Review

CLIAREM Model: A novel framework for postgraduate medical education in Sub-Saharan Africa

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Abstract

Background: An educational model serves as a systematic framework that delineates the structure and execution of an educational program. CLIAREM encompasses Clinical competencies, Leadership abilities, Instructional proficiency, Advocacy capabilities, Research expertise, Entrepreneurial and innovative skills, and Mentoring abilities. This paper intends to explore the elements, significance, and implementation of the innovative CLIAREM model for postgraduate medical education.

Methods: Utilizing suitable terminology, comprehensive searches were conducted in electronic medical databases including PubMed, Google Scholar, SCOPUS, and the African Journal Online (AJOL).

Results: In many countries in Sub-Saharan Africa, the existing postgraduate medical curricula are often derived from foreign sources and fail to address local and current needs, resulting in healthcare providers who may lack critical social skills. This scenario is unsustainable in the modern context, and a comprehensive and adaptable approach, exemplified by the CLIAREM model, presents the most effective and straightforward means to drive this transformation.

Conclusion: CLIAREM is a groundbreaking method that tackles the difficulties encountered in postgraduate medical education, particularly in under-resourced areas like sub-Saharan Africa. It signifies a fundamental change from the earlier notion that a clinician could treat patients but was unable to carry out other vital roles because of insufficient focus in the training curriculum.

Keywords: "Curriculum", "CLIAREM", "Medical education", "Postgraduate training", "Sub-Saharan Africa"

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INTRODUCTION

An educational model is defined as a structured framework that outlines the organization and implementation of an educational program aimed at maximizing learner potential.[1] It represents a strategic design that specifies the what, why, how, and where of the foundational elements that must be established before an educator can facilitate the intended behavioral transformation and skill development in students. In the absence of a clear blueprint for aligning the objectives of both educators and learners, the learning process tends to become chaotic, lacking direction and effectiveness, ultimately leading to a waste of resources.[2] As illustrated in **figure 1**, the educational model encompasses the entirety of events that facilitate the transfer of knowledge, attitudes, and skills from the trainer to the trainee. In regions like Sub-Saharan Africa, where resources are limited, it is essential to develop and implement an educational model that recognizes the unique characteristics of the environment. This model should emphasize the strategic integration of these scarce resources to generate value that is beneficial at the local level while also being competitive on a global scale.
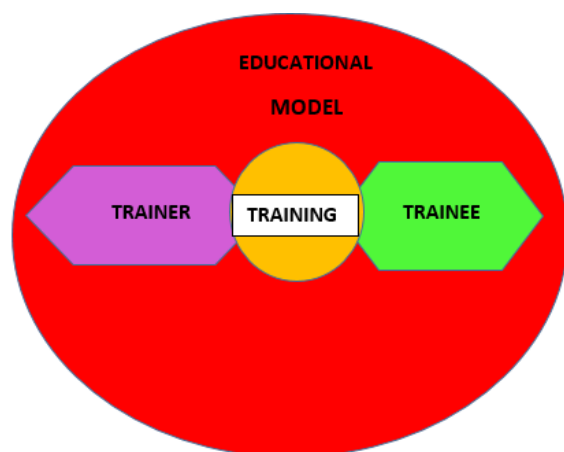

Figure 1: *Educational model encompasses skill transmission between trainer and trainee*

The World Federation for Medical Education (WFME) defines postgraduate medical education as the phase during which medical doctors, having successfully obtained their foundational medical qualifications and holding the necessary licenses to practice, engage in additional organized training by approved medical supervisors and educators.[3] This training is designed to develop specialized skills that empower them to practice autonomously, providing safe, evidence-based services and opinions that exceed the fundamental level of medical competence.[4] In many Sub-Saharan African nations, a regulatory body, which can be either government-operated or independent, is tasked with the responsibility of admitting physicians for training, developing the curriculum, overseeing the training process, and conducting exit skill assessments. These evaluations may culminate in the granting of a "Fellowship" or "Membership" in the postgraduate training organization.

The influence of colonialism has led many countries in Sub-Saharan Africa to adopt educational models, from primary to tertiary levels, which are derived from their colonial rulers.[5] Consequently, it is common to find that nations formerly colonized by Britain implement postgraduate medical education systems that closely resemble those used in Britain.[6] The primary limitation of this approach is that the Euro-American postgraduate medical education curriculum was developed without considering the unique characteristics of African nations, resulting in its often ineffective application on the continent. Therefore, there is a pressing need for a modern postgraduate medical education model that takes into account local contexts, global relevance, as well as the historical and future landscape of medical practice in Sub-Saharan Africa. This is where the CLIAREM model becomes essential. As depicted in figure 2, CLIAREM stands for Clinical competencies, Leadership abilities, Instructional proficiency, Advocacy capabilities, Research expertise, Entrepreneurial and innovative abilities, and Mentoring skills.

This paper seeks to explore the elements, significance, and implementation of the innovative CLIAREM model within postgraduate medical education in Sub-Saharan Africa. Extensive searches were conducted in electronic medical databases including PubMed, Google Scholar, SCOPUS, and the African Journal Online (AJOL). Additionally, the grey literature was examined. The search terms employed included 'medical education', 'postgraduate training', 'curriculum', 'residency training', 'clinical leadership', 'mentoring', 'innovation', 'clinical advocacy', 'research', as well as each of the 49 countries in Sub-Saharan Africa, such as 'Nigeria' and 'South Africa', and 'medical entrepreneurship'. Boolean operators like 'and' and 'or' were utilized as appropriate.

C- Clinical competencies

L- Leadership abilities

I- Instructional proficiency

A- Advocacy capabilities

R- Research expertise

E- Entrepreneurial and innovati

M- Mentoring skills

Figure 2: *Components of the CLIAREM model*

Why the new CLIAREM model?

Change is an ever-present phenomenon, serving as a catalyst for innovation and progress. The traditional curriculum models currently employed in many regions of Sub-Saharan Africa are rooted in the scientific and socioeconomic contexts of their time of creation.[7] As these contexts have evolved, there arises a pressing necessity for a new curriculum that aligns with the modern realities of Africa, particularly in its ambition to become a significant player in the global economy. For instance, African nations represent approximately 25% of the world's fastest-growing economies, which implies that healthcare needs and challenges will inevitably shift.[8,9] This underscores the importance of developing a framework that is responsive to these emerging trends. Furthermore, the postgraduate medical programs adopted from Euro-American countries have significantly contributed to the development of health human capital and a workforce in the health sector that is attuned to the needs of their respective nations.[10] These professionals are also capable of migrating and integrating into other developed countries with ease and effectiveness. At present, the models of postgraduate medical education differ greatly among Sub-Saharan African nations, which can be attributed in part to the

diverse influences of their colonial rulers and the subsequent cultural exchanges in the post-colonial period.[11] Nevertheless, to achieve strong regional integration and effective collaboration, particularly in healthcare delivery, a standardized postgraduate curriculum is essential. This curriculum serves as a framework for guiding advancements in the health sectors of these countries, highlighting the significance of the innovative CLIAREM model in this context.

An alternative viewpoint is that the Euro-American postgraduate medical education frameworks are regularly updated and revised, yet the Sub-Saharan African countries that have implemented these frameworks often overlook these changes.[6] As a result, their existing curricula have become outdated, making the development of a new curriculum essential. As a result, while developed nations have shifted their focus from solely clinical knowledge to encompass vital non-clinical skills, character, and suitable technology, Sub-Saharan Africa remains entrenched in a rigid mindset that views a specialist physician as solely concerned with clinical competencies. The CLIAREM model offers a solution to this impasse.

Postgraduate medical education frameworks in developed countries are the result of thorough research, comprehensive analysis, and critical evaluation.[12] In contrast, the scenario in Sub-Saharan Africa is markedly different, characterized by a lack of sufficient data and limited analysis regarding actual needs and future forecasts. Consequently, it is not surprising that successful approaches from abroad have proven ineffective in local contexts. This situation underscores the necessity for stakeholders to reconsider their strategies and explore alternative models, such as the CLIAREM model.

Additionally, it is frequently noted that the postgraduate medical education systems in many Sub-Saharan African nations exhibit a limited emphasis on inter-professional collaboration and inter-sectoral cooperation.[13,14] Consequently, there is a pressing need to move away from the traditional model where specialist clinicians struggle to connect with their peers and fail to engage effectively with the initiatives and strategies of professionals in other sectors. This has resulted in highly skilled clinicians who lack essential social competencies. Such a situation is not viable in today's world, and a comprehensive approach, like the CLIAREM model,

offers the most effective and straightforward solution to facilitate this change. The contemporary clinician, particularly at the postgraduate level, is required to have a fundamental grasp of finance and economics to comprehend the business aspects of the healthcare industry.[15] It is crucial to have a basic understanding of how the different elements of this sector, from an entrepreneurial perspective, come together to form a complex yet functional system in today's environment.

The rapid expansion of educational technology, particularly artificial intelligence, is transforming the understanding of effective learning methods.[16] Consequently, the integration of these technologies has prompted a significant shift in medical education policies and frameworks, successfully implemented in developed countries, yet still elusive in Africa. To bridge the existing infrastructural and technological gaps in Sub-Saharan Africa, a new framework for postgraduate medical education is crucial. Innovation is the heart beat of progress. Exploring new experiences brings an emotional excitement and a positive mindset, frequently leading to unexpected achievements. Many historical discoveries have emerged from this distinctive journey. Once more, due to the singular clinical emphasis prevalent in numerous postgraduate medical education frameworks in Sub-Saharan Africa, the significance of developing and showcasing teamwork and leadership skills has been unduly minimized.[17] Consequently, it is not unusual to encounter healthcare sectors that are deficient in leadership regarding strategic planning and vision dissemination, highlighting the shortcomings of the current training model and underscoring the necessity for an improved approach. At times, a fresh strategy is necessary to fully understand the limitations of the previous method. Employing a comprehensive framework that cultivates a well-rounded clinician, who is both adaptable and knowledgeable, is more cost-effective, quicker, and efficient than developing separate curricula or potentially academic programs to reach the same goal.[18] Notably, various sectors in Sub-Saharan Africa, including engineering and agriculture, are also revamping their postgraduate programs to facilitate seamless integration and enhance capacity. It would be unusual for medical education to lag in this regard.

The attributes of the CLIAREM model
The CLIAREM model represents a versatile and comprehensive educational framework specifically tailored for postgraduate medical training, particularly in low and middle-income countries, such as those in Sub-Saharan Africa. An educational or curriculum model may be problem-centered, learner-centered, or subject-centered; however, the CLIAREM model serves as a comprehensive framework that combines these three distinct approaches to improve effectiveness and address the needs of the community.[19] This model is also suitable for adaptation in undergraduate medical education and other health science disciplines, including Nursing, Physiotherapy, and Medical Laboratory Science. It serves as a foundational guide for curriculum development aimed at advanced physicians, advocating for a shift away from the traditional focus of medical education—whether at the undergraduate or postgraduate level—on clinical competencies alone. In today's world, it is essential for postgraduate or specialist physicians to possess not only clinical skills but also proficiency in other critical areas that are equally significant. The elements illustrated in figure 2 will be examined in detail in the subsequent sections. Each element will be examined through six dimensions and five stages. The dimensions, as shown in **figure 3**, include 'what', 'why', 'how', 'where', 'when', and 'evaluation'. The stages consist of 'beginner', 'insecure', 'confident', 'mastery', and 'coach'.

The six dimensions of CLIAREM
The dimensions of CLIAREM illustrate the different viewpoints through which the model is interpreted and utilized in postgraduate medical education, particularly in a developing area such as Sub-Saharan Africa. These dimensions address six fundamental questions regarding the framework.
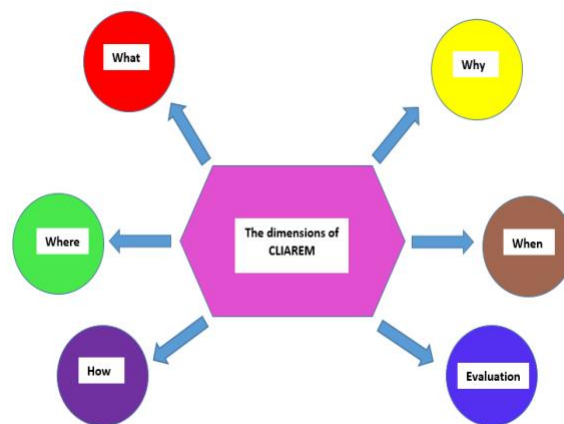

Figure 3: *The dimensions of CLIAREM*

1. **What is the content?**

The content refers to the subject matter relevant to each element of CLIAREM. It encompasses the competencies, skills, attitudes, and character traits anticipated within each domain of the model. This delineates what educators or supervisors are responsible for imparting and what learners are expected to absorb.

2. **Why is the domain?**

It is insufficient to merely expose learners to a body of knowledge; the objectives of the learning process must be clearly articulated and comprehended to facilitate a deeper understanding of the material. When the purpose of the educational experience is not explicitly defined, learners may exhibit significant reluctance and resistance to cognitive development.

3. **How will the learning process take place?**

This addresses the inquiry regarding educational methodology. It emphasizes the pedagogical strategy designed to fulfill the curriculum's objective of promoting the development of essential skills, knowledge, attitudes, and character.

4. **Where will the curriculum be administered**

The CLIAREM educational model is tailored for postgraduate medical education, especially in Sub-Saharan Africa. It is crucial for the model to clearly define the environments in which this learning occurs. Specific locations such as clinics, wards, classrooms, practical laboratories, and other pertinent settings must be distinctly outlined to guarantee consistency and reproducibility, both of which are vital for the effective execution of the framework.

5. **When will the learning take place**

The framework is intended for individuals who possess a foundational medical education. A screening process must establish the necessary level of exposure and expertise required to begin postgraduate training. Key components of the CLIAREM model in its implementation include its duration, stages, phases, and expectations.

6. **How will it be evaluated**

Evaluation plays a vital role in the development of curricula, and the implementation of the CLIAREM model must clearly outline the methods by which each component or domain of the framework will be assessed to ensure that learning has effectively occurred.

The stages of learning in the CLIAREM model

A fundamental characteristic of an educational model is the time required for complete implementation, which results in learners being categorized into different stages of learning and development. The curriculum is structured to facilitate a seamless transition from basic to advanced levels. The CLIAREM model for postgraduate medical education, as depicted in **figure 4**, consists of five distinct stages, which will be elaborated upon in the following sections.

Figure 4: *The stages of CLIAREM*

Stage 1 (Beginner stage)

At this point, the learner is beginning to engage with the postgraduate medical curriculum and is thus not yet fully cognizant of the extensive knowledge, skills, character, and attitudes that are anticipated of them. This marks the initial phase where the fundamental principles of each domain are introduced and absorbed. At this stage, the learner is unable to perform any tasks independently and requires close supervision due to a high susceptibility to fundamental mistakes. They need considerable guidance, mentoring, and support to fully understand the expectations placed upon them.

Stage 2 (Insecure stage)

The student is starting to grasp the fundamental concepts of postgraduate medicine; however, their practical experience remains quite restricted, preventing them from being entrusted with substantial responsibilities. The student lacks confidence in their capabilities and is uncertain about their ability to perform tasks without oversight. At this stage, the likelihood of making mistakes is notably elevated, even though there is a strong desire to engage in independent work. The student is beginning to acclimate to their environment but struggles to differentiate between the technical aspects of their tasks.

Stage 3 (Confident stage)

At this stage, the learner demonstrates a solid understanding of fundamental principles and possesses a good familiarity with the practical aspects of the subject. However, they have not yet taken on significant responsibilities without supervision. The learner is

capable of tutoring peers in stages I and II, but they still find the more complex elements of the work, which require innovative thinking, to be unfamiliar. Their experience with independent tasks remains limited, and they continue to need considerable oversight. Although the likelihood of errors is still relatively high, it is decreasing, and the learner is starting to develop confidence in handling tasks without supervision.

Stage 4 (Mastery stage)

This individual is an advanced postgraduate student with considerable experience in independent task execution. They possess a strong understanding of both fundamental and applied principles related to postgraduate medical practice. While the likelihood of making errors is minimal, it remains a notable concern. They are capable of effectively supervising less experienced learners. A defining feature of this stage is the relatively low number of complex cases encountered. Simple cases are managed with ease and confidence; however, they still require guidance and some supervision when faced with more intricate situations. At this level, learners have acquired local competencies and can benefit from exposure to international skills through exchange training or global experiences.

Stage 5 (Coach Stage)

This individual has gained extensive exposure and possesses the confidence to perform both straightforward and intricate tasks independently. At this exit stage, an evaluation is conducted, leading to the learner being officially recognized as an "expert" or "consultant." Learning remains an ongoing journey, and the learner continues to benefit from the profound insights of their supervisors. However, they have acquired sufficient experience to manage even unfamiliar situations effectively. Additionally, they are equipped to mentor less experienced learners and can competently represent the supervisor in certain situations.

The components of CLIAREM model

The different elements of the CLIAREM model are illustrated in Figure 2 and will be examined sequentially in the following sections.

Clinical Competency

Clinical competency is the composite capacity to exhibit clinical skills, demonstrate pertinent knowledge, express a suitable attitude, and display acceptable conduct while providing safe healthcare in accordance with established standards and guidelines. In other words, the fundamental elements of clinical competency for evaluation include conceptual knowledge, psychomotor skills, attitudinal framework, ethical conduct, safety practices, and quality of care. Conceptual knowledge refers to the comprehension of the underlying principles and theories upon which a subject or topic is built [20]. It addresses the question of 'why.' A learner must be able to articulate the facts and figures associated with a particular clinical event. This knowledge involves the practical application of established principles to link ideas, relate causes to consequences, anticipate the progression of a disease, and convey logical conclusions. Psychomotor clinical skills encompass the combination of cognitive abilities and intentional physical movements aimed at achieving specific results [21]. This involves both conceptualizing and executing actions in a physician's professional practice. Clinical skills are characterized by a range of physical actions, from simple tasks like palpating a pulse to intricate procedures such as conducting intrauterine brain surgery, all grounded in a comprehensive understanding of the rationale and methodology behind these actions. The hallmark of developing psychomotor clinical skills lies in the repetitive execution of these actions with purposeful refinement.

Attitude represents an individual's viewpoint and subsequent reaction to the understanding of a situation, concept, personality, or experience [22]. It is a composite result of the interactions among cognitive processes, emotional responses, and behavioral actions. All perceptions, values, beliefs, preferences, aversions, and expressed emotions towards a patient, colleague, workplace, and various situations, along with how these elements are formed, influenced, sustained, or altered within a clinical setting, are essential yet often understated aspects of clinical competence. The developed inclination towards ongoing learning, adaptive responses, professional decorum, empathetic behavior, and collaborative teamwork in the provision of healthcare is referred to as clinical attitude.

A fundamental aspect of clinical competence is ethical behavior, which encompasses the moral principles and professional standards that govern acceptable conduct in the daily provision of healthcare. Clinicians must recognize the ethical framework that mandates respect

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for patient autonomy while prioritizing their well-being in both straightforward and complex decision-making processes [23]. In this regard, healthcare professionals are required to honor their patients and colleagues, ensure fairness, and maintain the highest level of integrity consistently. It is imperative that they are familiar with and comply with the regulations and guidelines that oversee clinical practice, as well as diligently follow local policies that dictate professional behavior and conduct.

Effective healthcare delivery necessitates prioritizing patient safety, which includes risk management, error prevention, and harm avoidance during the execution of professional responsibilities. Patient safety is central to a patient-centered care approach and typically requires a structured framework along with contributions from various disciplines. A secure environment and a steadfast dedication to enhancing quality are vital elements of patient safety. The quality of care represents a systematic effort to ensure that healthcare services meet or exceed the minimum acceptable evidence-based standards. It is an integral aspect of clinical competence that focuses on achieving optimal outcomes through the prudent use of resources in a manner that is equitable, safe, and timely, while respecting the needs, preferences, and values of patients.

Leadership

In the context of clinical practice, leadership is characterized as a strategic process through which an individual motivates and organizes others to act in a manner that facilitates the achievement of a group's or organization's vision, ultimately leading to enhanced patient health outcomes and improved effectiveness in healthcare delivery.[24] Postgraduate medical training must prioritize the cultivation of strong leadership skills, which are essential for establishing a sense of purpose through a steadfast commitment to identifying challenges and devising innovative solutions. At the postgraduate level, clinicians are expected to inspire and motivate fellow healthcare professionals, promote teamwork among colleagues, and foster a positive and safe environment for both patients and staff.

Effective leadership in healthcare requires a problem-solving mindset that integrates strategic thinking, decision-making, and mentorship skills, all grounded in self-awareness and a deliberate focus on navigating the complexities of the healthcare landscape to improve the well-being of patients, their caregivers, and society as a whole.[25] Compassionate patient-centeredness lies at the heart of clinical leadership, driving coordinated advocacy efforts to enhance patient safety within a supportive environment. Modern leadership practices encourage the development of an inclusive atmosphere that empowers team members to think strategically and leverage their expertise to achieve both personal and institutional objectives. Healthcare leaders cannot perform at their best without effective communication with relevant stakeholders, primarily aimed at fostering trust and building strong relationships. Various leadership styles exist, each with its own set of advantages and disadvantages; however, a common thread among all these leadership theories is the intentional effort to enhance the quality of care through innovative strategies.

When training a postgraduate clinician to assume a leadership role within a team, it is essential to concentrate on various competency domains and consider multiple approaches to achieve this goal [26]. Methods such as formal training sessions—including lectures, seminars, workshops, and symposia—along with contemporary e-learning tools, mentoring, coaching, and practical scenarios that require the demonstration of leadership, can effectively instill leadership skills. Practical scenarios may involve assigning challenging projects and significant assignments. To facilitate this process, structured development programs are established to gradually transition a novice into higher leadership positions. This approach also allows learners to reflect on their actions and their consequences, fostering a mindset of continuous learning, unlearning, and relearning. Additionally, numerous online courses, whether or not they offer certifications, serve as valuable learning resources that should be considered.

Coaching and mentoring provide effective platforms for obtaining feedback from learners and offering the necessary support and guidance to help them reach their full potential [27]. This necessitates that supervisors receive formal training in coaching and mentoring techniques to assist learners effectively. By taking on the role of a team leader, postgraduate clinicians begin to develop leadership skills and build confidence. This methodology enables leadership training, as mentors and mentees can establish clear goals for their learning and outline expectations for their development.

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In a similar vein, soft skills such as active listening, emotional intelligence, strategic thinking, and effective communication are vital qualities for a team leader. A problem-solving and decision-making mindset is necessary. Leaders should actively listen to grasp the perspectives and concerns of their team members. Effective communication is imperative for issuing directives, motivating teams, and promoting collaboration both within the team and across different teams. As emotional beings, humans require leaders who can perceive, understand, and manage emotions effectively. This capability ultimately builds trust, which is crucial for developing relationships and resolving conflicts among team members. While empathy and sympathy are important, a leader must also possess the courage to make decisive choices and take bold actions to propel the team forward.

Instructional Proficiency
Instructional proficiency denotes the ability to generate contextual information and convey it effectively to learners [28]. It fundamentally represents the skill of teaching. This proficiency encompasses the competencies that educators develop over time, enabling them to employ structured educational strategies to fulfill students' learning objectives. Postgraduate medical professionals, who are advancing towards specialization, must adeptly present concepts and information in an organized manner to colleagues or subordinates for educational purposes. Achieving this necessitates specific skills that facilitate the explanation of concepts, demonstration of procedures, assessment of comprehension, and adaptation of instruction to accommodate individual student requirements.

A fundamental characteristic of a clinician with instructional proficiency is the ability to plan and design educational activities aimed at achieving specific objectives [29]. Merely delivering instructional content is insufficient; it must be executed systematically by establishing goals and selecting suitable teaching methodologies through engaging activities to fulfill these goals. This approach is most effective when the learning environment is appropriately structured to provide learners with experiences that lead to behavioral changes.

Furthermore, teaching proficiency demands that educators are well-versed in and have mastered various instructional techniques, allowing them to select the most suitable method for each session. In today's world,

educational technology has transformed teaching methodologies, and experienced educators are expected to integrate these modern tools to address diverse learning styles and needs. Traditional teaching methods, such as direct instruction, questioning techniques, demonstration sessions, and collaborative work, remain effective for training clinicians. Significant learning occurs in an environment that is inclusive, supportive, and conducive to educational growth.

Assessment plays a crucial role in the learning process. After establishing learning objectives and providing evidence-based instruction tailored to those objectives, it is vital to evaluate whether genuine learning has occurred [30]. Learners should participate in both formative and summative assessments to determine the effectiveness of the teaching methods, the delivery medium, and the teacher's capabilities. In essence, assessing a student's learning serves as indirect feedback on the instructional strategies employed by the teacher. This evaluation provides a foundation for refining and enhancing instructional materials, media, and methodologies. Consequently, learning approaches are not fixed but can be adjusted based on student needs and feedback, allowing for modifications in the pace and complexity of instruction to ensure that all students are actively engaged and learning. Therefore, achieving proficiency necessitates ongoing reflection and analysis of teaching effectiveness, along with deliberate efforts to enhance or develop the skills required to meet instructional objectives.

Postgraduate clinicians are expected to possess teaching capabilities; therefore, a structured training program is necessary to cultivate these skills. Educating a teacher necessitates a comprehensive approach. Obtaining a certificate, postgraduate diploma, or a full degree in education is vital for enhancing instructional competence [31]. This foundation enables clinicians to acquire the essential skills needed for effective clinical education delivery. Additionally, undergraduate training should prioritize elective courses in education to grasp fundamental teaching principles.

An apprenticeship within a higher education institution presents another valuable opportunity. Here, postgraduate clinicians can observe specialist medical students and practice under supervision, thereby establishing a robust foundation in pedagogy and subject

matter expertise [32]. This experience provides practical exposure, encourages reflective practice, and creates a nurturing learning environment where clinician-teachers can continuously enhance their skills. Furthermore, Continuing Professional Development (CPD) should incorporate initial teacher education, ongoing professional growth, and mentorship, ensuring that clinicians remain informed about the latest research, teaching strategies, and educational policies. Thus, the significant role of seasoned clinicians, who also serve as educators, is to offer essential guidance and support to postgraduate clinicians, assisting them in overcoming professional challenges and refining their teaching practices.

Similar to how clinicians engage in clinical research projects, it is essential to motivate them to participate in research and innovation within educational environments. They should explore novel methods to enhance student learning and actively participate in professional learning communities. Furthermore, clinicians who instruct students need to collaborate within these communities to exchange best practices, learn from one another's experiences, and collectively advance their skills and knowledge. The postgraduate training deanery must foster a positive and supportive teaching culture, which is crucial for clinicians undergoing specialist training to feel appreciated and supported, allowing them to concentrate on imparting knowledge. Moreover, clinicians in specialist training require access to essential resources, including technology, materials, and professional development opportunities, to effectively fulfill their roles as educators.

Advocacy capabilities

Advocacy capabilities encompass the knowledge, attitudes, and practices necessary to support and represent the interests of a cause, individual, community, or organization.[33] This involves comprehending the status and needs of those being represented, the legislative or ethical context of the representation, and the ability to effectively communicate the cause and anticipated outcomes. Clinical advocacy specifically pertains to understanding and supporting individuals with health and social care needs, aiming to promote, project, and protect their interests regarding health outcomes and overall well-being. A clinician advocating for patients or clients does not override their consent to

medical care or neglect the fundamental requirement of informed decision-making; rather, they assist the patient or client in making the most informed decision, taking into account their preferences, values, and beliefs.

Postgraduate medical trainees are not only training to become specialist clinicians but must also learn the vital role of being the voice for their patients. Consequently, clinical advocacy responsibilities include facilitating patient access to available medical services, ensuring patient comfort and dignity within healthcare settings, confirming that appropriate procedures are followed, and challenging controversial clinical decisions that may violate ethical principles or professional standards. Thus, clinical advocacy roles necessitate an understanding of rights and entitlements within the healthcare system, ensuring that these rights are protected, respected, and upheld during the medical care process. Patients often find the health and social care system challenging to navigate; therefore, clinicians as advocates must strive to promote streamlined systems through quality improvement and develop straightforward tools to assist patients in navigating healthcare systems.

Healthcare professionals, adhering to principles of professionalism and ethics, advocate for and articulate the interests of patients, particularly those who are vulnerable. They also promote and assist individuals in questioning clinical decisions that conflict with their personal values, desires, and perspectives by helping them evaluate their options and make informed choices regarding their care, including examining various alternatives and potential consequences. A frequent complaint among healthcare users is inadequate communication, particularly in relation to comprehending medical terminology; however, clinical advocates facilitate understanding of treatment plans, address inquiries, and ensure patients feel at ease and assured about their care.[34]

In multidisciplinary team meetings, the clinician representing the patient strives to guarantee that the patients' interests and preferences are prioritized consistently and may occasionally accompany them to referral appointments with other healthcare providers, offering support and ensuring their opinions are acknowledged. Furthermore, patients are encouraged to participate in formal advocacy groups that play a crucial role in representing individuals with specific conditions

or disabilities, providing information, support, and a platform for raising awareness and influencing policy.

In addition to comprehending the pertinent laws and regulations essential for effective advocacy, the competencies necessary for being a proficient advocate for patients encompass persuasive and empathetic communication, as well as analytical and problem-solving abilities. Key attributes that a clinician, who also serves as a patient advocate, must possess include active listening, assertiveness, trust-building, relationship enhancement, and perseverance.[35] Ultimately, the goal of clinicians is to empower individuals and groups to express their voices and make informed decisions to enhance patient outcomes. Advocacy enables clinicians to improve healthcare systems, promote equity in healthcare, elevate professionalism, and shape the future of healthcare by influencing policy changes and fostering innovation in the field.

Research expertise

Contemporary clinicians are required to engage in research activities by utilizing their daily clinical experiences to formulate research questions that address the disconnect between scientific knowledge and patient care, ultimately leading to the application of findings in enhanced clinical practices.[36] This engagement is vital, as innovative research initiatives form the basis for the advancement of medical knowledge and the enhancement of patient outcomes. Consequently, postgraduate medical trainees are educated to recognize real-world challenges in patient care and to convert these insights into testable research hypotheses. When these hypotheses are examined using suitable methodologies, they can yield answers that link fundamental science with clinical applications. The ability to access patient samples and data significantly benefits clinicians, enabling them to conduct pertinent research that can aid in the development of new treatments and the enhancement of patient care through the adoption of evidence-based practices. Nevertheless, it is essential for postgraduate medical trainees to cultivate a research-oriented culture within clinical research through effective mentoring and targeted training in research methodologies.

Educating and guiding a clinician to transition into a researcher necessitates formal education, hands-on experience through involvement in proposed or ongoing research projects, and ongoing learning in light of advancements in artificial intelligence and cutting-edge technology. Incorporating a relevant degree, diploma, or certificate in research methodology into postgraduate training can provide comprehensive knowledge and skills. Additional beneficial measures include participation in exchange programs or internships with research organizations and institutes, as well as active involvement in training programs and workshops. This networking with research leaders and academic institutions will enable clinicians to broaden their knowledge and access resources that may not be easily available in their local area. A requisite number of research projects within the postgraduate medical curriculum acts as a crucial motivator to stimulate interest in research activities, as well as the latest methodologies and findings in their respective fields. Specialized training on securing funding is also essential, as innovative multicentric research initiatives frequently depend on external financial support. By actively engaging in these roles, a postgraduate clinician in training cultivates analytical, problem-solving, communication, and critical thinking abilities, while also acquiring a robust understanding of statistical analysis techniques to validate research outcomes.

Striking a balance between research and clinical duties can lead to ethical dilemmas and role conflicts, especially when patient-participants are involved.[37] However, effective mentoring and training can guide postgraduate trainees in navigating these intricate challenges, enabling clinicians in specialist training to transition successfully into research careers without neglecting their clinical responsibilities. Despite systemic obstacles, clinical research can enhance the efficiency of healthcare organizations, lower costs, and elevate patient experiences by achieving quality improvement objectives and showcasing a commitment to excellence, adherence to the latest guidelines, and the integration of advanced technology. The philosophy of clinicians as researchers is vital for uncovering new causes of diseases, identifying novel treatment targets, and innovating healthcare delivery methods. Additionally, clinical research promotes collaboration among healthcare professionals, builds patient trust in their clinicians' ability to apply the best available evidence, and ultimately strengthens the clinician-patient relationship.

Entrepreneurial and innovative abilities

In today's dynamic context, it is becoming increasingly clear that unemployment among healthcare professionals is rising, while governments lack the

resources to fill this gap.[38] Even those who are employed are not receiving adequate remuneration, as supply far exceeds government demand. In the struggle to survive, clinicians around the world have been settling for welfare packages that do not reflect their true value. This alarming trend is even more worrying in economically disadvantaged regions such as sub-Saharan Africa, resulting in a mass emigration of their best professionals to developed countries, where, surprisingly, they face a new reality of financial devaluation, but which is still considered superior to the situation in their home countries.[39] Today, healthcare professionals, especially those in postgraduate training to become specialists, need to develop entrepreneurial and innovative skills that ensure their survival and satisfaction in the job market. Previous studies have shown that clinicians with greater job satisfaction have better patient outcomes and more effective communication.[40]

Entrepreneurial ability encompasses the knowledge, attitude, skills, and experience that enable a person to identify opportunities to create value and solve problems on a profitable scale, and to take action to transform these opportunities into reality.[41] Individuals with an entrepreneurial mindset have a specialized ability to combine resources, take calculated risks, make non-routine decisions, and adapt to changes in the business environment. Innovative abilities are those competencies that enable a creative thinker to generate new ideas, improve existing processes, and adapt to changes in order to set the pace in a specific procedure or endeavor. Entrepreneurial and innovative ability is an integrated mix of cognitive, behavioral, functional, and technical domains that seek to add value to people in need through the application of creativity, critical thinking, and problem-solving skills.

The modern clinician must acquire and develop relevant entrepreneurial and innovative skills, since contemporary governments do not generate jobs or pay professionals. Those who wish to prosper must create jobs and contribute taxes to the new world governments. Thus, postgraduate medical education offers a unique opportunity to instill these cultures and mindsets, aiming at the formation of responsible and productive specialists. The essential components of the entrepreneurial and innovative aspect of the CLIAREM proposed curriculum for postgraduate medical education include opportunity recognition, creativity,

adaptability, risk management, resource management, leadership and strategic thinking. There are unmet needs in the healthcare sector, such as low government funding, unemployment, underemployment and inadequate welfare packages, and clinicians must have the ability to create new products, services or processes that can differentiate a business and create a competitive advantage. Sometimes an appropriate approach for some clinicians is a form of entrepreneurship called intrapreneurship, which is the ability to leverage entrepreneurial skills and creativity to drive innovation within an existing organizational structure by acting as leaders responsible for taking the initiative to develop new products, services, or processes.

Therefore, clinicians must have the knowledge and skills to analyze market forces, understand customer preferences and satisfaction, and stay abreast of technological advances in order to take calculated risks through efficient resource allocation, creating businesses that can operate competitively in the industry.[42] This requires strategic leadership in the form of developing a variety of visions, leveraging financial, human, and physical assets, and inspiring, motivating, and guiding a team of like-minded individuals to achieve a common goal of creating and growing a sustainable business with a competitive advantage. Financial literacy and a solid understanding of business law and ethics, as well as imagination, communication, time management, resilience, analytical, and negotiation skills, are essential attributes of clinicians as entrepreneurs.

Leveraging medical expertise to start businesses that solve healthcare problems and improve patient outcomes through innovative thinking is a key component of the modern postgraduate medical education curriculum. Clinicians are best placed to do this because they already have a comprehensive understanding of the medical landscape, including diseases, treatments, and patient needs, and are often natural leaders and communicators who can lead teams, manage projects, and interact with patients and stakeholders. They can then build on this foundation by establishing relationships with other healthcare professionals, hospitals and healthcare organizations, and relevant government agencies, who can provide access to valuable resources and potential partnerships. Therefore, inculcating entrepreneurship and innovation in education would foster independence and self-direction, essential characteristics for successful

entrepreneurs. Similar analytical skills used in the diagnosis and treatment of clinical disorders can be adapted and applied to identify and solve entrepreneurial challenges. Some examples of entrepreneurial opportunities in the sector include developing and commercializing new medical devices, diagnostic tools, and treatment technologies, creating telemedicine platforms and other digital services, establishing healthcare practices (especially specialty or multi-specialty facilities), and leading hospitals, clinics, and other healthcare organizations as intrapreneurs.

Mentoring skills

Mentoring is an intentional, dynamic, collaborative, and reciprocal effort in which experienced professionals engage in productive and focused activities to develop the next generation of professionals over time.[43] Training professionals must cultivate the ability to mentor future clinicians to ensure the continuity and empowerment of the profession. The primary goal of a mentoring relationship is to help mentees grow, maximize their potential, and achieve goals that would otherwise be difficult or impossible to achieve. Mentoring is a structured program that enhances professional and career development through comprehensive support and role modeling. These complex skills, which can be taught, observed, practiced, and mastered, include active listening, effective communication, constructive feedback, motivation, empathy, and patience. A graduate clinician who has experienced and benefited greatly from mentoring is in a unique position to replicate the mentoring process.

The mentoring process begins with careful attention to the mentee, understanding their concerns and demonstrating empathy, which results in productive and mutually beneficial structured engagements where specific and useful feedback is provided to guide the mentee's development. For mentoring to be effective, an experienced mentor must establish a trusting and supportive relationship with the mentee, enabling the mentee to identify and set realistic goals through sincere and encouraging support that culminates in the mentee's holistic development. An empathetic and patient environment, based on genuine trust and integrity, where the mentor is aware of his or her own strengths and weaknesses, is a crucial process in the mentoring relationship. This relationship fosters a supportive environment for learning, sharing knowledge and facing

challenges, ultimately benefiting both the mentor and the mentee.

By sharing their knowledge, insights and experiences with mentees, experienced mentors can offer advice and encouragement on career paths, personal development and how to navigate the complexities of the healthcare industry, in a confidential and supportive environment where mentees can discuss challenges, concerns and their personal growth. Ultimately, the mentoring process is expected to improve job satisfaction, well-being and professional relationships, resulting in increased retention and performance. The postgraduate medical education curriculum should not only include a provision for mentoring future clinicians, but also create an appropriate ongoing platform, both formal and informal, where clinicians in training gain the practical skill of mentoring others.

Does the CLIAREM model align with the principles of effective education models?

There are fundamental principles that underpin the framework of a model, enabling it to function effectively as a strategic benchmark for process design.[44] The following section provides a concise overview of the key principles that characterize an effective educational or curriculum model, analyzing how the CLIAREM model align with these principles[45]:

1. Finding solutions by mastering challenges

An educational framework aims to enable students to develop a thorough understanding of the issues at hand and actively participate in the process by purposefully questioning to uncover solutions to these challenges.[46] This principle asserts that students cultivate their natural capacity to engage and participate actively in the learning process by employing critical thinking, rather than passively accepting the curriculum in its entirety. The primary objective of the CLIAREM model is to cultivate postgraduate physicians who possess the necessary expertise to address the unique challenges encountered in their respective practice environments.

2. Broad scope

An effective educational model should encompass a broad range of topics to enable learners to realize their full potential.[47] This approach encourages expansive thinking and fosters innovative problem-solving, rather than relying on a limited viewpoint that restricts

intellectual development. The central theme of this principle is to nurture learners who are exceptionally distinguished and intellectually comprehensive, achieved through the strategic design of the curriculum. In this context, the CLIAREM model highlights that a specialist physician should possess not only expertise in clinical medicine but also proficiency in additional pertinent fields, including research, clinical governance, advocacy, and mentorship.

3. Systematic evolution

Certain subjects are inherently simpler to grasp than others, and one effective strategy to maintain learner engagement is to introduce the materials in a gradual fashion, where more complex topics follow those that are more straightforward. In the absence of this methodical progression, students may become disheartened and distracted, making meaningful learning seem unattainable. This principle is clearly embodied in the CLIAREM model, which specifies that the curriculum is delivered by seasoned supervisors. These supervisors mentor postgraduate physicians during a well-organized training period, where the expectations placed on the students become progressively more intricate as they advance in their training.

4. Intensity with scheduled timetable

Structured training is consistently challenging and requires significant commitment, as well as adherence to specific time constraints. An educational framework outlines the requisite duration for individuals to develop the essential skills, attitudes, and knowledge that align with the expected depth and intensity of cognitive growth.[48] This framework promotes ongoing learning; however, the organized aspect of the training must follow a predetermined timetable. Consequently, learners are anticipated to possess the mental resilience, perseverance, energy, and resolve necessary to engage in training that fulfills the expectations of a structured society in today's world. The innovative CLIAREM model is transforming postgraduate medical education in Sub-Saharan Africa by recognizing existing global and regional trends regarding the roles and responsibilities of postgraduate physicians. It establishes a comprehensive framework designed to instill resilience, intentionality, and time management skills in these doctors through a well-structured and strategic approach that is both inclusive and beneficial for the region.

5. Tailored training and self-potential optimization

An effective educational and curriculum framework recognizes the diverse rates and depths of cognitive growth and skill acquisition among individuals. Consequently, a one-size-fits-all approach that lacks careful consideration of personal abilities and fails to incorporate necessary flexibility leads to an ineffective model that may appear sound in theory but proves impractical and unsustainable in real-world applications.[49] Thus, an educational model suitable for a highly diverse society like Sub-Saharan Africa must include elements that personalize the training process to maximize the varied potentials of all individuals. The proposed CLIAREM model embodies this principle by acknowledging the different roles of postgraduate physicians, suggesting that the pace of development across the model's components will vary among individuals, which is acceptable within the context of modern medicine. In essence, while postgraduate physicians are expected to possess a broad range of competencies, it is entirely acceptable for them to exhibit significant proficiency in one area, provided they are knowledgeable about other domains and can adapt to function effectively within the wider community.

6. Synchronized knowledge domains

This principle asserts that while segmenting knowledge and implementing training in phases can simplify delivery, the effective application of knowledge and skills necessitates a cohesive integration of various areas of skill development.[50] Although the modern society encourages specialization, it cannot operate efficiently in isolation; there must be a shared purpose and collaborative efforts to foster a productive and sustainable community. An educational framework should establish a central theme for students, making learning meaningful, applicable, and enjoyable. The CLIAREM model seeks to cultivate postgraduate physicians who are aware of their multiple roles while maintaining a strong focus on their primary goal: enhancing the health and well-being of the population. Despite the diversity of these roles, they share a common thread, which is a fundamental aspect of the CLIAREM model.

7. Operational relevance for societal progress

An educational model is fundamentally designed to enhance society by fostering the development of skills

and knowledge among its members, ultimately benefiting the community as a whole.[51] It should not merely serve as a theoretical framework without practical application. A curriculum model lacks meaningful significance in today's world unless it identifies and addresses operational gaps that facilitate equitable and sustainable progress within society. The CLIAREM model is specifically intended to cultivate postgraduate physicians capable of transforming the healthcare landscape in any region they inhabit, which is particularly crucial in Sub-Saharan Africa, where healthcare delivery remains significantly behind that of developed nations.

Strengths of the CLIAREM model
CLIAREM is an innovative approach that addresses the challenges faced in postgraduate medical education, especially in resource-poor settings such as sub-Saharan Africa. It represents a paradigm shift from the previous concept that a clinician could manage patients but not perform other essential functions due to the lack of emphasis in the training curriculum. The healthcare sector in Africa needs leaders who have received methodical training, and CLIAREM fills this gap. The shortage of clinical mentors is a significant problem, but CLIAREM was designed to address this issue. Due to the rising unemployment rate, specialists in sub-Saharan Africa often face underemployment or, out of frustration, emigrate in search of better opportunities. Most of the curricula used to train these clinicians do not address entrepreneurial skills.

The CLIAREM model identified this gap and was developed to fill it. Patients' rights are often disregarded, and clinicians who do not understand the rules and regulations governing their sector feel powerless. With the CLIAREM model, there is an emphasis on understanding the rules and regulations related to healthcare operations and the need to consciously advocate for patients. Therefore, the CLIAREM model has depth and will be found quite useful. Furthermore, the CLIAREM model meets the standard criteria for an effective educational curriculum for postgraduate training, which makes it reliable and extremely useful.

Limitations of the CLIAREM Model
The CLIAREM model is a new proposal that has not yet been tested in practice, although its theories are consistent and comparable to previous models. Therefore, until it is used, it is not possible to determine whether it has flaws or is perfect, which raises some doubts about its usefulness. However, it is subject to modifications, so that even if it presents some imperfections when adopted, these can be corrected, since its fundamental principle is solid. The model is quite detailed and clinicians may consider it overly sophisticated initially, but over time, this should not be a problem.

CONCLUSIONS
Postgraduate medical education requires a complete transformation to produce clinicians capable of meeting the contemporary demands of a specialist. There is a paradigm shift from clinically-centered training to comprehensive training that ensures that the clinician can function effectively in multiple roles. The CLIAREM model has a solid theoretical basis, making it an ideal curriculum for training specialists, training clinicians who are fully prepared to function optimally in the modern world, especially in developing countries in sub-Saharan Africa.

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