

The Double Burden of Ebola and COVID-19 Viral Infections and the Readiness for Safe Surgical Care Provision in Uganda and the Eastern Democratic Republic of the Congo: an Online Cross-sectional Survey

Franck Katembo Sikakulya (✉ francksikakulya@gmail.com)

Kampala International University

Robinson Ssebuufu

Kampala International University

Albert Ahuka Ona Longombe

Université de Kisangani

Francis Okedi

Kampala International University

Michel Kalongo

World Health Organisation, Epidemiological Surveillance, Beni, Democratic Republic of the Congo

Moise Muhindo Valimungighe

University Abomey-Calavi

Furaha Nzanzu Blaise Pascal

University of Malawi

Bienfait Mumbere Vahwere

Kampala International University

Simon Binezero Mambo

Youth Alliance for Reproductive Health, Goma, Democratic Republic of the Congo

Yusuf Mulumba

Makerere University

Muhindo Muhasa Muyisa

Universite Catholique du Graben, Butembo

Fatuma Djuma Sonia

Universite Catholique du Graben, Butembo

John Sekabira

Mulago Hospital

Jane Fualal

Mulago Hospital

Patrick Kyamanywa

Kampala International University

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The double burden of Ebola and COVID-19 viral infections and the readiness for safe surgical care provision in Uganda and the Eastern Democratic Republic of the Congo: An online cross-sectional survey

Franck Katembo Sikakulya^{1,2, *}, Robinson Ssebuufu¹, Albert Ahuka Ona Longombe³, Francis Okedi¹, Michel Kalongo⁴, Moise Muhindo Valimungighe^{2,5}, Furaha Nzanzu Blaise Pascal^{2,6}, Bienfait Mumbere Vahwere¹, Simon Binezera Mambo⁷, Yusuf Mulumba⁸, Muhindo Muhasa Muyisa² Fatuma Djuma Sonia², John Sekabira⁹, Jane Fualal⁹, Patrick Kyamanywa¹

¹*Department of General Surgery, Kampala International University, Western Campus, Bushenyi, Uganda*

²*Faculty of Medicine, Université Catholique du Graben, Butembo, Democratic Republic of the Congo.*

³*Department of General Surgery, Université de Kisangani, Democratic Republic of the Congo*

⁴*World Health Organisation, Epidemiological Surveillance, Beni, Democratic Republic of the Congo.*

⁵*Department of General Surgery, University Abomey-Calavi, Benin*

⁶*Department of Anesthesia and Intensive care, College of Medicine, University of Malawi, Blantyre, Malawi*

⁷*Youth Alliance for Reproductive Health, Goma, Democratic Republic of the Congo*

⁸*Biostatistics, Cancer Institute, Makerere University, Kampala, Uganda*

⁹*Department of Surgery, Mulago Hospital, Uganda*

Abstract

Objective: This study aimed at highlighting the extent to which Uganda and the Eastern DR Congo are ready for safe surgical care provision during the double burden of Ebola and COVID-19.

Methods: An online cross-sectional study was conducted in selected National, Regional Referral and General Hospital facilities of Uganda and in the Eastern part of D.R. Congo from 1st August 2020 to 30 October 2020. Data was analysed using Stata version 14.2.

Results: A participation rate of 37.5% for both countries (72/192). The mean bed capacity of participating health facilities (HF) was 184 in Eastern DR. Congo and 274 in Uganda with an average surgical ward bed capacity of 22.3% (41/184) of the beds in the DR. Congo and 20.4% (56/274) in Uganda. The mean number of operating rooms was 2 and 3 in Eastern DR. Congo and Uganda respectively. Nine hospitals (12.5%) reported being able to test for Ebola and 25 (34.7%) being able to test for COVID-19. Only 7 (9.7%) hospitals reported having a specific operating room for suspect or confirmed cases of Ebola or COVID-19. Provision of appropriate Personal Protection Equipment to personnel were reported to be available in 60 (83.3%) hospitals. The mean of readiness score for provision of surgical care was 7.8/16 (SD: 2.3) or 60% in both countries with no statistical significance in multiple linear regression analysis ($p > 0.05$).

Conclusion:

The majority of participating hospitals in both countries had a low level of readiness to provide safe surgical care due to lack of supplies to limit the exposure of Healthcare workers (HCW) to Ebola and Covid-19 viral infections, and poor funding. Governments and non-governmental organizations should work together to enhance health facility supplies and readiness for safe surgical provision in resource-limited settings.

Key-words: Double burden, Ebola, COVID-19, surgical care readiness, Uganda, Eastern DR. Congo

1 **Introduction**

2 As the COVID-19 continues to evolve and spread worldwide, health facilities are intensifying
3 measures for protecting patients and health workers from this highly infectious disease [1]. The
4 incubation period of the COVID-19 varies from 2 to 14 days [2]. Infected patients, both
5 asymptomatic and symptomatic, can transmit the disease to a non-infected person and this
6 accounts for the significant ongoing community transmission [2]. The spread of the COVID-19
7 virus in health facilities is largely from patients and healthcare providers with mild or nonspecific
8 respiratory syndromes, or asymptomatic, leading to a cluster of nosocomial infections [3]. With a
9 total of 148,999,876 cases confirmed worldwide (3,290,637 confirmed in Africa) as of 28th April
10 2021, COVID-19 compounded an already complicated situation in the Eastern Democratic
11 Republic of Congo (DRC), with both armed conflict and the highly contagious Ebola virus disease
12 (EVD) outbreak (from August 1, 2018 to of June 21, 2020 in the Kivu). A total of 3,317 confirmed
13 cases and a death toll of 2,287 patients including healthcare workers (HCWs) and two fatalities
14 registered in the neighboring Uganda was reported [4,5]. The 11th EVD outbreak was declared in
15 the Equator Province in the western DRC last year registering 130 cases including 55 deaths [6].
16 On 7th February 2021, the 12th EVD outbreak has been declared in Butembo in the eastern DRC
17 by the DRC Ministry of Health with 12 confirmed cases including 2 health care workers and has
18 claimed so far 6 lives as of 28th April 2021 [6].

19 Several facility-based measures have been put in place to mitigate the spread of COVID-19 and
20 Ebola and their impact on the health systems. The measures include the use of personal protective
21 equipment (PPE) when handling patients, testing, isolation and treatment of symptomatic patients,
22 and contact tracing, in addition to quarantine of the suspected cases [1,7]. However, since not all
23 patients in need of surgery are being routinely tested for COVID-19 or EVD and asymptomatic
24 patients could spread both diseases to the non-infected staff in the surgical operating rooms, it was
25 suggested that all surgical patients should be considered as possibly positive in order to limit the
26 contamination of healthcare workers [8]. Following the declaration of the COVID-19 pandemic in
27 March 2020, elective surgeries were cancelled in most countries and several additional measures
28 such as use of PPE, psychological support to all surgical teams, COVID-19 test for all patients
29 who need an emergency surgery and others have been proposed to limit the risk of contamination
30 among surgical patients and staff [9,10].

31 It is worth noting that during the West African Ebola outbreak in 2014, one of the measures put in
32 place was that, for surgery to be done, the caregiving team was requested to undertake a
33 documented utility risk analysis, which included not only the perspective of the patient, but also
34 the surrounding surgical team [11]. A similar practice would be beneficial even in the current
35 situation especially where there is a double threat from Ebola and COVID-19. Shortages of PPEs
36 and operating rooms have changed the way surgical diseases are managed during the COVID-19
37 [12], with the American College of Surgeons proposing a triage algorithm with the purpose of
38 preserving staff, PPE, and patient care supplies; ensuring staff and patient safety; and expanding
39 available hospital capacity during the COVID-19 pandemic [8,13-14].

40 In Africa, the College of Surgeons of East, Central and Southern Africa (COSECSA) proposed a
41 checklist for surgical readiness during the COVID-19 period that includes factors such as isolation
42 of confirmed COVID-19 patients, use and application of PPE, hand hygiene, limitation of
43 movement through the hospital and wearing of surgical masks for all confirmed cases when being
44 transported through hospital space or in rooms [14]. Similar measures have been applied by
45 surgical teams in different countries with varying success [15] as was also indicated during the
46 Ebola outbreak in Western Africa [11]. However, despite these measures, health workers are
47 reportedly being infected by the virus while providing health care during this pandemic. In China,
48 more than 3300 health care workers have been infected with SARS-CoV-2 with notified 23 deaths,
49 while in Italy 20% of responding health care workers have been infected as they cared for COVID-
50 19 patients [16-18]. In Spain, 37 deaths have been reported among 35,000 health care workers
51 (HCW) infected by COVID-19 [19]. African countries are registering deaths among confirmed
52 COVID-19 healthcare workers. As of 14th March 2021, a total of 104,103 HCWs had been
53 confirmed COVID-19 positive in Africa with 1,903 in Uganda and 256 in DR Congo (Verde et
54 al., 2021) [6].

55 Worldwide, surgical care delivery to the general population has been affected by the staggering
56 increase in the demand for medical supplies, reduced in-person medical visits, and shortages of
57 medical protective gear [20] which has led to the delay in surgical care and follow-up of surgical
58 patients in China, Germany and in Dubai [21].

59 In Africa, preparedness is challenged by the general weakness of health structures such as poor
60 quality of healthcare, shortage of human resources, lack of equipment and facilities and vulnerable
61 supply chains [22]. While most governments across Africa already rely heavily on assistance from

62 donors in the health area, the fragmented and insufficient responses have led to the creation of
63 national public health institutes that have obliged these countries to look for ways to collaborate
64 and work together to fight this weakness of health structures [22].

65 Furthermore, the COVID-19 pandemic has come at a time when low- and middle-income countries
66 are already facing a critical shortage of human resources for health and more especially the surgical
67 care human resources (Surgeons, anesthesiologists, theatre nurses) at 0.7 providers per 100, 000
68 population [23]. This could have an impact on access to surgical care given that 4.8 billion people
69 worldwide do not have access to surgery, with the greater strain being experienced in low- and
70 middle-income countries [24-25]. To be able to respond appropriately to the situation and to avoid
71 the negative impact on provision of surgical care, there is need to know the reality on the ground
72 in terms of facilities, the necessary equipment and supplies, and the strengths and weaknesses in
73 terms of availability of suitably qualified human resource for health for surgical care.
74 Nevertheless, the extent to which the African countries, particularly Uganda and the DRC, are
75 prepared to face the Ebola and COVID-19 burden to provision of safe surgical care is not known
76 and hence the need to undertake this study.

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80 **Methods**

81 **Study design and setting**

82 This was an online cross-sectional study conducted in selected National, Regional Referral and
83 General Hospital facilities of Uganda and in the Tertiary health facilities and General hospitals of
84 the Eastern part of DRC where surgeries are being done during the double burden of Ebola
85 outbreaks and COVID-19 viral infection pandemic. These two countries were chosen as they have
86 recently been affected by Ebola and the ongoing COVID-19 pandemic. Currently the Eastern DRC
87 is affected by both Ebola and COVID-19 and Uganda is facing COVID-19 and had Ebola
88 outbreaks in 2000, 2014, 2017 and 2018; and remains on alert given the outbreak in the Eastern
89 DRC. With the experience of viral disease outbreaks, it would be assumed that the countries could
90 have been prepared.

91 **Study participants and recruitment**

92 This study involved medical doctors and surgeons working in the selected health facilities and
93 consented to participate in the study and responded to the questionnaire. The participants doctors
94 (medical director or head of surgical department) were contacted by call phone in personal of the
95 behalf of the hospital and were encouraged to participate on the study.

96 **Data collection and instrument**

97 The study was conducted for a period of three months from 1st August 2020 to 30 October 2020
98 and the participants were asked and always encouraged to respond to an online structured
99 questionnaire, pre-validated by two independent hospitals and piloted in Uganda and in Eastern
100 DRC whose responses were not included in this study.

101 Judgement sampling technique was used to identify the hospitals and the participants per selected
102 hospital in both countries based on the fact that both countries have experienced multiple outbreaks
103 Ebola and share the borders. Data collection in each country was coordinated by one trained
104 researcher who was in charge of identifying and distributing the online structured questionnaire
105 via e-mail and/or WhatsApp to the heads of surgical departments of the selected hospitals in the
106 study setting. A total of 192 hospitals were selected out of which 158 were in Uganda and 34
107 hospitals in Eastern DRC.

108 After reading the preamble part of the questionnaire and consenting to participate, participants
109 were automatically directed to fill in an online questionnaire which was then automatically sent to
110 the principal investigator.

111 The questionnaire was composed of 23 items developed based on the elements from the study on
112 COVID-19 preparedness [14] and focused on several key concepts. Section A had six questions
113 related to characteristics of the health facility (country, name of hospital, hospital sector, hospital
114 bed capacity, surgical bed capacity and number of active operating rooms). Section B had sixteen
115 questions related to the readiness and Section C had one question related to the influencing factor
116 to provision of surgical care during the double burden Ebola and COVID-19 era (Table 1).
117 In section B each of the 16 readiness-related questions contained 2 options “Yes” and “No” and a
118 score of one point was given for answer (Yes), and zero point was awarded for answer (No). The
119 total score in this section ranged from 0 to 16, with the higher score indicating a higher level of
120 readiness among participant hospitals.

121 **Data processing and analysis**

122 The raw data was cleaned and entered into Microsoft Excel and exported into STATA version 14.2
123 used for statistical analysis (StataCorp, College Station, Texas, USA).

124 The categorical data (characteristics of the health facility) are described by frequencies and figure.
125 The sixteen questions on readiness were compared by country (Uganda and DRC) using the Chi-
126 square statistics and presented with their frequencies and percentages.

127 The analysis of variance (ANOVA) and simple linear regression were used to study the association
128 between readiness score (outcome) and independent variables (country, sector and having resource
129 shortages) and presented with f-value, t-value at a 95% confidence interval with significant
130 variables ($p < 0.05$). Furthermore, readiness score was subjected to multiple logistic regression and
131 presented with their coefficients and t-value at a 95% confidence interval with significant variables
132 ($p < 0.05$).

133 **Ethical consideration**

134 Ethical clearance for the survey was obtained from the Institutional Research Ethical Committee
135 of Kampala International University (KIU-REC-023/202019) in Uganda and the Comite d’Ethique
136 du Nord Kivu (004/TEN/CENK/2020) in the Democratic Republic of Congo. Permission to access
137 health facilities was obtained from all relevant local health authorities. The participation in this
138 survey was voluntary. Participants were allowed to withdraw from the study at any time by not
139 submitting their form online or sending an email to the PI and there was no penalty for withdrawing
140 from the study. The participants’ identities remained concealed as the form did not require any

141 identification. Names were not required from the participants. Informed consent was obtained from
142 all the participants in the current study. All methods were carried out in accordance with relevant
143 guidelines and regulations.

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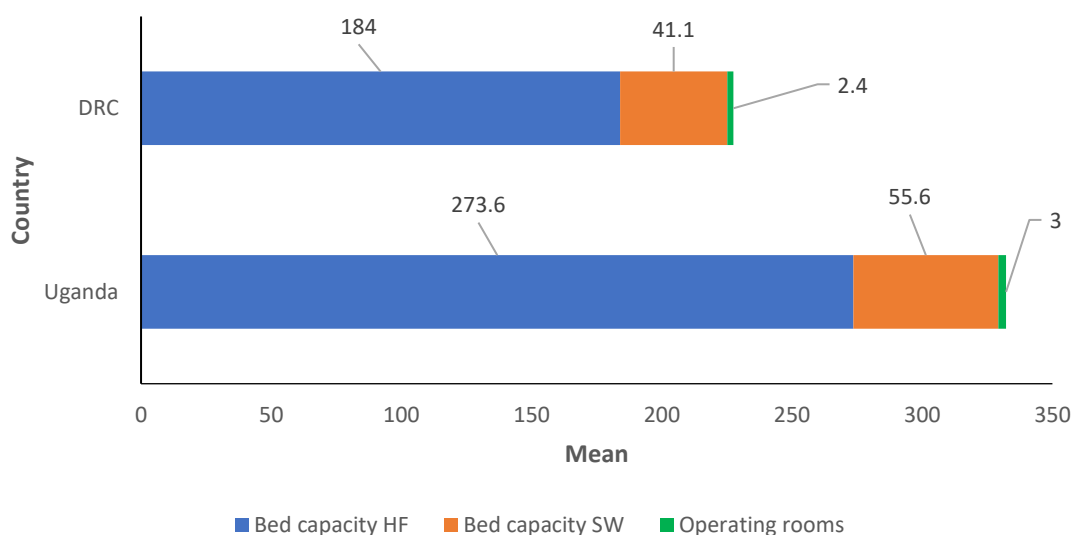
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164 **Result**

165 Out of 192 preselected hospitals in Uganda (158) and Eastern DRC (34), 72 hospitals responded
166 to the questionnaire during data collection period with a response rate of 37.5% for both countries.
167 From the 72 hospitals, 47 (65.3%) were from Uganda and 25 (34.7%) from Eastern DRC. The
168 mean bed capacity health facility (HF) was 184 (min: 60 and max: 500) in Eastern DRC and 274
169 (min: 80 and max: 1000) in Uganda. The average of bed capacity on surgical ward (SW)
170 represented 22.3% (41/184) of the beds in the DRC and 20.4% (56/274) in Uganda. The mean
171 operating rooms was 2 (Standard deviation of 1.7, minimum of 1 and Maximum of 9) and 3
172 (Standard deviation of 1.6, minimum of 1 and Maximum of 10) in Eastern DRC and Uganda
173 respectively (Figure 1).



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175 HF: Health facility

176 SW: Surgical ward

177 **Figure 1. Average of hospital bed capacity, surgical ward bed capacity and operating rooms**
178 **per responding hospital**

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184 **Readiness and Influencing factors**

185 Out of 72 respondent hospitals, 9 (12.5%) reported being able to test for Ebola and 25 (34.7%)
186 being able to test for COVID-19. Only 7 (9.7%) hospitals reported to have an operating room
187 specific for suspect or confirmed cases of Ebola or COVID-19. Team response for Ebola and
188 COVID-19 were reported to be present for 61 (84.7%) hospitals and provision of appropriate PPEs
189 to personnel were reported to be available for 60 (83.3%) hospitals. Overall, the rate of correct
190 answer on readiness reported by the hospitals ranged from 9.7 to 84.7% (Table 1).

191 **Table 1. Elements related to hospital readiness and influencing factor to provision surgical care during the double burden**
 192 **Ebola and COVID-19**

Variable group	Elements related to readiness and Influencing factor (Total size:72)	Total (%) n=72	Eastern DRC (%) n=25	Uganda (%) n=47
Readiness	Hospital able to test for Ebola (Yes)	9 (12.5)	5 (20.0)	4 (8.5)
	Hospital able to test for COVID-19 (Yes)	25 (34.7)	5 (20.0)	20 (42.6)
	Postponing elective surgeries during outbreaks period (Yes)	10 (13.9)	5 (20.0)	5 (10.6)
	Having one operating room specific for suspect or confirmed cases (Yes)	7 (9.7)	1 (4.0)	6 (12.8)
	Training of staff on appropriate donning and doffing of PPE (Yes)	40 (55.6)	9 (36.0)	31 (66.0)
	Having teams specifically for Ebola and COVID-19 response (Yes)	61 (84.7)	21 (84.0)	40 (85.1)
	Having protocols specifically for Ebola and COVID-19 response (Yes)	56 (77.8)	20 (80.0)	36 (76.6)
	Use of COVID checklist for suspected/known patients undergoing surgery (Yes)	46 (63.9)	17 (68.0)	29 (61.7)
	Avoid involving students/Residents in patient care of infected patients (Yes)	14 (19.4)	5 (20.0)	9 (19.1)
	Reduction of the staff number required in the hospital to preserve human resource (Yes)	24 (33.3)	7 (28.0)	17 (36.2)
	Providing appropriate PPEs to personnel (Yes)	60 (83.3)	25 (100.0)	35 (74.5)
	Having containers (disposable bag) for any used PPE (Yes)	54 (75.0)	12 (48.0)	42 (89.4)
	Disinfection of all hard surface areas regularly with 0.5% chlorine or 70% alcohol (Yes)	30 (41.7)	16 (64.0)	14 (29.8)
	Provide psychological support to staff during this time of crisis (Yes)	29 (40.3)	2 (8.0)	27 (57.4)
	Similarity or increase on HCW's remuneration (Yes)	52 (72.2)	17 (68.0)	35 (74.5)
Timely remuneration of HCW's (Yes)	46 (63.9)	14 (56.0)	32 (68.1)	
Influencing Factor	Resource shortages during the double burden Ebola and COVID-19 (Yes)	63 (87.5)	18 (72.0)	45 (95.7)

193 HCW's: Healthcare workers

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197 **Simple linear and multiple linear regression analyses of readiness score**

198 As shown in Table 2, the mean of readiness score to provision surgical care during the double
 199 burden of Ebola and COVID-19 in Uganda and Eastern DRC was 7.8 (SD: 2.3) suggesting an
 200 overall of 60% rate on readiness. Multiple linear regression analysis showed that there is no
 201 statistical significance of readiness score across country, sectors and resource shortages (p>0.05)
 202 (Table 3).

203 **Table 2. Simple linear regression of readiness score to provision surgical care by country,**
 204 **hospital's sector and influencing factor**

Variable	Frequency (%)	Mean (SD)	t/F	P-Value
Country			2.54	0.115
Eastern DRC	25 (34.7)	7.2 (2.3)		
Uganda	47 (65.3)	8.1 (2.2)		
Hospital's sector			0.9	0.345
Private	27 (37.5)	8.1 (2.2)		
Public	45 (62.5)	7.6 (2.3)		
Resource shortages			0.47	0.497
No	9 (12.5)	7.3 (2.0)		
Yes	63 (87.5)	7.9 (2.3)		
Total	72 (100.0)	7.8 (2.3)		

205 SD: Standard deviation

206

207 **Table 3. Multiple linear regression of country, hospital's sector and influencing factor**
 208 **associated with readiness score to provision surgical care**

Variable	Coefficient	t	95% CI	P-Value
Country				
DRC				
Uganda	0.8	1.23	(-0.47 - 1.99)	0.223
Hospital's Sector				
Private				
Public	-0.4	-0.67	(-1.52 - 0.76)	0.505
Resource shortages				
No				
Yes	0.2	0.24	(-1.52 - 1.95)	0.807

209 CI: Confident Interval

210 **Discussion**

211 The availability of human resources, drugs, equipment and basic infrastructural amenities is crucial
212 for providing quality services that meet minimum standards [26]. In high- and middle-income
213 countries, suitable facilities and equipment, human resources, and infrastructure are available even
214 in the district hospitals [27]. The situation is quite different in low-income countries, especially in
215 Africa. For a health facility to be considered ready, it has to: (a) develop a clear plan for providing
216 essential operations during the pandemic; (b) develop strategies to decrease exposure of health
217 care staff and (c) develop capacity to conserve PPE and consumables [14].

218 Across the two countries, the hospitals that reported to be offering surgical services did not have
219 all of the elements of readiness for offering the safe surgical care during the double burden of
220 Ebola and COVID-19 viral infections. This study reported that 60% of hospitals were ready to
221 provide surgical care during the Ebola and COVID-19 era at the time of data collection period. In
222 Uganda, the mean of readiness was higher than in Eastern DRC, though not statistically significant.
223 This result is similar to findings in a study done by Spiegel *et al* [28] on surgical availability and
224 readiness in 8 African countries in which Uganda was reported to have a higher readiness score
225 for basic surgery compared to other countries. In our study, the average bed capacity varied across
226 the two countries. Hospitals in Uganda reported having a lower average of bed capacity on surgical
227 ward than those in the Eastern DRC. However studies assessing public hospital surgical capacity
228 in the DRC [29] and Uganda [30] have shown the average number of hospital beds to be 150 (2.5
229 operating rooms) and 257.1(2.63 operating rooms) respectively. With such an average of operating
230 rooms available in the participating hospitals in both countries, the study found that 90.3% of
231 hospitals reported not having a separate theatre room specific for suspect or confirmed cases of
232 Ebola and COVID-19. This increases the potential risk for infectious disease dissemination among
233 patients and HCWs, and is compounded by the lack of testing for Ebola and COVID-19 in most
234 respondent hospitals. However, it has been proposed for each hospital providing surgical care to
235 have a separate operating room specific for confirmed or suspected COVID-19 [14] or Ebola cases
236 [31].

237 According to the International Monetary Fund (IMF), LIC's reported financial shortage in most of
238 the hospitals [32] and this survey has found that both countries, Uganda and Eastern DRC hospitals
239 are facing financial shortages to provision of safe surgery. However, teams, protocols and
240 appropriate PPE's to HCWs were reported to be available in most hospitals of Uganda and Eastern

241 DRC. This can be due the fact that both countries have participated in infectious disease control
242 related campaigns in response to repeated outbreaks of Ebola and Marburg Outbreaks [33].
243 However, the level of training of staff on appropriate donning and doffing of PPE was found to be
244 inadequate in both countries despite the recommendation that guidance and training should be
245 provided immediately to HCWs so as to make the best use of their technical and clinical skills
246 [14,34].

247 Our study found a lack in provision of psychological support to staff during Ebola and COVID-19
248 in Eastern DRC and Uganda yet it was reported that HCWs during periods of outbreaks need
249 psychological support as they have been reported to have significant anxieties while providing
250 care outside of their normal scope of practice or working beyond their area of competence [35]
251 and this anxiety must be acknowledged and managed to allow them to have reassurance that the
252 system will protect them and support them and their family.

253 **Study limitations**

254 Participation of all pre-selected hospitals in Uganda and Eastern DRC was not possible despite
255 the effort made to get responses from the participants to whom we sent the link, thus the findings
256 from this survey will not be generalized for all the hospitals. This study is not to illustrate the
257 effectiveness or ineffectiveness of management of hospitals.

258 It could be more useful to carry out a qualitative research in the selected hospitals to have in-depth
259 insights of what is ongoing in the hospitals but due to restrictions measures to move during data
260 collection period, it was not possible and we converted questions to an online form to allow the
261 researchers to have an idea of surgical readiness of hospitals in Uganda and Eastern DRC.

262

263 **Conclusion**

264 This study was highlighting the level of readiness of hospitals to provision of surgical care during
265 the double burden of Ebola and COVID-19 in Eastern DRC and Uganda. The findings suggest
266 lack of readiness among hospitals in both countries in terms of supplies to limit the exposure of
267 HCWs, remuneration and support of the HCWs, and in terms of financing. There is urgent need
268 for intervention by the concerned governments and non-governmental organizations to work
269 together in improving health facility supplies and funding to enhance the readiness for safe surgical

270 provision in the two countries. The readiness process must be constantly monitored, the surgical
271 societies should champion the advocacy for adequate supplies and better remuneration of HCWs.

272 **List of abbreviations**

273 CENK: Comite d’Ethique du Nord Kivu

274 COSECSA: College of Surgeons of East, Central and Southern Africa

275 DRC: Democratic Republic of Congo

276 EVD: Ebola virus disease

277 HCW: Health Care Workers

278 IMF: International Monetary Fund

279 IREC: Institutional Research Ethical Committee

280 KIU: Kampala International University

281 LIC: Low Income Country

282 PPE: personal protective equipment

283 **Data availability**

284 The data used to obtain the findings is available from the corresponding author FKS and the author
285 YM on a reasonable request.

286 **Ethical approval and consent to participate**

287 Ethical clearance for the survey was obtained from the Institutional Research Ethical Committee
288 of Kampala International University in Uganda (KIU-IREC-023/202019) and the Comite
289 d’Ethique du Nord Kivu (004/TEN/CENK/2020). Informed consent was obtained from all the
290 participants in the current study. All methods were carried out in accordance with relevant
291 guidelines and regulations.

292 **Consent for publication**

293 Informed consent was obtained from all the participants in the current study.

294 **Competing interest**

295 Authors declare no competing interest.

296 **Author's contributions**

297 FKS was the principal investigator, conceived and designed the survey, supervised data collection
298 and critically reviewed the manuscript. YM analyzed data; RS, FNBP and SBM reviewed the
299 manuscript development, revised the data tool and revised the methodology. AAOL, FO, MK,
300 MMV, BMV, MMM, FDS, JS and JOF participated in data collection; BJS and PK critically
301 reviewed the manuscript. All authors read and approved the final manuscript.

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Figures

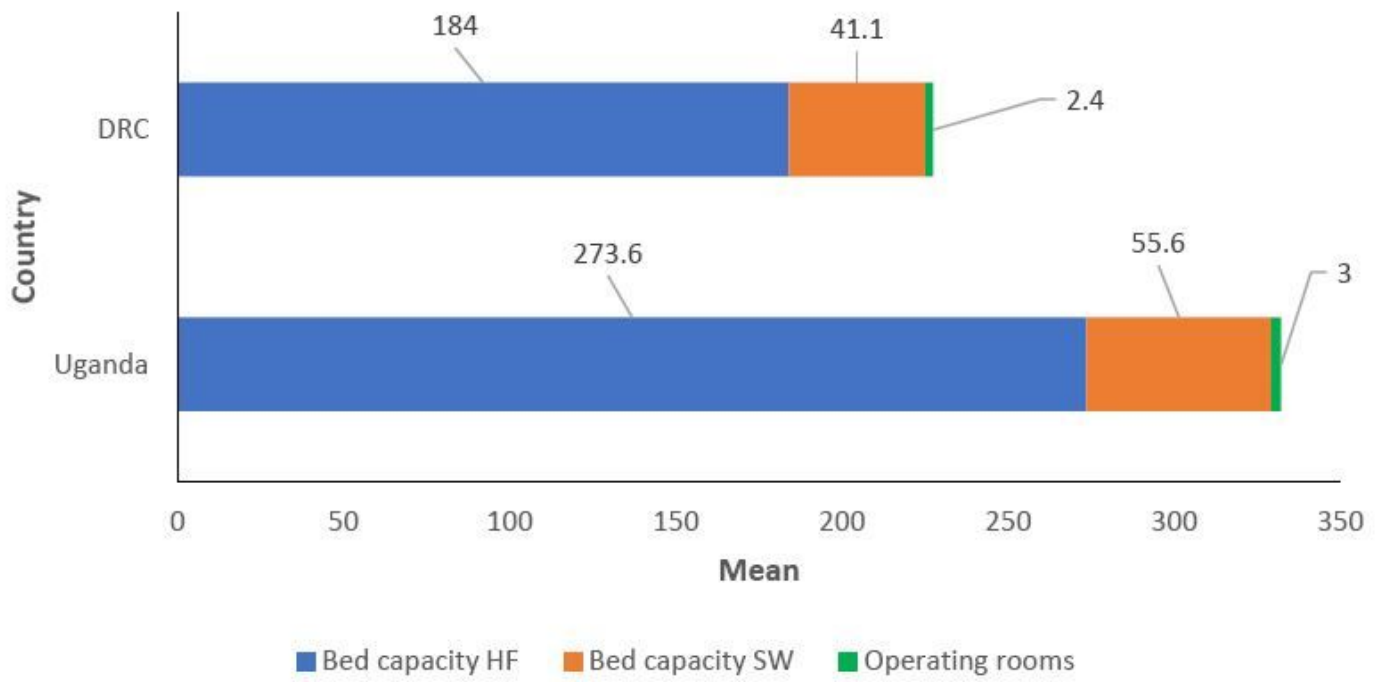


Figure 1

Average of hospital bed capacity, surgical ward bed capacity and operating rooms per responding hospital. HF: Health facility SW: Surgical ward