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POLICY BRIEF ARTICLE

Implementation of Artificial Intelligence in Nursing Education in Iran: A Policy Brief

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Executive Summary

Artificial intelligence (AI) is a transformative technology with the potential to substantially enhance the quality of nursing education, clinical decision-making, and patient care. This policy brief examines the current status of AI integration in nursing education in Iran and identifies key challenges, including inadequate infrastructure, limited knowledge and skills, and unresolved ethical concerns. This report recommends the systematic integration of AI into nursing curricula to enable students, researchers, and policymakers to benefit from advanced tools such as intelligent simulations and clinical decision support systems.

Integrating AI into nursing education in Iran provides an opportunity to develop technologically competent nurses and improve patient-centered care. Strategies such as curriculum integration, practical workshops, regional collaboration, and ethical frameworks can overcome challenges related to faculty expertise, infrastructure, and ethical concerns. Coordinated efforts and investment in training and infrastructure will enable Iran to standardize AI competencies and strengthen its healthcare system, positioning it as a regional leader in nursing education innovation.

Keywords Artificial intelligence, Curriculum development, Educational technology, Health policy, Iran, Nursing education

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Introduction

In the contemporary era, Artificial intelligence (AI) plays a pivotal role in transforming both educational and healthcare systems. Within nursing education, AI facilitates personalized learning, enhances clinical skill acquisition, and supports diagnostic and clinical decision-making processes. Recent evidence indicates that Iran remains in the early stages of AI integration in nursing education; however, the country demonstrates considerable potential for future development.[1,2]

Current Status of AI in Nursing Education in Iran

In Iran, the application of AI in nursing practice and education is gradually expanding. Nursing students generally report positive attitudes toward AI, with more than 91% expressing favorable perceptions of its potential applications. Nevertheless, their actual practical performance and proficiency in using AI-based tools remain limited.[1]

Doctoral nursing programs in Iran, when compared with international standards, place less emphasis on educational technologies and collaborative learning approaches. Despite this gap, there is substantial potential for effective AI integration through the adoption of appropriate educational models and curricular reforms.[3] Comparative analyses of AI-based nursing curricula between Iran and other Persian Gulf countries reveal opportunities for regional collaboration, while simultaneously underscoring the need for further curriculum development and policy support within Iran.[4]

Challenges in Integrating AI

The integration of AI into nursing education in Iran is constrained by several interrelated challenges:

- Ethical challenges: Concerns regarding potential conflicts with core nursing values, including compassionate and holistic care, as well as the emergence of new ethical dilemmas in healthcare settings.[2]
- Social challenges: Fear of reduced human interaction among students, faculty members, and healthcare professionals.[5]
- Potential loss of clinical skills: Concerns about diminished development of clinical problem-solving, critical thinking, clinical reasoning, and individualized patient care planning skills.[5]
- Practical limitations: Very limited real-world application of AI in nursing and midwifery education, coupled with weak technological infrastructure.[4]
- Low knowledge and performance: Despite positive attitudes, many nursing students and practicing nurses demonstrate insufficient practical competence in AI utilization.[1,6]
- Infrastructure and educational limitations: Absence of formal AI training programs, data privacy and security concerns, and the need for advanced and sustainable digital infrastructure.[7]

Design and Implementation Strategies

The following strategies are proposed to support the effective design and implementation of AI in nursing education in Iran:

Curriculum integration

This option involves the systematic incorporation of AI and related content into undergraduate and postgraduate nursing curricula. Educational components may include intelligent simulation platforms, virtual reality, clinically based scenarios, and clinical decision support systems to strengthen theoretical knowledge and clinical reasoning skills. Integration would align with existing course structures and predefined learning outcomes, rather than being introduced as a standalone subject.[4]

Advantages

- Promotes early and continuous exposure to AI concepts among nursing students.
- Enhances clinical decision-making and problem-solving abilities through simulation-based learning.
- Supports alignment of nursing education with emerging healthcare technologies.
- Facilitates standardized and sustainable implementation of AI education at the national level.

Potential Limitations or Risks

- Requires curriculum revision and formal approval processes, which may be time-consuming.
- May increase academic workload for both students and faculty members.
- Limited faculty expertise in AI may affect instructional quality.
- Unequal access to technological resources across institutions may exacerbate educational disparities.

Practical and workshop-based training

This option focuses on the delivery of short-term, hands-on workshops and applied training courses for nursing students and practicing nurses. Training programs emphasize the practical use of AI-based tools, such as clinical decision support systems and digital simulation technologies, to enhance real-world competencies and confidence in clinical practice settings.[1,6]

Advantages

- Enables rapid improvement in practical skills and

applied knowledge.
- Allows flexible implementation without major restructuring of existing curricula.
- Suitable for both pre-service nursing students and in-service nurses.
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Potential Limitations or Risks
- Limited long-term impact if training is not reinforced through formal education.
- Variability in training quality depending on instructors, facilities, and available resources.
- May not reach all nursing professionals equally, particularly those in remote or underserved areas.
- Risk of fragmented learning if not integrated into broader educational objectives.

Collaboration and policy development

This option emphasizes national and regional collaboration to facilitate the integration of AI into nursing education. Key components include learning from successful experiences in Persian Gulf countries, establishing formal national AI education programs, and investing in educational and technological infrastructure through coordinated policy initiatives.[4]

Advantages
- Promotes harmonization of educational standards at the regional level.
- Enables efficient use of resources through shared expertise and infrastructure.
- Strengthens national capacity through structured and coordinated policy support.
- Encourages long-term sustainability and scalability of AI initiatives.
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Potential Limitations or Risks
- Requires strong intersectoral coordination and sustained political commitment.
- Policy development and implementation processes may be prolonged.
- Dependence on external models may limit adaptation to local educational and cultural contexts.
- Financial constraints may delay infrastructure development and implementation.

Emphasis on ethical considerations

This option involves the development and implementation of clear, context-specific ethical frameworks governing the use of AI in nursing education and clinical practice. Ethical guidelines would address key issues such as patient privacy, data security, accountability, and preservation of core nursing values, including compassionate and holistic care.[2]

Advantages
- Enhances trust and acceptance of AI among students, educators, and clinicians.
- Reduces ethical ambiguity and professional resistance to technology adoption.
- Ensures alignment between AI applications and fundamental nursing values.
- Supports responsible, safe, and ethically sound implementation of AI technologies.

Potential Limitations or Risks
- Ethical frameworks may lag behind rapid technological advancements.
- Overly restrictive regulations may limit innovation and flexibility.
- Requires continuous monitoring, periodic revision, and active stakeholder engagement.
- Inconsistent enforcement across institutions may reduce overall effectiveness.

Change Management and Technology Acceptance Strategies

This approach systematically addresses human and organizational factors that influence the adoption of artificial intelligence technologies in nursing education. Grounded in established change management models, such as Kotter's 8 Step Model,[8] ADKAR (Awareness, Desire, Knowledge, Ability, and Reinforcement) is a widely used change management framework developed to support successful organizational change implementation (ADKAR),[9] and technology acceptance frameworks, including the Technology Acceptance Model and the Unified Theory of Acceptance and Use of Technology,[10] this strategy emphasizes stakeholder engagement, capacity building, and cultural readiness to reduce resistance and support sustainable adoption among faculty members, students, and administrative leaders. Key components include: (i) conducting baseline assessments of digital literacy and attitudes toward artificial intelligence, (ii) establishing interdisciplinary change champion teams composed of faculty members, students, and information technology specialists, (iii) designing phased implementation plans with pilot projects that demonstrate early benefits, (iv) providing targeted incentives and formal recognition for early adopters, and (v) creating structured feedback mechanisms to continuously address concerns and refine implementation strategies.[1,6]

Advantages
- Reduces psychological and organizational resistance by proactively addressing fears of job displacement, increased workload, or loss of humanistic care values.
- Enhances ownership and engagement among faculty

and students through participatory design and co-creation of AI integration plans.
- Increases the likelihood of sustainable adoption by aligning technological interventions with institutional culture and professional values.
- Enables data-driven adaptation through continuous monitoring of acceptance metrics and implementation barriers.
- Strengthens institutional capacity for future technological innovations by building a culture of adaptive learning.

Potential Limitations or Risks

- Requires dedicated time, expertise, and resources for change management activities, which may compete with other institutional priorities.
- Success depends on sustained leadership commitment; turnover in key administrative roles may disrupt momentum.
- Cultural heterogeneity across Iranian nursing schools may necessitate context-specific adaptations, complicating national standardization.
- Overemphasis on acceptance metrics may inadvertently delay necessary but initially unpopular reforms.
- Risk of superficial engagement if stakeholder consultation is tokenistic rather than genuinely participatory.

The major policy options, advantages, and potential limitations for AI integration in Iranian nursing education are summarized in Table 1.

Table 1 Executive summary: Policy options for integrating Artificial Intelligence into nursing education in Iran

Strategies	Advantages (Iranian use-case examples)	Potential limitations / risks (Iranian use-case examples)
Curriculum integration	— Inclusion of AI-supported clinical case analysis in foundational nursing courses at public medical universities; — Virtual ICU simulations in nursing faculties; — Student training on AI-based clinical decision support tools piloted in Iranian educational hospitals; — Ministry-approved AI learning outcomes applied across nursing schools.	— Delays in revising nursing curricula due to centralized approval; — Added AI content without reduction of existing course hours; — Shortage of nursing educators with AI training at provincial universities; — Limited access to simulation labs in smaller nursing schools.
Practical/workshop training	— Hospital-based workshops on AI-assisted early warning systems; — Short online/blended programs provided by nursing schools; — Continuing education programs for in-service nurses in public hospitals; — Hands-on simulation workshops demonstrating reduced documentation burden.	— Absence of follow-up training after workshops in teaching hospitals; — Workshops delivered by non-specialist instructors; — Limited participation of nurses from rural regions; — Lack of linkage between workshop content and national competency frameworks.
Collaboration & policy development	— Adaptation of AI nursing competency frameworks from Persian Gulf countries; — Establishment of shared national simulation centers; — Ministry-led national roadmap for AI integration; — Phased rollout beginning with major universities.	— Limited collaboration between universities, Ministry of Health, and technology sectors; — Delays in national AI policy approval; — Imported models not fully aligned with Iranian clinical workflows; — Insufficient funding for infrastructure development.
Ethical considerations	— National ethical guidance clarifying data protection in AI-supported platforms; institutional policies defining nurses' responsibilities when using AI-based decision support; — Guidance emphasizing AI supports compassionate, patient-centered care; — Mandatory ethics review of AI educational tools by university committees.	— Ethical guidelines not keeping pace with rapidly evolving AI technologies; — Rrestrictive institutional rules limiting pilot use; — Limited capacity of committees to continuously review AI applications; — Variable application of ethical standards across universities and hospitals.
Change management and technology acceptance strategieS	— Formation of "AI Change Champion" teams; — Baseline digital literacy surveys; — Phased rollout of AI simulation labs starting with flagship universities before provincial expansion; — Recognition awards for faculty who successfully integrate AI tools into their teaching portfolios.	— Limited availability of change management expertise within nursing faculties, requiring external consultants; — Bureaucratic delays in approving incentive structures for early-adopter faculty; — Resistance from senior faculty accustomed to traditional teaching methods in conservative educational settings; — Uneven implementation capacity between well-resourced metropolitan universities and smaller provincial schools

Recommendations

- **For policymakers** Develop formal national AI education programs for nursing students and practicing nurses, invest in robust digital infrastructure, and allow flexibility within elective curricula to facilitate the integration of emerging technologies.[4] Integrate change management principles and technology acceptance frameworks into AI implementation plans by establishing stakeholder feedback mechanisms, recognizing early adopters, and providing targeted support to address resistance among faculty, students, and administrators.[11]
- **For researchers** Prioritize evaluation studies assessing the impact of AI on clinical competence and performance, and conduct comparative research involving regional and international contexts.[6]
- **For students** Actively engage in AI-related workshops and training programs to strengthen both attitudes toward AI and practical competencies.[1]
- **General recommendations:** Establish national ethical frameworks and promote sustained collaboration among universities, the Ministry of Health, and relevant stakeholders to address existing barriers and support long-term implementation.[2]

Conclusion

The successful integration of AI into nursing education in Iran offers a strategic opportunity to develop a technologically competent nursing workforce and enhance patient-centered care. Key strategies, including curriculum integration, practical workshops, regional collaboration, and ethical frameworks, can address challenges such as limited faculty expertise, infrastructure gaps, and ethical concerns. Achieving these objectives requires coordinated national efforts, investment in infrastructure, faculty training, and active engagement of students, academic institutions, and policymakers. Implementing these measures will enable Iran to standardize AI competencies, strengthen its healthcare system, and establish a competitive position as a regional leader in nursing education innovation.

Declarations

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Artificial Intelligence Disclosure
Artificial intelligence-assisted tools were used only for language refinement and editorial support. All conceptualization, interpretation, and final approval of the manuscript were performed by the author.

Authors' Contributions
Naser Parizad contributed to the conception, literature review, drafting, revision, and final approval of the manuscript.

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Consent for Publication
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