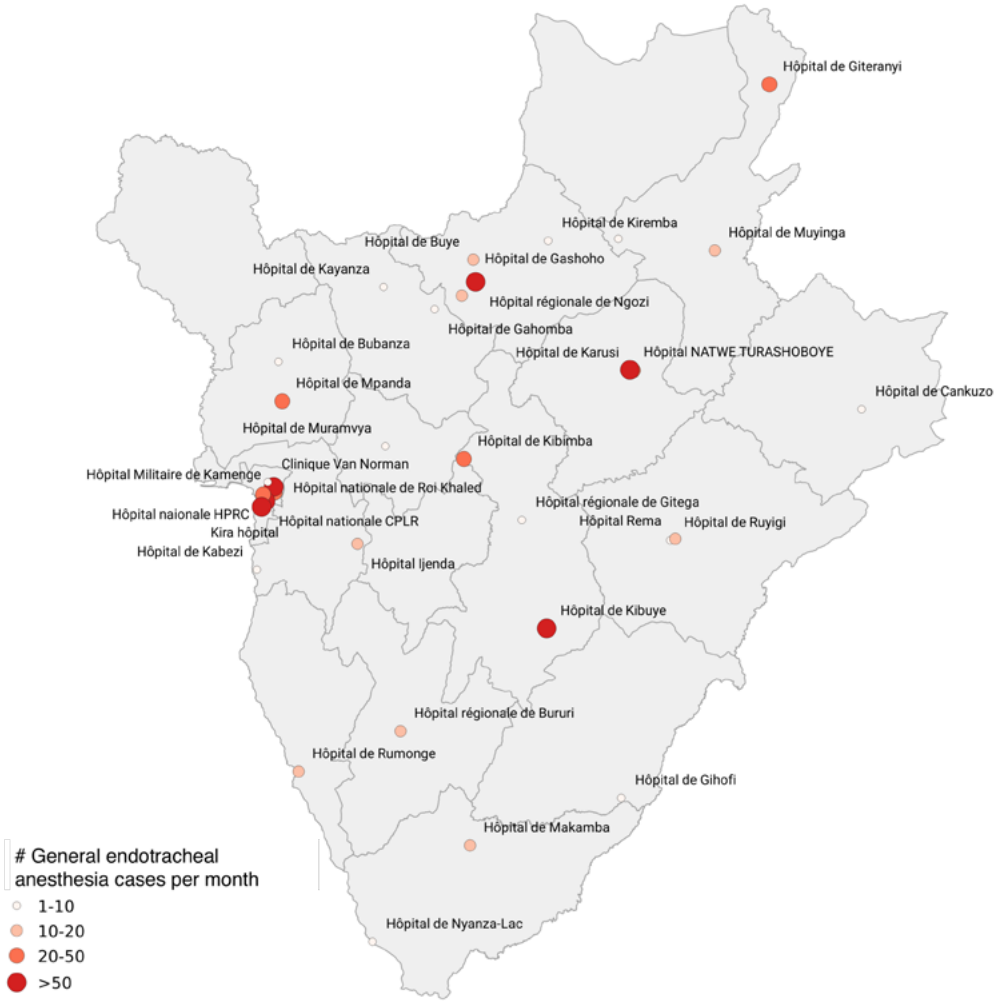

Figure 2: Number of reported cases performed under general endotracheal anaesthesia per month at each hospital

From respondents surveyed, it was determined that 50 (91%) hospitals had at least one anaesthesia machine, although respondents for 17/50 (34%) hospitals reported that their machine(s) were not functional, and 9/50 (18%) reported that their machine(s) were only partially functional. From the nine hospitals reported to have only partially functioning machines, six respondents surveyed specified that the ventilator feature did not work. Respondents from only nine out of 55 hospitals (16%) reported capnography. Respondents from fourteen hospitals reported having an ECG monitor; however, one of these specified that their monitor was non-functional (which was considered as an indeterminate response).

Respondents from only eight hospitals out of 56 (14%) reported the presence of a defibrillator in their operating room (Table III). Of these eight hospitals, the number of defibrillators present was reported to be one (two hospitals), two (four hospitals), three (one hospital) and four (one hospital). We did not include an evaluation of the functionality of defibrillators in our survey.

Results regarding number of general endotracheal anaesthetics performed each month varied and are presented in Figure 2. Respondents from 33 out of 55 hospitals (60%) reported performing general endotracheal anaesthetics on a monthly basis. Of note, of the 17 hospitals which were reported to have a non-functional anaesthesia machine, five were reported to be performing general endotracheal anaesthesia on a monthly basis. Of the nine that were reported to have an anaesthesia machine(s) which was/were partially functional, seven were reported to be performing general endotracheal anaesthesia on a monthly basis.

Discussion

We have demonstrated the feasibility of an underutilised method of rapid data collection in a low-resource environment using a WhatsApp chat group among a professional society of anaesthetists. At the same time, we have performed an initial brief audit of five pieces of essential anaesthesia equipment among hospitals in Burundi. Many obstacles to data collection exist in low-resource settings; therefore, simple and inexpensive approaches to data collection need to be developed.

The African Peri-Operative Research Group (APORG), representing over 30 countries and 500 hospitals across Africa, recently listed facility audit as one of their top ten research priorities in Africa.[13] We chose to evaluate for the presence of five pieces of equipment that are considered "recommended" (anaesthesia machine, capnography and ECG) or "highly recommended" (pulse oximeter and defibrillator) by the WHO–WFSA International Standards for a Safe Practice of Anesthesia.[12] To the best of our knowledge, this is the first nationwide anaesthesia facility evaluation in Burundi. A cross-sectional survey of hospitals in Uganda in 2017 found that among 64 hospitals surveyed, the presence of capnography, ECG and defibrillator was reported in 17.2%, 35.9% and 21.9% respectively.[14] We found in Burundi that exceedingly few hospitals meet the WHO–WFSA standards regarding the equipment we have surveyed for. Only three hospitals surveyed (5%) had pulse oximetry, a functional anaesthesia machine, capnography, ECG and a defibrillator. An assessment of anaesthesia capacity of district level hospitals in Malawi, Tanzania, and Zambia reported the presence of an anaesthesia machine respectively in 73%, 60% and 83% of hospitals surveyed.[15] In our study, while 91% of respondents in Burundi reported the presence of an anaesthesia machine, 26 out of 50 (52%) reported that their machines were either not functional or partially functional.

Although we have only surveyed five pieces of equipment, the results likely indicate severe limitations across the board regarding what is considered essential equipment by the WHO–WFSA. Data regarding the type of anaesthesia machines present, availability of a consistent oxygen source and consistency of electricity were not collected but are important infrastructure issues that may also limit the provision of safe anaesthesia in Burundi. In a survey of Ugandan hospitals in 2007, only 19% of surveyed anaesthetists reported electricity to be "always available", while 14% reported that it was never available.[16] Similarly in Ethiopia, access to continuous electricity and running water was very limited.[17] Given the current infrastructure in Burundi, it is likely that most hospitals do not have consistent electricity.

Access to safe surgery and anaesthesia depends on proximity to equipped healthcare facilities as well as an adequate surgical and anaesthesia workforce. Among hospitals which responded to our survey, only 60% reported performing general endotracheal anaesthesia on a monthly basis. This, in combination with the low surgeon density in Burundi, suggests that many hospitals may be unable to offer emergency surgical care (e.g. emergency laparotomy). A geospatial analysis of 48 countries and islands in sub-Saharan Africa, including Burundi, found that only 4.3% of the population of Burundi live outside of a two-hour travel time to a public hospital, however, the authors of this study were not able to determine which services were available at each of the mapped hospitals.[18] As our study suggests, even though most of the population of Burundi lives in geographic proximity to a public hospital, this may be a poor proxy for access to care as many of these hospitals are likely to be unable to provide essential emergency surgeries without the ability to perform general endotracheal anaesthesia. We believe that as further data regarding resource gaps across Burundi is gathered, this information may be useful in decision-making about how best to scale up anaesthesia capacity. WhatsApp may also prove useful in gathering demographic information about the ATSARPS society members and identifying hospital locations where both resource and personnel gaps exist. We chose as our metric for success the collection of data from at least 80% of hospitals in Burundi. Our hope is to use this platform to perform future audits regarding information about training gaps that may also exist among anaesthetists in Burundi. In order to collect this data, however, different metrics may be necessary such as an increased overall response rate (as opposed to hospital response rate), as well as comparisons of response rates between urban and rural areas.

Our study also highlights Lifebox's impact in Burundi, with respondents from 89% of hospitals reporting the use of Lifebox pulse oximeters. Since September 2017, there have been three Lifebox workshops held in Burundi, and 116 pulse oximeters distributed. These workshops included training on maintenance and proper usage of the Lifebox pulse oximeter and how to recognise and treat hypoxia, as well as implementation of the WHO surgical safety checklist. While significant progress has been made in Burundi with respect to the use of pulse oximetry, our study highlights ongoing monitoring shortfalls which include capnography. A "capnography gap", the difference between the need for capnography and its availability, has been previously described in other sub-Saharan African countries, including Malawi.[19] The Global Capnography Project in Malawi reported significant improvements in availability of capnography as well as early recognition of critical airway incidents after distribution of capnography monitors along with an educational package. Our results suggest that similar efforts should be considered in Burundi.

There are several limitations to our study. First, this is not a comprehensive assessment of anaesthesia capacity in Burundian facilities. More robust facility assessment tools exist, including the WFSA anaesthesia facility assessment tool (AFAT),[20] the Surgeons Overseas (SOS) PIPES Survey[21] and the World Health Organization tool for situational analysis to assess emergency and essential surgical care.[22] However, by limiting the number of questions posed, our goal was to rapidly achieve a higher response rate than has been achieved by AFAT implementation in other countries. Another limitation was the use of an unvalidated survey. Due to logistical constraints, we are unable to confirm the accuracy of what was reported by the anaesthesia providers who responded, and it is possible that some providers may have either under or overreported equipment availability. Although our overall response rate was low, our aim was to collect data from at least 80% of hospitals providing surgical services in Burundi which we have achieved. Given the nature of the questionnaire and the fact that most responses were viewed by the entire WhatsApp chat group, it seems likely that anaesthesia providers would have little incentive to respond after another provider from their same institution had already responded, which could in part explain our low overall response rate but high hospital response rate. The follow-up phone calls used in part one of our survey were also a limitation, and were not intended in the original study design, but were undertaken independently by the director of programmes for ATSARPS. We corrected this limitation during part two of the questionnaire during which all responses were received via WhatsApp. While this method of data collection was possible in Burundi, use of WhatsApp as a tool for facility evaluation may be less applicable in more populous or geographically larger countries or in those that do not have a national association that communicates via WhatsApp.

Conclusion

While the safety and quality of anaesthesia care has improved dramatically in recent decades, the rate of gain has not been shared equally around the world. A recent review identified three critical elements to providing safe anaesthesia care which included standards and training, equipment and resources, and an adequate number of anaesthesia providers.[23] We have utilised a tool (WhatsApp) accessed by most anaesthesia providers in Burundi to gather information about equipment and resources. Information about standards and training is also often being shared on this platform. There is currently an "Afro-Anaesthesia/ICU" WhatsApp chat group with 152 participants which routinely shares recent publications and announcements about upcoming conferences to physician anaesthesia providers around Africa.

WhatsApp can be used to easily and rapidly collect data on anaesthesia equipment and facility capacity in low-resource settings. Our study has helped identify a limited number of essential anaesthesia equipment gaps in Burundi. We hope these can serve as a foundation for more robust, longitudinal data collection and quality improvement programmes to increase access to safe anaesthesia care in Burundi and other similar settings.

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Conflict of interest

The authors declare no conflict of interest.

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Ethical approval

Ethical approval was obtained from the IRB committee of Kibuye Hope Hospital (KHH2019:000004). The IRB committee waived the need for informed written consent for this study.

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References

1. Central Intelligence Agency. The World Factbook; 2019. Available from: www.cia.gov/library/publications/the-world-factbook/geos/by.html. Accessed 18 November 2019.
2. O'Flynn E, Andrew J, Hutch A, et al. The specialist surgeon workforce in east, central and southern Africa: a situation analysis. World J Surg. 2016;40(11):2620-7. https://doi.org/10.1007/s00268-016-3601-3.
3. World Federation of Societies of Anaesthesiologists. World Anaesthesiology Workforce, 2019. Available from: https://www.wfsahq.org/workforce-map. Accessed 18 November 2019.
4. Epiu I, Tindimwebwa JVB, Mijumbi C, et al. Challenges of anaesthesia in low- and middle-income countries: a cross-sectional survey of access to safe obstetric anaesthesia in east Africa. Anesth Analg. 2017;124(1):290-9. https://doi.org/10.1213/ANE.0000000000001690.
5. Statista. Most popular global mobile messenger apps as of October 2019, based on monthly active users. Available from: https://www.statista.com/statistics/258749/most-popular-global-mobile-messenger-apps/. Accessed 13 January 2019.

6. Quartz Africa. WhatsApp is the most popular messaging app in Africa. Available from: https://qz.com/africa/1206935/whatsapp-is-the-most-popular-messagingapp-in-africa/. Accessed 13 January 2019.
7. Giordano V, Koch H, Godoy-Santos A, et al. WhatsApp messenger as an adjunctive tool for telemedicine: an overview. Interact J Med Res. 2017;6(2):e11. https://doi.org/10.2196/ijmr.6214.
8. Martinez R, Rogers AD, Numanoglu A, Rode H. The value of WhatsApp communication in paediatric burn care. Burns. 2018;44(4);947-55. https://doi.org/10.1016/j.burns.2017.11.005.
9. Carmona S, Alayed N, Al-Ibrahim A, D'Souza R. Realising the potential of real-time clinical collaboration in maternal-foetal and obstetric medicine through WhatsApp. Obstet Med. 2018;11(2):83-9. https://doi.org/10.1177%2F1753495X18754457.
10. Williams V, Kovarik C. WhatsApp: an innovative tool for dermatology care in limited resource settings. Telemedicine and e-Health 2018;24(6). https://doi.org/10.1089/tmj.2017.0197.
11. Ministére de la Santé publique et de la Lutte contre le Sida. Annuaire statistique 2018. August 2019.
12. Gelb AW, Morriss WW, Johnson W, Merry AF; on behalf of the International Standards for a Safe Practice of Anesthesia Workgroup. World Health Organization–World Federation of Societies of Anesthesiologists (WHO–WFSA) International Standards for a Safe Practice of Anasthesia. Anesth Analg. 2018;126(6):2047-55. https://doi.org/10.1213/ANE.0000000000002927.
13. Biccard BM, Zoumenou E, Sama H. Priorities for peri-operative research in Africa. Anaesthesia. 2020;75(S1):e28-e33. https://doi.org/10.1111/anae.14934.
14. Epiu I, Wabule A, Kambugu A, et al. Key bottlenecks to provision of safe obstetric anaesthesia in low-income countries; a cross-sectional survey of 64 hospitals in Uganda. BMC Pregnancy Childbirth. 2017;17:387. https://doi.org/10.1186/s12884-017-1566-3.
15. Gajewski J, Pittalis C, Lavy C, et al. Anaesthesia capacity of district-level hospitals in Malawi, Tanzania, and Zambia: a mixed-methods study. Anesth Analg. 2020 Apr;130(4):845-53. https://doi.org/10.1213/ANE.0000000000004363.
16. Hodges SC, Mijumbi C, Okello M, et al. Anaesthesia services in developing countries: defining the problems. Anaesthesia. 2007;62(1):4-11. https://doi.org/10.1111/anae.14934.
17. Chao TE, Burdic M, Ganjawalla K, et al. Survey of surgery and anaesthesia infrastructure in Ethiopia. World J Surg. 2012;36(11):2545-53. https://doi.org/10.1007/s00268-012-1729-3.
18. Ouma PO, Maina J, Thuranira PN, et al. Access to emergency hospital care provided by the public sector in sub-Saharan Africa in 2015: a geocoded inventory and spatial analysis. Lancet Glob Health. 2018;6(3):e342-50. https://doi.org/10.1016/S2214-109X(17)30488-6.
19. Jooste R, Roberts F, Mndolo S, et al. Global Capnography Project (GCAP): implementation of capnography in Malawi – an international anaesthesia quality improvement project. Anaesthesia. 2019;74(2):158-66. https://doi.org/10.1111/anae.14426.
20. World Federation of Societies of Anesthesiologists website: Available from: https://www.wfsahq.org/resources/anaesthesia-facility-assessment-tool. Accessed 14 January 2020.
21. SOS PIPES Surgical Capacity Assessment tool. Surgeons Overseas. Available from: https://www.surgeonsoverseas.org/resources/. Accessed 29 February 2020.
22. World Health Organization. Tool for situational analysis to assess emergency and essential surgical care. Available from: http://www.who.int/surgery/publications/QuickSitAnalysisEESCsurvey.pdf. Accessed 29 February 2020.
23. Law TJ, Lipnick M, Joshi M, Rath GP, Gelb AW. The path to safe and accessible anaesthesia care. Indian J Anaesth. 2019;63(12):965-71. https://doi.org/10.4103/ija.IJA_756_19.