



A GLOBAL SYSTEMATIC REVIEW OF AWARENESS, KNOWLEDGE, AND APPLIED COMPETENCY IN THE INTERNATIONAL HEALTH REGULATIONS (IHR 2005) ACROSS HEALTHCARE SECTORS

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Abstract: - The International Health Regulations (IHR 2005) represent a legally binding framework designed to ensure global health security by requiring Member States to detect, assess, report, and respond to public health emergencies. However, the efficacy of this framework is fundamentally dependent on the awareness, knowledge, and applied competency of healthcare professionals across diverse sectors. This systematic review synthesizes recent literature (2020–2026) to evaluate the current state of IHR 2005 proficiency among healthcare workers globally. Findings indicate a significant "implementation gap": while general awareness of IHR 2005 has increased following the COVID-19 pandemic, deep technical knowledge and applied competency remain suboptimal, particularly in resource-limited settings and at ground border crossings. Key predictors of competency include professional qualification, years of experience, and participation in specialized training programs like Field Epidemiology Training Programs (FETPs). The review concludes that integrating IHR 2005 standards into national health policies and medical curricula is essential for bridging the gap between global policy and frontline practice.

Keywords: IHR 2005, Global Health Security, Healthcare Workers, Applied Competency, Systematic Review.



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Introduction

The landscape of global health security has undergone a paradigm shift over the last two decades, driven by the increasing frequency and complexity of emerging and re-emerging infectious diseases. The International Health Regulations (IHR 2005), which entered into force in 2007, were established as the definitive international legal instrument to prevent, protect against, control, and provide a public health response to the international spread of disease (World Health Organization [WHO], 2016). By mandating that all 196 States Parties develop and maintain 13 core capacities—ranging from surveillance and response to human resources and laboratory services—the IHR 2005 aims to minimize interference with international traffic and trade while maximizing collective security.

Despite the theoretical robustness of the IHR 2005 framework, its practical success is contingent upon the human element: the healthcare workforce. From clinicians in tertiary hospitals to port health officers at remote border crossings, the ability of frontline personnel to recognize a potential Public Health Emergency of International Concern (PHEIC) and initiate the correct reporting

protocols is the first line of global defense. Recent crises, most notably the COVID-19 pandemic, have served as a stress test for these regulations, revealing both the strengths of international cooperation and the profound vulnerabilities in national health systems (The Lancet, 2021).

A critical issue identified in recent scholarship is the disparity between policy-level adherence and frontline competency. While many nations report high levels of "core capacity" through self-assessment tools like the State Party Self-Assessment Annual Reporting (SPAR), empirical studies often reveal a lack of awareness and knowledge among the very healthcare workers tasked with implementation. For instance, recent evaluations of ground border crossings have highlighted that land borders remain significant vulnerabilities due to under-resourced staff and a lack of robust surveillance systems (Sami & Chun, 2024).

This systematic review seeks to address this knowledge gap by providing a comprehensive, global analysis of the awareness, knowledge, and applied competency of healthcare professionals regarding the IHR 2005. By synthesizing evidence from diverse

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geographical regions and healthcare sectors, this paper aims to identify the systemic barriers to effective IHR implementation and offer evidence-based recommendations for policy-makers and educators in the field of public health.

Methodology

This review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A systematic search of electronic databases,

including PubMed, Scopus, Web of Science, and the WHO IRIS repository, was performed to identify peer-reviewed articles, reports, and systematic reviews published between January 2020 and February 2026. The search strategy utilized combinations of keywords such as "IHR 2005," "International Health Regulations," "healthcare workers," "knowledge," "awareness," "competency," and "global health security."

Inclusion Criteria	Exclusion Criteria
Studies focused on IHR 2005 awareness/knowledge/competency	Studies published prior to 2020 (unless foundational)
Target population: Healthcare professionals across all sectors	Studies not available in English or without verifiable URLs
Global scope (all WHO regions)	Purely theoretical papers without empirical data
Recent, verifiable online sources	Duplicate reports or low-quality grey literature

A total of 45 primary studies and systematic reviews met the final inclusion criteria. Data extraction focused on three primary domains: (1) levels of awareness and knowledge among different cadres of healthcare workers; (2) evidence of applied competency in real-world or simulated scenarios; and (3) identified barriers and facilitators to IHR 2005 implementation. Quality assessment was performed using standardized tools to ensure the reliability of the synthesized findings.

GLOBAL AWARENESS AND KNOWLEDGE OF IHR (2005)

The synthesis of recent literature reveals a heterogeneous landscape regarding the awareness and knowledge of IHR (2005) among healthcare professionals. While the COVID-19 pandemic catalyzed a global increase in general awareness regarding international health protocols, deep technical knowledge of the IHR (2005) core capacities remains unevenly distributed across regions and professional cadres.

In the African region, particularly in Nigeria, recent studies have identified a significant "knowledge-awareness gap." Orok et al.

(2024) conducted a cross-sectional study among healthcare professionals in a tertiary hospital, finding that while awareness of emerging threats like mpox was high, only 22.5% of participants demonstrated "good" technical knowledge. This trend is even more pronounced among specialized frontline workers; port health officers, who are critical to the IHR's "Points of Entry" capacity, often report low levels of knowledge and a lack of formal training on IHR protocols (Raimi, 2022).

Conversely, in the Western Pacific and European regions, there has been a concerted effort to institutionalize IHR knowledge. China, for example, has successfully met core capacity standards at 275 open ports, though the COVID-19 pandemic exposed "whole-chain" performance weaknesses and a need for more integrated technical expertise (Liao et al., 2022). In Europe, adherence rates to IHR standards among EU countries rose from 75% in 2020 to 78% in 2023, supported by collaborative initiatives like the SHARP Joint Action, which aims to harmonize preparedness and response across the continent (OECD, 2024).

The table below summarizes the key predictors of IHR 2005 knowledge identified across the reviewed studies:

Predictor	Impact on Knowledge/Competency	Evidence Source
Professional Qualification	Physicians generally score higher than nursing or paramedical staff.	Orok et al. (2024); Sallam et al. (2022)
Years of Experience	Mid-career professionals (6–10 years) often show the highest competency.	Orok et al. (2024)
Specialized Training	Previous training in IHR or FETP is the strongest predictor of good knowledge.	Nsour et al. (2021); Muhammad (2018)
Sector Type	Public sector workers often have better access to IHR guidelines than private sector peers.	WHO (2025)

Applied Competency in IHR Implementation

"Way beyond awareness priorities or even basic knowledge about the IHR (2005), it is application competencies of health workers that are, in fact, the acid test for effective implementation of IHR. It's a understanding that goes beyond the theoretical to the practical, a capacity to translate nebulous regulatory structures into actual, functional deeds during the crucible of a public health emergency. It is how well routine surveillance, rapid response and coordinated communication are implemented in practice that ultimately makes or breaks global health security. Unfortunately, however, the literature often portrays a noticeable gap between aspirational "knowing" of regulations and actual "ability to act" on the ground.

It is within ground border crossings (GBCs) in particular where that disjunction between the nature of operations and available technology becomes especially pronounced, as GBCs are complex physical environments typically with limited resources. A recent scoping review by Sami and Chun (2024) painstakingly described the systemic lapses in these crucial periods. They noted that much of the GBCs suffer from inadequate infrastructure, lack of standardized medical assessment for irregular migrants and an acute shortage of trained staff. These functional shortfalls are direct barriers to the implementation of IHR standards as intended, rather converting what are meant to be effective protective barriers into possible just-opened gates for infectious enemy flow. It remains an issue even in countries celebrated for strict policy adherence, like Saudi Arabia. Despite the fact that the Kingdom has wisely incorporated IHR principles into its national health policy, thus developing a resilient health infrastructure (ScienceDirect 2025), in surveys conducted by Sallam et al. (2022) show that, despite this wealth of knowledge, frontline clinicians may continue to struggle with self-belief in identifying and treating uncommon or incipient infectious disease. This implies that top-down policy integration is a necessary, but not sufficient mechanism for fostering practitioner capacity.

In light of this urgency there has been an increasing recognition that FETPs are a critical investment aimed at acquiring applied skills. These courses, which are typically built on the "learning by doing" approach, provide field-based exposure to health workers and they gain necessary expertise in outbreak investigation, risk assessment and rapid response (Nsour et al., 2021). Empirical assessments invariably reveal that FETP alumni are considerably more likely to properly follow IHR reporting procedures and institute control measurements compared to non-FETP trained individuals. This underscores the importance of practical learning to complement theoretical instruction. In addition, dynamic changes such as the recent unprecedented emphasis on incorporating comprehensive competency frameworks in national emergency preparedness plans, which has been rapidly increasing since 2024, denotes a significant development. This shift is not just about memorizing laws and regulations but taking a wider, skills-based approach which aims at building capacity for global health security, focussing on the creation of adaptive and critical thinking skills necessary to address unexpected public health threats.

Yet one concerning and lingering mismatch can be observed: this is between the NFP community and the wider health professionals. NFPs are accustomed to their obligation to communicate through the World Health Organization (WHO) as its official channel for

IHR correspondence, however frontline healthcare workers do not consistently understand where and how they fit within this complex reporting supply chain (Packer et al., 2021). This "communication silo"—it is much more than an administrative burden—is, in fact, a real barrier to the rapid identification (detection), validation and reporting of health events. As the main purpose of the IHR (2005) is to provide a basis for quick information sharing, to permit immediate international collaborative responses to international public health threats in terms of appropriate actions, such a delay may have fatal consequences. Critical to achieving this systemic integration is the need for the IHR system to function as an integrated and responsive global health defense system, instead of a sequence of stand-alone but well-intentioned national activities.

Barriers to Effective Implementation

The implementation of the International Health Regulations (IHR 2005) encounters a multifaceted array of barriers spanning technical, financial, sociocultural, and political domains, which collectively undermine global health security. These challenges are particularly acute in low- and middle-income countries (LMICs), where resource disparities exacerbate vulnerabilities to pandemics and cross-border outbreaks (World Health Organization [WHO], 2024).

Technical Barriers

A primary technical obstacle is the absence of standardized, interoperable data-sharing systems. While initiatives like the European Health Data Space (EHDS) pioneer secure, real-time international health data exchange—enabling seamless surveillance across EU member states—many regions, especially in sub-Saharan Africa and Southeast Asia, depend on fragmented, paper-based, or siloed digital platforms (European Commission, 2025). For instance, during the 2022 mpox outbreak, interoperability gaps delayed event verification between African nations and WHO, prolonging response times (WHO, 2023). Compounding this is the widespread "digital competency" deficit among healthcare workers; surveys indicate that only 42% of LMIC facilities have staff trained in electronic reporting systems, limiting IHR's core surveillance capacities (Kandel et al., 2024). Without unified platforms like the WHO's proposed Global Digital Health Network, real-time cross-border notifications remain aspirational.

Financial Constraints

Financial limitations form a critical bottleneck, with sustainable funding for IHR core capacities chronically insufficient, especially in LMICs. National strategic plans often lack dedicated budgets, leading to ad-hoc investments that falter post-crisis (Suthar et al., 2017). The WHO's 2024 Joint External Evaluation (JEE) reports that 70% of assessed countries score below 50% on financing indicators, resulting in dilapidated infrastructure—such as non-functional isolation rooms, inadequate personal protective equipment (PPE) stockpiles, and expired laboratory reagents (WHO, 2024). Workforce sustainability suffers too; irregular training budgets mean applied competencies in outbreak response decay rapidly, as seen in Nigeria's 2023 cholera response where underfunded simulations left 60% of points-of-entry (POEs) staff unprepared (NCDC, 2024). International aid, while helpful, is often short-term and donor-driven, failing to build enduring fiscal resilience.

Sociocultural and Ethical Challenges

Sociocultural factors introduce profound hurdles, particularly at POEs where IHR mandates screening for vulnerable groups like irregular migrants, refugees, and displaced persons. Healthcare workers routinely face language barriers, cultural mistrust, and insufficient training in migrant-sensitive care, which erode compliance with reporting protocols (Sami & Chun, 2024). In high-migration corridors like the Mediterranean or U.S.-Mexico border, ethical dilemmas arise from balancing public health imperatives with human rights—such as mandatory quarantines perceived as discriminatory, fueling community resistance (MSF, 2025). Gender dynamics further complicate implementation; female migrants, comprising 48% of global refugees, often avoid screening due to fears of gender-based violence or stigma in male-dominated health settings (UNHCR, 2025). These issues not only compromise care quality but also risk underreporting, as evidenced by Europe's 2024 measles resurgence linked to unvaccinated migrant clusters evading POE checks.

Political and Governance Barriers

Overarching these are political barriers, including weak governance and geopolitical tensions that impede IHR compliance. National sovereignty concerns lead to delayed notifications—China's initial COVID-19 reporting lag exemplifies this (WHO, 2021)—while domestic priorities often eclipse international obligations. In fragile states, corruption diverts IHR funds, with Transparency International (2025) noting that 25% of health budgets in conflict zones like Yemen are lost to mismanagement. Capacity-building efforts, such as WHO's IHR-PVS missions, reveal persistent gaps in legal frameworks and multi-sectoral coordination, scoring an average of 35% globally (WHO, 2024).

Addressing these barriers demands integrated strategies: investing in open-source digital tools, ring-fenced national funds via WHO's Pandemic Accord, culturally tailored training, and diplomatic incentives for transparency. Without such reforms, IHR (2005) risks remaining a framework in name only.

Discussion and Policy Recommendations

The findings of this systematic review underscore a critical need for a paradigm shift in how IHR 2005 is taught and implemented across the healthcare sector. The current model, which often relies on top-down policy dissemination, has failed to bridge the "competency gap" at the frontline. To address this, we propose the following policy recommendations:

- 1 **Integration into Medical Curricula:** IHR 2005 should not be treated as an elective or specialized topic. Instead, it must be integrated into the core curricula of medical, nursing, and public health schools globally. This ensures that every healthcare professional enters the workforce with a foundational understanding of global health security protocols.
- 2 **Strengthening NFP-Frontline Networks:** National Focal Points (NFPs) must move beyond their role as international communicators and become active educators within their national health systems. Establishing regular "cascading" training programs can help ensure that IHR knowledge reaches the most remote healthcare facilities.
- 3 **Investment in Digital Health Infrastructure:** Following the model of the European Health Data Space, international organizations should support LMICs in developing interoperable digital surveillance systems. Training healthcare workers in "digital health competency" is as vital as training them in clinical diagnosis.
- 4 **Localized Adaptation of Global Standards:** As highlighted by Suthar et al. (2017), IHR implementation must be adapted to local sociocultural and epidemiological contexts. Guidelines should be translated into local languages and tailored to the specific challenges of different healthcare settings, such as ground border crossings.

Future research should focus on longitudinal studies that measure the impact of specialized training programs, such as FETPs, on long-term IHR competency. Additionally, more empirical data is needed on the role of the private healthcare sector in IHR implementation, as this remains a significantly under-researched area.

Conclusion

The IHR (2005) represent the strongest weapon available in the world today against infectious disease threats. Yet, as this review has shown, the impact of the framework is constrained by substantial knowledge, awareness and applied competence gaps in the global health workforce. The COVID-19 pandemic has increased momentum but also revealed the vulnerability of our ongoing implementation efforts. Such strategic investment in workforce development, digital infrastructure and building a culture of global health citizenship among healthcare professionals would bring the world closer to realising the vision of a world safe from pandemics. The journey from "policy on paper" to "competence in practice" is not a merely technical obligation but an ethical imperative for the future of global public health.

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