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Medical Education: Past and Present

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Abstract

Background/Objectives: Medical education has transformed dramatically over the past two centuries, moving from the apprenticeship model to the Flexnerian approach, and now to the Outcome-Based Medical Education (OBME). This review explores the journey of these transformation, focusing on evolution and challenges of OBME.

Methods: A comprehension review of the literature was conducted to examine the historical progression of Medical Education.

Results: The apprenticeship model, which dominated until the 19th century, relied on students learning through hands-on observation of residents and attendings. In the mid 19th century, Abraham Flexner, though not a doctor or a medical educator, revolutionized medical education by introducing a strong scientific foundation. This model included 1-2 years of basic sciences followed by 2-3 years of clinical training. While the Flexnerian model shaped modern medical schools, it was criticized for separating basic and clinical sciences, causing to a disconnect between education and real-world healthcare needs. In response, global reforms led by organizations like the World Federation for Medical Education (WFME) introduced the OBME framework. OBME emphasizes a competency-based approach, aligning medical training with community health needs and focusing on students achieving specific, measurable competencies. Despite its advantages, OBME faces challenges such as inconsistent definitions of competencies, concerns over the reliability of assessments, and high demands on faculty. Overcoming these issues requires professional expertise from medical educators and strong support from medical schools for faculty development.

Conclusions: In summary, modern medical education has struggled to balance theory and practice. Traditional models faced criticized for separating basic sciences from clinical practice, while OBME-based reforms now emphasize active learning, integrated disciplines, need-based approach. Strong stakeholder commitment is essential for the successful design, implementation, and evaluation of OBME.

Keywords: Global reforms; Competency-based approach; Outcome-based medical education; Stakeholder commitment.

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1. INTRODUCTION

Medical education, the specialized field focused on teaching and learning in medicine, has been pivotal in preparing individuals for careers as doctors and healthcare professionals [1]. Over the past two centuries, this field has undergone

profound changes, driven by scientific advancements like the rise of chemistry, physiology, and biomedical technology, as well as shifting global health challenges such as the increasing prevalence of non-communicable diseases [2-5]. As medical knowledge expanded and healthcare

delivery became more complex, the structure and content of medical training needed to adapt to these new realities.

In recent decades, there has been a growing emphasis on training healthcare professionals who are not only knowledgeable but also skilled in applying their expertise to real-world clinical scenarios [6-8]. This shift has led to a move away from traditional, content-heavy curricula towards more integrated, competency-based approaches. Medical education now prioritizes outcomes that align with the health needs of diverse populations while fostering adaptability to rapidly evolving medical technologies and practices [9-11].

This review aims to explore key milestones in the evolution of medical education, focusing on how it has transformed over the past century. We also examine the current landscape, with particular emphasis on the development and challenges of Outcome-Based Medical Education (OBME).

2. METHODS

A comprehensive literature review was conducted in June–July 2024 to explore the evolution of medical education. An electronic search was performed across databases including PubMed, MedRxiv, Scopus, and Cochrane Library, using Medical Subject Headings to locate relevant studies and articles from the past few decades. The Rayyan tool was also used to organize the data and check for duplicates during the review process.

3. RESULTS

3.1. The apprenticeship model

The apprenticeship model has been a cornerstone of medical training since the era of the Hippocratic, where students

primarily learned through hands-on observation of more experienced practitioners like residents [12]. This "see one, do one, teach one" approach allowed students to observe a procedure, perform it themselves, and eventually teach it to others [12,13]. While this method provided valuable real-world experience, it also led to significant challenges, particularly for students practicing on real patients for the first time without adequate preparation. This often resulted in performance anxiety, as they faced the pressure of making decisions and performing procedures with little prior experience, potentially compromising both student confidence and patient safety. As medical education evolves, there is increasing recognition that this model needs more structured support to help students gain the necessary skills before they engage in patient care, while still preserving the essential hands-on learning it provides.

3.2. The Flexnerian model

By the mid-19th century, medical school programs differed greatly between institutions and countries, with little consistency in training [14,15]. Only a few universities, such as Johns Hopkins University and University of Pennsylvania in the United State, as well as a couple of schools in the Netherlands, had developed well-known medical training programs [15]. Many other schools were established for profit and the quality of training in these institutions was often questionable, creating a growing need for reform.

In 1910, Abraham Flexner, a former private school headmaster (not a medical doctor), was commissioned by the Carnegie Foundation to review the state of medical education in North America. In

his report, “Medical Education in the United States and Canada,” Flexner pointed out several major flaws in the American medical education system [16]. These included: (1) only a few training programs were affiliated with universities, (2) most programs operated as for-profit ventures, combining lectures with on-the-job training, and (3) the majority of programs lasted only two years and did not require any exams [16,17]. Based on these findings, Flexner made several key recommendations: (1) all medical education should be university-affiliated to ensure higher standards, (2) curricula should include a balance of theoretical knowledge and practical, hands-on training, and (3) the variability in medical training needed to be carefully observed. As a result of Flexner’s findings, American medical education underwent a significant transformation in the middle of the 19th century. The new model, called Flexnerian model, was divided into two distinct phases: a pre-clinical phase, which focused on subject-based courses in the foundational sciences, and a clinical clerkship phase, where students gained hands-on experience in major medical specialties [17,19]. The traditional Flexnerian model is still used in some schools today, but it focuses heavily on building a strong foundation in basic

sciences, often taught separately from clinical practice [2,19]. As a result, when students transitioned from the pre-clinical phase to the clinical phase, much of their knowledge became disconnected from practical application, creating gaps between learning and practice. In some cases, trainers even had to repeat unnecessary content [2]. This lack of continuity and hands-on training raised concerns about how effectively the model prepared students for real-world patient care. These issues led to criticism and calls for reform, with many proposed changes focusing on integrating basic sciences throughout the entire curriculum, rather than limiting them to the first 2-3 years. The curriculum should be interdisciplinary and interdepartmental, with the goal of blending theory and practice, and making basic sciences more relevant to the practice of medicine. This approach gave rise to what is known as integrated medical education. However, simply integrating basic and clinical sciences is insufficient. It is also essential to emphasize the importance of humanism and population health sciences in medicine, and, most importantly, to address the needs of the population. As a result, outcome-based medical education (OBME) was eventually developed.

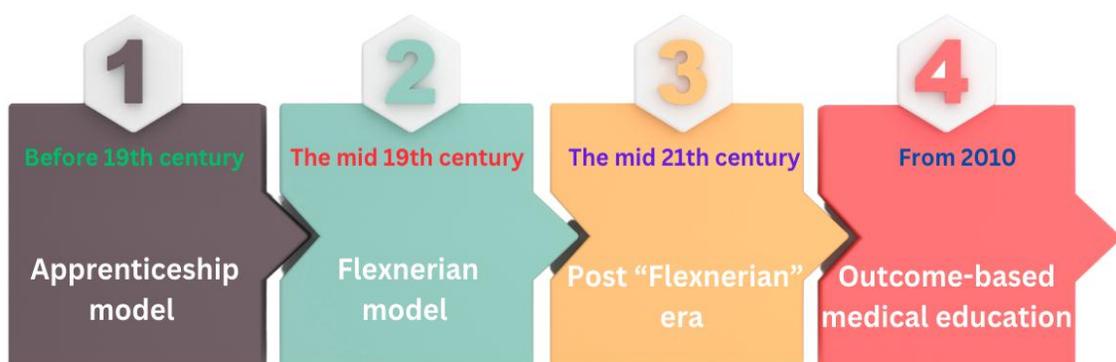


Figure 1. Timeline of the evolution of medical education

3.3. The Outcome-Based Medical Education

In response to criticisms of the traditional system and changing health needs, global curricular reforms were initiated by organizations such as the World Health Organization (WHO) and the World Federation for Medical Education (WFME). These post-Flexnerian reforms aimed to equip physicians for the 21st century, focusing on modern clinical reasoning and decision-making [6,11,19]. Key changes included integrating basic sciences throughout the entire curriculum, with interdisciplinary courses linking early clinical problems to basic science knowledge, and continuing this approach into the clinical years [7,20,21]. Additionally, behavioural, social, and ethical aspects of health, like statistics and information sciences, were incorporated to prepare graduates for health promotion and life-long learning. Clinical training

was also broadened beyond tertiary hospitals, exposing students to settings like ambulatory care, rural hospitals, and nursing homes, helping them understand the critical role of primary care [5,9].

However, the best curriculum is one that produces graduates who align with the medical school's mission and meet society's health needs [10]. To achieve these goals, Outcome-Based Medical Education (OBME) was introduced. OBME adopts a competency-based approach, using backward design to align medical training with community health needs. In contrast to the traditional teacher-centered, lecture-based, and discipline-oriented model, OBME focuses on students achieving specific, measurable competencies, with an emphasis on patient-centered outcomes rather than cognitive knowledge [9,10,22]. The content was centered on an outcome framework, with students introduced to the basics of patient care in their first year.

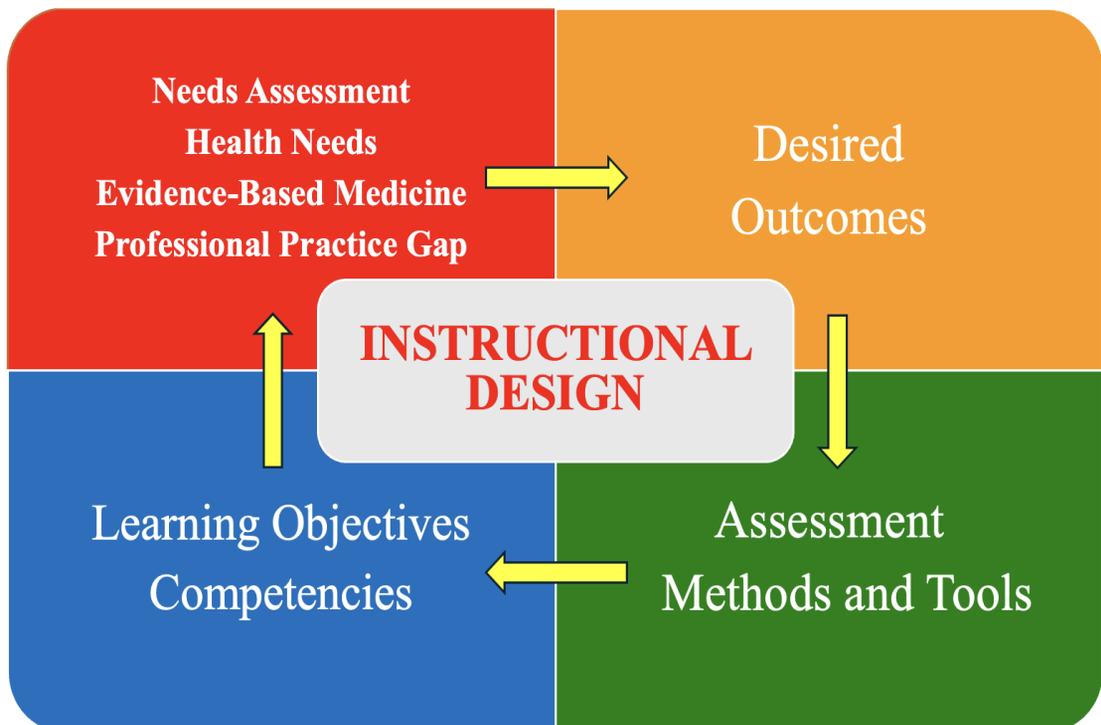


Figure 2. The backward design in outcome-based medical education

Despite its advantages, OBME faces several challenges. One major issue is the inconsistent definition of competencies across different institutions in one country even in one city, making it difficult to standardize expectations for student outcomes. Additionally, there are

concerns about the reliability and validity of assessments, as accurately measuring competencies can be complex [23,24]. OBME also places high demands on faculty, requiring significant time and effort to design, implement, and evaluate competency-based curricula effectively.

Table 1. The differences of traditional and outcome-based medical education

Traditional model	Outcome-based model
Define teaching objectives	Define learning outcomes
Time is fixed, outcomes variables	Time is variable, outcomes fixed
Assessment is secondary	Assessment is central
Focus on teaching	Focus on learning
Standardized curriculum	Individualized curriculum
Teacher as guardian of curriculum	Teacher as guide and advisor

Overcoming these challenges requires the expertise of skilled medical educators and strong institutional support from medical schools [10,13]. Faculty must be provided with ongoing professional development to ensure they are equipped to conduct OBME. This can be facilitated by establishing a faculty development unit or center for medical education, which focuses on training, mentoring for faculties, and conducting research in medical education to continually improve teaching methods and assessment tools. These units play a critical role in supporting faculty and advancing the overall effectiveness of OBME.

4. DISCUSSION

The evolution of medical education reflects a growing emphasis on integrating theory with practical application. Although both the apprenticeship and Flexnerian models were foundational in shaping medical training, they had notable

limitations—especially in addressing real-world healthcare demands.

The shift towards OBME aims to resolve these issues by focusing on developing outcomes aligned with health needs [22,25]. OBME prioritizes patient-centered learning, departing from the traditional, teacher-centered approach. It fosters interdisciplinary learning and early clinical exposure, helping students bridge the gap between basic science and its practical application. A key strength of OBME is its "backward design," where the curriculum is tailored to meet society’s health needs. However, a major challenge lies in the inconsistent definitions of competencies across institutions, complicating efforts to standardize student outcomes.

Assessing competencies is more complex than traditional exams, which means educators need the right tools and training to develop assessments that accurately reflect student abilities [23,24].

This places additional demands on faculty, requiring them to be equipped with ongoing professional development and support from their institutions. Faculty development unit plays a crucial role by providing training, mentorship, and resources to enhance teaching and assessment in outcome-based education. Therefore, continuous adaptation is essential in medical education to produce competent, patient-focused physicians who can meet the evolving needs of healthcare.

5. CONCLUSION

Medical education has continuously evolved to meet the demands of modern healthcare, but challenges persist across different educational models. The need for more integrated, competency-based approaches is evident in efforts to align training with real-world healthcare needs. Although outcome-based medical education holds promise, its implementation requires strong institutional support and ongoing faculty development to overcome existing barriers. The future success of medical education depends on continuous innovation, ensuring that training and assessing methods stay relevant and responsive to the complex, evolving health needs.

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