The Review Of
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The Role Of Health Informatics In Coordinating Nursing, Laboratory, And Epidemiology Services For National Healthcare Security

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Abstract

Health informatics is an emerging discipline that is essential for the coordination of intricate healthcare services and is crucial for ensuring the security of healthcare within countries. This paper will discuss the role of health informatics in the coordination of nursing, lab, and epidemiology services based on analysis of the current capabilities of the human resource in these services, technology adoption, and challenges of coordination. From current literature in the development of a health informatics public health practitioner workforce, the adoption of electronic medical records, and health informatics education, this review underscores the essential determinants of success in the coordination of these services, including human resource skills, data security, documentation quality, and integration. Findings of this review show that, despite the very low levels of health informatics practitioners as an estimation of 1.1% of the healthcare professional population working within state health services and 0.2%—0.5% within equivalent local health services, their role is paramount in linking the two domains of clinical and public health practice. Much is still needed in terms of health informatics education within nursing, lab, and epidemiology, and this is for the optimal coordination of these practices.

Keywords: health informatics, nursing informatics, laboratory informatics, epidemiology, healthcare coordination, public health, workforce, national security.

1. Introduction

The rising intricacy of healthcare delivery systems, along with emerging threats to public health security, calls for sophisticated coordination mechanisms that span diverse healthcare disciplines. Health informatics has emerged as a vital enabler of this coordination and is defined as an interdisciplinary field mixing science, innovation, and application of information technology to health. The COVID-19 pandemic reflected both the potential and limitations that current health information systems have in coordinating responses across clinical care, laboratory diagnostics, and epidemiological surveillance.

National health security is based on the principle of timely detection, evaluation, and response to health security threats posed by infectious disease outbreaks, bioterrorism, and natural disasters. This relies on streamlined information exchange between the first-line clinical providers, laboratory professionals

performing diagnostic testing, and epidemiologists monitoring the pattern of diseases. Health informatics provides the technological infrastructure and workforce expertise for this coordination.
This article examines the status of health informatics in coordinating nursing, laboratory, and epidemiology services, focusing on current workforce capability, challenges of technological implementation, and implications for national healthcare security. We analyze recent empirical studies on public health informatics workforce development, electronic medical record implementation in clinical settings, and the broader health informatics workforce landscape to identify critical factors influencing successful coordination.

Figure 1: Education - Trends in Nursing Informatics

1.1 Research Objectives

This paper will answer the following research questions:

1. What is the capacity of the workforce in health informatics with regard to coordination between nursing, laboratory, and epidemiology?
2. What technological and organizational barriers exist for the coordination process to effectively
3. What is the effect of documentation quality and data security concerns on the capabilities of coordination?
4. What are the approaches that should be taken to strengthen the coordination of workforce development to ensure health security within the country?

2. Background and Conceptual Framework

2.1 Significance to Healthcare Coordination

"Health informatics comprises five core areas of study: bioinformatics, imaging informatics, clinical informatics, consumer informatics, and public health, population health, and social service informatics" (ASCP, 2023,). In terms of coordination between nursing, lab, and epidemiological operations, the following three domains could be identified:
Clinical Informatics is also employed in direct patient care functions such as electronic health records, computerized provider order entry, clinical decision support systems, and point-of-care charting systems, mainly utilized by nurses and physicians (ASCP, 2023,). . The Health Information Technology for Economic and Clinical Health Act, passed in 2009, spurred the adoption of electronic health records, with 80.5% of the nation's hospitals having adopted at least the most basic level by the end of 2019 (McFarlane et al., 2019).
Laboratory Informatics involves the use of Information Technology solutions used for the purpose of data acquisition, analysis, and dissemination within the laboratory environment. This includes Laboratory Information Management Systems (LIMS), electronic laboratory notebooks, and laboratory automation instruments (CDC, 2023). Such systems have started being integrated with Clinical Information Systems in order to enable the surveillance of infectious diseases (CDC, 2023).

"Public Health and Epidemiology Informatics" deals with issues of information technology and analytical support to organizations that deal with the health of communities. This includes surveillance systems, disease registries, and analytical support systems for disease outbreak investigations (Cho, 2023). The systems have evolved independently from the EHR systems, resulting in issues with the ability to work together properly (McFarlane et al., 2019).

2.2 The Challenge of Coordination

Effective healthcare coordination is a function of not just the availability of information systems in each domain but rather their meaningful integration to support bidirectional data flow. Nurses document patient assessments and interventions in clinical systems, laboratories generate diagnostic test results that inform clinical decisions and trigger public health reporting requirements, and epidemiologists need timely access to clinical and laboratory data so that they can detect and investigate disease outbreaks.
Current coordination challenges include: (1) data standards that are not harmonized across the systems, (2) lack of interoperability between clinical and public health information systems, (3) insufficient workforce capacity in health informatics to develop and maintain interfaces, (4) concerns about data security and privacy, and (5) incomplete documentation limiting data quality for secondary uses including surveillance (Health IT.gov, 2023; Pourasghar et al., 2009).

3. Methodology

This review synthesizes findings from three major empirical studies examining different aspects of health informatics relevant to coordination:

1. Public Health Workforce Study: McFarlane et al., 2019 Cross-sectional analysis of 17,136 state health agency central office employees and 26,533 local health department employees from the 2017 Public Health Workforce Interests and Needs Survey (PH WINS), by characteristic, distribution, job satisfaction, and informatics skills gaps of public health informatics specialists.
2. EMR Implementation Study: The study by Pourasghar et al. (2009) was conducted in Iran, involving a mixed-methods design. It assessed the quality and security of documentation during the transition from paper-based medical records to electronic medical records. It reviewed 300 paper-based and 300 electronic records and included qualitative interviews with physicians and nurses.
3. Health Informatics Workforce Landscape, LeRouge et al., 2023. This provides a comprehensive review of the health informatics workforce roles, educational pathways, and competency requirements across clinical, public health, and laboratory informatics domains.

Data were extracted on workforce capacity, mechanisms of coordination, barriers to integration, quality of documentation, security-related issues, and the need for education related to the coordination of nursing, laboratory, and epidemiological services.

4. The Health Informatics Workforce: Current Capacity for Coordination

4.1 Workforce Size and Distribution

The health informatics workforce remains remarkably small relative to its critical coordination functions. McFarlane et al. (2019) found that public health informatics (PHI) specialists constituted only 1.1% of state health agency central office respondents, 0.5% of Big City Health Department respondents, and 0.2% of other mid- to large-sized local health department respondents. Information technology specialists or information system managers represented an additional 3.4% of state health agency workforce and 0.9-1.3% of local health department workforce (McFarlane et al., 2019).
These findings indicate substantial understaffing relative to informatics needs. Earlier estimates suggested the health information technology workforce would need to increase by approximately 50% to reach the highest stage of electronic health record adoption maturity, and actual need may be much higher given the emergence of big data analytics and population health initiatives (LeRouge et al., 2023).

4.2 Workforce Characteristics and Experience

Public health informatics specialists most closely resembled public health science employees in demographics but had significantly less public health experience and lower salaries (McFarlane et al., 2019). Within state health agencies, 33.9% of PHI specialists had 0-5 years of public health experience compared to 24.3% of public health science workers, and only 8.1% held manager or executive positions compared to 24% of public health science workers (McFarlane et al., 2019).

This relative inexperience has implications for coordination capabilities. Effective integration of clinical, laboratory, and epidemiology systems requires deep understanding of workflows, data requirements, and organizational contexts across all three domains—knowledge typically acquired through substantial practical experience.

4.3 Program Area Distribution

Only one-third of state health agency PHI specialists worked primarily in informatics or programs including informatics; the remainder were dispersed across non-informatics program areas (McFarlane et al., 2019). The most common program areas for PHI specialists were:

- Epidemiology and surveillance (18%)
- Vital records (8%)
- Communicable disease (7%)
- Health promotion and wellness (4%)
- Clinical immunization services (3%)

This dispersion suggests that health informatics functions are addressed through discrete projects rather than coordinated, agency-wide programs (McFarlane et al., 2019). While this distribution places informatics expertise near frontline operations, it may impede development of integrated systems spanning multiple program areas.

4.4 Nursing Informatics Workforce

Within clinical settings, nursing informatics has emerged as a more established specialty. The 2020 HIMSS survey found that nearly one-third of nurse informaticists had more than 10 years of experience in the field, with top job responsibilities including systems implementation (44%) and utilization/optimization (41%) (Hinton & Stolyar, 2023). However, nursing informatics degree programs declined from 37% of respondents holding master's degrees or PhDs in nursing informatics in 2014 to 31% in 2017, while vendor certifications increased from 20% to 25%, suggesting a shift toward less formal educational pathways (LeRouge et al., 2023).

4.5 Laboratory Informatics Workforce

Laboratory informatics represents perhaps the least developed informatics specialty relevant to coordination. LeRouge et al. (2023) noted relatively few academic educational pathways dedicated to laboratory informatics, with most professionals acquiring skills through on-the-job experience, vendor training, or general health informatics programs. The lack of standardized educational pathways and professional certifications in laboratory informatics creates challenges for developing the specialized expertise needed to integrate laboratory information systems with clinical and public health platforms.

5. Coordination Challenges: Documentation Quality and Completeness

5.1 Documentation in Paper-Based Systems

Pourasghar et al. (2009) found that all 300 paper-based medical records evaluated were incomplete in terms of medical data. Documentation quality varied substantially by record section, with lowest percentages for demographic and administrative information and highest for diagnostic, treatment, and care provider identity information. Prominent factors influencing poor documentation included illegible handwriting, missing sheets, high workload, and insufficient quality control mechanisms (Pourasghar et al., 2009).

These documentation deficiencies directly impede coordination. Incomplete demographic information complicates patient matching across systems. Missing administrative data prevents tracking of patient care episodes. Illegible handwriting renders information unusable for secondary purposes including disease surveillance.

5.2 Impact of Electronic Medical Record Implementation

Electronic medical record implementation improved documentation in some domains while creating new challenges. Pourasghar et al. (2009) found that EMR introduction increased documentation

completeness for fields where nurses entered data, but physician involvement in EMR documentation remained low. Comparison of 300 paper-based and 300 electronic records revealed:
Demographic information documentation improved to 100% in EMR (from 52-99% in paper records) due to automatic data distribution
Administrative admission information improved to 100% in EMR for nurse-entered fields
However, physician documentation of medical history, physical examination, orders, and progress notes declined to 46-48% completeness in EMR (from 91-99% in paper records)
This differential adoption created a critical gap: the clinical information most relevant to epidemiological surveillance and laboratory result interpretation—physicians' assessments, diagnoses, and treatment plans—was less completely documented in EMR than in paper systems (Pourasghar et al., 2009).

5.3 Factors Influencing EMR Documentation

These data reveal that while PHI specialists generally reported lower skills gaps than other workforce segments, substantial proportions of all groups reported inadequate skills for informatics-related competencies. Most concerning, approximately one-third of all workforce segments reported gaps in quality improvement competencies—essential for using data to improve coordination and system performance.
Public health science workers—including epidemiologists—reported significant gaps in identifying appropriate data sources (16.1%) and collecting valid data (9.3%), despite these being fundamental epidemiological competencies (McFarlane et al., 2019). Clinical and laboratory workers reported the highest skills gaps across most domains, with over 20% unable to identify appropriate data sources and nearly one-third lacking quality improvement skills.

6. Informatics Skills and Training Gaps

6.1 Skills Gaps Among Healthcare Workforce

McFarlane et al. (2019) estimated the sizes of informatics-related skills gaps for each workforce segment. Table 1 depicts the size of skills gaps in four core public health competencies with significant informatics components.

Table 1: Informatics Skills Gaps by Workforce Segment in State Health Agencies

Competency	PHI Specialists (%)	IT/IS (%)	Public Health Science (%)	Clinical/Lab (%)
Identify appropriate data sources	8.3	18.6	16.1	22.9
Collect valid data for decision making	3.8	6.7	9.3	13.3
Participate in quality improvement	26.1	32.4	29.4	32.7
Identify evidence-based approaches	14.7	24.5	13.3	18.5

Source: Adapted from McFarlane et al. (2019)

These data also show that, overall, the PHI specialists reported lower skills gaps compared with other workforce segments, but substantial proportions of all groups reported inadequate skills for informatics-related competencies. Most troubling, about one-third of all workforce segments also reported gaps in quality improvement competencies, which are essential to making data useful in improving coordination and system performance.
Public health science workers, including epidemiologists, reported significant gaps in identifying appropriate data sources (16.1%) and collecting valid data (9.3%), despite these being foundational epidemiological competencies (Markets and Markets, 2023). Clinical and laboratory workers reported the largest skills gaps across most of the domains assessed, including over 20% unable to identify appropriate data sources and nearly one-third lacking quality improvement skills.

6.2 Gaps in Learning Pathways

LeRouge et al. (2023) described significant variability in informatics education across healthcare professions for which a corresponding relevant need exists:

Nursing: Although nursing informatics is one of the more established health informatics specialties, there continues to be inconsistency in integrating informatics competencies into baccalaureate nursing curricula. Faculty members have a general lack of familiarity with competency frameworks, including the recommendations from TIGER (Technology Informatics Guiding Education Reform), and report insufficient training on how to implement informatics into curricula (Miliard, 2023).

Medicine: For most medical curricula, health informatics is neither core competency nor graduation requirements. While approval as a subspecialty of clinical informatics was obtained in the year 2011, with fellowships starting in 2014, applications to these programs seem to be facing decline, partly due to lack of appropriate preparation for medical students through their curricula, as some state.

Laboratory Sciences: Few graduate and professional concentrations exist specifically in the area of laboratory informatics. Most laboratory professionals acquire skills about informatics through on-the-job experience, vendor training related to particular systems, or general health informatics programs untargeted toward laboratory workflows (LeRouge et al., 2023).

Public Health/ Epidemiology: Public health informatics fellowships are available with the CDC, and the recent Public Health Informatics & Technology Workforce Development Program issued through ONC is now funding $75 million to train over 5,000. These programs are generally new and have thus far resulted in relatively small numbers of trained individuals (PHII, 2023).

6.3 Competency Framework Gaps

While several professional organizations have created informatics competency frameworks, these are usually not coordinated across professions. AMIA developed competency models for master's level health informatics education and clinical informatics physicians. TIGER, on the other hand, prepared frameworks for nurses. The Public Health Informatics Institute published applied public health informatics competencies. As such, no framework was identified that explicitly addressed interprofessional competencies germane to effective coordination across services, such as nursing, laboratory, and epidemiology services (Regis University, 2023).

7. Outcome: Synthesis of Coordination Capabilities and Gaps

7.1 Current Situation Appraisal

It is clear from the review of these three empirical studies what is actually known about health informatics support for coordination across nursing, laboratory, and epidemiology services. Key findings are summarized in Table 2.

Table 2: Health Informatics Coordination Capabilities Across Domains

Dimension	Clinical/Nursing	Laboratory	Public Health/Epidemiology
Workforce Size	Nurse informaticists: ~30% with 10+ years experience; growing but declining formal education	Very limited; no standardized roles or certifications	PHI specialists: 0.2-1.1% of workforce; minimal growth
Primary Systems	EHR (80.5% hospital adoption); CPOE; clinical decision support	LIMS; automated instruments; interfaces to EHR	Surveillance systems; registries; separate from clinical systems
Documentation Quality	Improved for nurse-entered data in EMR; declined for physician data (46-48% complete)	Not directly assessed but dependent on clinical documentation	Dependent on clinical/lab data quality; incomplete source data
Interoperability	Limited integration with public health systems; primarily within healthcare delivery	Growing integration with EHR; limited public health connectivity	Poor integration with clinical systems; manual processes remain common

Security Infrastructure	Inadequate in many settings; username/password only; no encryption	Shares clinical system security weaknesses	Additional concerns about bidirectional data sharing
Skills Gaps	29-33% lack quality improvement skills; documentation variability	18-27% lack data identification/collection skills	8-16% PHI specialists; 13-23% other staff lack core informatics skills
Educational Pathways	Nursing informatics established but declining; inconsistent integration in BSN programs	Very limited dedicated programs; mostly OJT and vendor training	Recent investments ($75M ONC); historically underdeveloped

Sources: Synthesized from McFarlane et al. (2019), Pourasghar et al. (2009), and LeRouge et al. (2023)

7.2 Coordination Barriers and Enablers

Table 3 categorizes specific barriers and enablers identified across the studies.

Factor Category	Primary Barriers	Potential Enablers
Workforce	• Small PHI workforce (0.2-1.1%) • Limited experience (34% <5 years) • Dispersed across programs vs. centralized • Declining formal nursing informatics education • Minimal laboratory informatics specialization	• Growing recognition of need • New federal investments ($75M ONC) • Established nursing informatics specialty • Fellowship programs in clinical informatics • Inter professional potential
Technology	• Separate clinical and public health systems • Limited interoperability/standards • Inadequate security infrastructure • Lack of integrated laboratory-public health platforms • Insufficient hardware at point of care	• High EHR adoption (80.5%) • FHIR and emerging standards • Automated laboratory instruments • Cloud-based platforms emerging • Reminder systems proven effective
Data Quality	• Incomplete physician EMR documentation (46-48%) • Illegible handwriting in paper systems • Missing demographic/administrative data • High workload impeding documentation	• Improved nurse documentation in EMR • Automatic data distribution • Reminder systems (48% to 88% improvement) • Template-based data entry potential
Security/Privacy	• No formal security policies • Weak authentication (username/password only) • No encryption • Provider concerns about data modification • HIPAA compliance gaps	• Growing awareness of need • Available encryption technologies • Digital signature standards • Authentication technology advances • Legal frameworks (HIPAA)
Skills/Training	• 30% lack quality improvement skills • 16-23% lack data identification skills • Inconsistent informatics curricula • Limited inter professional training • Faculty knowledge gaps	• Multiple competency frameworks exist • Professional certification programs • Growing academic programs • Online/continuing education expanding • MOOCs increasing access

Organizational	• Limited physician involvement in EMR development • Lack of quality control mechanisms • Insufficient budget/resources • Siloed program structures • Management prioritizes financial over clinical informatics	• Recognition of strategic value • Value-based care incentives • COVID-19 highlighting importance • Accreditation requirements • Public health emergencies driving investment

Sources: Synthesized from McFarlane et al. (2019), Pourasghar et al. (2009), and LeRouge et al. (2023)

7.3 Implications for National Healthcare Security

The coordination gaps identified have direct implications for national healthcare security capabilities:

Detection Capabilities: Incomplete clinical documentation, limited laboratory system integration with surveillance platforms, and skills gaps in data analysis impede early detection of disease outbreaks or bioterrorism events. When only 46-48% of critical physician documentation is complete in EMR systems (Pourasghar et al., 2009) and 16% of public health science workers lack skills to identify appropriate data sources (McFarlane et al., 2019), timely detection of anomalous patterns becomes problematic.

Response Coordination: Effective emergency response requires rapid information sharing across clinical care, laboratory diagnostic, and epidemiological investigation activities. Current system silos, security concerns impeding bidirectional data exchange, and dispersed informatics workforce limit response coordination capacity.

Surge Capacity: The small health informatics workforce (0.2-1.1% of public health staff) with limited experience provides minimal surge capacity during public health emergencies when informatics needs dramatically increase. The COVID-19 pandemic revealed these limitations, spurring new federal investments, but capacity remains inadequate (LeRouge et al., 2023).

Health Equity: Coordination gaps disproportionately affect vulnerable populations. Limited integration of social determinants of health data, language barriers in documentation systems, and digital divides in access to health information technology compound existing disparities, creating differential security risks across populations (LeRouge et al., 2023).

8. Discussion

8.1 The Paradox of Health Informatics: Critical Function, Minimal Investment

The above literature analysis indicates a paradoxical situation: health informatics has proven to carry critical coordination roles and tasks that are imperative to the national health security agenda and, by the look of it, is allocated the least resources as far as the workforce is concerned. Specialists working under the PHI umbrella make up only 1% of the total personnel in the area of public health (McFarlane et al., 2019), and laboratory informatics specialists, and even nursing informatics, for that matter, whose informatics specialty has the longest history, continue to suffer a dwindling number of formal education entrants (LeRouge et al.,

This relative lack of investment stems from a combination of factors. The needs of providing healthcare and/or managing finances have traditionally taken precedence over information infrastructure in healthcare organizations (Pourasghar et al., 2009). While health informatics can positively impact coordination, quality of information, and decision-making, it does not provide a direct economic return. It involves high technical levels of difficulty and rapid development, making it a challenging area in regard to workforce planning or education program development. Perhaps the most fundamental aspect of the importance of information coordination is its visibility in situations of concern, an outbreak of disease or a bioterrorism attack.

8.2 The Documentation Quality Challenge

"Quality of documentation" turned out to be an "important bottleneck" of the coordination process. The result that the completion rate of physician EMR entries reduced to 46 to 48% vs. 91 to 99% for paper documents (Pourasghar et al., 2009) has major implications. It is crucial to point out that clinical documentation is "the backbone of laboratory test ordering and interpretation, disease surveillance," as well as "quality improvement activities" and "research." "Incomplete documentation" leads to cascading failures of

Various issues are responsible for the poor documentation. This includes the busy nature of the clinical work schedules that leave inadequate time to document. Lack of physician engagement with the design of the electronic medical record systems leads to systems that are not aligned with the work processes. Misgivings concerning the possible alteration of data due to security issues have hindered documentation. However, the vast improvement perceived from 48% to 88% completeness with automated reminder systems (Pourasghar et al., 2009) illustrates that with proper system development, the issues may not be severe.

The differences in the pattern of differential documentation observed for nurses and physicians imply the significance of professional, work flow, and system work process interactions. Nurses were more actively engaged in the process of electronic medical records, and the workflow-oriented design for nursing was effective in achieving positive results in the area of documentation (Pourasghar et al., 2009). Similar results for physician documentation can be achieved.

8.3 Security as a Coordination Prerequisite

The identified security deficiencies-no encryption, weak authentication, no formal policies, and no review of audit logs (Pourasghar et al. 2009)-are fundamental barriers to coordination. It is reasonable for healthcare providers to hesitate to document sensitive information and not participate in information exchange when security is not adequate. Public health agencies cannot establish bidirectional connectivity with healthcare systems that cannot protect patient privacy.

Security remains amongst the least concerns in the implementation of health information systems. Organizations focus on functional capabilities such as ordering medicines, seeing test results, and the generation of reports while security remains merely an afterthought. The lack of formal information security policies in all six hospitals studied here is indicative of systemic rather than isolated problems. Addressing security requires both technical measures-encryption, authentication, access controls, integrity checking-and organizational measures-formal policies, staff training, regular security assessments, incident response capabilities. The technical measures are well-established and widely available; the main barrier is organizational commitment to implementation. Information security cannot be solely an IT department responsibility but has to become a core competency across the health informatics workforce and a priority for healthcare leadership.

8.4 Workforce Development Imperatives

The small size, experience level, and training of the health informatics workforce creates a fundamental constraint on coordination capabilities. A number of workforce development strategies merit priority:

Interprofessional Competency Frameworks: Current competency frameworks are specific to professions: nursing informatics, clinical informatics, and public health informatics. Coordination within nursing, laboratory, and epidemiology services requires interprofessional competencies that transcend these professional boundaries. Explicit coordination competency frameworks would lead and guide the development of curricula and workforce training.

Educational Pipeline Expansion: 9.3 Security as a Prerequisite for Coordination

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8.5 National Healthcare Security Implications

The issues created by the coordination gaps are potential deficiencies within a country's readiness and response to healthcare security. Some implications of security that need to be highlighted include:

Early Warning Systems: An appropriate flow of information is the hallmark of effective disease surveillance, spanning the continuum from the clinical encounter through confirmation in the lab and finally onto epidemiological analysis. The issues surrounding the incompleteness of the current level of documentation, the fragmentation, and the staff constraints work against effective early warning.

Distributed Response Capability: The country's health care security is dependent on distributed capacity in state and local health departments, and this cannot be addressed by the federal government alone. That local health departments with fewer personnel would have even more limited informatics capacity than state health departments or larger city health departments, with only 0.2% PHI specialists compared with 1.1% in state health departments (McFarlane et al., 2019), shows vulnerability in terms of geographic distribution.

Surge Capacity Limitations: The surge capacity in health informatics is extremely low due to the lack of staff and the unavailability of the opportunity for rapid training of more specialists in health informatics. This was highlighted during the COVID-19 outbreak, with overwhelmed disease surveillance systems and reporting delays.

Health Equity and Security: Gaps and inequities in coordination affect vulnerable sectors that are more deeply connected to and reliant on public health systems and the safety net for health care. These sectors are also the ones that are most vulnerable to health security risks.

Conclusion

Fill the crucial gaps in the healthcare security needs of the country, and for this, the development of the five-fold structure is necessary. Firstly, the focus needs to be placed on the development and improvement of the healthcare staff by increasing government expenditure in specialized training, developing the concept of interdisciplinary education by merging nursing, laboratory, and public health, the integration of informatics in professional education, and the development of defined and remunerated professional careers. Secondly, technology and system development are also necessary and involve the integration of the use of interoperability standards such as FHIR in federally supported systems, the development and expansion of robust security infrastructural investments in the sectors of encryption, authentication, and logging, the development of systems to coordinate intersystem activities, and the creation of safe and bi-directionally connected interfaces between clinical, laboratory, and public health platforms. Finally, changes at the level of institutions and policies are necessary to facilitate and establish the concept of encouragement and standardization, including accreditation with information security policies, the integration of informatics metrics and quality improvement projects, the integration of end-users in the system development phase, and new payment systems to promote the concept of data sharing.

The fourth pillar is centered on conducting research and evaluation for purposes of ongoing improvement and involves conducting standardized data collection for the healthcare workforce, conducting evaluations of coordination initiatives, and conducting ongoing security evaluations. Also, it involves monitoring trends in the quality of healthcare documentation and conducting assessments of specific effects of informatics systems on healthcare equity. Lastly, emergency preparedness involves activities such as planning for informatics workforce surge capacity, negotiated data sharing in emergency settings, conducting cross-domain activities for emergency preparation, and capacity building.

Recommendations like these reflect the harsh reality that health informatics—the engine of coordinated healthcare—is woefully underfunded. Experts comprise a mere 0.2-1.1% of the workforce in public health, electronic health record documentation is incomplete from a physician standpoint, the security infrastructure is problematic, the systems are still disintegrated, and a substantial gap in skills exists. A crisis like the COVID-19 pandemic has revealed these weaknesses in the system and has shown how a smooth exchange of information is a security necessity not a mere administrative need. Ultimately, the essence of a solid interdisciplinary workforce in health informatics, proper system infrastructure with security considerations in place, equitable outcomes, and the infusion of required resources even in the face of a pandemic is necessary.

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