

Abstract

Background and Objectives: Health systems are considered one of the essential pillars of social development, with primary health care (PHC) at their core, playing a key role in ensuring population health. The emergence of novel technologies such as artificial intelligence (AI) has introduced new opportunities and challenges for these systems. The integration of AI into front-line health services has the potential to enhance service quality, increase efficiency, and improve clinical decision-making. However, achieving these outcomes requires strengthening health system readiness, particularly by developing institutional, technical, and human infrastructure. This study aimed to design a context-specific readiness model to support the implementation of AI technologies within Iran's primary health care system.

Methods: This research employed a mixed-methods design and was conducted in three distinct phases. In the first phase, through a systematic review of the literature, content analysis of international studies, and in-depth interviews with health and AI experts in Quebec, Canada (as part of a one-year research fellowship), real-world AI applications in PHC were identified alongside associated opportunities, challenges, and implementation requirements. In the second phase, qualitative data were gathered through semi-structured interviews and a focused-expert group discussion with Iranian professionals in the health and technology domains. The findings from these two phases were analyzed using content and framework analysis, aligned with the four core functions of the World Health Organization (WHO)'s Primary Care Evaluation Tool (PCET) (i.e., Stewardship, Financing & Incentives, Resource Generation, and Service Delivery). In the third phase, based on previous findings, a preliminary preparation model was developed and then refined through a two-round Delphi study to reach expert consensus on AI implementation

requirements adapted to Iran's context. The final model was complemented by a conceptual framework, integrating key strategic elements derived from the study findings.

Findings: The study's findings were derived from a triangulated analysis of three primary data sources : a systematic review, expert interviews in Canada, and qualitative data from Iranian interviews and the focus group. Numerous real-world AI applications in PHC were identified, spanning domains such as screening and early diagnosis, clinical decision support, continuity of care management, remote symptom assessment, automated documentation, and public health alerts, illustrating a wide array of services, tools, and implementation models. Through integrated analysis, a comprehensive set of opportunities, challenges, and implementation requirements was extracted, capturing the technological transformation of PHC from policy, institutional, technical, data-driven, human, and ethical perspectives. In the final phase, these requirements were validated and prioritized through a two-round Delphi study with national experts, resulting in consensus on core components tailored to Iran's health system. Consequently, a structured, five-level, thirteen-phase preparation model was developed to guide the progression from conceptual analysis to implementation and evaluation of AI interventions in PHC. A complementary conceptual framework was also established to articulate the theoretical and policy foundations of the model, including strategic orientation, core values, overarching goals, high-level policy strategies, and operational requirements.

Conclusion: This study presents an innovative and context-driven readiness model aimed at enabling Iran's PHC system to effectively engage with and implement AI. The integration of theoretical insights and empirical data from both national and international sources has resulted in a flexible, actionable tool for guiding digital health interventions at both national and local

levels. The model is designed to support strategic planning, policy formulation, and operational deployment of AI in PHC and may serve as a practical reference for policymakers, medical universities, and health networks. A key innovation lies in its simultaneous attention to ethical, institutional, technical, and cultural dimensions, facilitating implementation in complex health environments. The findings of this research may inform equity-oriented policies, enhance digital human resource capacity, and contribute to the development of health innovation ecosystems in Iran and other low- and middle-income countries. The model's adaptive and structured architecture positions it as a potentially inspiring blueprint for digital health transformation globally.

Keywords: Artificial intelligence, Primary Health Care, AI Implementation, Preparation Model, AI in PHC, Health System Readiness, Iran.



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Title

**Presenting The Preparation Model of Iran's Primary Health Care (PHC) for
Artificial Intelligence (AI) Implementation**

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