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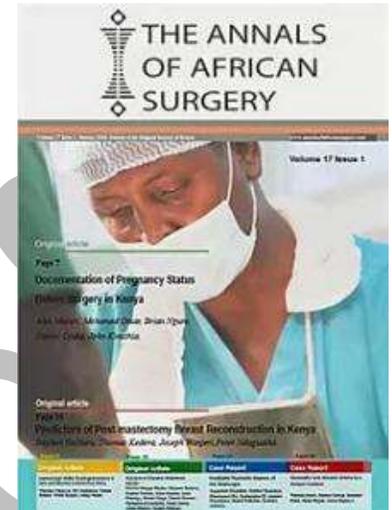
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**Opportunities for Surgical Research in the COVID-19 pandemic era.**

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## Editorial

The World Health Organization (WHO) declared the coronavirus (COVID-19) pandemic on March 11, 2020 (1) and this has been followed by near total disruption of all sectors including the health sector, that will have a lasting impact. The WHO further warns that COVID-19 will be here for a long time to come. Without a vaccine or known cure as yet, the preventive measures such as travel restrictions, social distancing and isolation, have had obvious and hidden consequences, including disruption in access to and continuity of health care. In many countries surgical services especially for elective cases were suspended (2) and access to surgical care has been a challenge (3). In sub-Saharan Africa, published guidelines to enhance the preparedness of health systems for the provision of essential surgical, obstetric and anaesthetic services in the region have recommended several steps aimed at reducing risk of transmission to patients and staff as well as optimizing the scarce resources (3). Many surgical training programs have also been suspended. Although COVID-19 is typically not a surgical condition, surgery is one of the essential health services impacted by the pandemic and so the surgical fraternity also has to adapt to the “new normal” brought about by the COVID-19, in order to ensure continuity of care.

In this issue, the *Annals of African Surgery* presents a number of articles seeking to innovate and contextualize methods (5) and materials (6,7) for surgical practice in the African context. The use of locally available Banana Leaf Dressing (BLD) for skin grafts (6) offers a good example of the need for innovative local solutions as a way of mitigating the logistical and other challenges for imported supplies presented by the COVID-19 restrictions. Although the African continent has been proportionately less affected in comparison to Europe and the Americas (4), the COVID-19 pandemic now puts the traditional practice of medicine and indeed surgery under the lens seeking innovations in the way we teach and practice surgery. Already burdened by a severe shortage of

surgical workforce and weak health systems, Africa is now faced with a worsened access to essential surgical care due to the COVID-19 pandemic (9). The traditional clinical set up of surgeon-patient and surgeon-student face-to-face interactions and team practice is no longer safe and has to be reassessed. There is need for innovation, flexibility, and quick adaptation of new approaches for optimum safe surgical care and training ensuring increased protection of the patient and the surgical team.

The COVID-19 virus is spread through aerosols released from the infected person's airway on talking, laughing, coughing, or sneezing. The risk of transmission is higher when individuals are less than 2 meters apart or when the aerosols contaminate surfaces. This is in addition to the risk of transmission by asymptomatic patients (10).

Therefore, the COVID-19 era has created a need for high quality research on a number of aspects in the provision of surgical care and training. This being a new disease, there are many unknowns and time is of the essence. In view of the impact on surgical care and training and the predicted long term presence and effects of the COVID-19, research using various designs, methods and material, is needed to quickly address both current and future challenges to surgical health systems. The African and global surgical fraternity is in need of context specific research addressing aspects such as, efficiency and sustainability of interventions to ensure continuity of surgical care and training during the COVID -19 and future pandemics.

A short list of possible research areas is proposed below to demonstrate the vast nature of unknowns presenting as opportunities for research in surgery.

- *Access to care:* The traditional approach to surgical care from the surgical outpatient clinics, to the wards and theaters has depended on person-to-person /face-to-face contact

between the surgeon and patient. However with the requirement for social distancing and the travel restrictions in place, this is no longer tenable and many surgical outpatient clinics have registered decreased numbers either by design or as a consequence of the wider restrictions. This presents a need for research into alternative ways of surgical care delivery such as self-care, m-Health, and blended care, exploring aspects such as feasibility and cost-effectiveness. Self-care is already gaining traction as an intervention in improving patient-centred care and access to essential health especially for sexual and reproductive health as well as mental health (11) . Self-care in surgery has been shown to improve pre-operative and post-operative performance of surgical patients (12,13). The use of mobile technologies (m-health) through call centers, help lines, emergency toll-free telephone services, telemedicine and other packages for consultations, patient monitoring and treatment follow-up is only growing in Africa and has not been well studied in surgery and yet could provide a new way of increasing access and improving care (14)

- *Ward, Clinic and Theatre set up and safety:* Surgical theatres are closed environments and often depend on air-conditioning. In addition the surgical team is often composed of several members each offering a specific service to the success of the surgery. Unfortunately the coronavirus has been shown to spread faster in air-conditioned closed and congested spaces and it is now recommended to switch off air-conditioning in theatre (15,16,17). In addition, ventilation systems are in direct contact with the patients' airways and many procedures such as intubations, suction, and endoscopy generate aerosols (18). Although the use of PPE is common in the surgical environment, the COVID-19 transmission risk may demand additional standardized operating procedures. We therefore need research informing the optimal set up and modifications necessary to ensure safety of the theater environment.

- *Patient triage and selection:* The provision of emergency surgical care requires intimate contact and often every minute counts. This poses a higher risk of infection transmission. There is need for guidelines on how to improve surgeon and patient safety in this setting for example guidelines on how to conduct patient triage and selection, use of personal protective equipment, disinfection of spaces, objects, and equipment and composition of the emergency surgical teams.
- *The COVID-19 positive patient:* The management of the COVID-19 positive surgical patient is still a dilemma. Several recommendations and guidelines have been issued by various surgical societies and authorities on how to organize surgical services, prevent transmission and optimize use of the available surgical workforce and supplies (2,4) but these are yet to be evaluated in the different contexts.
- *Consent versus risks of infection:* The risk of a patient contracting infection in the course of surgical care is an ever present one. The risk for COVID-19 transmission is even greater in the absence of routine screening and testing of surgical patients and teams. However there are no guidelines as yet for consenting patients with a risk for contracting COVID-19 in the course of surgical care (19,20). Therefore there may be need to research and develop of guidelines regarding the consent process and handling of patients that end up infected while seeking care.
- *Training:* Surgical training requires high volume hands-on exposure (21,22). However due to the many restrictions in place, this has been interrupted and many trainees are unable to attend to their clinical duties and learning sessions. This is an opportunity to review how we deliver surgical training and ensure and assess achievement of intended learning

outcomes using various delivery models such as e-learning and simulations, while maintaining safety.

- *Access and adherence to prevention guidelines including use of Personal Protective Equipment (PPE) in the surgical setting.* The COVID-19 presents more strict requirements for adherence to infectious disease prevention protocols beyond the routine surgical infections prevention practices. There is need for research to assess the access to recommended PPE, context-relevance and adherence to guidelines to inform policy and practice in the prevention of disease transmission in the surgical environment.

Surgical and related research has not enjoyed as much funding as the infectious diseases and other public health research and has been referred to as the “neglected step-child of global health” (23). However, the COVID-19 pandemic presents new funding opportunities for surgical research. As enumerated above, there are several gaps in our knowledge on safe surgical care and training in the COVID-19 era that need to be addressed through research. Many governments and funding organizations are now putting out calls for proposals to address health systems strengthening, clinical management and training related research to inform decisions and actions aimed at mitigating the effects of the COVID-19 pandemic.

We therefore do look forward to a proliferation of manuscripts from context-specific research to inform our response to the COVID-19 effects on the access, continuity, and safety of surgical care and training.

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