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RESEARCH LETTER

Africa's critical care capacity before COVID-19

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Critical care capabilities in affluent countries have been overwhelmed by the 2019 novel coronavirus disease (COVID-19) pandemic. Data from the African Surgical Outcomes Study (ASOS)[1] suggests that this critical care crisis will be significantly worse in Africa.

Data from ASOS, and three country audits (South Africa [Alex van den Heever, unpublished data], Kenya[2] and Uganda[3]) were used to determine the critical care bed capacity for Africa. Using Global Burden of Disease (GBD) 2017 population estimates, and World Bank estimates of hospital beds per capita, we estimate 1 055 846 hospital beds and 10 784 critical care beds across Africa for 1.2 billion people, equating to 0.8 (0.3–1.45) critical care beds per 100 000 population (analysis and individual country data shown in Supplementary material, and the dataset can be found at http://dx.doi.org/10.17632/crsm4s6dc4.1). Only six countries have a median of more than two critical care beds per 100 000 population (Figure 1). It is likely that the true number of critical care beds in most African countries is lower than we have calculated, as the majority of hospitals in ASOS were secondary and tertiary hospitals.[1] In contrast, Europe has 14 times the critical care bed capacity at 11.5 beds per 100 000 population,[4] and has still had to provide extra critical care beds outside of intensive care units (ICUs).

The insufficient critical care beds will be further compromised by a limited healthcare workforce in Africa. There are insufficient critical care nurses. Unpublished data from ASOS show that over 50% of participating ICUs were unable to maintain a nurse: patient ratio of at least 1:2. Anaesthetists comprise a substantial proportion of providers capable of providing critical care support and ventilator management. Yet, the World Federation of Societies of Anaesthesiologists (WFSA)[5] estimates that 78% of African countries have non-physician anaesthetists comprising more than 50% of their anaesthesia workforce. Reassigning anaesthesia providers to cover this gap in the critical care workforce as has been done elsewhere would not be possible in Africa due to insufficient anaesthesia providers (Figure 1). There is little data on other crucial components of critical care in Africa, including the actual number of functional ventilators and patient monitors, access to medical oxygen, airway, resuscitation, and personal protective equipment, and ICU drugs.

With this potential critical care crisis in the COVID-19 pandemic in Africa, a mass educational programme on basic management of critically ill patients in a resource-limited setting for non-critical care staff is urgently needed to minimise unnecessary, excess mortality across Africa.

Authors' contributions

All authors equally contributed to the literature search, figures, study design, data collection, data analysis, data interpretation, writing, and approval of the final manuscript.

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Conflict of interest

All authors have nothing to disclose.

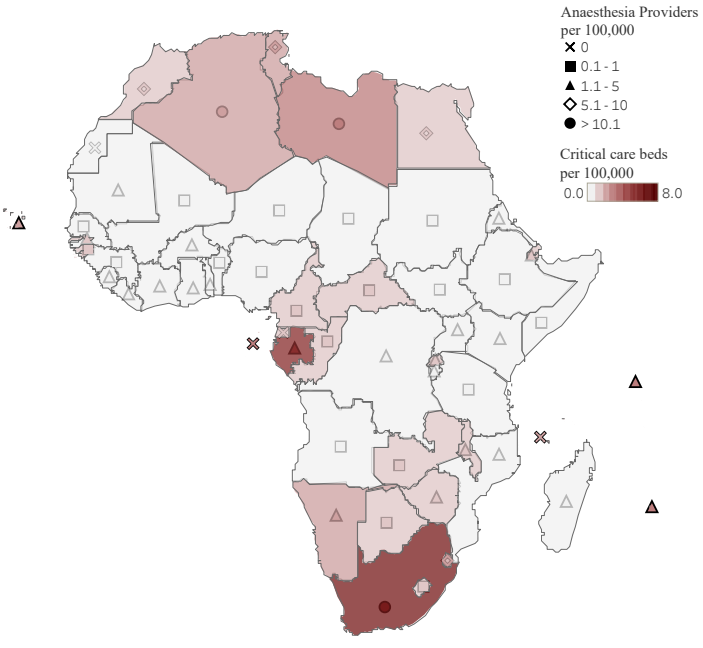

Figure 1

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Supplementary material

Calculation used in estimating Africa's critical care capacity

Hospitals sampled by the African Surgical Outcomes Study had a median of 3 (IQR 0–7) critical care beds providing mechanical ventilation, with 0.9% (IQR 0–2) of hospital beds serving as critical care beds. This being the most current audit of hospital bed:critical care bed ratio in Africa, we adopted 0.9% as our conversion factor in estimating the total number of critical care beds per country. We calculated the total number of hospital beds per country from World Bank estimates (Supplementary Table I). The total number of hospital beds per country was then multiplied by 0.9% to obtain the estimated number of critical care beds. This estimate was divided by the Global Burden of Disease (GBD) 2017 country-specific population estimate to obtain critical care beds per 100 000 people. Data on the number of critical care beds from the most recent national critical care capacity audits conducted in South Africa, Kenya and Uganda were used instead of estimates for these countries.

Supplementary Table I. Country-specific number and density of hospital beds, critical care beds, physicians, nurses and midwives, and anaesthesia providers

Country	Hospital beds	Hospital beds/1 000*	Critical care beds	Critical care beds/ 100 000	Physicians/ 1 000*	Nurses and midwives/ 1 000*	Total anaesthesia providers/ 100 000†	Proportion of non-physician anaesthesia providers (%)†
Algeria	76 533	1.9	689	1.7	1.8	2.2	12.73	69.3
Angola	15 640	0.8	141	0.5	0.2	1.3	0.66	66.7
Benin	4 600	0.5	41	0.4	0.2	0.6	0.70	78.9
Botswana	3 627	1.8	33	1.4	0.4	3.3	0.80	..
Burkina Faso	6 244	0.4	56	0.3	0.1	0.6	2.77	89.8
Burundi	7 914	0.8	71	0.7	0.1	0.7	3.34	98.2
Cabo Verde	1 055	2.1	9	1.7	0.8	1.2	2.12	0.0
Cameroon	25 961	1.3	234	0.8	0.1	0.9	0.53	80.6
Central African Republic	4 476	1.0	40	0.9	0.1	0.2	0.49	100.0
Chad	4 028	0.4	36	0.2	0.0	0.4	0.14	95.0
Comoros	1 517	2.2	14	1.9	0.2	0.9	..	..
Democratic Republic of Congo	45 323	0.8	408	0.5	0.1	0.5	1.42	91.1
Congo	5 949	1.6	54	1.1	0.1	1.7	0.19	..
Cote d'Ivoire	7 480	0.4	67	0.3	0.2	0.9	2.07	64.5
Djibouti	1 277	1.4	11	1.0	0.2	0.5	1.01	0.0
Egypt	146 896	1.6	1 322	1.4	0.8	1.4	6.01	0.0
Equatorial Guinea	1 997	2.1	18	1.4	0.4	0.5	..	..
Eritrea	3 129	0.7	28	0.5	0.1	0.6	1.07	100.0
Eswatini	2 573	2.1	23	2.0	0.1	2.0	5.36	87.0
Ethiopia	29 961	0.3	270	0.3	0.1	0.8	0.81	93.6
Gabon	10 332	6.3	93	5.5	0.4	2.6	1.28	0.0
Gambia	1 921	1.1	17	0.8	0.1	1.6	1.96	89.7

Ghana	22 608	0.9	203	0.7	0.2	1.2	2.74	85.3
Guinea	3 312	0.3	30	0.3	0.1	0.4	0.34	93.0
Guinea-Bissau	1 517	1.0	14	0.8	0.2	1.4	0.11	0.0
Kenya	57 890	1.4	130	0.3	0.2	1.5	1.71	74.4
Lesotho	2 556	1.3	23	1.2	0.1	0.7	0.23	0.0
Liberia	2 930	0.8	26	0.6	0.0	0.1	1.33	100.0
Libya	22 954	3.7	207	3.0	2.2	6.7	11.23	53.2
Madagascar	4 230	0.2	38	0.1	0.2	0.1	1.05	78.4
Malawi	20 319	1.3	183	1.0	0.0	0.3	1.17	97.0
Mali	1 508	0.1	14	0.1	0.1	0.4	0.78	61.6
Mauritania	1 288	0.4	12	0.3	0.2	1.0	3.37	83.9
Mauritius	4 257	3.4	38	3.0	2.0	3.4	4.32	0.0
Morocco	37 752	1.1	340	1.0	0.7	1.1	6.25	69.8
Mozambique	17 458	0.7	157	0.5	0.1	0.4	1.13	81.1
Namibia	5 770	2.7	52	2.2	0.4	2.8	2.44	0.0
Niger	5 970	0.3	54	0.3	0.1	0.3	0.66	89.4
Nigeria	67 700	0.5	609	0.3	0.4	1.5	0.71	19.2
Rwanda	15 115	1.6	136	1.1	0.1	0.8	4.10	93.5
Sao Tome and Principe	518	2.9	5	2.5	0.3	2.3	..	..
Senegal	3 660	0.3	33	0.2	0.1	0.3	0.95	34.7
Seychelles	315	3.6	3	3.0	0.9	3.3	4.17	..
Sierra Leone	2 340	0.4	21	0.3	0.0	1.0	2.05	98.5
Somalia	12 159	0.9	109	0.6	0.0	0.1	0.29	100.0
South Africa	171 818	2.8	3 318	6.0	0.9	3.5	16.18	0.0
South Sudan	..	..	..	..	0.0	1.2	0.34	90.5
Sudan	29 480	0.8	265	0.7	0.4	0.8	0.87	45.7
Tanzania	32 270	0.7	290	0.5	0.0	0.4	0.43	78.3
Togo	4 675	0.7	42	0.6	0.0	0.3	3.01	92.3
Tunisia	25 921	2.3	233	2.0	1.3	2.6	5.06	0.0
Uganda	16 960	0.5	55	0.1	0.1	0.6	1.29	85.7
Western Sahara	..	..	..	..	..	..	..	..
Zambia	27 700	2.0	249	1.4	0.1	0.9	0.95	74.7
Zimbabwe	24 463	1.7	220	1.5	0.0	1.2	1.79	68.9
TOTALS/ MEDIANS	1 055 846	1 (0.5–1.95)	10 784	0.8 (0.3–1.45)	0.1 (0.1–0.4)	0.9 (0.5–1.5)	1.28 (0.7–3.01)	78.65 (37.45–92)

*https://data.worldbank.org/ accessed on 20 March 2020; †https://www.wfsahq.org/workforce-map accessed on 20 March 2020.