

# Evolution Of The BScClinical Medicine Curriculum: Bridging The Gap Between Theory And Practice

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## **Abstract:**

The Bachelor of Science in Clinical Medicine (BSc) program in Kenya is critical in training Advanced Clinical Practitioner who serve as the backbone of the country's healthcare system. Over the past decade, the curriculum has evolved significantly to better align with the demands of the healthcare landscape and international standards. This narrative review examines the historical development of the BSc Clinical Medicine curriculum, identifying key changes aimed at bridging the gap between theoretical instruction and practical application. The review explores drivers of curriculum transformation, including shifting disease burdens, technological advancements, and input from stakeholders such as healthcare institutions and graduates. Notable updates include the early integration of clinical training, competency-based education, and the inclusion of emerging health topics such as telemedicine. The curriculum's alignment with local healthcare needs and global frameworks is also assessed, alongside challenges in implementing these changes, such as resource limitations and resistance from academic institutions. Finally, recommendations are provided for future curriculum reviews, emphasizing the need for continuous updates to ensure that graduates are well-equipped to meet the demands of Kenya's healthcare system while possessing the skills needed for global mobility. This review highlights the importance of maintaining a dynamic and responsive curriculum to produce Clinical Officers capable of delivering high-quality care in a rapidly evolving medical landscape.

**Keywords;**curriculum Evolution; clinical medicine; Telemedicine; clinical Officers; Mental Health; AI

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## I. Introduction

### Background of Clinical Medicine in Kenya

Clinical officers (COs) are midlevel health care providers whose training takes shape through the Bachelor of Science (BSc) in Clinical Medicine. Per initial research by Akinyi and Choge (2021) and a recent review conducted by Oginga et al. (2024), it is undeniable that COs work in various places, among them rural and underserved areas, offering necessary primary healthcare solutions in areas without physicians. Initially, the COs program followed a relatively classical medical curriculum in which theoretical sciences dominated (anatomy, physiology), and practical skills training was an afterthought, often in the latter age of education. This basic knowledge of CO preparation has been the core of their training for a long time. However, the shifts in the health stack have made stakeholders realize the need for a curriculum beyond theory (Akinyi&Choge, 2021). As the responsibilities of COs increase, they now work with complex health conditions on multidisciplinary teams and utilize advanced medical technology; education that balances theory and practical skills is needed to prepare graduates for the dynamic healthcare environment in Kenya.

### Importance of Curriculum Evolution

New healthcare regulations, changing disease burdens, and technology improvements have substantially impacted Kenya's healthcare practitioners. In Kenya, there has been an increase in the number of non-communicable diseases (such as diabetes and hypertension) as the country's disease management has transitioned from infectious diseases to non-communicable diseases. For this reason, the curriculum has to be continuously updated for COs to deliver as high-quality care as possible for various complex health problems (Oginga et al., 2024). Such learning practices as competency-based education (CBE), simulation training, and early advancement of clinical exposures, when embraced by the BSc Clinical Medicine, will help prepare graduates with the right skills to tackle current health challenges (Mbindyo, 2013; Kaguthi et al., 2020; Akinyi&Choge, 2021). Indeed, the health sector needs a new type of workforce; CBE training places increased

focus on training students to gain measurable competencies in essential skills needed for the COs and the quality of patient outcomes.

### **The Objective of the Review**

This review looks at how Kenya's BSc Clinical Medicine curriculum has changed over time, highlighting significant changes that have been made to close the gap between theory and practice. It analyzes forces for the change in curriculum derived from the gaps identified in the study by Linley (2024) and Oginga et al. (2024), which include the requirement of a responsive healthcare system in resonance with local and global standards, advancement of medical technology and feedback from healthcare stakeholders, clinical supervisors, healthcare institutions, and graduates. Among discussions, this also includes ongoing health topics in the curriculum to teach, along with a landscape of healthcare solutions such as telemedicine.

Thus, the review delves into obstacles to implementing these curriculum changes: resource constraints and opposition from 'conventional' academic institutions. It emphasizes the importance of overcoming these obstacles and having an educational system that is more adept at responding. It also offers recommendations for a career in clinical medicine, including that education should cater to Kenya's national health goals and those enunciated in the global frameworks, as encouraged by Jegan and Dierickx's (2023) findings. The review highlights the urgency for a dynamic and responsive managed curriculum with which COs can be equipped to serve the requirements of contemporary healthcare in Kenya and skilled to be mobile outside of the country.

## **II. Historical Development Of The BSc Clinical Medicine Curriculum**

### **Early Curriculum Design**

The Kenya BSc Clinical Medicine curriculum was developed originally to train mid-level health care providers to fill the country's need for essential health care, especially in the underserved rural areas. As highlighted earlier, compared to today's curriculum structure, the early curriculum was heavily theory-based, and coursework was mainly devoted to basic medical sciences, such as anatomy, physiology, biochemistry, and pharmacology (Akinyi&Choge, 2021). When the program was conceived, the goal was a solid foundational knowledge of human biology and how disease develops to properly serve as a platform for hands-on practice during later training. The early curriculum was primarily based on traditional lecture teaching with little or no student interaction. Initially, there needed to be more attention paid to teaching students to become critical thinkers and clinical decision-makers, with relatively little expectation placed on students to learn from their instructors actively (Zhao et al., 2021; Halestrap et al., 2023). The practical clinical exposure was brought in only at the end of the program through clinical rotations in health facilities. Although the focus on theory was good in some ways, it was increasingly recognized as inadequate in producing COs capable of responding to the changing healthcare landscape in Kenya.

### **Timeline of Curriculum Evolution**

For the past few decades, the BSc Clinical Medicine curriculum has changed in many ways in its futile attempt to find a link between theory training and practical skills training. Special milestones in the evolution of the curriculum are:

- 1. 1980s -Traditional Curriculum:** The early years of training were extremely theoretical and did not allow for much clinical exposure until the last few years (*KRCHN Course, 2017*).
- 2. 1990s-Introduction of Early Clinical Exposure:** As stakeholders began to recognize that early clinical training is required, basic clinical skills from the second year of study were added to enhance readiness for clinical practice (Akinyi&Choge, 2021).
- 3. 2000s-Competency-Based Education (CBE):** The program was enacted in response to global shifts in medical education, which led to competency-based education (*KRCHN Course, 2017*). Under this approach, students must acquire clinically focused and soft skills such as communication and professionalism by graduation.
- 4. 2010s-Emphasis on Simulation and Technology:** Training in which the students can develop clinical skills in a controlled, low-risk environment has always been done years away from simulation (Akinyi&Choge, 2021). For example, standardized patients and high-fidelity manikins were used to improve the procedural training of patient interaction skills.
- 5. 2020s-Telemedicine and Emerging Topics:** Recent curriculum updates have included training in telemedicine, digital health technologies, and managing chronic non-communicable diseases, as Kenya needs such training and is in high demand per global healthcare trends (Oginga et al., 2024). The curriculum also centers carefully on interprofessional education for COs so that they can practice in diverse teams.

### **Comparative Insights**

The BSc Clinical Medicine curriculum in Kenya has similarities with other regional and international programs, but it adapts uniquely to local needs. Pivoting to competency-based education and earlier clinical

exposure similar to East African countries like Tanzania and Uganda proves that students need more practical training. Nevertheless, Kenya's curriculum is unique because it places a significant premium on the primary care angle, especially regarding healthcare disparities in rural areas (Kuria et al., 2021). A primary care focus fits into Kenya's present health care strategy given the weighty and broad courses and the rural placements, including those in the field of community health, which are more substantive than some regional colleagues. The curriculum has been internationally and globally aligned with organizations like the World Federation for Medical Education (WFME standards, n.d.), which is designated to advocate for competency-based education and early clinical exposure. However, unlike most Western curricula, the Kenyan BSc Clinical Medicine program faces resource constraints, which affect its ability to ultimately adopt modern training methods, such as extensive simulation-based education (Njeru&Onguru, 2020). Students often have much more opportunity to practice complex procedures on actual patients behind sophisticated Western technology, which is often more available than anywhere in the world. For instance, to address the COVID-19 pandemic, many international programs have revised curricula, including telemedicine and digital health as core subjects. Telemedicine is now part of Kenya's curriculum. However, ultimately, regional adaptations are vital. For example, the Kenyan program has adapted telemedicine training to local conditions, so the internet and technological infrastructure could be better so that graduates are prepared for the issues they may face in their professional careers. Overall, Kenya's BSc Clinical Medicine curricula have significantly moved to incorporate many globally recognized educational practices while being national-oriented, preparing COs responsive to Kenya's specific healthcare needs.

### III. Drivers Of Curriculum Transformation

#### Shifting Disease Burdens

The shift in disease burden is one of the critical drivers towards curriculum transformation, according to Oginga et al. (2024), in the BSc Clinical Medicine program in Kenya, which has changed drastically over the past few decades. In the past, infectious diseases such as malaria, HIV/AIDS, and tuberculosis were the leading health problems in Kenya, as covered by the Ministry of Health report ("*Global Burden of Disease Generating Evidence*," n.d.). Over recent years, there has been a dramatic increase in the number of non-communicable diseases (NCDs) like diabetes, hypertension, cardiovascular diseases, and cancers. This epidemiological shift has made a compelling case for significant curriculum revision for COs to provide them with skills to manage more conditions, especially those that call for long-term treatment and preventative strategies. In order to respond to these emerging health challenges, the NCD training has been more comprehensive in the curriculum. For example, clinical medicine students are given more training in chronic disease management through courses covering diabetes care, cardiovascular health, and cancer screening. The curriculum is complemented by case studies and practical workshops, allowing students to get hands-on experience with chronic disease patients. For diabetes care modules, students learn, for example, how to develop long-term management plans for a patient based on creating a lifestyle change and adhering to taking the medication while monitoring for any complications (Kavili et al., 2020). These modules demonstrate that preventive healthcare practices are critical for managing a burgeoning NCD burden. Further, the COVID-19 pandemic illustrated the need to change the curriculum to handle emerging diseases and have pandemic preparedness (Brotherton et al., 2021). Training on infectious disease management courses, such as pandemic response strategies, infection control, and epidemiology, were added to the course. Based on the *Healthcare Workers' (Clinical Officers) Level of Preparedness in Response to the COVID-19 Assessment Report* (n.d.), the Kenyan experience with the viral pandemic is used as a case study that allows students to explore the challenges the healthcare system has faced during the pandemic. The curriculum transformation addresses emerging infectious diseases and NCDs, intending to create better COs to handle various health problems that match the changing Kenyan healthcare landscape.

#### Technological Advancements

The BSc Clinical Medicine curriculum is also a direct consequence of technological advancements. Traditionally, Kenya has relied less on advanced diagnostics or digital health tools, which defines its limited technological expertise (Akinyi&Choge, 2021). However, according to a recent study by Zainal et al. (2022), with this growing accessibility to new technologies, a great effort has been made to incorporate them into healthcare education globally. Digital health, telemedicine, and electronic health records (EHRs) are needed in the curriculum to familiarize students with the technology that is now crucial in modern healthcare delivery. Telemedicine has experienced rapid adoption in Kenya, especially in relatively remote areas with low access to medical practitioners (Mutuku, 2022). In response to this trend, the Clinical Medicine curriculum has included training in telemedicine and instructs students on how to provide virtual clinical consultation, interpret digital health data, and appropriately communicate with patients through the telehealth platform. This training includes a practical component of simulation exercises in which students practice teleconsultations under faculty

supervision. Through this addition, COs can link with patients in the most remote settings, helping Kenya achieve its national objective of universal health coverage (Onsongo et al., 2023; Oginga et al., 2024). Another big step is simulation technology, which significantly impacts curriculum design. Traditional high-fidelity manikins and virtual simulators allow students to practice their clinical skills in a controlled, risk-free environment. For example, other students can practice using advanced cardiac life support to perform advanced cardiac life support procedures on manikins that distract like real-world cardiac events to improve preparedness for emergencies (*AKU opens a healthcare simulation center in Nairobi*, 2021). Simulation-based learning has been instrumental in Kenya, where several students might not come across specified high-risk cases in their clinical rotations because some healthcare facilities are resource-constrained (Kavinya et al., 2023). These technological updates are designed to bridge the gap between learning facts and applying them in the lab toward clinical competence and confidence. Also, COs must be trained in using data management systems and EHRs as they have more patient documentation and continuity of care duties (Njeru&Onguru, 2020). With Kenya transitioning toward digitizing healthcare records, this skill set aligns with its emerging need to create clinicians who can offer clinical healthcare and health information management.

### **Stakeholder Contributions**

Curriculum transformation has been essential to the input of stakeholders, including alums, faculty, and employers, who have been instrumental in ensuring that a curriculum remains relevant to real-world healthcare needs. Alums provide feedback based on what they have done in the workforce and what they feel can have additional training (Chandler, 2024, June 10). For example, in this case, alums have also highlighted the need for practical skills and being in the clinic early enough, for instance, in the primary care settings. This was the outcome of inquiring from a CO. "My first year on the job was difficult; I had not practiced hands-on some clinical procedures," said the CO. "Had I early exposure and simulation training, I would have been much more ready." One of the main reasons behind the changes in the curriculum is that faculty members, primarily practicing clinicians, bring insights from clinical practice and knowledge of what is happening in the current healthcare system. Expanding modules on chronic disease management, preventive healthcare, and mental health have been instrumental in faculty-led curriculum reviews (Mai et al., 2020). In particular, mental health was underemphasized historically but now has gained more attention as faculty argued for its inclusion in light of the increasing need for mental health services in Kenyan communities. The same CO stated, "There are students who need to be able to recognize and address mental health conditions." "We cannot avoid the psychological sides of patient care if we wish to offer holistic health care services." Thus, employers, such as healthcare institutions and government agencies, must provide input, which results in curriculum updates. All these stakeholders often describe the skills they want graduates to have, supplying essential details concerning the shifting needs of the healthcare workforce. For example, public hospitals have also requested more extensive training in primary care and emergency management as these hospitals are typically constrained at resource levels and have high patient volumes (Kavili, 2020). In light of this feedback, curriculum changes have included a stronger clinical decision-making focus, such as for emergency procedures or resource management in a low-resource setting. Courses on interprofessional collaboration as an essential skill among COs who often work in multidisciplinary teams were also integrated based on employer feedback. Those who can coordinate hand-in-glove with other healthcare professionals, including nursing, pharmacy, and medicine, have been said to be what hospital administrators are looking for (Njeru&Onguru, 2020). "We need COs who know how to value teamwork," the interviewee said. "Especially in busy facilities, everyone's input counts in patient outcomes, so coordinating care effectively is essential." Working with these stakeholder contributions has enabled adjustments to the curriculum to produce graduates who can better address Kenya's healthcare needs. The curriculum is responsive to healthcare trends, and graduates possess the technical and soft skills needed in clinical practice as groomed by alums, faculty, and employer input.

## **IV. Key Curriculum Updates**

### **Early Integration of Clinical Training**

The early integration of clinical training, through which students have early exposure to hands-on experiences, is one of Kenya's most impactful updates to the BSc Clinical Medicine curriculum. While traditionally, clinical training took place in the last years of the program, feedback from alums and healthcare employers indicated that students would benefit from more practical clinical training earlier in the program to bridge the gap between theory and practice better (Tuitoek, 2022). Today's clinical rotations begin in the program's second year, and students begin developing their practical skills alongside their theoretical learning.

A good example can be found in a recent case study at the University of Zambia that implemented early clinical training, which saw improvements in patient care outcomes (Kalusopa et al., 2023). Students assigned to local health facilities performed primary patient care by assisting with initial patient assessments and supervising routine procedures. The possible scenario is that students can perform a timely assessment,

initiate rehydration, and forward detailed recommendations for further evaluation to a supervisor when presented with a patient, for example, displaying signs of dehydration and weakness. The patient improves, but it is essential that the student 'learns confidence and competence to deal with real-world clinical situations.' Graduates with early clinical exposure have been better prepared to transition into the workforce, given their prior experience working in the healthcare environment and the opportunity to apply theory to practice.

### **Competency-Based Education**

Another curriculum update has been the shift to a competency-based education (CBE) model, moving from viewing course completion as the goal to emphasizing skill acquisition and clinical competencies. This model achieves the required competencies, such as the ability to demonstrate practice learning competencies, so that students can obtain essential skills before graduating (Tuitoek, 2022). Instead, competency-based education is measured through practical exams, examinations through simulations, and ongoing performance through clinical placement, where students are expected to have practical skills and knowledge in various areas, including patient assessment, diagnosis, treatment plans, and clinical procedures. An example of CBE's success is the experience of a graduate finding that they were able to detect signs of neonatal jaundice in a newborn during a rural placement. As a result of the competency-based curriculum, this student can receive early identification and initial management training on common neonatal conditions. CBE is inclined to prepare students with skills pertinent to patient outcomes, and this swift response prevents complications (Gravina, 2017; Kavili, 2020). Moreover, competency-based education has enabled graduates to independently perform more work in resource-limited settings, which is especially important in areas with high patient volumes and few healthcare providers.

### **Emerging Health Topics**

The curriculum reflects the global tendency for modern and technology integrated into healthcare solutions and has realized new courses in emerging health topics like mental health, digital health, and telemedicine to respond to the changing health needs in Kenya. The following topics have been added to equip graduates with knowledge and skills to address contemporary healthcare challenges and work on rapidly digitizing the medical landscape. For example, digital health now consists of training on electronic health records (EHRs) and mobile health applications, which are critical to healthcare delivery in Kenya (*MOH-VA: All courses / MOH-VA*, 2024). Students learn to document and retrieve patient data electronically and can better participate in coordinated, data-driven patient care (Ngugi et al., 2021). Using this training, students learn to prepare for the reality of healthcare practice when digital tools are used to manage and follow up with patients. In recognition of the rising burden of mental health disorders in Kenya, Okwembah (2023, July 3) reported that mental health education has also been incorporated into the curriculum. Mental health has previously been a neglected topic, with hardly any time spent on it in general health modules other than to maybe touch upon it briefly. Today, it is a core part of the program; modules on mental health screening, the most typical mental illnesses, and culturally acceptable mental health interventions have been added (McGorry et al., 2021). The resulting curriculum equips students with skills to diagnose and manage their patients' mental health problems, thereby playing a part in the overall holistic practice of healthcare.

Another vital addition is telemedicine, and its importance has been made clear in rural and underserved areas. Thus, students are exposed to the best practices in telemedicine, such as conducting virtual consultations, facilitating virtual communication through video conferencing, and following up on digital patients (Onsongo et al., 2023). With the COVID-19 pandemic, telemedicine became emphasized in continuing care without physical contact. For instance, there are examples of students participating in teleconsultations with supervising physicians during clinical placements to gain direct experience of remote patient interaction. Using telemedicine effectively after graduation is something that this experience prepares them for, as it will help them overcome geographic and resource barriers to care. The BSc Clinical Medicine curriculum integrates emerging health topics to effectively align with local healthcare needs and global best practices. These updates guarantee that as graduates, they will have more than the foundational clinical skills that have always been required (Kavili, 2020); they will also have the advanced competencies that are needed to match the omnipresent changing face in Kenya's healthcare delivery system (Tuitoek, 2022). Digital health, mental health, and telemedicine are included in the curriculum as a forward-looking approach to medical education to prepare clinical officers to provide care in urban and rural areas and embrace upcoming healthcare improvements.

## **V. Comparative Curriculum Analysis**

### **Local Relevance and Global Mobility**

The BSc Clinical Medicine curriculum in Kenya has been crafted in such a way as to address local healthcare needs while at the same time meeting global competencies so that the graduates can practice effectively both in and out. The program aims to produce COs who will confront prevalent health problems, especially in rural and underserved areas where a shortage of healthcare personnel is in dire

need (Njeru & Onguru, 2020). Consequently, the curriculum comprises modules on infectious diseases, maternal and child health, and non-communicable diseases (NCDs) that directly respond to Kenya's health profile. Curriculum focus areas are visually compared, and time spent in core areas, like infectious disease management, maternal health, and chronic disease management, show how the curriculum is designed to address national health needs. Graduate impact statistics also reveal that many Kenyan COs currently work in rural areas, serving at the community health center and clinic level, where they engage in primary care (Kavili, 2020; Linley, 2024; Oginga et al., 2024). It also makes the local relevance of the trained healthcare workforce the areas of greatest need and is based on foundational skills needed to be capacitated globally. Kenyan COs are global citizens and, directly or indirectly, are actively sought or considered for opportunities abroad. The Kenyan curriculum has been benchmarked with internationally acceptable standards, such as those from the World Health Organization (WHO) and the International Medical Education Directory (IMED). For example, the clinical competencies of Kenyan graduates in patient assessment, diagnosis, and acute care management are such that they are prepared to undertake international postgraduate programs (Kavili et al., 2020). Kenyan training of COs is curriculum aligned to enable the qualification by Kenyan trained COs to be recognized for further specialization or practice in another country; for example, some African countries and regions can accept the qualification through partnership due to the recognized equivalency of the qualifications.

### **International Curriculum Comparisons**

Comparing the Kenyan BSc Clinical Medicine curriculum with the curricula of both regions of similar settings (Nigeria, Uganda, and South Africa), there were similarities and areas for growth. Kenya focuses its curriculum for mid-level health providers on practical training and rural health, like Uganda, Nigeria, and South Africa. Also, they focus on community health and disease management, given that they share health burdens on maternal health challenges and infectious diseases (Couper et al., 2018). However, South African programs emphasize emergency preparedness and epidemiology, and Kenya's curriculum could devote more time to these particular public health competencies. In high-income countries, Physician Assistant (PA) or similar training focuses on specialized modules, such as advanced diagnostics and pharmacology, to allow PAs or similar to handle more complex clinical cases (Couper et al., 2018). While Kenyan COs receive foundational training on these topics, few, if any, have access to advanced diagnostic tools and technologies during their educational training. If exposed to such technologies, Kenyan graduates could be better trained in more diverse clinical settings. Moreover, interprofessional education (IPE) is practiced in curricula of high-income countries in favor of collaborative practice between the health disciplines. However, this needs to be addressed in Kenya's curriculum, though recent updates include workshops and simulations engaging students from different healthcare fields (Kavinya et al., 2023). Interprofessional education is valuable because of the involvement of COs who practice in community settings and who work with nurses and public health professionals. It may help strengthen team-based healthcare delivery.

### **Influence of Global Health Trends**

Global health trends have impacted curriculum development in Kenya, with emerging health crises such as the recent COVID-19 pandemic. In medicine, the pandemic has also shown a need for training in emergency response, infection control, and the use of digital health technologies, and the world's medical education has immediately responded (Rinke de Wit et al., 2022). This has translated to more pandemic prep, telemedicine, and PPE for COs in Kenya. Kenya's BSc Clinical Medicine curriculum has been designed so that pandemic-specific training modules for pandemic specific training were incorporated quite quickly, including managing COVID-19, respiratory care, and vaccination protocols, among others. Clinical training included case-based learning exercises and simulations on managing COVID-19 patients with a chance to practice relevant skills (Kavili et al., 2020). In the fight against COVID-19, Kenyan graduates were able to play a crucial role, adapting quite significantly quickly to the role of screening, testing, and providing primary care in such resource-limited environments.

Telemedicine has been integrated into the curriculum as another direct response to COVID-19, as there has been an increase in remote consultations during the pandemic (Onsongo et al., 2023; Wei & Lang'at, 2024). Preparing students to carry out virtual consultations on video platforms and deal with remote patient interactions has helped to hone them for a future when telemedicine is anticipated to be universal in healthcare delivery. That is because telemedicine has become the focus of medical training programs in high-income countries with well-developed digital health infrastructure (Haleem et al., 2021). However, implementing telemedicine is a limitation for Kenyan graduates in rural settings since there are infrastructural gaps. Kenya has yet to address these disparities as we try to keep our curriculum in line with global trends.

Other global health priorities, including antimicrobial resistance (AMR) and mental health, have also informed curriculum changes beyond COVID-19. For example, the WHO's push for AMR management has resulted in some new additions to the curriculum in Kenya based on training programs on responsible antibiotic

use, infection control practices, and AMR education (Njeru et al., 2023). Kenya's program reinforces these topics in keeping with a global mandate to combat AMR, which does not stop at the country's borders. Moreover, in line with the WHO's promotion of mental healthcare and understanding that mental healthcare is among the most burdened global health issues facing sub-Saharan Africa, mental health has been incorporated within the Kenyan curriculum as part of growing global health education (Okwembah, 2023, July 3). As a result, graduates learn to identify and manage mental health conditions commonly present in primary care, enabling them to improve the quality of holistic patient care in Kenya. Nevertheless, when compared to high-income countries where a person's mental health is ingrained in almost every aspect of their medical education, Kenya's curriculum still has much to improve on by way of depth and attention to mental health.

## **VI. Challenges In Curriculum Implementation**

Though essential to enhancing healthcare education, the evolution of Kenya's BSc in Clinical Medicine curriculum has had to grapple with several implementation challenges. These challenges need to be addressed to translate curriculum changes into healthcare delivery improvements. This means that the development of service learning in universities is accompanied by many challenges: resource limitation, institutional resistance, policy support, faculty development, and innovative solutions.

### **Resource Limitations**

According to the narrative review of diverse sources by Oginga et al. (2024), the need to meet the urgent demand for increased medical personnel in Kenya, on the one hand, and limited resources, on the other hand, are the biggest bottlenecks in rolling out the updated BSc Clinical Medicine curriculum. To meet the demands of a more hands-on, competency-based curriculum, medical schools and training institutions that need medical students must provide well-equipped laboratories, updated clinical facilities, and comprehensive libraries (Couper et al., 2018). However, in this case, many universities in rural areas work with minimal resources and old-fashioned equipment, preventing students from carrying out practical experiences and adhering to quality learning materials. This resource gap makes the quality and consistency of training across institutions a problem (McCowan, 2018). Urban medical school students benefit from superior infrastructure and exposure to medicine compared to their classmates in resource-deprived rural schools. This disparity is more consistent in the competency levels of graduates, weakening the quality of healthcare service delivery in the country (Kavili, 2020). In terms of limitations, funding also limits the availability of modern medical education technologies and even new technologies of simulation labs and digital learning platforms found in many modern institutions.

### **Institutional Resistance and Policy Needs**

A lack of support from academic institutions and entrenched educational norms has also prevented the change. Although some institutions take their sweet time adopting new practices, this is because of a need for more alignment with traditional teaching methods, too much emphasis is on the cost of change, and a lack of administrative support for novel approaches, as pointed out by Oginga et al. (2024). The move towards competency-based and early clinical training necessitates significant changes to teaching schedules, formative assessment, and faculty engagement, which can disrupt existing routines and curricula. As predicted by Amutabi (2019) and backed by the findings of Kavinya et al. (2023), progress is further complicated by the need for clear national policy guidelines for implementing curriculum change. To do this, policies are needed to support the modernization of medical education and provide a common framework by which curricula can be standardized for all institutions (Bai, 2020; Weisz & Nannestad, 2021). On the other hand, policies can include minimum clinical exposure requirements, competency evaluations, and incorporation of emergent health need topics. There is a role for government and other professional bodies, such as the Kenya Medical Practitioners and Dentists Council (KMPDC) in Kenya, in setting standards and even incentivizing institutions to adopt updated curricula (KMPDC, n.d.). Moreover, collaborating with regulatory agencies could help gain agreement on curriculum across regions, eliminate disparities, and encourage equitable access to quality education.

### **Faculty Development and Solutions**

A lack of development for instructors and faculty shortages creates other barriers to curriculum implementation. With many faculty not having clinical experience or advanced training in emerging health topics, such as digital health and mental health, there are not enough qualified instructors to teach hard and soft components, leaving most medical schools lacking sufficient instructors (Mbuthia et al., 2024). Although there are sometimes faculty around, their knowledge of modern instructional methods does not reflect current practices, and they need to be given sufficient professional development to teach what is now in the curriculum, which is the case in sub-Saharan African countries, as documented by Tadesse et al. (2024) in the case of Ethiopia. Innovative solutions are required to improve faculty skills, fill these gaps, and realize some potential.

One approach is using digital platforms to enhance faculty training by giving them access to online courses and virtual workshops on new curriculum elements or updated faculty training methods. As a low-cost solution, these platforms let instructors from different regions access resources and training without the hindrance of travel, which is often an obstacle in low-resource settings (dos Santos et al., 2022; Rakhmetov et al., 2024). Additionally, booking partnerships with international organizations and non-governmental organizations (NGOs) whose particular field is medical education would be additional resources for training and access to digital platforms designed for low- and middle-income countries. It morphs into partnering with NGOs and healthcare organizations that have experience supporting healthcare education in resource-limited settings. For instance, NGOs might help fund faculty development workshops, sponsor faculty fellowships, and provide resources for hands-on training where faculty could work in emergency care and telemedicine (Rajabi et al., 2021). Moreover, partnerships between international academic institutions may provide faculty exchange programs between high-resource and low-resource settings to bring valuable knowledge and skills back to the Kenyan curriculum. Knowledge, transfer, and a culture of continual learning among faculty members can be achieved through these programs, which is required to keep the curriculum relevant.

## **VII. Future Directions In Medical Education**

Consequently, the BSc in Clinical Medicine curriculum in Kenya has to keep up with the new health challenges, new health technologies, and new methods of education. Several critical areas for growth and innovation in medical education are looking forward to ensuring our graduates are ready to meet future demands (Tuitoek, 2022). These include identifying areas that need to be addressed ahead of time for the anticipated curriculum, including advancements in artificial intelligence (AI) and simulations, and providing a system to review the curriculum continuously.

### **Anticipated Curriculum Needs**

Global healthcare is changing; emerging health problems include but are not limited to the rise of Non-Communicable Diseases (NCDs) and mental health situations. NCDs in Kenya, like cardiovascular diseases, diabetes, and cancers, are on the rise, paralleling global trends and a more urgent need for health providers whose skills in diagnosis and care for chronic conditions have arisen as a result. Medical education in Kenya has traditionally been very heavily skewed toward infectious diseases for the reason that it has a very high burden of conditions like HIV/AIDS and malaria (Kavinya et al., 2023). However, the curriculum needs to be updated with content on NCDs so that the graduates can identify and manage NCDs. Another emerging healthcare education priority is mental health. Medical training has traditionally under-emphasized mental health issues, but now people know mental health problems are enormous contributors to disease burden. The high rates of mental health conditions, coupled with their aggravating socio-economic factors and limited access to mental health services, necessitates arming Clinical Medicine graduates with skills to manage psychological and psychiatric conditions (Sørvold et al., 2021). If these graduates are to be better prepared for holistic patient care, they must be required to complete mental health modules that cover both diagnosis and management. Future updates can be shaped by emerging health related to climate change and environmental health. With more extreme weather events and other climate impacts happening in Kenya, more healthcare providers will need to be trained to treat the health consequences – increased respiratory conditions and waterborne diseases. An updated curriculum that integrates these topics will allow healthcare professionals to respond to the changing healthcare needs of their communities.

### **AI, Simulation, and Training Trends**

The advancement of technology, especially artificial intelligence (AI) and simulation training, is changing medical education worldwide. These technologies promise to be integrated into the BSc Clinical Medicine curriculum in Kenya to improve learning outcomes and close the chasm between theory and practice (*AKU opens healthcare simulation center in Nairobi*, 2021). AI has great potential to revolutionize the delivery of medical training to improve diagnostic accuracy, streamline patient management, and increase the potential for data-driven decision-making. For example, AI algorithms can take in massive datasets and dissect patterns within them, providing insight into how diseases will progress. More so, virtual assistants and adaptive learning platforms are AI-enabled educational tools that deliver personalized feedback and support self-directed learning (Alowais et al., 2023). Integrating AI tools will allow Kenyan institutions to learn more efficiently, thereby making it easier for the institutions to attain optimal learning in resource-constrained settings where it might be a challenge to give individualized attention to each student.

Simulation labs also represent a critical component of future medical education. Student practice on high-fidelity simulation equipment such as mannequins and virtual reality (VR) systems is in a low-risk environment compared to actual patients. Simulation-based learning can significantly enhance the student's clinical competence and confidence in complex or emergencies. Establishing well-resourced simulation labs in



Kenyan medical schools will allow students to work on a broad spectrum of clinical skills, from basic procedures to advanced interventions that do not involve immediate reference to a clinical setting, as recommended by Kavinya et al. (2023). For example, a simulation-based module in emergency medicine can allow students to deploy their capabilities of cardiac arrest or trauma response while developing essential competencies that will lead to high-quality patient care. VR and AR open up possibilities to enrich anatomical training by interacting with the human body in 3D, where complex structures can be explored and manipulated within an interface that is not accessible by conventional teaching methods (Chytas et al., 2020; Zhou et al., 2021). The AI, combined with these technologies, can lead to improved learning experiences, be it immersive, facilitating captivating views and detail through retention. With more affordable simulation technology available, these tools may be integrated into the Clinical Medicine curriculum to provide a more engaging, hands-on educational experience that will better prepare students for clinical practice.

### **Continuous Curriculum Review**

In this fast-evolving healthcare environment, the BSc Clinical Medicine curriculum must constantly be reassessed and revised. A process for continuous curriculum review provides educational institutions with the opportunity to respond in a timely way to changes in healthcare needs, advances in technology, and global health priorities (Mbuthia et al., 2024). It increases the relevance of the curriculum and aligns it with local and international healthcare standards. A continuous and structured review process will require input from a variety of stakeholders, faculty, students, healthcare practitioners, and policymakers. Regular consultations with these groups can give beneficial feedback about the strengths and weaknesses of the curriculum and emerging content needs. For example, feedback from recent graduates can inform what critical gaps exist and need to be filled in practical training and areas where extra emphasis is needed, making the program flexible enough to respond to real-world needs if recent studies by Akinyi and Choge (2021) and Oginga et al. (2024) are taken seriously. Moreover, through partnerships with international medical institutions and organizations, Kenya's programs can adopt global best practices and standards into the curriculum, improving graduate mobility and increasing employability both locally and internationally. Continuous review also enables new methods in education, including blended learning, a combination of online and in-person education. With the flexibility to be more accessible, blended learning models have become popular. For medical students, a hybrid approach can offer the best of both worlds: a blending between the depth of classroom instruction and the flexibility of online resources, which allows students to have easier access to the material at their own pace (Vigilaloro et al., 2021). More online modules on foundational knowledge, like on the use of airbag algorithms, can be best thought for use by institutions to reserve in-person sessions for hands-on clinical training and simulation exercises.

## **VIII. Conclusion**

Kenya's BSc Clinical Medicine curriculum has changed from being a purely theoretical subject of six years of study to bridging the gap between theory and practice. This narrative review has made it clear that improvements have taken place through several significant developments in response to the local needs of health and international standards. Graduating classes receive clinical training early in their program for practical experience on the job, are engaging in a competency-based approach that emphasizes learning skills over rote knowledge, and are being trained in emerging health areas, including telemedicine and mental health, to serve 21st-century healthcare needs. These updates reflect a commitment to ensuring that graduates of Clinical Medicine are prepared to meet the varied and increasingly complex requirements of patient care in Kenya and beyond.

Several emerging trends are likely to determine the future trend of curriculum updates. With non-communicable disease and mental health issues showing increasing burden, the curriculum needs to be tailored for these emerging areas to enable the future poled COs to manage chronic conditions, including mental health needs effectively, and in parallel, deploy effective responses to infectious diseases. Beyond, health trends in the global arena, like the recent COVID-19 pandemic, highlight the requirement for adequate training in preparation for emergencies and on public health so that COs are ready to address a health crisis. Technological progress, especially in artificial intelligence (AI) and digital health, offers excellent opportunities to improve medical education. Digital health platforms expand access to telemedicine and fuel valuable skills that are relevant in a digitally connected world of healthcare. At the same time, AI-driven tools can suck up the diagnostic process and deliver data-driven insights. The applications of these technologies can result in an adaptive and interactive learning environment that is more congruent with real-world medical practice.

Finally, there is a need for a flexible and responsive curriculum that will produce clinical officers who will fit into Kenya's growing healthcare needs. The growth of Kenya's healthcare workforce requires a dynamic curriculum that is periodically reassessed, incorporating stakeholder feedback, new health trends, and technological advancements. With a BSc in clinical medicine and an educated workforce of highly skilled clinical officers, the program contributes positively to the delivery of quality healthcare for Kenyan

communities and shores up global health standards that promote mobility and competitiveness of graduates in the global healthcare field. The ongoing development of the curriculum has been a cornerstone of assurance that graduates of Clinical Medicine respond both to present and future health challenges, which, in turn, helps strengthen Kenya's healthcare system and contribute towards improving public health globally.

## References

- [1] Akinyi, D., & Choge, J. K. (2021). Clinical Officers: The Heart Of Kenyan Healthcare. *Social Innovations Journal*, 8(2021), 1-10. <https://socialinnovationsjournal.com/index.php/sij/article/download/978/729/3740#:~:Text=The%20birth%20of%20clinical%20officers,Patients%20in%20the%20healthcare%20system.>
- [2] Mbindyo, P., Blaauw, D., & English, M. (2013). The Role Of Clinical Officers In The Kenyan Health System: A Question Of Perspective. *Human Resources For Health*, 11, 1-11. <https://link.springer.com/content/pdf/10.1186/1478-4491-11-32.pdf>
- [3] Linley, K. (2024). Family Health Clinical Officers: Key Professionals To Strengthen Primary Healthcare In Kenya. *African Journal Of Primary Health Care & Family Medicine*, 16(1), 1-3. <https://www.scielo.org/za/pdf/phcfm/v16n1/77.pdf>
- [4] Oginga, F. O., Kulimankudya, V. D., & Okila, C. S. (2024). Integrating Clinical Officers Into Primary Healthcare Delivery In Kenya: Challenges, Innovations, And Future Directions. *International Journal Of Research And Scientific Innovation*, 11(15), 15-29. [https://www.researchgate.net/profile/Fredrick-Oginga/publication/383566878\\_Integrating\\_Clinical\\_Officers\\_Into\\_Primary\\_Healthcare\\_Delivery\\_In\\_Kenya\\_Challenges\\_Innovations\\_And\\_Future\\_Directions/links/66d5b568b1606e24c2ae6211/integrating-clinical-officers-into-primary-healthcare-delivery-in-kenya-challenges-innovations-and-future-directions.pdf](https://www.researchgate.net/profile/Fredrick-Oginga/publication/383566878_Integrating_Clinical_Officers_Into_Primary_Healthcare_Delivery_In_Kenya_Challenges_Innovations_And_Future_Directions/links/66d5b568b1606e24c2ae6211/integrating-clinical-officers-into-primary-healthcare-delivery-in-kenya-challenges-innovations-and-future-directions.pdf)
- [5] Halestrap, P., Aliba, D., Otieno, G., Brotherton, B. J., Gitura, H. W., Matson, J. E., ... & Mbugua, E. (2023). Development And Delivery Of A Higher Diploma In Emergency Medicine And Critical Care For Clinical Officers In Kenya. *African Journal Of Emergency Medicine*, 13(4), 225-229. <https://www.sciencedirect.com/science/article/pii/S2211419x23000411>
- [6] Zhao, Y., Osano, B., Were, F., Kiarie, H., Nicodemo, C., Gathara, D., & English, M. (2021). Characterising Hospitals' Suitability For Medical Officer Internship Training In Kenya: Analysis Of The Kenya Harmonized Health Facility Assessment. *Bmj Open Science*, 130-145. [https://iris.univ.it/bitstream/11562/1081911/1/Bmjopen\\_Yangxi.pdf](https://iris.univ.it/bitstream/11562/1081911/1/Bmjopen_Yangxi.pdf)
- [7] Krchn Course - AicKijabe College Of Health Sciences. (2017). *Kchs.Ac.Ke*. <https://kchs.ac.ke/clinicalofficer.php>
- [8] Kuria, E. M., Nyongesa, M. W., Choge, J. K., & Boruett, N. (2021). Factors Influencing Bachelor Of Science In Clinical Medicine Students Performance In Clinical Officer Council Licensure Examination, Kenya. *International Journal Of Community Health And Public Health*, 8(12), 5676-5681.
- [9] "Wfme Standards - World Federation For Medical Education." (N.D). The World Federation For Medical Education. <https://wfme.org/standards/>.
- [10] The Global Burden Of Disease Generating Evidence, Guiding Policy In Kenya A Report Produced By The Institute For Health Metrics And Evaluation And The International Centre For Humanitarian Affairs. (N.D.). [https://www.healthdata.org/sites/default/files/files/policy\\_report/2016/policyreport\\_the%20global-burden-of-disease-generating-evidence-guiding-policy\\_kenya\\_2016.pdf](https://www.healthdata.org/sites/default/files/files/policy_report/2016/policyreport_the%20global-burden-of-disease-generating-evidence-guiding-policy_kenya_2016.pdf)
- [11] Brotherton, B. J., Mbugua, E., Halestrap, P., & Lee, B. W. (2021). Covid-19 And The Need For Global Critical Care Training. Why Ventilators Alone Are Not The Answer. *Ats Scholar*, 2(1), 13-18. <https://www.atsjournals.org/doi/pdf/10.34197/ats-scholar.2020-0060ps>
- [12] Healthcare Workers (Clinical Officers) Level Of Preparedness In Response To Covid-19 Assessment Report. (N.D.). Retrieved November 14, 2024, From <https://www.kelinkenyia.org/wp-content/uploads/2020/05/Clinical-Officers-Level-Of-Preparedness-In-Response-To-Covid-19-Assessment-Report-Min.pdf>
- [13] Zainal, H., Xin, X., Thumboo, J., & Fong, K. Y. (2022). Medical School Curriculum In The Digital Age: Perspectives Of Clinical Educators And Teachers. *Bmc Medical Education*, 22(1), 428. <https://link.springer.com/content/pdf/10.1186/s12909-022-03454-z.pdf>
- [14] Mutuku, S. N. (2022). Telemedicine As A Mechanism For Providing Accessible Medical Care: What Are The Determinants Of Its Adoption In Nairobi County? A Case Of Mp Shah (Doctoral Dissertation, Strathmore University). <https://su-plus.strathmore.edu/server/api/core/bitstreams/2c20f5fa-54db-454c-ba00-c20b2075f277/content>
- [15] Onsongo, S., Kamotho, C., Rinke De Wit, T. F., & Lowrie, K. (2023). Experiences On The Utility And Barriers Of Telemedicine In Healthcare Delivery In Kenya. *International Journal Of Telemedicine And Applications*, 2023(1), 1487245. <https://onlinelibrary.wiley.com/doi/pdf/10.1155/2023/1487245>
- [16] Tuitoek, D. J. (2022). Perceptions On Clinical Training Among Bachelor Of Science (In-Service) Nursing Students At Kenya Methodist University, Nairobi Campus (Doctoral Dissertation, Kemu). <http://repository.kemu.ac.ke:8080/bitstream/handle/123456789/1536/Doris%20jtuioek%20final%20thesis.pdf?sequence=1&isallowed=Y>
- [17] Aku Opens Healthcare Simulation Center In Nairobi. (2021). *Www.Aku.Edu*. [https://www.aku.edu/news/pages/news\\_details.aspx?nid=news-002558](https://www.aku.edu/news/pages/news_details.aspx?nid=news-002558)
- [18] Kavinya, M. P., Lugulu, J., & Mosol, P. (2023). Examining The Challenges Affecting The Application Of Innovative Simulation-Based Teaching And Learning Among Teaching Staff In Selected Kenya Medical Training College Campuses Offering Medical Laboratory Sciences In Kenya. *Int J Trop Dis*, 6, 071. [https://www.researchgate.net/profile/Prominah-Muia/publication/371350339\\_Examining\\_The\\_Challenges\\_Affecting\\_The\\_Application\\_Of\\_Innovative\\_Simulation-Based\\_Teaching\\_And\\_Learning\\_Among\\_Teaching\\_Staff\\_In\\_Selected\\_Kenya\\_Medical\\_Training\\_College\\_Campuses\\_Offering\\_Medical\\_Laboratory\\_Sciences\\_In\\_Kenya/links/64804d3e79a722376515c9a5/Examining-The-Challenges-Affecting-The-Application-Of-Innovative-Simulation-Based-Teaching-And-Learning-Among-Teaching-Staff-In-Selected-Kenya-Medical-Training-College-Campuses-Offering-Medical-Laboratory-Sciences-In-Kenya.pdf](https://www.researchgate.net/profile/Prominah-Muia/publication/371350339_Examining_The_Challenges_Affecting_The_Application_Of_Innovative_Simulation-Based_Teaching_And_Learning_Among_Teaching_Staff_In_Selected_Kenya_Medical_Training_College_Campuses_Offering_Medical_Laboratory_Sciences_In_Kenya/links/64804d3e79a722376515c9a5/Examining-The-Challenges-Affecting-The-Application-Of-Innovative-Simulation-Based-Teaching-And-Learning-Among-Teaching-Staff-In-Selected-Kenya-Medical-Training-College-Campuses-Offering-Medical-Laboratory-Sciences-In-Kenya.pdf)
- [19] Njeru, S. K., & Onguru, D. (2020). Evaluating Clinical Medicine Training Outcomes In Western Kenya. *Advance Research Journal Of Medical And Clinical Science*, 6(05), 140-153. <http://www.arjmcs.info/index.php/arjmcs/article/view/139>
- [20] Chandler. (2024, June 10). How Unlocking The Power Of Alumni Surveys Can Drive Educational Improvement. *Faculty Focus | Higher Ed Teaching & Learning*. <https://www.facultyfocus.com/articles/teaching-and-learning/how-unlocking-the-power-of-alumni-surveys-can-drive-educational-improvement/>
- [21] Mai, D. H., Taylor-Fishwick, J. S., Sherred-Smith, W., Pang, A., Yaworsky, J., Whitty, S., ... & Dobrian, A. D. (2020). Peer-Developed Modules On Basic Biostatistics And Evidence-Based Medicine Principles For Undergraduate Medical Education. *Mededportal*, 16, 11026. [https://www.mededportal.org/doi/full/10.15766/mep\\_2374-8265.11026](https://www.mededportal.org/doi/full/10.15766/mep_2374-8265.11026)

- [22] Kavili, J. N. K., Mutinda, A. K., & Kithinji, W. K. (2020). The Influence Of Clinical Nurse Instructor Practices On Clinical Performance Among Bachelor Of Science In Nursing (Bscn) Students In Kenya. *Journal Of Health, Medicine And Nursing*, 5(3), 78-102. <https://www.prjhb.org/journals/index.php/jhmn/article/download/1124/1239>
- [23] Kalusopa, V. M., Katowa-Mukwato, P., Chitundu, K., Mvula, M., Nzala, S., Kabinga-Makukula, M., ... & Goma, F. (2023). Experiences Of Early And Enhanced Clinical Exposure For Postgraduate Neonatal Nursing Students At The University Of Zambia, School Of Nursing Sciences: Lessons And Implications For The Future. *Open Journal Of Nursing*, 13(6), 352. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10469329/>
- [24] Gravina, E. W. (2017). Competency-Based Education And Its Effect On Nursing Education: A Literature Review. *Teaching And Learning In Nursing*, 12(2), 117-121. <https://www.sciencedirect.com/science/article/pii/S1557308716300944>
- [25] Moh-Va: All Courses | Moh-Va. (2024). *Health.Go.Ke*. <https://elearning.health.go.ke/course/index.php?categoryid=10>
- [26] Ngugi, P., Babic, A., & Were, M. C. (2021). A Multivariate Statistical Evaluation Of Actual Use Of Electronic Health Record Systems Implementations In Kenya. *Plos One*, 16(9), E0256799. <https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0256799&type=printable>
- [27] Okwembah, N. (2023, July 3). Ntv Kenya: Education Stakeholders Work On Curriculum To Teach Learners How To Cope With Mental Health Issues. Ntv Kenya. <https://ntvkenya.co.ke/news/education-stakeholders-work-on-curriculum-to-teach-learners-how-to-cope-with-mental-health-issues/>
- [28] Onsongo, S., Kamotho, C., Rinke De Wit, T. F., & Lowrie, K. (2023). Experiences On The Utility And Barriers Of Telemedicine In Healthcare Delivery In Kenya. *International Journal Of Telemedicine And Applications*, 2023(1), 1487245. <https://onlinelibrary.wiley.com/doi/pdf/10.1155/2023/1487245>
- [29] Linley, K. (2024). Family Health Clinical Officers: Key Professionals To Strengthen Primary Healthcare In Kenya. *African Journal Of Primary Health Care & Family Medicine*, 16(1), 1-3. <https://www.scielo.org/za/pdf/phcfm/V16n1/77.pdf>
- [30] Couper, I., Ray, S., Blaauw, D., Ng'wenja, G., Muchiri, L., Oyungu, E., ... & Fonn, S. (2018). Curriculum And Training Needs Of Mid-Level Health Workers In Africa: A Situational Review From Kenya, Nigeria, South Africa And Uganda. *Bmc Health Services Research*, 18, 1-12. <https://link.springer.com/content/pdf/10.1186/s12913-018-3362-9.pdf>
- [31] Haleem, A., Javaid, M., Singh, R. P., & Suman, R. (2021). Telemedicine For Healthcare: Capabilities, Features, Barriers, And Applications. *Sensors International*, 2, 100117. <https://www.sciencedirect.com/science/article/pii/S2666351121000383>
- [32] Rinke De Wit, T. F., Janssens, W., Antwi, M., Milimo, E., Mutegi, N., Marwa, H., ... & Spieker, N. (2022). Digital Health Systems Strengthening In Africa For Rapid Response To Covid-19. *Frontiers In Health Services*, 2, 987828. <https://www.frontiersin.org/articles/10.3389/frhs.2022.987828/pdf>
- [33] Wei, C. R., & Lang'at, G. C. (2024). Utilization Of Telehealth In Kenya During Covid-19. *Coronaviruses*, 5(2), 5-7. [https://www.researchgate.net/profile/Godwin-Langat/publication/375682198\\_Utilization\\_Of\\_Telehealth\\_In\\_Kenya\\_During\\_Covid-19/links/65589ffcb1398a779d992435/Utilization-Of-Telehealth-In-Kenya-During-Covid-19.pdf](https://www.researchgate.net/profile/Godwin-Langat/publication/375682198_Utilization_Of_Telehealth_In_Kenya_During_Covid-19/links/65589ffcb1398a779d992435/Utilization-Of-Telehealth-In-Kenya-During-Covid-19.pdf)
- [34] Njeru, J., Odero, J., Chebore, S., Ndung'u, M., Tanui, E., Wesangula, E., ... & Thaiyah, A. (2023). Development, Roll-Out And Implementation Of An Antimicrobial Resistance Training Curriculum Harmonizes Delivery Of In-Service Training To Healthcare Workers In Kenya. *Frontiers In Microbiology*, 14, 1142622. <https://www.frontiersin.org/articles/10.3389/fmicb.2023.1142622/pdf>
- [35] Mccowan, T. (2018). Quality Of Higher Education In Kenya: Addressing The Conundrum. *International Journal Of Educational Development*, 60, 128-137. <https://discovery.ucl.ac.uk/id/eprint/10043348/1/Quality%20of%20he%20in%20kenya,%20author%20version.pdf>
- [36] Amutabi, M. N. (2019). Competency Based Curriculum (Cbc) And The End Of An Era In Kenya's Education Sector And Implications For Development: Some Empirical Reflections. *Journal Of Popular Education In Africa*, 3(10), 45-66. [https://www.researchgate.net/profile/Maurice-Amutabi-2/publication/350174401\\_Competency\\_Based\\_Curriculum\\_Cbc\\_And\\_The\\_End\\_Of\\_An\\_Era\\_In\\_Kenya's\\_Education\\_Sector\\_And\\_Implications\\_For\\_Development\\_Some\\_Empirical\\_Reflections/links/606e971ca6fdcc5f778cab60/Competency-Based-Curriculum-Cbc-And-The-End-Of-An-Era-In-Kenya's-Education-Sector-And-Implications-For-Development-Some-Empirical-Reflections.pdf](https://www.researchgate.net/profile/Maurice-Amutabi-2/publication/350174401_Competency_Based_Curriculum_Cbc_And_The_End_Of_An_Era_In_Kenya's_Education_Sector_And_Implications_For_Development_Some_Empirical_Reflections/links/606e971ca6fdcc5f778cab60/Competency-Based-Curriculum-Cbc-And-The-End-Of-An-Era-In-Kenya's-Education-Sector-And-Implications-For-Development-Some-Empirical-Reflections.pdf)
- [37] Weisz, G., & Nannestad, B. (2021). The World Health Organization And The Global Standardization Of Medical Training, A History. *Globalization And Health*, 17(1), 96. <https://link.springer.com/content/pdf/10.1186/s12992-021-00733-0.pdf>
- [38] Bai, H. (2020). Focus: Medical Education: Modernizing Medical Education Through Leadership Development. *The Yale Journal Of Biology And Medicine*, 93(3), 433. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7448395/>
- [39] Kenya Medical Practitioners And Dentists Council – Ensuring Quality Health Care. (N.D.). *Kmpdc.Go.Ke*. <https://kmpdc.go.ke/>
- [40] Tadesse, D., Solomon, Y., Hailu, M., & Tigistu, F. (2024). Challenges Of Clinical Education: From The Perspective Of Clinical Instructors And Clinical Staffs At Dire Dawa University, Dire Dawa, Ethiopia, Qualitative Study. *Journal Of Medical Education And Curricular Development*, 11, 23821205241249378. <https://journals.sagepub.com/doi/pdf/10.1177/23821205241249378>
- [41] Dos Santos, V. M., Cernev, A. K., Saraiva, G. M. M., & Bida, A. G. (2022). Faculty Experience And Digital Platforms In Education. *Revista De Gestão*, 29(3), 252-266. <https://www.emerald.com/insight/content/doi/10.1108/Rege-05-2021-0090/full.pdf>
- [42] Rakhmetov, M., Kuanbayeva, B., Saltanova, G., Zhusupkalieva, G., & Abdykerimova, E. (2024, July). Improving The Training On Creating A Distance Learning Platform In Higher Education: Evaluating Their Results. In *Frontiers In Education* (Vol. 9, P. 1372002). *Frontiers Media Sa*. <https://www.frontiersin.org/journals/education/articles/10.3389/feduc.2024.1372002/pdf>
- [43] Søvdal, L. E., Naslund, J. A., Kousoulis, A. A., Saxena, S., Qoronfleh, M. W., Grobler, C., & Münter, L. (2021). Prioritizing The Mental Health And Well-Being Of Healthcare Workers: An Urgent Global Public Health Priority. *Frontiers In Public Health*, 9, 679397. <https://www.frontiersin.org/articles/10.3389/fpubh.2021.679397/pdf>
- [44] Alowais, S. A., Alghamdi, S. S., Alsuhebany, N., Alqahtani, T., Alshaya, A. I., Almohareb, S. N., ... & Albekairy, A. M. (2023). Revolutionizing Healthcare: The Role Of Artificial Intelligence In Clinical Practice. *Bmc Medical Education*, 23(1), 689. <https://link.springer.com/content/pdf/10.1186/s12909-023-04698-z.pdf>
- [45] Zhou, Y., Hou, J., Liu, Q., Chao, X., Wang, N., Chen, Y., ... & Diwu, Y. (2021). [Retracted] Vr/Ar Technology In Human Anatomy Teaching And Operation Training. *Journal Of Healthcare Engineering*, 2021(1), 9998427. <https://onlinelibrary.wiley.com/doi/pdf/10.1155/2021/9998427>
- [46] Chytas, D., Johnson, E. O., Piagkou, M., Mazarakis, A., Babis, G. C., Chronopoulos, E., ... & Natsis, K. (2020). The Role Of Augmented Reality In Anatomical Education: An Overview. *Annals Of Anatomy-AnatomischerAnzeiger*, 229, 151463. <https://www.academia.edu/download/110481819/J.Aanat.2020.15146320240115-1-UwI9s9.Pdf>

- [47] Vigliarolo, R. M., Condino, S., Turini, G., Carbone, M., Ferrari, V., & Gesi, M. (2021). Augmented Reality, Mixed Reality, And Hybrid Approach In Healthcare Simulation: A Systematic Review. *Applied Sciences*, 11(5), 2338. <https://www.mdpi.com/2076-3417/11/5/2338/Pdf>
- [48] Kaguthi, G. K., Nduba, V., & Adam, M. B. (2020). The Impact Of The Nurses', Doctors' And Clinical Officer Strikes On Mortality In Four Health Facilities In Kenya. *Bmc Health Services Research*, 20, 1-10. <https://link.springer.com/content/pdf/10.1186/s12913-020-05337-9.pdf>
- [49] Mbuthia, G., Rensburg, G. R., & Shaibu, S. (2024). Clinical Experiences Of Rn To Bscn Nursing Students In Kenyan Universities. *Journal Of Nursing Education And Practice*, 14(5), 1. [https://ecommons.aku.edu/cgi/viewcontent.cgi?article=1518&context=EastAfrica\\_Fhs\\_Sonam](https://ecommons.aku.edu/cgi/viewcontent.cgi?article=1518&context=EastAfrica_Fhs_Sonam)
- [50] McGorry, P. D., Mei, C., Chanen, A., Hodges, C., Alvarez- Jimenez, M., & Killackey, E. (2022). Designing And Scaling Up Integrated Youth Mental Health Care. *World Psychiatry*, 21(1), 61-76. <https://onlinelibrary.wiley.com/doi/pdfdirect/10.1002/wps.20938>
- [51] Rajabi, M., Ebrahimi, P., & Aryankhesal, A. (2021). Collaboration Between The Government And Nongovernmental Organizations In Providing Health-Care Services: A Systematic Review Of Challenges. *Journal Of Education And Health Promotion*, 10(1), 242. [https://journals.lww.com/jehp/\\_layouts/15/Oaks.Journals/Downloadpdf.aspx?An=01679914-202110000-00233](https://journals.lww.com/jehp/_layouts/15/Oaks.Journals/Downloadpdf.aspx?An=01679914-202110000-00233)