

# Horizontal Education in Medical Sciences in Iran: A Certificate-Based Strategy for Skill Enhancement

Masoumeh Jorjani<sup>1,2,3\*</sup>, Matin Baghani<sup>4,5</sup>

<sup>1</sup>Department of Pharmacology, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>2</sup>Neurobiology Research Center, Institute of Neuroscience and Cognition, Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>3</sup>Department of Medical Education, Iranian Academy of Medical Sciences, Tehran, Iran

<sup>4</sup>Functional Neurosurgery Research Center, Research Institute of Functional Neurosurgery, Shohada Tajrish Comprehensive Neurosurgical Center of Excellence, Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>5</sup>Department of Foresight, Theorizing, and Macro Health Monitoring, Iranian Academy of Medical Sciences, Tehran, Iran

**Received:** 2025 February 24

**Revised:** 2025 July 31

**Accepted:** 2025 October 04

**Published online:** 2025 October 04

**\*Corresponding author:**

Department of Pharmacology, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Email: msjorjani@sbmu.ac.ir

**Citation:**

Jorjani M, Baghani M. Horizontal Education in Medical Sciences in Iran: A Certificate-Based Strategy for Skill Enhancement. *Strides Dev Med Educ.* 2025 October; 23(1):e1535. doi:10.22062/sdme.2025.200961.1535

## Abstract

Education plays a crucial role in sustainable development and is a significant investment in building a skilled workforce that fosters enduring societal growth. In medical sciences, horizontal education is a novel and effective method to continuously improve the knowledge and skills of healthcare professionals. Recent advancements in technology and the significant influence of artificial intelligence are driving the need for updated skills in healthcare. Short-term, need-based courses in horizontal education allow healthcare professionals to refresh their specialized skills quickly, without the obligation of lengthy academic programs. This approach is aligned with national health policies and the country's seventh development plan. It holds the promise of enhancing both public and specialized healthcare services, empower graduates from medical and allied health disciplines, reduce skill gaps, and modernize the nation's health system. This concise report offers a practical framework for implementing horizontal education in Iran's health and medical education sectors. It underscores the significance of establishing clear policy guidelines, developing robust infrastructure, and creating comprehensive quality assurance mechanisms to ameliorate health outcomes and elevate Iran's standing in the global health arena.

**Keywords:** Horizontal Education; Iranian Health Education; Professional Skills; Certificate-Based Training; Continuing Education

## Background

### The Imperative for Educational Innovation in Iranian Healthcare

Education transcends the mere acquisition of knowledge—it serves as a powerful tool for sustainable progress. Traditional medical training in Iran, typically provided through long-term programs and fellowships, struggles to keep pace with rapidly evolving healthcare landscape (1). Horizontal education (HE) responds to this challenge by offering short-term, targeted training courses that allow professionals to update their skills effectively without requiring prolonged academic commitments (2). This educational model represents a paradigm shift from traditional vertical specialization toward cross-

disciplinary, competency-based approach to skill enhancement integrating various domains of knowledge at the same educational level (3-5). This educational model underscores the dissolution of traditional departmental barriers to establish connections between different medical specialties and disciplines, facilitating knowledge transfer and skill integration across conventional academic boundaries (4, 6).

Further, the rapid integration of digital and virtual learning modalities—propelled by technological advancements and artificial intelligence—further facilitates the transition toward more agile educational methods (7).

Horizontal education fundamentally contrasts with conventional continuing medical education (CME) in

various key aspects that merit thorough analysis (3). The distinctions between horizontal education and traditional CME are multifaceted and fundamental. Traditional CME generally centers on single-specialty knowledge updates provided through rigid, scheduled programs that utilize time-based credit systems. These create isolated learning experiences characterized by fixed time requirements and participation-based assessment structures. Conversely, horizontal education prioritizes multi-disciplinary integration through flexible, need-responsive training programs. It applies outcome-based assessment methods and competency-based evaluation systems, promoting cross-specialty collaboration with variable duration based on mastery achievement (3, 6, 8, 9).

The conceptual framework of horizontal education is founded on five fundamental principles. First, cross-disciplinary integration ensures that knowledge and skills are acquired across traditional specialty boundaries instead of being confined to isolated disciplines (6, 10). Second, competency-based progression indicates that advancement hinges on demonstrated competencies rather than the duration of training (9). Third, flexible learning pathways enable educational trajectories to adjust to individual learning needs and professional demands (8). Fourth, real-world application contextualizes learning within genuine clinical scenarios that necessitate multi-disciplinary expertise (11). Lastly, collaborative learning environments enable learners from various specialties to learn together, fostering interprofessional collaboration (6).

**Methods**

This concise report was developed utilizing a two-stage methodology. Initially, a narrative literature review was performed to examine the conceptual evolution, operational models, and effectiveness of horizontal as well as certificate-based education in health sciences. Databases including PubMed, Scopus and Google Scholar were searched using keywords such as “horizontal education”, “modular training”, “competency-based medical education” and “micro-credentials” concentrating on studies published between 2010 and 2024. Pertinent global policy documents and implementation frameworks were also included.

Secondly, insights were obtained from national expert panels comprising senior faculty, curriculum designers, and healthcare policy advisors affiliated with Iranian medical universities and the Ministry of Health, Treatment, and Medical Education (MoHME). These panels were organized to pinpoint national implementation deficiencies, prioritize strategic

initiatives, and confirm the proposed policy recommendations. The synthesized findings derived from literature and expert consultation serve as the foundation for the proposed operational framework and policy recommendations presented in this report.

This comprehensive analysis indicates that while horizontal education offers substantial promise for Iranian medical education, several interconnected challenges currently hinder its effective implementation.

**Systemic Barriers to Educational Modernization**

The current educational framework in Iran primarily relies on structured, long-term programs such as fellowships and formal continuing education initiatives, which have established a robust foundation for professional development. Nevertheless, several challenges have arisen with this traditional approach (Table 1).

**Table 1.** System-level Challenges in Implementation of Horizontal Education in Iranian Medical Sciences

Challenge Category	Identified Issues
Current System	Vertical specialization emphasis Limited adaptability to emerging needs Resource allocation inefficiencies
Infrastructure	Insufficient technological integration Limited digital learning platforms Inadequate virtual education tools
Regulatory Framework	Lack of standardized certification process Unclear quality assurance mechanisms Undefined assessment criteria

Numerous courses prioritize prolonged specialization, leaving minimal opportunity for rapid skill updates (12). In addition, there exists a mismatch in resources, as health professionals require a broad range of skills that current programs often fail to address (13). Further, current offerings often focus too narrowly on specialized content, neglecting the wider competencies required for general practice and local needs. This leads to a shortage of courses designed for non-specialist audiences, ultimately impeding overall workforce development (5). Traditional curricula frequently find it difficult to keep pace with rapid technological and scientific advancements, leading to a lack of flexibility (7). Moreover, lack of clear guidelines creates uncertainty regarding the value and recognition of certificate-based short courses (14). Inconsistent oversight and the absence of standardized evaluation methods further compromise the quality of these training programs (15). The distinction between horizontal education and conventional continuing

medical education remains ambiguous, leading to confusion among stakeholders. Meanwhile, ongoing resource limitations make the allocation of essential financial, human, and infrastructural support uncertain (13, 16).

**A Strategic Framework for Implementation**

In recent years, Iran has made significant progress in implementing horizontal, certificate-based education within the medical and health sciences sector through various pilot programs showcasing practical feasibility and positive effect on learner competence and service delivery. The National Center for Skills and Vocational Training of Medical Sciences (NACEHVET), operating under the Ministry of Health, Treatment, and Medical Education (MoHME) has taken the lead in creating short, competency-based educational modules that are distinct from traditional curricula (17). These modules result in recognized certificates while placing a strong emphasis on interdisciplinary professional skills and responding dynamically to evolving health system requirements.

The Iran Advanced Clinical Training (iACT) Center, in partnership with NACEHVET and Tehran University of Medical Sciences, offers modular programs in clinical procedures, medical technologies, and professional competencies. These programs are delivered through theoretical instruction, simulation exercises and supervised clinical experiences. Current programs include certificates in professional communication, workshops on practical clinical skills in emergency medicine and clinical reasoning, as well as medical technology literacy in digital health and telemedicine (18).

*International Precedents and Validation:* Global experiences further substantiate the horizontal education approach through systematic applications across diverse healthcare systems. The Royal College of Physicians and Surgeons of Canada has pioneered comprehensive competency-based medical education based on its "Competence by Design" framework, revolutionizing specialty training across 67 specialties and serving over 13,000 trainees through time-variable, competency-focused pathways that underscore individualized progression (19). The European Union has officially endorsed horizontal education through its 2022 Council Recommendation on micro credentials, advocating for short-term, modular learning experiences that offer flexible skill development across healthcare disciplines (20). The World Health Organization's Global Competency Framework sets forth international benchmarks for competency-based

health worker education, organizing competencies within six domains that directly parallel Iran's horizontal education principles: people-centeredness, decision-making, communication, collaboration, evidence-informed practice, and personal conduct (21). WHO's execution of the EQUIP-Foundational Helping Skills program across Nepal, Peru, and Uganda illustrates successful scaling of horizontal education via modular, culturally-adapted curricula, with assessments indicating significant improvements in healthcare worker competencies and enhanced helping knowledge following completion (22). International evaluations consistently reveal positive outcomes from horizontal, certificate-based medical education, including improved trainee preparation for practice, enhanced assessment quality, greater alignment with patient care needs and boosted workforce resilience during public health emergencies (23). These global implementations affirm Iran's systematic approach to horizontal education and highlight the growing international trend toward competency-based, modular medical training that adapts dynamically to evolving healthcare needs.

To incorporate horizontal education effectively into the Iran's medical training system, the following framework is proposed (Figure 1, Table 2):

**Table 2.** Core Components of the Horizontal Education Implementation Framework

Component	Key Elements
Policy Structure	Dedicated ministerial unit National digital platform Standardized guidelines
Quality Control	Expert committee oversight Accreditation system Performance monitoring framework
Stakeholder Integration	Medical universities integration Professional association participation Healthcare organization involvement

*Establishing Governance Infrastructure:* For defining the role of horizontal education, a detailed policy document should be created which outlines its purpose, scope and operational requirements, while also establishing a dedicated unit within the MoHME to manage and monitor these programs effectively. This unit will elucidate how short-term courses integrate within the broader health service delivery system while ensuring regular evaluations to update course content and pedagogical methods based on scientific advances and local needs.

It is essential to align horizontal education with existing continuing medical education policies for systematic integration. This necessitates revising current policies to incorporate horizontal education principles, harmonizing credit systems and incentives for both traditional and modular courses, as well as developing unified management systems for delivering diverse training modalities.

Such integration establishes a cohesive educational landscape which addresses the evolving needs of health professionals while maintaining quality standards and professional recognition across all pathways.

#### *Building Digital and Physical Learning Ecosystems:*

Establishing a robust infrastructure starts with the creation of a national digital platform that allows educators and learners to access, manage and oversee course activities seamlessly. This necessitates amelioration of domestic internet infrastructure to support remote and blended learning environments, while also investing in simulation technologies that provide realistic virtual training environments.

Effective execution necessitates the establishment of multidisciplinary simulation centers that cater to various specialties at the same time, as opposed to isolated department-specific facilities. Physical co-location allows for cross-specialty equipment sharing, with advanced technologies including surgical navigation systems, robotic surgery platforms and high-fidelity simulators accessible to learners from different disciplines simultaneously. Digital platforms should support integrated scheduling systems enabling learners from multiple disciplines to engage in shared training sessions, incorporating enterprise-wide standardization protocols that enhance resource utilization and knowledge transfer.

Technology integration needs to support collaborative assessment methodologies ascertaining interprofessional skills alongside discipline-specific competencies. The execution requires phased development starting with shared technology platforms serving multiple specialties. It is then followed by integrated digital assessment systems, concluding with comprehensive collaborative learning management systems that reflect the interdisciplinarity of modern healthcare delivery.

#### *Ensuring Excellence through Collaborative Oversight:*

Establishing explicit standards for needs-based education requires formation of expert committees tasked with developing content and operational standards. This process involves creating frameworks for course duration, curriculum design and evaluation methods. It encompasses defining qualifications for

instructors and training institutions alongside the establishment of systematic processes for regularly ascertaining and prioritizing training needs to ensure course relevance as well as effectiveness.

Quality assurance necessitates establishing independent oversight units or integrating with current quality commissions to manage accreditation processes. It is imperative to establish clear accreditation guidelines and performance indicators in conjunction with continuous monitoring and evaluation systems to ascertain course effectiveness. Further, procedures for issuing and renewing certificates based on quality standards are crucial for maintaining program credibility.

Engaging stakeholders involves professional associations, healthcare organizations and non-governmental groups in course design and delivery, establishing partnerships with medical universities for co-hosting programs, promoting private sector contributions and collaborating with the Medical Council as well as regulatory bodies for proper oversight and accreditation.

Comprehensive evaluation requires systematic evaluation across various outcome domains. Essential indicators include knowledge retention rates ascertained through longitudinal evaluation, competency scores based on validated frameworks such as CanMEDS or ACGME domains, employment rates within six months post-certification and program quality metrics including completion rates as well as participant satisfaction. Health system impact measures should evaluate patient outcomes, effectiveness of team collaboration, and graduates' contributions to healthcare innovation. All of these indicators incorporate specific measurement methodologies and benchmark targets based on international best practices (9, 24).

Whereas these quality assurance and stakeholder engagement mechanisms provide the foundation for successful horizontal education, the practical implementation of this framework confronts significant operational and cultural obstacles that warrant strategic intervention.

#### *Navigating Implementation Barriers and Solutions:*

Faculty resistance represents a significant challenge, often arising from institutional cultures and professional identities. Medical educators frequently experience "change fatigue" caused by continuous reforms, resulting in skepticism toward new approaches (25, 26). This resistance is further compounded by traditional disciplinary boundaries that delineate

professional expertise and status within academic medical centers.

Implementation necessitates considerable initial investment in technology infrastructure, faculty development, and curriculum redesign. Traditional funding models seldom support innovative cross-disciplinary initiatives, especially in resource-limited settings. The current regulatory frameworks designed around specialty-based training models may face resistance from accrediting bodies unfamiliar with cross-disciplinary competency-based assessment methods.

Addressing faculty resistance necessitates structured change management programs dealing with underlying psychological and professional concerns. Early adopter networks have the capacity to identify and support faculty champions who exhibit success and influence colleagues through peer validation. Incentive alignment achieved through restructured reward systems should recognize cross-disciplinary teaching contributions and educational innovation. Professional development opportunities should aim to improve faculty cross-disciplinary competencies, thereby alleviating anxiety about teaching outside traditional expertise areas.

Addressing funding limitations requires the creation of public-private partnership models that involve healthcare systems, technology companies, and government agencies as educational innovation stakeholders. Phased implementation approaches allows for gradual expansion based on proven success and available resources. Cost-effectiveness demonstrations through pilot initiatives can provide evidence of enhanced learning outcomes and cost savings compared to traditional approaches.

#### Strategic Priorities for National Implementation

Given the challenges identified in Iran's current educational framework and the proposed operational framework for horizontal education, several key recommendations emerge to guarantee its effective implementation:

1. **Develop a Clear Policy:** Generate a detailed document that outlines the goals and requirements for horizontal education.
2. **Establish dedicated Structures:** Develop a specific organizational unit to manage these programs within the Ministry of Health and Medical Education.
3. **Set National Standards:** Form expert committees to establish and monitor content as well as operational standards.
4. **Implement a Robust Accreditation System:** Ensure that all courses fulfil quality standards through a thorough evaluation process.

5. **Invest in IT Infrastructure:** Build a comprehensive digital platform to manage course delivery along with monitoring.

6. **Foster Stakeholder Collaboration:** Leverage the expertise of academic institutions, professional organizations and private companies.

7. **Integrate with Existing Programs:** Align horizontal education with current continuing education systems in order to maximize efficiency.

**Limitations:** This report had limitations that should be acknowledged. The proposed framework has not yet undergone pilot testing or validation, where resource requirements for full implementation were not quantitatively ascertained. Nevertheless, the expert panel consultations drew from the prestigious Academy of Medical Sciences of Iran, comprising healthcare elites from the ministry, universities and clinical practice, strengthening the validity of our policy recommendations. Future research should deal with remaining limitations through pilot implementations and comprehensive cost-benefit analyses.

#### Conclusion

Horizontal education offers a practical and dynamic solution to the evolving needs of medical professionals in Iran. By offering flexible, certificate-based training, this approach effectively addresses skill gaps, improves service quality, and keeps pace with technological advancements. With a solid policy framework, strong infrastructure, and active stakeholder involvement, horizontal education has the capacity to revolutionize medical training and elevate Iran's standing within the global healthcare community.

**Acknowledgements:** The authors express their sincere appreciation to the Medical Education Group of the Academy of Medical Sciences of Iran for their valuable support. The authors also thank all colleagues who contributed to the conceptual design and analytical discussions of this work.

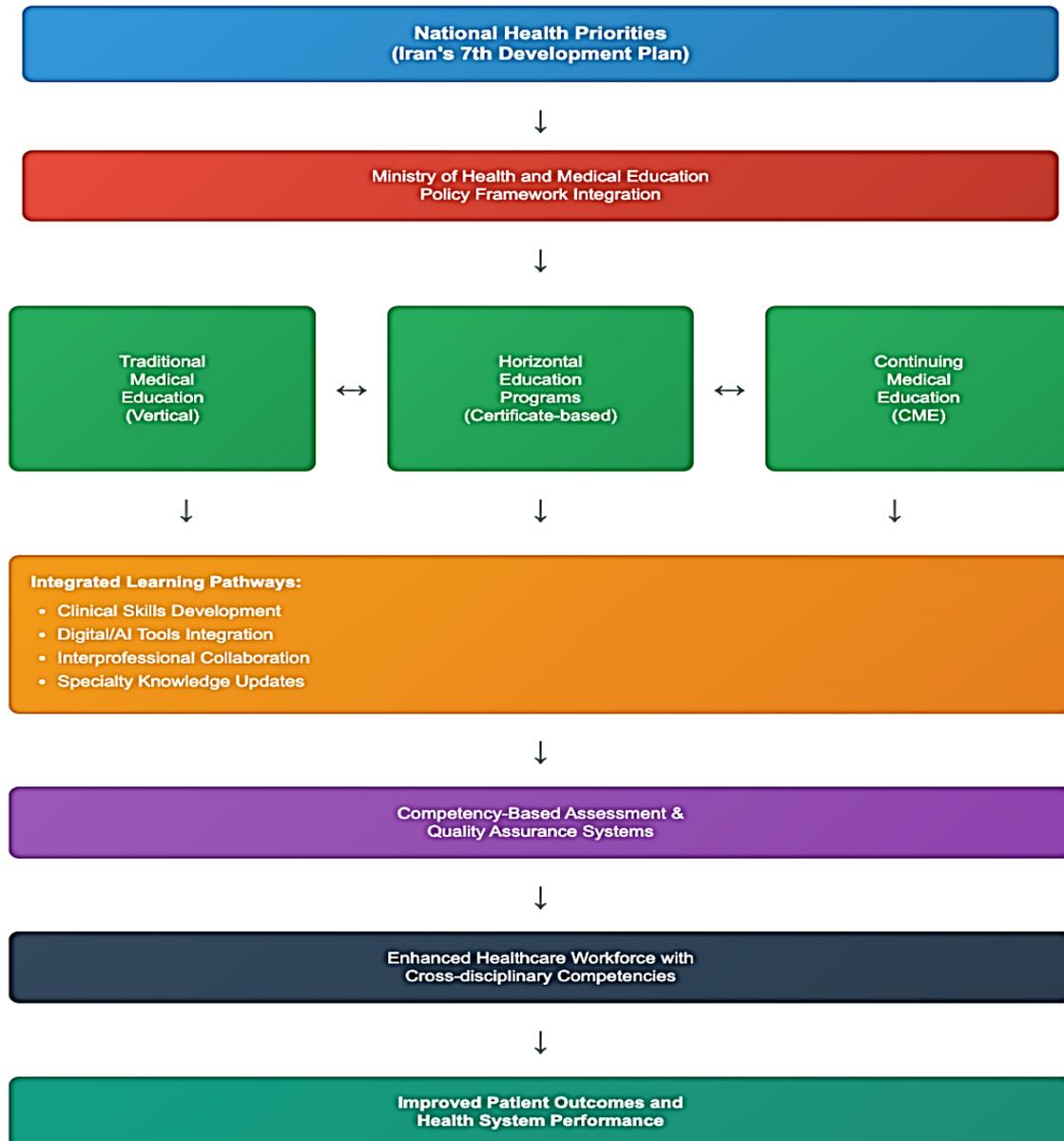
**Conflict of interests:** There is no conflict of interest.

**Ethical approval:** This article is derived from scholarly activities conducted within the Medical Education Group of the Academy of Medical Sciences of Iran. As it was not part of a formal approved project involving human or animal subjects, obtaining an ethics code was not required.

**Funding/Support:** This study received no specific grant from any funding agency, commercial, or not-for-profit sectors.

## References

- Javanparast S, Baum F, Labonte R, Sanders D, Rajabi Z, Heidari G. The experience of community health workers training in Iran: a qualitative study. *BMC Health Serv Res*. 2012 Aug 31;12:291. doi: [10.1186/1472-6963-12-291](https://doi.org/10.1186/1472-6963-12-291). [PMID: [22938138](https://pubmed.ncbi.nlm.nih.gov/22938138/)] [PMCID: [PMC3475089](https://pubmed.ncbi.nlm.nih.gov/PMC3475089/)]
- Ostad N, Mohammadi M, Gholami Kh, Ahmadi S, Namazi S, Ebrahimipour Sh. Designing, Implementation, and Evaluation of an Online Modular Course on Patient Education and Counseling at the Community Pharmacy. *J Pharm Care* 2021; 9(1): 13-7. doi: [10.18502/jpc.v9i1.6031](https://doi.org/10.18502/jpc.v9i1.6031).
- Brauer DG, Ferguson KJ. The integrated curriculum in medical education: AMEE Guide No. 96. *Med Teach*. 2015 Apr;37(4): 312-22. doi: [10.3109/0142159X.2014.970998](https://doi.org/10.3109/0142159X.2014.970998). [PMID: [25319403](https://pubmed.ncbi.nlm.nih.gov/25319403/)]
- Youm J, Christner J, Hittle K, Ko P, Stone C, Blood AD, et al. The 6 degrees of curriculum integration in medical education in the United States. *J Educ Eval Health Prof*. 2024;21:15. doi: [10.3352/jeehp.2024.21.15](https://doi.org/10.3352/jeehp.2024.21.15). [PMID: [38872249](https://pubmed.ncbi.nlm.nih.gov/38872249/)] [PMCID: [PMC11261157](https://pubmed.ncbi.nlm.nih.gov/PMC11261157/)]
- Malik AS, Malik RH. Twelve tips for developing an integrated curriculum. *Med Teach*. 2011;33(2):99-104. doi: [10.3109/0142159X.2010.507711](https://doi.org/10.3109/0142159X.2010.507711). [PMID: [20874013](https://pubmed.ncbi.nlm.nih.gov/20874013/)]
- Lankarani KB, Honarvar B, Faghihi SA, Haghghi MRR, Sadati AK, Rafiei F, et al. Demanded interdisciplinary subjects for integration in medical education program from the point of view of graduated medical physicians and senior medical students: a nationwide mixed qualitative-quantitative study from Iran. *BMC Med Educ*. 2024;24(1):125. doi: [10.1186/s12909-024-05079-w](https://doi.org/10.1186/s12909-024-05079-w). [PMID: [38326809](https://pubmed.ncbi.nlm.nih.gov/38326809/)] [PMCID: [PMC10851448](https://pubmed.ncbi.nlm.nih.gov/PMC10851448/)]
- Khani A, Fahimi S, Alinejad S, Rastgar Z, Ghaemi M. Electronic Learning in Iran's Medical Schools; Students' Need for Basic Computer Skills. *Educ Health (Abingdon)*. 2014 ;27(1):69-70. doi: [10.4103/1357-6283.134325](https://doi.org/10.4103/1357-6283.134325). [PMID: [24934950](https://pubmed.ncbi.nlm.nih.gov/24934950/)]
- Cate Ot, Carraccio C. Envisioning a True Continuum of Competency-Based Medical Education, Training, and Practice. *Acad Med*. 2019 Sep; 94(9): 1283-1288. doi: [10.1097/ACM.0000000000002687](https://doi.org/10.1097/ACM.0000000000002687). [PMID: [31460916](https://pubmed.ncbi.nlm.nih.gov/31460916/)]
- Karpinski J, Stewart J, Oswald A, Dalseg TR, Atkinson A, Frank JR. Competency-Based Medical Education at Scale: A Road Map for Transforming National Systems of Postgraduate Medical Education. *Perspect Med Educ*. 2024 Feb 6;13(1): 24-32. doi: [10.5334/pme.957](https://doi.org/10.5334/pme.957). [PMID: [38371306](https://pubmed.ncbi.nlm.nih.gov/38371306/)] [PMCID: [PMC10870941](https://pubmed.ncbi.nlm.nih.gov/PMC10870941/)]
- Albert M, Rowland P, Friesen F, Laberge S. Barriers to cross-disciplinary knowledge flow: The case of medical education research. *Perspect Med Educ*. 2022 Jun;11(3): 149-155. doi: [10.1007/s40037-021-00685-6](https://doi.org/10.1007/s40037-021-00685-6). [PMID: [34648134](https://pubmed.ncbi.nlm.nih.gov/34648134/)] [PMCID: [PMC9240116](https://pubmed.ncbi.nlm.nih.gov/PMC9240116/)]
- Wells GB, Baxter DA, Day LJ, Boone TB, Moreno MR, Gibson JL, et al. A transdisciplinary dual degree curriculum yields novel and successful learning outcomes: early lessons from training physicianeers. *Front Med (Lausanne)*. 2025 Feb 28;12:1520976. doi: [10.3389/fmed.2025.1520976](https://doi.org/10.3389/fmed.2025.1520976). [PMID: [40093015](https://pubmed.ncbi.nlm.nih.gov/40093015/)] [PMCID: [PMC11906449](https://pubmed.ncbi.nlm.nih.gov/PMC11906449/)]
- Farmad SA, Esfidani A, Shahbazi S. A comparative study of the curriculum in master degree of medical education in Iran and some selected countries. *BMC Med Educ*. 2023 May 30;23(1):393. doi: [10.1186/s12909-023-04366-2](https://doi.org/10.1186/s12909-023-04366-2). [PMID: [37254168](https://pubmed.ncbi.nlm.nih.gov/37254168/)] [PMCID: [PMC10227390](https://pubmed.ncbi.nlm.nih.gov/PMC10227390/)]
- Faghihi SA, Khankeh HR, Hosseini SJ, Soltani Arabshahi SK, Faghih Z, Shirazi M. Impractical CME programs: Influential parameters in Iran. *Med J Islam Repub Iran*. 2017 Jan 26;31:6. doi: [10.18869/mjiri.31.6](https://doi.org/10.18869/mjiri.31.6). [PMID: [28638813](https://pubmed.ncbi.nlm.nih.gov/28638813/)] [PMCID: [PMC5473012](https://pubmed.ncbi.nlm.nih.gov/PMC5473012/)]
- Farhadi Z, Rezaei E, Bazrafkan L, Amini M, Sanaiey NZ, Barati-Boldaji R, et al. Need assessment of medical school curriculum for MOOCs: perspectives of instructors and students of Shiraz University of Medical Sciences. *BMC Med Educ*. 2024 Feb 13;24(1):141. doi: [10.1186/s12909-024-05102-0](https://doi.org/10.1186/s12909-024-05102-0). [PMID: [38351037](https://pubmed.ncbi.nlm.nih.gov/38351037/)] [PMCID: [PMC10865553](https://pubmed.ncbi.nlm.nih.gov/PMC10865553/)]
- Faghihi SA, Khankeh HR, Hosseini SJ, Soltani Arabshahi SK, Faghih Z, Parikh SV, et al. Improving continuing medical education by enhancing interactivity: lessons from Iran. *J Adv Med Educ Prof*. 2016 Apr;4(2):54-63. [PMID: [27104199](https://pubmed.ncbi.nlm.nih.gov/27104199/)] [PMCID: [PMC4827757](https://pubmed.ncbi.nlm.nih.gov/PMC4827757/)]
- Iravani M, Nasab MB, Bahmaei H, Ghanbari S, Mohaghegh Z, Siahkal SF. The level of satisfaction and quality of E-learning in medical universities of Iran during the epidemic of COVID-19. *J Educ Health Promot*. 2022 Jan 31;11:9. doi: [10.4103/jehp.jehp\\_1555\\_20](https://doi.org/10.4103/jehp.jehp_1555_20). [PMID: [35281399](https://pubmed.ncbi.nlm.nih.gov/35281399/)] [PMCID: [PMC8893104](https://pubmed.ncbi.nlm.nih.gov/PMC8893104/)]
- National Center for Skills and Vocational Training of Medical Sciences (NACEHVET). National Center for Skills and Vocational Training of Medical Sciences [Internet]. Tehran: Ministry of Health and Medical Education, Iran; 2025. [cited 2025 July 31]. Available from: <https://nacehvet.behdasht.gov.ir>
- Iranian Advanced Clinical Training (iACT) Center. Iranian Advanced Clinical Training Center [Internet]. Tehran: Tehran University of Medical Sciences; 2025. [cited 2025 July 31]. Available from: <https://iactcenter.ir>
- Hall AK, Oswald A, Frank JR, Dalseg T, Cheung WJ, Cooke L, et al. Evaluating Competence by Design as a Large System Change Initiative: Readiness, Fidelity, and Outcomes. *Perspect Med Educ*. 2024 Feb 6;13(1):95-107. doi: [10.5334/pme.962](https://doi.org/10.5334/pme.962). [PMID: [38343556](https://pubmed.ncbi.nlm.nih.gov/38343556/)] [PMCID: [PMC10854467](https://pubmed.ncbi.nlm.nih.gov/PMC10854467/)]
- Zdunek K, Dobrowolska B, Dziurka M, Galazzi A, Chiappinotto S, Palese A, et al. Challenges and opportunities of micro-credentials as a new form of certification in health science education-a discussion paper. *BMC Med Educ*. 2024 Oct 18;24(1):1169. doi: [10.1186/s12909-024-06174-8](https://doi.org/10.1186/s12909-024-06174-8). [PMID: [39425060](https://pubmed.ncbi.nlm.nih.gov/39425060/)] [PMCID: [PMC11490131](https://pubmed.ncbi.nlm.nih.gov/PMC11490131/)]
- World Health Organization (WHO). Global Competency and Outcomes Framework for Universal Health Coverage [Internet]. Geneva: World Health Organization; 2022. [cited 2025 July 31]. Available from: <https://www.who.int/publications/i/item/9789240034662>
- Watts S, Hall J, Pedersen GA, Ottman K, Carswell K, van't Hof E, et al. The WHO EQUIP foundational helping skills trainer's curriculum. *World Psychiatry*. 2021 Oct;20(3):449-50. doi: [10.1002/wps.20880](https://doi.org/10.1002/wps.20880). [PMID: [34505376](https://pubmed.ncbi.nlm.nih.gov/34505376/)] [PMCID: [PMC8429346](https://pubmed.ncbi.nlm.nih.gov/PMC8429346/)]
- Alharbi NS. Evaluating competency-based medical education: A systematized review of current practices. *BMC Med Educ*. 2024 Jun 3;24(1):612. doi: [10.1186/s12909-024-05609-6](https://doi.org/10.1186/s12909-024-05609-6). [PMID: [38831271](https://pubmed.ncbi.nlm.nih.gov/38831271/)] [PMCID: [PMC11149276](https://pubmed.ncbi.nlm.nih.gov/PMC11149276/)]
- Swing SR, Schneider S, Bizovi K, Chapman D, Graff LG, Hobgood C, et al. Using patient care quality measures to assess educational outcomes. *Acad Emerg Med*. 2007 May;14(5): 463-73. doi: [10.1197/j.aem.2006.12.011](https://doi.org/10.1197/j.aem.2006.12.011). [PMID: [17395960](https://pubmed.ncbi.nlm.nih.gov/17395960/)]
- Price I, Regehr G. Barriers or costs? Understanding faculty resistance to instructional changes associated with curricular reform. *Can Med Educ J*. 2022 Jul 6;13(3):113-115. doi: [10.36834/cmej.74041](https://doi.org/10.36834/cmej.74041). [PMID: [35875449](https://pubmed.ncbi.nlm.nih.gov/35875449/)] [PMCID: [PMC9297245](https://pubmed.ncbi.nlm.nih.gov/PMC9297245/)]
- Dana C, Soffe B, Shipley J, Licari F, Larsen R, Plummer K, et al. Why do faculty resist change? *MedEdPublish* (2016). 2021 Apr 8;10:89. doi: [10.15694/mep.2021.000089.1](https://doi.org/10.15694/mep.2021.000089.1). [PMID: [38486568](https://pubmed.ncbi.nlm.nih.gov/38486568/)] [PMCID: [PMC10939649](https://pubmed.ncbi.nlm.nih.gov/PMC10939649/)]



**Figure 1.** Integrated Horizontal Education Model and Its Relationship to Existing Iranian Medical Education Systems. The model indicates how horizontal education programs complement rather than replace traditional vertical education and continuing medical education pathways. National health priorities drive policy formation at the ministerial level, establishing an integrated framework where certificate-based horizontal modules work synergistically with existing educational structures. Learners can access cross-disciplinary competencies based on clinical skills, digital/AI technology, interprofessional collaboration, and specialty update modules. The framework highlights competency-based assessment and quality assurance mechanisms that eventually contribute to enhanced healthcare workforce capabilities and enhanced patient outcomes. The bidirectional arrows reveal the interconnected nature of these educational pathways, allowing for flexible movement and integration between various learning modalities based on individual professional development needs and healthcare system requirements.