Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Editorial

COVID-19 in Africa: Current difficulties and future challenges considering the ACCCOS study

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> "It doesn't matter how many resources you have. If you don't know how to use them, it will never be enough"
>
> Albert Einstein

Coronavirus disease-2019 (COVID-19) represents a major threat facing the medical community with > 3 million mortalities worldwide. The pandemic pattern of COVID-19 was responsible for increased mortality due to overwhelming surges of patients in short timeframes, which exceeded the capacity of the healthcare systems of some countries. While the outcomes of COVID-19 have been extensively reported in many settings, data from Africa are lacking. Thus, the African COVID-19 Critical Care Outcomes Study (ACCCOS), which was recently published in *The Lancet*, represents an interesting contribution to the current literature, being a large, multicentre report from many African countries [1]. We commend the authors for this important contribution, and we present some comments on the study results as well as insights for future improvement of patient management in African countries.

1. Can the mortality rate be used for benchmarking?

The ACCCOS evaluated the outcomes of critically ill patients with COVID-19 in Africa and compared these with those of other continents, concluding that African countries had the highest mortality rate in critically ill patients. Critical illness was defined by patient location in a critical care unit and not by physiological parameters. Although understandable in a pragmatic study, it does introduce potential selection bias. Furthermore, outcomes of critically ill patients are best benchmarked with adjustment for the severity of illness to ensure homogeneity of the populations being compared [2]. While a meta-analysis of the available sequential organ failure assessment (SOFA) scores was also performed, this was limited by missing SOFA data in the study and lack of reporting of SOFA data in many of the comparator studies. Given these limitations and the marked heterogeneity in the meta-analyses, it is difficult to make meaningful comparisons of mortality rates between Africa and other regions. The correct tool to describe and compare severity of illness in COVID-19 is also debatable. Given the apparent difficulties in performing a full SOFA score, ACCCOS has highlighted the use of the quick SOFA (qSOFA). While a significant predictor of outcome in this study, the qSOFA might not be the best tool to determine the degree of respiratory failure, which is the mainstay of evaluation of patients with COVID-19 [3]. A multicentre study had reported that qSOFA has limited utility for predicting outcomes in critically ill patients with infection [4]. Would it have been more appropriate to present the disease severity through the P/F ratio, SpO2/FiO2 ratio, or the World Health Organization classification? As a further consideration, most of the centres that participated in the study were tertiary and university hospitals; this might explain the high mortality due to the complexity of cases. Alternatively, these institutions may have had better outcomes than those not represented in the study, as they potentially had superior resources and training. All in all, it is difficult to make meaningful outcome comparisons on the limited data available; it does however highlight a potential area of concern that requires further study.

2. Did the ACCCOS report a real lack of resources in African countries?

In the ACCCOS, the high mortality was linked to a lack of resources in the countries participating in the study. However, at face value, the data do not suggest a gross lack of resources across the board. What is apparent is a marked discrepancy in resource allocation on the continent; while some hospitals were providing extracorporeal membrane oxygenation (ECMO), others could not provide pulse oximetry. The inability to provide pulse oximetry to all patients in 14% of the hospitals is frustrating because this device is frequently used in home monitoring in African countries, and, moreover, we suggest that doing a reverse-transcriptase polymerase chain reaction assay for diagnosis of COVID-19 seems to be more expensive than provision of a pulse oximeter. Pulse oximetry should be an achievable standard of care in all critically ill patients in Africa.

Abbreviations: ACCCOS, African COVID-19 Critical Care Outcomes Study; COVID-19, Coronavirus disease 2019; FiO_2, fraction of inspired oxygen; P/F ratio, PaO_2/fraction of inspired oxygen ratio; SOFA, sequential organ failure assessment; qSOFA, quick SOFA.

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Having one in three patients deceased without having received vasoactive drugs appears unusually low and is unlikely to be explained by a shortage of drugs. The data revealed that 79% and 84% of the patients received therapeutic anticoagulation and steroid therapy, potentially more costly agents, respectively. Thus, it does not seem that the problem was drug shortage and worryingly this might be due to a lack of experience and/or timely detection of patient collapse. Alternatively, it could represent difference in the pathophysiology of COVID-19 critical illness, or aggressive patient triage precipitated by bed or other resource pressure.

The discrepancy in resources is most probably because the study only included 10 of 55 African countries, including South Africa and Egypt, which are relatively well resourced and together account for 43% of the intensive care unit beds on the continent, and that 70% of the hospitals were tertiary hospitals [5]. It would appear essential for future improvement in health service to focus on ensuring an appropriate minimum standard of care in all critical care units. We should also avoid advocating interventions that are resource intensive and may not have an appropriate cost-benefit ratio in the resource limited setting *e.g.*, ECMO.

3. Insights in patient management

While the staffing ratios mentioned in the article appear surprisingly reasonable in the context of a pandemic, with median nurse: patient ratio of 1:2, the interquartile range suggests that a nursing ratio of 1:4 was not uncommon and might have resulted in delayed management. Furthermore, there is no mention of the qualification level or experience of the healthcare providers, which might be more important than the crude number, especially in such a difficult to treat disease. The lack of physician experience might be responsible for the unexplained points in patient management such as the lack of respiratory and cardiovascular support in a considerable proportion of patients who died [6].

The ACCCOS presented the frequency of the use of some drugs. However, there is no data about the use of important drugs such as antimicrobials and tocilizumab. The relatively low rate of steroid therapy (83.7%) is interesting because most of patients were recruited from May to December 2020, after the release of preliminary results of the dexamethasone arm of the RECOVERY trial [7]. The study reported liberal use of therapeutic anti-coagulation (79%), which is surprising and raises an important question about the local protocols of anticoagulation in the participating centres. Available guidelines recommend prophylactic anticoagulation in critically ill patients with COVID-19, which could be augmented to intermediate doses in selected patients [8]. The use of therapeutic anticoagulation should be restricted to patients with confirmed venous thrombosis or undergoing specific extracorporeal therapies; otherwise, there would be a possibility of serious bleeding [9] whose incidence is not presented in the study. It must be emphasised that adherence to evidence-based strategies is important [10], especially in resource-limited environments and that costly "experimental" approaches should probably not be implemented unless there is evidence for their benefit. The adherence of the physicians to evidence-based "standard of care" practices is one of the important tools for benchmarking of critical care unit performance [2].

4. What are the possible short and long-term achievable solutions?

ACCCOS has shown that critical care in Africa may be different to critical care in other areas. Besides the need to improve economic resources, the human resources seem to be equally, and sometimes more, important to improve in African countries. We need to continue to work on developing a basic package of critical care that would be appropriate for the continent. This would include an agreed upon minimum equipment list and minimum training. Despite these best intentions, a lack of resources is a fact, which could, at times, be inevitable. Thus, it is essential to have appropriate alternatives and realistic guidelines to provide the desired balance between good medical service and conservation of resources. Who would be responsible for this though? Perhaps the time has come for an African Society of Critical Care.

Limited resources and/or experience might have contributed to the high mortality in critically ill patients with COVID-19 in Africa; however, having a high mortality in such a pandemic has also been reported in countries with higher levels of healthcare [11]. Thus, reaching a definitive solution requires a deeper insight towards a pragmatic approach, which is not in reality more critical care resources, but is indeed promoting and supporting vaccination programs in African countries. Vaccination has been associated with a substantial mitigation of COVID-19 outbreaks in several countries [12,13]. The rate of vaccination in most of African countries requires more attention by the international medical community with the aim of rapid and fair vaccine distribution [14]. Another challenge in vaccination is that public acceptance of vaccines is not yet sufficient in many African and even western countries [15,16]. Extensive community engagement efforts are warranted to reject myths and misconceptions and to eliminate vaccine hesitancy. Agreeing with the fact that many countries are not able to provide vaccines to most of their population in a proper timeline, it is desirable and economic for African countries to build their vaccine manufacturing capacity through collaboration with vaccine developers.

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Registration

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