Int Surg 2017;**102:**387–393
DOI: 10.9738/INTSURG-D-16-00153.1

Surgical Care Capacity in Uganda: Government Versus Private Sector Investment

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Background: Uganda is a low-income country with blended, tiered government health care facilities and private/non-governmental (NGO)/mission hospitals. The population is 84% rural; 100% of referral hospitals and majority of specialist physicians are urban.

Summary of background data: This project compared various levels of government hospitals with private/NGO hospitals to determine adequacy to deliver emergency and essential surgical care (EESC) and anesthesia.

Methods: Using the WHO Situational Analysis Tool, a representative selection of 38 hospitals (25% of Ugandan hospitals) was assessed for capacity to deliver surgical, anesthetic and obstetric care in 4 domains: infrastructure, human resources, surgeries performed or referred, and equipment.

Results: In all facilities, laboratory availability was 86%; anesthesia machines, 66%; generators, 55%; and continuous running water, 42%; oxygen, 32%; and electricity, 26%. Resuscitator bags and mask/tubing were present less than 50% of health facilities. Only 84% of all health facilities had a stethoscope; sterilizers only at 50%. This situation was

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much more dismal in district hospitals. Surgeons were found at 71% of public hospitals and 63% of NGO/mission hospitals; 60% surgeons, and over 50% of anesthesiologists were only in teaching hospitals; obstetricians almost exclusively in higher-level hospitals.

Conclusions: The infrastructure for surgical services and anesthesia were noticeably absent at district hospital level and below, yet were readily available at the tertiary care center level. Overall national and regional referral hospitals were better equipped than NGO facilities, suggesting the government is capable of fully equipping hospitals to provide surgical care. These surveys highlight potential for improvement in surgical care at all levels.

Key words: Surgery – Anesthesia – Obstetrics – Uganda – Oxygen – District hospital

Uganda is a landlocked nation in eastern sub-Saharan Africa categorized by the World Bank as a low-income developing country. With an estimated population of 37.58 million and an annual growth rate of 3.3% increase, Uganda has a decidedly young population with 49% younger than 15 years old; 84% live in rural areas.[1] The impoverished nature of the country is represented by the 33% of the Ugandan population that lives on less than US$2 a day.[2] Northern Uganda, in particular, has been afflicted by continuing humanitarian crisis with 1.6 million people living in internally displaced population camps.[3]

Uganda's national health care system is divided into a public sector, under the Ministry of Health, and a private sector which includes not-for-profit, private for-profit, non-governmental (NGO), missions, and traditional health providers.[4] The public sector infrastructure promotes government-led health care and consists of a tiered network of hospitals and community clinics. Each level of the health care system is intended to provide a specific function and role. The tiered infrastructure include: health center (HC) I, II, III, and IV, general hospitals, regional referral hospitals (RRHs), and national referral hospitals. There is no physical structure to HC I but consists of the village health team, which links health facilities and the community.[5] The HC II is at the parish level; HC III serves at the subdistrict level. This system is decentralized in an effort to improve access to care and aimed at establishing an internalized referral network; patients presenting at the subdistrict level can be referred to district, regional, and national facilities as needed.[5,6] At the core of the referral network is HC IV, the district hospital. This is the highest level within the district-level designation, is the first-referral health facility, and is intended to serve 100,000 individuals per hospital. District-level refers to general hospitals to the RRH and finally to the national referral hospitals. There are 2 national referral hospitals: Mulago and Butabika. Mulago is strictly for high-level medical care, and Butabika for mental health care. There are 14 RRHs, and 139 general and district hospitals. Of these, 65 are government owned, 63 are private not-for-profit and 27 private for-profit hospitals.[7]

The Ugandan health care system is characterized by a deficiency of health care professionals and health care facilities.[8,9] This is most apparent with population physician-to-patient ratio of 1:24,725 and nurse to patient ratio of 1:11,000. In 2011, 42% of staff health worker positions were vacant,[6] with higher position vacancy at lower level facilities (HC II) compared to RRH.[5] This skewed number of health care providers can be rationalized when contextualized within a health care system in which specialized care is deemphasized.[1]

Due to the decentralization of the Ugandan health care system, privatization, absenteeism, and "double-dipping" in which physicians hold dual government and private positions define the nature of surgical care delivery. More than 54% of Ugandan physicians work in both the private and the public sector.[10] The unstable environments of the more rural health centers are therefore abandoned by specialists and left to non-physician clinical officers with 3 years of specialty training. Clinical officers can practice independently in well-equipped settings, offering a potential model for expanding surgical care at the district hospital and community levels.[9,11–13]

With emphasis on its national health care system and coexistent NGOs, Uganda offers a unique opportunity to compare capacity of the national healthcare system with NGO facilities. The provision of surgical care at all levels of the Uganda health care system for which data has been collected will be assessed.

Table 1 Human resources for surgical care and anesthesia

Total number of full-time health workers (part-time health workers)	District hospital (N = 23)	Private/ NGO/ mission hospitals (N = 9)	Higher-level centers (N = 6)
Surgeons	0 (1)	10 (22)	45 (0)
Anesthesiologists	0 (0)	0 (2)	15 (0)
Obstetricians	0 (0)	3 (5)	48 (0)
GP: surgery	18 (2)	26 (3)	40 (0)
GP: anesthesia	3 (0)	0 (0)	5 (0)
Nonphysician: surgery	26 (2)	18 (1)	31 (0)
Nurse: anesthesia	8 (1)	17 (9)	54 (1)
Midwives/paramedics	217 (8)	94 (1)	577 (0)

GP, general practitioner.

Materials and Methods

Assessment of surgical resources

The WHO Situational Analysis Tool (SAT) was the survey tool for this study.[14] Data were collected through the Ugandan Ministry of Health and WHO country office. Completed surveys were entered into the WHO Emergency and Essential Surgical Care (EESC) global surgery database.[15] This tool has been validated and used extensively in multiple countries.[16–21]

The survey includes a total of 108 questions with multiple answers for total of 254 potential data points. The survey is divided into 4 sections: Section I—health infrastructure and patient population demographics, Section II—human resources providing surgical care (surgery, anesthesia, and obstetrics), Section III—surgical interventions and rationale for referral to higher level facilities, Section IV—availability of surgical and anesthetic equipment and supplies.

Certain basic surgical procedures have been listed by WHO to be a "primary surgical care package"—the basic surgical procedures that a health care facility should be able to provide to adequately address simple surgical issues.[22] Seven of these procedures: incision and drainage of abscess, suturing, wound debridement, basic resuscitation (airway, hemorrhage, peripheral intravenous access, peripheral venous cutdown), acute burn management, removal of foreign body, and chest tube insertion were assessed at each facility as an assessment of ability to deliver surgical care.

Data Analysis

Descriptive data was collected on the four domains for each health facility. Univariate statistical analysis with a z-test was performed to compare the proportions of procedures provided at each category of health facility.

Results

Health facility characteristics

Thirty-eight facilities (25% all hospitals) completed the survey: 23 (61%) were district hospitals, 9 (24%) were private/NGO/mission hospitals, 2 (5%) were general hospitals, 3 (8%) were regional referral hospitals, and 1 (3%) was the national referral hospital, Mulago Hospital in Kampala, which performs over 13,000 major surgical procedures annually. The populations served ranged from 19,000 to 25,000,000.

There was a representative geographical distribution of the hospitals surveyed: West—15, East—13, Central—5, and North—5. The land areas of these regions, from largest to smallest: North, Central, West, and East. The populations of these areas are relatively similar with 8.2–8.5 million in each of the Central, Eastern and Western regions and 7.5 million in the Northern region. The capital Kampala is located in the Central region.

Human resources

The surgical and anesthesia workforce data is displayed in Table 1. Clearly there is a severe shortage of surgical and anaesthesia physicians at the district hospital level—there is 1 part-time surgeon at the district level (4% of district hospitals), with the majority of surgical care by general practitioners and nonphysician surgeons (approximately 2 of these surgeons per district hospital). At higher level government hospitals, on average there are 7.5 surgeons per facility, 2.5 anesthetists and 8 obstetricians. In these facilities, there are still higher numbers of general practitioners, nonphysician

Table 2 Availability of oxygen and water

Hospital type	O_2	Intermittent	None	H_2O	Intermittent	None
NGO (9)	5	4	0	7	2	0
NRH (1)	1	0	0	1	0	0
RRH (3)	2	1	0	2	1	0
GH (2)	0	2	0	1	1	0
DH (23)*	4	8	10	5	8	10
Totals	12	15	10	16	12	10

DH, district hospital; GH, general hospital; NGO, non-governmental organization; NRH, national referral hospital; RRH, regional referral hospital.

*One facility had no data on O_2.

surgeons and nurse anesthetists practicing surgery and anesthesia.

Health infrastructure

Among all health facilities, there was consistent use of medical records (100%) and access to laboratory facilities (86%). Infrastructure included anesthesia machines (66%), generators (57%), and uninterrupted running water (42%), oxygen source (32%), and electricity (26%). At district hospital levels, however, 78% had no or only intermittently available water, 78% had no or intermittent O_2, and fully 91% had no or occasional electricity. Government hospitals above the district level were significantly more likely than private/NGO hospitals to have consistent access to oxygen cylinder, running water, electricity, anesthesia machine, blood bank, and X-ray machine. In contrast, the health centers performed better than nonhealth centers in providing management guidelines for emergency room (23% versus 8%), surgery (19% versus 0%), anesthesia (23% versus 17%), and pain (43% versus 0%). Data for oxygen, water, and electricity are presented in Tables 2 and 3.

Although generally uncommon, pulse oximetry was available at all times at 4 NGO hospitals (11%) and intermittently at 1 NGO and the national referral hospital (5%).

Thirty percent of the district hospitals do not have a functioning operating theater compared with higher level facilities having on average > 3. The greatest number of operating rooms was seen at Mulago Hospital where there are a total of 21 operating theaters, a number comparable with the total number of 1,800 beds. All higher-level facilities had over 80 beds, district hospitals ranged from 5 to 80, more than 60% ranged from 21–50 beds.

Primary surgical care package

The percentage of procedures performed in each type of facility is shown in Table 4. Of these 7 procedures, all except for chest tube insertion were performed at over 75% of the facilities; chest tube insertion was only performed in 26% of district hospitals. Acute burn management and removal of foreign body was performed at 78% overall. Consistently, government higher-level centers outperformed private/NGO hospitals and district in their ability to provide the primary surgical care package.

General and specialty surgical procedures

For trauma-related minor procedures, less than 60% of the facilities performed chest tube insertions and 22% performed cricothyroidotomy/tracheostomy. A statistically significant difference existed between district and nondistrict health facilities in resuscitation ($P < 0.031$), chest tube insertion ($P < 0.0001$), and cricothyroidotomy/tracheostomy ($P < 0.003$), with district-level facilities offering a low percentage of surgical services. Private/NGO facilities provided a higher rate of chest tube insertion than government facilities that was statistically significant ($P = 0.0384$).

Health centers without operating theatres were able to perform basic surgical procedures including

Table 3 Availability of electricity and generator

Hospital type	Electricity	Intermittent	None	Generator	Intermittent	None
NGO (9)	7	1	1	8	1	0
NRH (1)	1	0	0	1	0	0
RRH (3)	0	3	0	2	1	0
GH (2)		2		1	1	0
DH (23)	2	6	15	9	9	5
Totals (38)	10	12	16	22	11	5

DH, district hospital; GH, general hospital; NGO, non-governmental organization; NRH, national referral hospital; RRH, regional referral hospital.

Table 4 Percentage availability of essential surgical procedures

Procedure	Total (n = 38)	Private NGO Mission facilities (n = 9)	Government facilities (n = 29)		*P* value
			Higher-level centres (n = 6)	District hospitals (n = 23)	
Incision & drainage of abscess	95.0	88.9	100.0	95.6	Health center = 0.242 nonhealth center = 0.00058 Government facilities = 0.121 Health versus nonhealth = 0.00000
Suturing	95.0	88.9	100.0	95.6	Health center = 0.242 Nonhealth center = 0.00058 Government facilities = 0.121 Health versus nonhealth = 0.00000
Wound debridement	85.0	88.9	100.0	78.3	Health center = 0.245 Nonhealth center = 0.00058 Government facilities = 0.488 Health versus nonhealth = 0.00032
Resuscitation	82.5	88.9	100.0	69.6	Health center = 0.129 Nonhealth center = 0.00058 Government facilities = 0.3095 Health versus nonhealth = 0.00181
Acute burn management	77.5	66.7	87.5	78.2	Health center = 0.2483 Nonhealth center = 0.156 Government facilities = 0.1469 Health versus nonhealth = 0.28434
Removal of foreign body	77.5	66.7	100.0	73.9	Health center = 0.2981 Nonhealth center = 0.00866 Government facilities = 0.0808 Health versus nonhealth = 0.00082
Chest tube insertion	52.5	88.9	87.5	26.0	Health center = 0. 00062 Nonhealth center = 0.4641 Government facilities = 0.0384 Health versus nonhealth = 0.00118

acute burn management, incision and drainage, wound debridement, and suturing, but avoided minor procedures such as biopsy, foreign body removal, chest tube insertion, and cricothyroidotomy/tracheostomy or any major procedures as compared to district hospitals with operating theaters. Referral for procedures was primarily due to lack of skills.

Emergency equipment and supplies

The availability of the oxygen (28.9%) and mask/tubing (47.4%) show a statistically significant difference between district hospital and higher level facilities. Only 84% of all health facilities had access to a stethoscope; sterilizers were available at 50% of facilities. Health facilities above the district level and private/NGO/mission hospitals had more consistent access to supplies.

Discussion

According to Uganda's National Hospital Policy adopted in 2010, the roles of each level of governmental healthcare are clearly delineated.[5] Surgical care is intended to be provided at the referral hospital level with more specialized services reserved for the regional referral and national referral hospitals.

The most significant finding of the survey was that the physical resources and infrastructure for providing emergency and essential surgical services and anesthesia were noticeably absent at the district

hospital level—the intentioned first-referral health facility. Items such as running water, emergency supplies, and electricity were inconsistently available at all health facilities and markedly more so at the district hospital and below. However, these resources and services were readily available at the tertiary care center level, suggesting that the government is capable of fully equipping hospitals to provide surgical care.

The availability of an operating theater did not appear to be a limiting factor in the provision of basic surgical services. More than one-quarter of the health centers did not have a functioning operating room and another nearly 40% only had 1 functioning operating room, yet there was no difference in the number of major/minor surgical procedures performed at these facilities.

Although the only mention of surgery in the National Health Plan of Uganda is with regards to trachoma, there is recognition for the role of surgical intervention in managing obstetric care. As only 36% of women deliver in some level of hospital care, ideally there should be increased investment into hospitals for surgical and obstetric care.[7] Our survey results as well as those from other resource-poor countries have shown that simple caesarean section and dilatation and curettage can be performed at the district hospital as it is equipped to offer a labor ward, surgery theater for emergencies, as well as general health care services. As the first-referral health facility at the community level, the district hospital is the ideal location to offer basic emergency and essential surgical care.[5]

NGO facilities in developing counties supplement the national health care system. Traditionally, due to their funding mechanisms, NGOs are considered to have resources and capacity exceeding local government facilities, especially for surgical care. We compared the capacity of governmental and nongovernmental health care providers in Uganda. While the survey demonstrated deficiencies at the district hospital level in addressing surgical needs, overall the national referral hospitals were better equipped than the NGO facilities, suggesting that the government has the ability to provide for essential surgical care. One can deduce from the high performance status of the national referral hospital that government resources could be redirected to the district hospital level to provide for basic level of surgical care.

Surgeons, anesthesiologists, and obstetricians are concentrated above the district hospital level in both government and private/NGO hospitals. Additionally, there is compelling evidence of successful integration of clinical officers delivering surgical, anesthetic and obstetric care.[11–13] These findings correlate with percentage of unfilled positions at each government hospital level.[6] Expectedly, the most significant shortage is seen at the lower health center levels.

Conclusion

This paper assesses the availability of integrated surgical services including surgery, anesthesia, and obstetrics services in the Ugandan health care system and suggests mechanisms to monitor and evaluate where the best service investment could be made. In Uganda, aside from the regional and national hospitals, local governments are responsible for delivery of health services at district and subdistrict levels (including public and private sector) indicating that proper implementation of health care reform around surgical care delivery in Uganda requires a targeted and localized approach.

The results of the surveys of government and non-governmental hospitals in Uganda demonstrate the potential for improvement in surgical care delivery at all levels of health care. The district level government hospitals performed as well as and in some cases better than the private/NGO hospitals. These findings are encouraging and suggest that government should remain a focal point of improving access to surgical care in resource-poor countries.

Acknowledgments

There are no funding disclosures, potential or real conflicts of interest, or ethical approvals to disclose for any of the authors in the preparation of this manuscript.

References

1. WHO: Uganda. World Health Organization. Available at: http://www.who.int/countries/uga/en/ and http://www.afro.who.int/en/uganda/who-country-office-uganda.html. Accessed June 1, 2016
2. World Bank: Uganda. World Bank. Available at: http://www.worldbank.org/en/country/uganda. Accessed June 1, 2016
3. The World Factbook: Uganda. Central Intelligence Agency. Available at: https://www.cia.gov/library/publications/the-world-factbook/geos/ug.html. Accessed June 1, 2016

4. Mills A, Brugha R, Hanson K, McPake B. What can be done about the private health sector in low-income countries? *Bull World Health Organ* 2002;**80**(4):325–330
5. Government of Uganda Ministry of Health: Health Sector Strategic Plan III 2010/11 - 2014/15. Available at: http://www.health.go.ug/docs/HSSP_III_2010.pdf. Accessed June 1, 2016
6. Government of Uganda Ministry of Health: The Second National Health Policy: Promoting People's Health to Enhance Socio-economic Development. (2010) Available at: http://library.health.go.ug/publications/leadership-and-governance-governance/policy-documents/second-national-health-policy. Accessed June 1, 2016
7. Government of Uganda Ministry of Health. Available at: http://www.health.go.ug/hospitals. Accessed June 1, 2016
8. Government of Uganda Ministry of Finance, Planning and Economic Development: Budget Monitoring and Accountability Unit (BMAU) Briefing Paper. Health workers' shortage in Uganda: where should the government focus its efforts? 2013. Available at: http://www.finance.go.ug/dmdocuments/6-13%20Health%20Workers%20Shortage%20in%20Uganda%20May%202013.pdf. Accessed June 2, 2016
9. Ozgediz D, Galukande M, Mabweijano J, Kijjambu S, Mijumbi C, Dubowitz G *et al*. The neglect of the global surgical workforce: experience and evidence from Uganda. *World J Surg* 2008;**32**(6):1208–1215
10. Lwasa, S. Geospatial analysis and decision support for health services planning in Uganda. *Geospat Health* 2007;**2**(1): 29–40
11. Chu K, Rosseel P, Gielis P, Ford N. Surgical task shifting in sub-Saharan Africa. *PLoS Med* 2009;**6**(5):1–4
12. Mullan F, Frehywot S. Non-physician clinicians in 47 sub-Saharan African countries. *Lancet* 2008;**370**(9605):2158–2163
13. Dovlo D. Using mid-level cadres as substitutes for internationally mobile health professionals in Africa. A desk review. *Hum Resour Health* 2004;**2**(1):7
14. The WHO Situational Analysis Tool. Available at: http://www.who.int/surgery/publications/immesc_research_tools/en/. Accessed June 1, 2016
15. WHO Emergency and Essential Surgical Care Programme. Available at: http://www.who.int/surgery/en/. Accessed June 2, 2016
16. Choo S, Perry H, Hesse AA, Abatanga F, Sory E, Osen H *et al*. Assessment of capacity for surgery, obstetrics and anaesthesia in 17 Ghanaian hospitals using a WHO assessment tool. *Trop Med Int Health* 2010;**15**(9):1109–1115
17. Spiegel D, Choo S, Cherian M, Orgoi S, Kehrer B, Price R *et al*. Quantifying surgical and anaesthetic availability at primary health facilities in Mongolia. *World J Surg* 2011;**35**(2):272–279
18. Sherman L, Clement P, Cherian M, Ndayimirije N, Noel L, Dahn B *et al*. Implementing Liberia's poverty reduction strategy: an assessment of emergency and essential surgical care. *Arch Surg* 2011;**146**(1):35–39
19. Iddriss A, Shivute N, Bickler S, Cole-Ceesay R, Jargo B, Abdullah F *et al*. Emergency, anaesthetic and essential surgical capacity in The Gambia. *Bull World Health Organ* 2011;**89**(8):565–572
20. Penoyar T, Cohen H, Kibatala P, Magoda A, Saguti G, Noel L *et al*. Emergency and surgery services of primary hospitals in the United Republic of Tanzania. *BMJ Open* 2012;**2**(1):1–7
21. Osen H, Chang D, Choo S, Perry H, Hesse A, Abatanga F *et al*. Validation of the World Health Organization Tool for Situational Analysis to Assess Emergency and Essential Surgical Care at district hospitals in Ghana. *World J Surg* 2012;**35**(12):500–504
22. Primary Surgical Care Package. Available at: http://www.who.int/surgery/publications/s16378e.pdf. Accessed June 2, 2016