Evolution of Medical Education: Historical Perspectives, Objectives, and Changing Processes.

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1.0 INTRODUCTION

In response to scientific advancement and the increasing societal needs, medical education has evolved and continues to evolve. Throughout most of the twentieth century, the traditional medical educational system has led to the production of generations of clinically skilled and scientifically grounded physicians [1]. Notwithstanding, sporadic changes during the turn of the millennium have greatly contributed to a revolution in undergraduate medical education (UME) and graduate medical education (GME) [1,2,3]. This multifaceted change qualifies as an abrupt and disruptive innovation. It therefore requires continuous assessment of the enduring value of the medical educational system and sustainable medical practice in shaping the healthcare system worldwide [2, 4].

This review article will examine the historical development and perspectives of medical education. It also explores the purpose and objectives of medical education and its changing processes. This will help create feedback that can be imbibed in our academic curricula and in bridging obtainable gaps in modern healthcare, with the beneficiaries being burgeoning practitioners, developing physicians, and the general public, thus, ensuring better outcomes for academic medicine and clinical practice.

2.0 HISTORICAL PERSPECTIVES OF MEDICAL EDUCATION.

The teaching of medicine from the days of the early priest-physicians has had a highly personal characteristic through a close physician-pupil relationship, which despite varying in degrees as times have changed has remained persistent even till modern times [5]. This is reflected in what is termed "The evolution of Medical education". Medical education is simply defined as art with scientific principles. The uniqueness of medical education is in its dealing with human life and well-being. Medical education requires distinctive knowledge, skills, and behavior unlike other branches of science, technology, literature, and art [6].

Furthermore, research shows that it is difficult to ascertain the origin of medical education however, many authorities usually consider that it goes back several thousand years to the era of Ancient Greece where the ancient precepts on the earliest statement on pupil-teacher relationship can be traced back to [5, 7]. This inference can be found in the commentaries written by a Charaka, who like Hippocrates was a great teacher in medicine [5]. It is also further exemplified in the Hippocratic oath. This apprenticeship system spread across Rome and Greece where medical practices began to emphasize a scientific approach thus giving way to the medieval times.

During the medieval times, the first school of medicine was founded by the representatives of the four cultural forces persisting during the era: a Greek, a Jew, a Latin, and an Arab [5,8]. This era gave way to the Renaissance which marked the renaissance of Italian medical schools especially those of Padua, Bologna, Ferrara, and Pisa. A good number of the practicing physicians of the fourteenth and fifteenth century England practiced in these medical schools.

The period of transition was soon after the Renaissance. It gave way to "new learning" in the Western world giving life to both science and medicine. The development of medical schools in the 18th and 19th Centuries saw the establishment of key medical institutions in Europe and the US [5,9]. It was also remarkably marked by the advances in anatomy, pathology, and morbid anatomy which significantly transformed the curriculum of medical schools [9, 10].

Furthermore, we also witnessed the transition from physician-student tutorship to formalized and structured medical education with well-organized curricula, as shown by the Flexner's report of 1910 [11]. This report transformed the nature and process of medical education via; standardization of medical education and learning, promoting emphasis on science, reduction in the number of schools, an increase in more rigorous training, and the increased role of government participation [11,12]. Ultimately, this marked a radical shift in how medicine was taught and embraced scientific knowledge and its advancement as the defining ethos of a modern physician and leading to the establishment of the biomedical model as the gold standard of medical training.

3.0 OBJECTIVES OF MEDICAL EDUCATION

3.1 Personal and Professional Development

Medical education exemplifies the qualities that are crucial for sustaining development in the field of medicine. The development of self-awareness of one's emotional limitations is very key to enabling practitioners and medical students to learn when to seek help. This involves practicing healthy coping mechanisms in response to stress, managing competitive demands among personal and professional responsibilities and applying flexibility and maturity when adjusting to change and difficult situations [12].

In addition, through professional development, medical professionals learn to demonstrate trustworthiness which plays a fundamental role in building strong relationships, ensuring that all parties—patients, families, and healthcare teams, feel at ease.

Also, to balance the increasing demands of health care, medical education through professional development enables medical professionals to develop administrative, leadership, organizational and time management skills which are essential for optimizing work-life balance [13]. Also, medical education enables health professionals learn that uncertainty is an inevitable part of clinical healthcare and thus, must rely on appropriate resources that can help guide decision-making and patient care effectively.

3.2 MULTIDISCIPLINARY COLLABORATION.

To deliver safe and effective patient centered care, inter-professional collaboration is key. It demonstrates the ability to work with different healthcare professionals to provide a climate of mutual respect, dignity, diversity, and trust [12, 14]. Medical education also provides the channel which helps to describe the roles of every member of the healthcare team. This helps to apply the team's diverse knowledge to address and ensure a holistic approach to the health needs of individuals and populations. Effective communication is crucial for multidisciplinary collaboration. Healthcare professionals are required to interact responsibly to foster seamless coordination of care for individual patients and entire populations.

3.3 PRACTICE-BASED LEARNING AND IMPROVEMENT

Practice-based learning and improvement as an objective in medical education helps medical professionals to investigate and evaluate patients' care. It further emphasizes the ability to appraise one's medical practice to integrate scientific evidence into everyday decision-making. By identifying the strengths and limitations in one's knowledge, skills, and attitudes, healthcare professionals can set personal learning and improvement goals that help address this deficiency in their area of expertise [15].

Furthermore, practice based learning enables the systemic analysis of medical practice using quality improvement methods and further helps to implement changes with the purpose of improvement. Also, by continuously incorporating feedback and self-reflection into daily practice, healthcare providers can identify areas for improvement and implement changes to enhance patient outcomes.

Staying informed about recent developments, technologies, guidelines, and scientific advances is crucial and practice-based learning and improvement provides opportunities where healthcare providers can continuously seek out, appraise, and assimilate new research and evidence that is relevant to their patients' health problems [15].

3.4 PATIENT CARE

Through medical education, patient care that fosters compassion, appropriate and effective treatment of health problems, and health promotion is possible. It involves performing medical, diagnostic, and technical procedures that are essential to post-graduate training [16]. The process begins with gathering accurate and critical information through history taking, physical examination, lab data, and imaging to assess a patient's condition. Medical education offers clinical reasoning through which healthcare professionals develop a differential diagnosis to achieve a focused approach to treatment. Also, the use of evidence-based practices allows for accurate diagnoses and effective treatment plans through monitoring and interpreting necessary tests.

A key aspect of patient care involves carrying out management plans that are patient-centered, safe, effective, and value-based. These plans through counseling and education, empower patients to engage in preventive health care and take an active role in their care plans to involve patients and their families in the decision-making process. Additionally, patient care helps medical professionals initiate evaluation and management by recognizing a patient requiring urgent or emergent care early enough [16, 17].

Also, providing appropriate referrals of patients helps ensure continuity of care, particularly when patients transition between different providers or healthcare settings.

This includes specialist referrals, follow-ups, and steady monitoring of patient's progress, providing health care services to communities geared towards preventing health problems. Through these collaborative interventions, Medical objectives through patient care are extended to include prevention, education, and collaboration for better health outcomes.

3.5 INTERPERSONAL AND COMMUNICATION SKILLS.

Through interpersonal and communication skills, the exchange of information and collaboration with health professionals, patients and their families is effective. Medical professionals are trained to speak with empathy, compassion, and active listening, geared to a diverse range of socioeconomic and cultural backgrounds, fosters a positive and productive work environment which is very critical for high-quality care [18].

Teamwork is another key aspect of communication skills. Healthcare professionals are trained to effectively work with others as members or leaders of a healthcare team to ensure that everyone collaborates to achieve the best outcomes for patients.

Also, maintaining clear, accurate, and original records with attention to privacy is essential through proper medical education. It ensures patients' safety while adhering to legal and ethical standards. Furthermore, it teaches medical professionals how to handle difficult conversations, such as those about death, end-of-life care, breaking bad news, and disclosure of errors.
Through interpersonal communication, medical professionals understand the emotional dynamics between healthcare professionals, patients, and families, thus, fostering meaningful interactions [12,18, 19]. Additionally, medical education also helps healthcare providers identify and address barriers such as language differences, education levels, or intellectual challenges crucial to ensure that communication remains clear and effective, thus contributing to improved care and a supportive environment for all involved.

3.6 KNOWLEDGE FOR PRACTICE.

Medical education enables practitioners to demonstrate knowledge of evolving biomedical, clinical, epidemiological, and social-behavioral sciences and subsequently and apply that knowledge to patient care. Medical practitioners are trained to apply effective clinical reasoning to assess and respond to clinical situations by utilizing investigative and analytical approaches [12, 20]. This involves applying established and emerging scientific principles that are crucial to healthcare and broader populations.

Physicians are trained to integrate principles of clinical sciences into clinical reasoning and other aspects of evidence-based healthcare. This involves the application of the principles of epidemiological sciences to identify health problems, risk factors, and treatment strategies while addressing healthcare disparities and focusing on disease prevention and health promotion for both patients and populations.

In addition to scientific and clinical knowledge, social-behavioral sciences play a crucial role in patient care. Healthcare providers must be able to assess how psychosocial and cultural factors influence health, disease, care-seeking behaviors, and adherence to treatment plans. Understanding and addressing barriers and attitudes toward care is essential for effective patient care [20].

4.0 CHANGING PROCESSES IN MEDICAL EDUCATION.

Medical education is constantly evolving to reflect advancements in science, shifts in healthcare delivery, and societal needs. As the focus of medical care shifts from acute to chronic disease management, curricula have adapted and schools have also broadened instructions on emerging public health issues with a more comprehensive understanding of patient care. Thus, the structure of medical training is changing as well, with a focus on early clinical exposure and integrated curricula that combine basic and clinical sciences. These processes are highlighted in the following preceding paragraphs.

4.1 SIMULATION AND VIRTUAL LEARNING

The rise of high-fidelity simulations and virtual reality has played a crucial role in revolutionizing medical simulations and training. In traditional training models, real patients were practiced by students, which led to mistakes that compromised patient safety. Simulations by providing immersive and hands-on learning environments without risks to real patients allow students to practice complex procedures in a safe and controlled setting [22].
Thus, this safe space fosters an environment where students can learn from their mistakes without causing any harm.

For example, simulation-based training (SBT) utilizing virtual reality systems allow medical students to conduct virtual surgeries or navigate complex anatomy with life-like precision.

These technologies enable students to build muscle memory, increase their confidence, and bridge the gap between theoretical knowledge and clinical application [22, 23]. More so, because simulations can be repeated as often as necessary, students are better prepared to gain early mastery before interacting with real-life situations.

4.2. E-LEARNING AND ONLINE RESOURCES

E-learning platforms and Massive Open Online Courses (MOOCs) have transformed the accessibility and flexibility of medical education. These platforms provide flexibility in learning by providing students from around the world with access to high-quality lectures, peer discussions, and assessments [24]. This allows students to study at their own pace and further helps to break down geographical limitations and time constraints.

The COVID-19 pandemic fueled this trend, as many medical universities had to shift to online platforms to make medical education more accessible and convenient [25]. This caused traditional lectures and textbooks to be complemented and even replaced by interactive digital platforms, thus offering a more enhanced learning experience in a more dynamic and personalized way.

Today, the hybrid model of "blended learning", which combines online resources with hands-on clinical practice has become a core part of medical education. Students can now access a pool of medical databases and video tutorials, and revisit lectures and course materials as needed, allowing students to deepen their knowledge beyond what is taught in the traditional classrooms.

4.3 TELEMEDICINE AND REMOTE LEARNING

The World Health Organization defines telemedicine as "the delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment, and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities" [26].

The rise of telemedicine has redefined both healthcare delivery and medical education. In light of the COVID-19 pandemic, telemedicine became a necessity for remote consultations and medical schools began to adapt by incorporating telemedicine training into their curricula [27]. This training includes diagnosing patients remotely, conducting vital consultations, and maintaining effective doctor-patient communication through telecommunication tools, hence, fostering efficient healthcare delivery. Telemedicine education allows medical professionals to be prepared for a fast-evolving healthcare landscape where remote care is becoming the norm, especially in rural communities.

4.4 ADAPTIVE LEARNING AND ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) is a branch of computer science that centers on developing algorithms and software that copy human thinking and decision-making. The rapid emergence of AI in today's world has emerged as an integral part of healthcare and medical education, and has been adopted by several medical institutions worldwide [28,29].

In medical institutions, AI is used as an intelligent and effective tool for facilitating the decision-making process. The sub-themes of the use of AI such as chatbots, intelligent tutoring systems (ITSs), virtual patients and adaptive learning systems can enhance students' knowledge, skill development, and understanding of complex medical concepts [28]. Thus, AI-integrated medical education paves new opportunities for advanced teaching and learning experiences with improved outcomes.

4.5 COMPETENCY-BASED EDUCATION

Competency-based medical education (CBME) is a model for medical training and assessment that focuses on achieving specific competencies required for the practice of medicine [30]. These competencies are defined based on the needs of patients, society, and the healthcare system and they do not follow the fixed, time-based curriculum. Student progress in medical school is demonstrated by the mastery of these crucial skills which include clinical reasoning, communication, procedural skills, and professional behavior. CBME better aligns with the objectives of producing highly skilled and competent healthcare professionals by focusing on competencies other than the time spent on training [30, 31].

4.6 CROSS-CULTURAL COMPETENCIES AND TRAINING

There is a growing emphasis on teaching students cross-cultural competencies as healthcare systems become increasingly multicultural. Medical education now trains students on how to work effectively with patients from different cultural backgrounds, understand different health beliefs, and also on managing cultural sensitivities [32]. This is important not only for patient care improvement but also for reducing health disparities and culture shocks in the global healthcare systems.

4.7 INTERDISCIPLINARY EDUCATION

The shift towards "interdisciplinary education" reflects the complexity of modern healthcare and a "silo" approach to healthcare cannot continue. Hence, collaboration among healthcare providers is crucial for positive outcomes. Coming together as a team will bring the individual strengths of each discipline to focus on patient care and complement the weaknesses of other healthcare providers [33]. Thus, many medical schools now integrate various basic sciences from the outset, creating a more holistic learning experience. This approach enables students to make connections between practical application and theoretical knowledge, helping them to see the correlation of multidisciplinary approaches to patient care.

5.0 CONCLUSION

In conclusion, the evolution of medical education illustrates the responses to advancements in healthcare and medical sciences. To meet the increasing demands of modern healthcare, Medical education has consistently evolved to better equip physicians for these changes, this is evident from its historical roots of apprenticeship-based learning to a more revised evidence-based curricula.

The integration of new technologies, such as simulation-based training, e-learning, and telemedicine, has substantially enhanced a learning experience that is better adapted to the disruption in the medical landscape. These changes emphasize the importance of continuous innovation in medical education to create a burgeoning generation of medical professionals who are flexible, adaptable, skilled, and prepared to address the turbulent tides of evolution in both local and global health landscapes.

By continuously adapting to new knowledge and healthcare needs, medical education shines a ray of light in shaping the future of healthcare that we all desire and subsequently, it ensures that medical students and physicians remain at the helm of clinical excellence and practice.

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