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REVIEW ARTICLE

Training of nursing personnel for the public health system

Nataliia V. Hrechyshkina[1], Inessa G. Bibyk[1], Kateryna O. Bobkovych[2], Borys I. Palamar[1]

[1]BOGOMOLETS NATIONAL MEDICAL UNIVERSITY, KYIV, UKRAINE
[2]BUKOVINIAN STATE MEDICAL UNIVERSITY, CHERNIVTSI, UKRAINE

ABSTRACT

Aim: To analyse contemporary global approaches to training nursing personnel for the public health sector, focusing on the integration of competency-based, interprofessional, and practice-oriented models, and to evaluate their strategic relevance to the transformation of national health systems.

Materials and Methods: A systematic literature review and narrative synthesis were conducted using international scientific databases (PubMed/Medline, Scopus, Web of Science) covering 2010-2026, with an analytical focus on publications from 2021-2026. The search strategy was guided by Boolean logic and targeted MeSH terms. Of the 120 records initially identified, 35 core sources, including global strategic guidelines from the WHO and ICN, met the strict inclusion and exclusion criteria and were selected for final qualitative analysis.

Conclusions: Transitioning from traditional clinical education to integrated instructional models (CBE, IPE, and the ADDIE framework) is crucial for developing a resilient workforce. For transforming national systems, such as Ukraine's, managing this transition through adaptive, asynchronous e-learning under emergency conditions ensures the attainment of critical population-based competencies, with a focus on epidemiological surveillance and community-based preventive care.

KEYWORDS: preventative medicine, medical education, workforce, competencies

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INTRODUCTION

Nursing personnel are a foundational component of the contemporary public health system, delivering a substantial share of primary prevention, health education, screening, and health promotion services directly to the population [1, 2]. Under highly volatile global conditions, characterised by emerging pandemics, rapid demographic ageing, an escalating burden of chronic non-communicable diseases (NCDs), and widening health inequities, the strategic training of the nursing workforce has become unprecedentedly urgent [3]. Modern public health emergencies require a workforce capable of swift operational responses, systemic crisis mitigation, and flexible professional adaptation [4, 5].

The traditional, legacy model of nursing education, which remains predominantly clinically oriented and focused on secondary or tertiary hospital-based care, no longer aligns with the macro-level needs of the public health infrastructure [6, 7]. Today's public health nurse is expected to work as an autonomous professional with advanced analytical capabilities, epidemiological literacy, leadership skills, and the capacity to facilitate intersectoral and interprofessional collaboration [8, 9]. Consequently, there is an essential need to systematically evaluate current educational pathways, identify structural barriers, and establish integrated frameworks that bridge the gap between academic preparation and real-world health demands [10-12].

AIM

To analyse contemporary global approaches to training nursing personnel for the public health sector, focusing on the integration of competency-based, interprofessional, and practice-oriented models, and to evaluate their strategic relevance to the transformation of national health systems.

MATERIALS AND METHODS

To rigorously synthesise current educational approaches, the authors conducted a systematic review. The research involved a comprehensive evaluation of peer-reviewed literature, institutional reports, and global strategic guidelines published between 2010 and 2026, with a specialised analytical focus on high-impact literature from the past five years (2021-2026) to ensure maximal temporal relevance.

The authors compiled the information base through targeted queries on international scientific and medical databases, including PubMed/Medline, Scopus, and Web of Science. The search syntax used controlled Medical Subject Headings (MeSH) and Boolean operators, incorporating key terms such as: „public health nursing education", „competency-based nursing curricula", „interprofessional education in public health", „community-based nursing practice", and „ADDIE instructional design in healthcare education". The inclusion criteria required: (a) peer-reviewed publications examining theoretical, conceptual, or empirical models of nursing education tailored to public health; (b) official policy documents, action frameworks, and declarations issued by the World Health Organisation (WHO) and the International Council of Nurses (ICN); and (c) national regulatory instruments defining professional qualification standards. Exclusion criteria applied to non-peer-reviewed data, conference abstracts without full text, localised

clinical case studies lacking educational generalisability, and articles focusing solely on specialised hospital nursing sub-specialities.

The quantitative results of the selection process comprised a „primary" macro-array of 120 publications identified in the initial database search. After removing duplicates and applying strict thematic screening, the authors selected a final array of 35 core sources for in-depth narrative synthesis, structural analysis, and conceptual modelling.

ETHICS

The authors conducted this review study solely through secondary analysis of publicly available scientific data from peer-reviewed journals, official clinical guidelines, and institutional databases. It did not utilise any private, confidential, or identifiable patient data, involve any new clinical interventions or animal testing, or require the primary collection of human subject data. Consequently, formal approval from a local institutional review board or bioethics committee was not required.

The authors strictly adhered to the ethical principles of the Declaration of Helsinki of the World Medical Association and to international standards of publication ethics, including the comprehensive recommendations of the International Committee of Medical Journal Editors (ICMJE). This work contains no plagiarism, data fabrication, or falsification. All secondary sources of information, data points, and conceptual models used in this review have been rigorously and transparently cited and properly listed in the bibliographic block, thereby ensuring complete academic integrity.

AI STATEMENT

During the preparation of this work, the authors used Gemini (Google) solely for basic language quality checks and technical reference formatting.

Detailed description of the use of AI:

- formatting and mechanical alignment of the bibliographic list;
- proofreading for minor grammatical and spelling accuracy.

The artificial intelligence tool was not used to generate, rewrite, or synthesise any scientific text, data, or core ideas. The entire manuscript was conceived, written, and approved solely by the human authors, who accept full intellectual responsibility for its content.

REVIEW AND DISCUSSION

THE SHIFT TOWARD COMPETENCY-BASED PUBLIC HEALTH NURSING

The competency-based education (CBE) model is the contemporary international baseline for modernising healthcare curricula. Unlike traditional models that prioritise instructional hours, CBE focuses directly on the verifiable attainment of multidimensional learning outcomes. These outcomes encompass specific cognitive knowledge, practical psychomotor skills, professional attitudes, and ethical behaviours [13]. Within the public health domain, the CBE model organises professional training into three distinct tiers of competencies:

General Core Competencies: advanced critical thinking, ethical reasoning, transcultural communication, and digital data literacy.

Professional Core Competencies: Epidemiological risk modelling, community health assessment, biostatistical analysis, design of primary-prevention interventions, emergency preparedness, and health policy development.

Personal/Leadership Competencies: adaptive leadership, systemic management, emotional intelligence, and continuous professional development (CPD) [14, 15].

The authors deliberately mapped these competency streams against the Essential Public Health Functions (EPHFs), which encompass surveillance, health protection, disease prevention, and governance. Global architectural benchmarks – such as the World Health Organisation (WHO) nursing guidelines, the Centres for Disease Control and Prevention (CDC) core competency matrices, and the Quad Council competencies in the United States – demonstrate a high degree of structural granularity. These frameworks place strong emphasis on a population-based approach, shifting the locus of care from individual clinical diagnostics to community-wide macro-surveillance. Within statutory national health frameworks, establishing clearly defined professional boundaries and functions remains a structural necessity for personnel deployment. Comparative international analysis shows that aligning national qualification standards with global competency frameworks significantly shortens the adaptation period for nursing graduates entering the primary care sector [16-18].

This alignment is critical for Ukraine, where the nursing education model is currently hybrid. It dynamically balances traditional hospital-based training with the newly mandated functions under the Law of Ukraine ‚On the Public Health System' (2022) [5], requiring rapid capacity building in epidemiological surveillance and community-based prevention.

INTERPROFESSIONAL EDUCATION AND COLLABORATIVE PRACTICE (IPCP)

Public health challenges are complex and multifaceted, making it difficult for any single medical discipline to operate effectively in isolation. Interprofessional Education (IPE) is the primary mechanism for breaking down professional silos, enabling students from nursing, medicine, epidemiology, social work, and healthcare management to learn with, from, and about one another. The IPE model is structured around three functional layers:

1. Educational Layer: Implemented through joint academic modules, Problem-Based Learning (PBL) seminars, and high-fidelity simulation scenarios focused on outbreak containment or community health crises.
2. Competency Layer: Focused on mastering shared decision-making models, cross-disciplinary communication tools, team-based conflict resolution, and mutual professional respect.
3. Practical Layer: Delivered through immersive clinical rotations within multidisciplinary public health teams, joint field epidemiological investigations, and collaborative community health promotion initiatives [19].

4. Empirical evidence indicates that institutionalising IPE significantly reduces fragmentation in healthcare services, minimises communication errors, and optimises resource allocation during epidemiological emergencies. In highly developed healthcare systems – such as those in Canada, the United Kingdom, and the Netherlands – interprofessional core competencies are fully embedded in university accreditation frameworks, ensuring that graduating nurses are thoroughly prepared for Interprofessional Collaborative Practice (IPCP) [20-24].

PRACTICE-ORIENTED EDUCATION AND COMMUNITY HEALTH IMMERSIONS

The practice-oriented educational model is grounded in community-based learning. It marks a paradigm shift from a clinical, hospital-centric training environment to an expansive, population-focused practical setting. The authors base this model on sustainable academic-practice partnerships that link higher education institutions with primary health networks, non-governmental organisations, and regional public health centres. This framework comprises three core elements:

1. The Dual/Integrated Curricular Pathway: This approach ensures that theoretical university lectures are immediately followed by simulation labs and field practice in local communities.
2. The „Community-Hospital-Community" Cycle: This practical model prioritises the early initiation of home health visits. Under this model, students conduct community screenings and directly participate in immunising and educating populations.
3. The Lifelong Learning Continuum: This component integrates structured, continuous professional development (CPD) with specialised postgraduate certifications in public health and community care nursing [25-27].

This model has reached a high level of operational maturity in the Scandinavian countries, Canada, and the United Kingdom, where public health nurses enjoy a high degree of clinical autonomy, leading nurse-led community health centres and actively managing regional preventive programmes. By immersing students in real-world socioeconomic contexts, this model ensures that future nurses can identify and mitigate the social determinants of health affecting diverse populations [28-31].

INSTRUCTIONAL DESIGN AND ADAPTIVE E-LEARNING: THE ADDIE FRAMEWORK

To ensure that nursing curricula remain structurally coherent, evidence-based, and highly responsive to evolving health data, a systematic framework for educational programme planning is necessary. The ADDIE model (Analysis, Design, Development, Implementation, Evaluation) is the premier instructional design framework used globally for designing public health curricula. The linear and iterative stages of ADDIE proceed as follows:

1. Analysis: Involves conducting an exhaustive gap analysis between current population health indicators (e.g., the rise in NCDs and pandemic threats) and the existing competency levels of the nursing workforce, while assessing the educational needs of the target student audience.
2. Design: Focused on translating identified needs into clear, verifiable learning outcomes, structuring the competency framework, and selecting the most appropriate instructional methods (such as hybrid learning or IPE simulation).
3. Development: Dedicated to building tangible educational infrastructure, including interactive digital modules, validated clinical case studies, public health field protocols, and Learning Management System (LMS) content.
4. Implementation: Launching the finalised programme across higher education institutions or on continuous professional development platforms, with interprofessional training tracks.
5. Evaluation: Measuring the programme's educational efficacy using Key Performance Indicators (KPIs), analysing students' competency acquisition, and tracking graduates' long-term impact on community health indicators [32, 33].

The primary advantage of the ADDIE methodology is its exceptional structural flexibility. It enables academic institutions to rapidly update and pivot educational content in response to sudden healthcare disruptions or changes in institutional policies. Modern nursing education must be flexible and adaptable, particularly when facing disruptive events such as pandemics or security and military restrictions [3, 34].

In the specific case of Ukraine, systemic disruptive events – including continuous air-raid alerts, damage to critical infrastructure, and safety restrictions – have significantly accelerated reliance on the ADDIE framework. It serves as a vital methodological baseline for Ukrainian medical universities to design resilient, asynchronous E-learning environments that maintain high standards despite external disruptions [35].

SYNTHESIS, LIMITATIONS AND PERSPECTIVES

The results of this narrative synthesis indicate that no single educational model is sufficient when used in isolation. The most effective paradigm is a multi-dimensional, integrated educational model in which CBE establishes rigorous professional standards, IPE builds collaborative team capacity, practice-oriented training ensures an immediate connection to community needs, and the ADDIE framework provides the operational mechanism for systemic curriculum engineering and continuous evaluation [7, 8, 11].

For Ukraine, this integrated paradigm marks a strategic shift from the legacy model of the nurse as a purely clinical executor to that of an autonomous public health professional. Embedding interprofessional collaborative practice (IPCP) and structured instructional design within national curricula is essential to prepare the workforce for post-war healthcare reconstruction and emergency management. Modernising workforce policies requires embedding digital technologies, strengthening biostatistical and analytical education, and establishing independent, simulation-based and community-based training pathways [1, 2, 5].

POTENTIAL LIMITATIONS AND PERSPECTIVES

This review acknowledges limitations, as it relies on secondary data synthesis across diverse national education contexts with highly varied infrastructures. Future empirical research should focus on implementing longitudinal cohort studies to track long-term public health outcomes directly linked to integrated, nurse-led community health interventions and localised preventive frameworks.

CONCLUSIONS

1. Modern public health demands a clear shift away from isolated, hospital-centred nursing education. To build a resilient workforce, training must pivot towards population-wide thinking, primary prevention, data-driven epidemiology, and systemic crisis management.
2. Merging competency-based frameworks, interprofessional modules, and hands-on community practice is the most effective way to build workforce capacity. This practical combination ensures that graduates can immediately join complex, multidisciplinary primary care teams and collaborate effectively.
3. Relying on structured instructional design, particularly the ADDIE model, gives medical universities the operational agility they need. It enables educators to quickly adapt and rebuild curricula in response to evolving global health threats, technological advances, and institutional disruptions.
4. For Ukraine's healthcare system, adopting this integrated, ADDIE-managed approach is an urgent necessity amid ongoing wartime and emergency conditions. This methodology provides a practical blueprint for keeping nursing programmes resilient and ensuring that new graduates possess the precise analytical, digital, and preventive skills required to sustain public health on the ground.

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CONFLICT OF INTEREST

The Authors declare no conflict of interest

CORRESPONDING AUTHOR

Borys I. Palamar
Bogomolets National Medical University
13 Taras Shevchenko Blvd, 01601 Kyiv, Ukraine
e-mail: palamar.bi@ukr.net

ORCID AND CONTRIBUTIONSHIP

Nataliia V. Hrechyshkina: 0000-0002-9499-4362 A D F
Inessa G. Bibyk: 0009-0006-6576-6412 A D E
Kateryna O. Bobkovych: 0000-0001-5783-2412 A D E
Borys I. Palamar: 0000-0003-2510-0713 B F

A – Work concept and design, B – Data collection and analysis, C – Responsibility for statistical analysis, D – Writing the article, E – Critical review, F – Final approval of the article

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