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From Surveillance Signals to Coordinated Outbreak Response: An Integrative Review of Family Medicine, Epidemiological Surveillance, Clinical Laboratories, Nursing, Health Education, and Healthcare Security Roles

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ABSTRACT: Outbreak response depends on translating early warning signals into timely, coordinated action across professional and institutional boundaries. Fragmented reporting, delayed laboratory communication, inconsistent patient guidance, and poorly coordinated facility operations can interrupt this process even when individual services perform their assigned tasks. This theoretical integrative review examines how family medicine, epidemiological surveillance, clinical laboratories, nursing, health education, and healthcare security can contribute to a coherent pathway from initial detection to organized response. The review considers literature published between 2010 and 2026 and relevant institutional guidance, using a structured analytical approach to examine professional responsibilities, information exchanges, escalation arrangements, and implementation conditions. Particular attention is given to the relationship between community presentation, clinical recognition, notification, specimen management, interpretation of laboratory information, patient follow-up, public communication, and safe access to healthcare facilities. The central analytical proposition is that coordination depends on explicit interfaces between these activities rather than the simple presence of multiple professional groups. The proposed framework therefore connects shared

situational awareness, accountable communication, role clarity, and feedback mechanisms with operational readiness. Healthcare security is considered within its supporting remit of access management, safe patient movement, and protection of service continuity. The framework does not assign clinical authority to security personnel or assume that conceptual integration demonstrates measurable effectiveness. Its contribution is to organize complementary responsibilities into an interpretable model that can guide institutional discussion, training, and subsequent empirical evaluation. The review emphasizes context-sensitive implementation and distinguishes evidence-supported practices from theoretical propositions requiring validation in public health and primary healthcare settings.

1. INTRODUCTION

Infectious disease outbreaks test the ability of health systems to connect early recognition with timely, organized action. A warning signal may emerge through an unusual clinical presentation, a cluster of community illnesses, an unexpected laboratory finding, or an observation made during routine patient care. Its practical value depends on whether the relevant information reaches professionals who can verify the concern and initiate an appropriate response. The World Health Organization (WHO, 2023) describes collaborative surveillance as an approach that strengthens cooperation across information sources, institutions, and sectors to improve public health intelligence. Its Health Emergency and Disaster Risk Management Framework similarly places preparedness and response within a coordinated health system rather than a single organizational unit (WHO, 2019). Together, these perspectives establish coordination as a central concern in outbreak preparedness. who.int

Timeliness provides an important way to examine the transition from surveillance to response. Swaan et al. (2018) demonstrated that infectious disease notification involves a sequence of events, with potential delays arising before and after the recognition of a reportable condition. Consequently, rapid transmission of a notification cannot compensate fully for delayed identification earlier in the pathway. Frieden et al. (2021) proposed the 7-1-7 approach to organize attention around detecting suspected outbreaks, notifying public health authorities, and completing specified early response actions. This approach provides a framework for identifying operational bottlenecks rather than treating preparedness as the possession of separate institutional capacities. It also encourages examination of what happens between services, where responsibility for advancing an alert may otherwise remain unclear. pmc.ncbi.nlm.nih.gov

Evidence from implementation research reinforces the importance of these organizational interfaces. In a retrospective observational study across five countries, Bochner et al. (2023) assessed 41 public health events and found that 11 met all three components of the 7-1-7 target. Detection bottlenecks frequently occurred at the health facility level, while notification and response bottlenecks often arose at intermediate public health levels. These findings do not establish that one professional configuration will improve every outbreak response. They demonstrate, however, that performance can be constrained at different points across the same operational pathway. A useful framework must therefore explain how information moves from initial recognition through verification and notification to coordinated action, while retaining clear responsibility at each transition. pubmed.ncbi.nlm.nih.gov

Family medicine provides a relevant clinical interface for examining this pathway. The operational framework for primary health care developed by WHO and the United Nations Children's Fund (UNICEF) connects integrated health services, community participation, and essential public health functions (WHO & UNICEF, 2020). Within this broader orientation, the present review considers how family medicine can contribute to recognizing concerning presentations, documenting relevant clinical and exposure information, arranging appropriate assessment, and maintaining continuity of care. These proposed responsibilities require coordination with established surveillance procedures and specialist advice. The concern is therefore how routine clinical encounters can generate information useful for public health assessment while preserving the immediate care needs of the individual patient. who.int

Epidemiological surveillance provides mechanisms for converting reports into assessed public health intelligence. Experience from Vietnam illustrates the importance of connecting community and healthcare facility reporting within an organized event-based surveillance system (Clara, Do, et al., 2018). A related investigation of implementation identified practical factors influencing how community surveillance operated, demonstrating the need to examine the conditions under which reporting

systems are used (Clara, Dao, et al., 2018). For the present review, these studies support attention to recognizable reporting triggers, accessible communication channels, and defined verification arrangements. A reported signal requires assessment before its significance can be established. Accordingly, coordination must support both the communication of concerns and their subsequent evaluation, without treating every alert as a confirmed outbreak. CDC

Community surveillance research also demonstrates why detection cannot be understood solely as a facility-based activity. Ratnayake et al. (2016) assessed community event-based surveillance implemented during the Ebola response in Sierra Leone, while Stone et al. (2017) described the establishment of a national system during the same crisis. These studies provide context-specific examples of connecting community observations with formal response structures. Their relevance to other settings requires careful interpretation because disease characteristics, workforce arrangements, and institutional resources differ. Nevertheless, they establish a basis for considering how community-facing personnel and clinical services can exchange information. In the proposed framework, this connection is examined as a potential means of bringing concerning events to professional attention, rather than as a substitute for clinical or epidemiological verification. CDC

Clinical laboratories contribute another essential interface between suspicion, diagnostic information, and response decisions. Their outbreak readiness includes the safe handling of specimens and the capacity to sustain appropriate operations under changing demands. WHO's laboratory biosafety guidance addresses outbreak preparedness and resilience within a broader approach to managing laboratory risks (WHO, 2020a). The timing of information also matters. In a modelling study of repeated COVID-19 population screening, Larremore et al. (2021) found that testing frequency and reporting speed strongly influenced screening effectiveness under the conditions examined. This finding should not be generalized into a claim that diagnostic accuracy is unimportant. It instead supports distinguishing analytical performance from the operational process through which a result becomes available for timely use. who.int

The implications of delay extend beyond the laboratory. Kretzschmar et al. (2020) modelled how testing and tracing delays affected the potential effectiveness of COVID-19 contact tracing strategies. Hellewell et al. (2020) likewise examined how outbreak control through isolation and contact tracing depended on characteristics of both the pathogen and the response. These studies provide conditional modelling evidence rather than direct evaluations of the multidisciplinary framework proposed here. They nevertheless clarify why activities should be examined as a connected sequence. Prompt recognition has limited preventive value if assessment, communication, or subsequent action is delayed. Conversely, a coordinated pathway must remain responsive to pathogen-specific evidence and cannot rely on a uniform response timetable for all infectious threats. PubMed

Nursing contributes to this pathway through sustained patient contact and participation in organized care delivery. WHO's report on the nursing workforce emphasizes investment in education, employment, and leadership as foundations for stronger health services (WHO, 2020b). This review builds on that workforce perspective by examining nursing interfaces with clinical observation, documentation, specimen-related procedures, patient education, and follow-up within authorized scopes of practice. These activities also require an operational environment that supports infection prevention. WHO's outbreak preparedness implementation manual identifies the need to strengthen the practical application of infection prevention and control arrangements (WHO, 2025). Accordingly, the framework treats nursing readiness as dependent on training, resources, communication, and institutional support rather than individual awareness alone. who.int

Health education links technical response decisions with public understanding and participation. Gilmore et al. (2020) identified community engagement activities spanning intervention design, trust building, communication, surveillance, tracing, and logistical support. WHO's emergency risk communication guideline also emphasizes the influence of social and cultural context on how people understand risk and respond to protective advice (WHO, 2017). These sources support examining communication as an interactive process. Information should be understandable, consistent with current guidance, and responsive to questions arising in affected communities. Brooks et al. (2020) further identified psychological stressors associated with quarantine, including inadequate information and supplies. Their findings underscore the need to consider the practical and emotional circumstances in which people are asked to follow outbreak-related instructions. pubmed.ncbi.nlm.nih.gov

Healthcare security introduces an operational dimension requiring explicit professional boundaries. In this review, the term refers to personnel supporting safe access, orderly movement, and continuity within healthcare facilities. It does not refer to cybersecurity or confer authority to diagnose infection, undertake clinical triage, or determine public health restrictions. The

proposed integration of this function is an analytical extension of the coordinated preparedness perspective outlined above. Security personnel may support arrangements established by clinical and operational leadership, but the appropriateness of individual duties depends on local policies, training, and legal authority. Including this role makes it possible to examine how the physical organization of care interacts with communication and service delivery while maintaining accountability for clinical decisions.

The problem addressed by this review is therefore the organization of complementary responsibilities across the surveillance-to-response pathway. Existing research provides evidence about notification, community surveillance, laboratory operations, contact tracing, workforce capacity, and communication, but these bodies of evidence differ in design and applicability. Clara et al. (2020) demonstrated how monitoring and evaluation tools can examine surveillance timeliness alongside implementation fidelity, staff perceptions, and acceptance. Building on this evaluative orientation, the present integrative review examines how six professional domains can be connected through reporting, verification, escalation, feedback, and operational support. Its objective is to develop an evidence-informed conceptual framework that distinguishes established findings from proposed relationships. The framework is intended to support institutional discussion and subsequent empirical evaluation; it does not presume that conceptual integration alone demonstrates improved outbreak outcomes.

2. LITERATURE REVIEW

The literature examined in this chapter addresses outbreak detection, notification, laboratory information, clinical protection, community engagement, and operational coordination. Twenty publications are discussed, including primary empirical studies, mathematical modelling studies, evidence syntheses, and an implementation report. These designs provide different forms of evidence and are interpreted accordingly. Several publications describe related programmes in Vietnam, Sierra Leone, and Uganda; their findings offer complementary perspectives but should not be counted as entirely independent demonstrations of effectiveness. The chapter uses these sources to examine the interfaces between professional responsibilities and to identify the boundaries of an evidence-informed framework for coordinated outbreak response.

2.1. Community Surveillance Assessment: Ratnayake et al. (2016)

Ratnayake et al. (2016) assessed community event-based surveillance for Ebola virus disease in Sierra Leone over a seven-month period. The assessment examined case detection and included a shorter analysis of reporting timeliness for cases without previously identified epidemiological links. Among 12,126 community reports, 287 met the suspected case definition and 16 were confirmed as Ebola cases. The system detected 16 of the 53 confirmed cases identified during the assessment period, demonstrating a contribution to case finding alongside a substantial burden of false alerts. The limited number of cases in the timeliness analysis prevented firm conclusions about reporting speed. This study supports integrating community observations with professional verification rather than equating reporting volume with surveillance effectiveness. For the present framework, it highlights the need for clear alert definitions, staff training, and sufficient assessment capacity when community signals enter formal response pathways. CDC

2.2. National Surveillance Implementation: Stone et al. (2017)

Stone et al. (2017) conducted a process evaluation of community event-based surveillance established during the Ebola emergency in Sierra Leone. The evaluation combined analysis of alerts, stakeholder interviews, and rapid assessments of community health monitors. Although implementation was expected to reach full scale by March 2015, logistical difficulties delayed this until June, after the epidemic peak. Community monitors generated 9,131 alerts during the first six months, and an average of 82% reported to their supervisors at least weekly. Most alerts concerned deaths unrelated to Ebola, indicating challenges in the relevance and specificity of reporting triggers. This publication describes the implementation of a programme also examined by Ratnayake et al. (2016), so the findings are complementary. Its contribution to the present review is the demonstration that workforce mobilization, supervision, supplies, and context-sensitive reporting definitions must be considered together when designing a surveillance network. PMC

2.3. Workplace Safety Intervention: Arnetz et al. (2017)

Arnetz et al. (2017) evaluated a randomized intervention to prevent patient-to-worker violence across 41 units in seven hospitals. Twenty-one units received unit-level violence data to support the development of prevention action plans, while 20 units served as controls. At six months, intervention units had a lower rate of violent events than control units, and a lower risk of violence-

related injury was observed at 24 months. The study provides evidence that locally relevant information can support structured workplace safety action. However, it did not investigate infectious disease outbreaks, surveillance performance, or the independent contribution of healthcare security personnel. Its relevance to this review is therefore indirect. It supports examining data-informed safety planning as an operational consideration, while providing no basis for claiming that security participation improves outbreak detection or reduces transmission. Any application to outbreak readiness requires separate evaluation within the relevant institutional setting. pubmed.ncbi.nlm.nih.gov

2.4. Community and Facility Surveillance: Clara, Do, et al. (2018)

Clara, Do, et al. (2018) evaluated an event-based surveillance pilot connecting community and healthcare facility reporting in Vietnam. The programme combined training, reporting materials, designated contacts, and procedures for verification and response. During the reported assessment period, 2,520 signals were communicated to district authorities, of which 176 were verified as events and received a response. Available observations indicated mean intervals of less than 24 hours from detection to notification and less than 48 hours from detection to response. However, the absence of comparable baseline timing data limited conclusions about improvement attributable to the pilot. The study illustrates how reporting arrangements can connect community observations with organized assessment. For the present review, its strongest contribution is the description of an operational pathway linking detection, communication, verification, and action. It also demonstrates why signals and verified events must remain distinct categories when interpreting surveillance outputs. CDC

2.5. Surveillance Implementation Conditions: Clara, Dao, et al. (2018)

Clara, Dao, et al. (2018) investigated factors influencing community event-based surveillance during pilot implementation in Vietnam. The publication examined practical lessons from establishing reporting functions across geographically dispersed communities and health services. Supportive supervision and monitoring were identified as important for sustaining community health worker reporting. The authors also highlighted unresolved implementation questions concerning training strategies, signal definitions, electronic reporting, and sustainable motivation. These findings complement the programme assessment reported by Clara, Do, et al. (2018), rather than constituting a wholly separate test of effectiveness. Their relevance lies in explaining why a technically specified surveillance process may operate differently across locations. The present review draws on this study to examine supervision, feedback, and workforce support as conditions for coordination. It also recognizes that maintaining reporting activity does not establish improved outbreak outcomes unless the quality, relevance, and consequences of reports are assessed. pubmed.ncbi.nlm.nih.gov

2.6. Notification Timeliness Review: Swaan et al. (2018)

Swaan et al. (2018) systematically reviewed 48 articles examining infectious disease notification timeliness. The authors organized notification as a chain of events and compared performance against study-defined, standardized, and disease-specific timeframes. Findings varied substantially across systems and measurement approaches, and none of the studies assessed against disease-specific timeframes met those criteria. This variation demonstrates the difficulty of comparing surveillance systems when their starting points, reporting stages, and definitions of acceptable delay differ. As an evidence synthesis, the review summarizes existing research rather than directly testing a new intervention. Its contribution to the present framework is methodological as well as operational: coordination should be evaluated through clearly defined intervals across the pathway. Measuring only the speed of electronic submission could overlook earlier delays in care seeking, clinical recognition, specimen processing, or confirmation. Accordingly, the study supports examining total pathway performance alongside the performance of individual reporting stages. pubmed.ncbi.nlm.nih.gov

2.7. Reporting Reform and Recognition Delays: Swaan et al. (2019)

Swaan et al. (2019) retrospectively analysed 144,066 notifications concerning 28 notifiable diseases in the Netherlands between 2003 and 2017. The study distinguished disease identification delay, notification delay, and subsequent reporting delay. It examined changes associated with revised statutory requirements and increased awareness during outbreaks. Notification and reporting intervals shortened following legal adjustments, while greater awareness was associated with reduced identification delay for selected diseases. The observational design limits causal attribution because other changes may have occurred during the study period. Nevertheless, the analysis demonstrates that different stages of the reporting chain respond to different influences. Its relevance to family medicine and laboratory coordination is particularly important: faster administrative reporting

does not remove delays before a disease is recognized or confirmed. The present framework therefore treats clinical awareness, diagnostic access, and notification procedures as connected but separately assessable components of preparedness. pubmed.ncbi.nlm.nih.gov

2.8. Surveillance Monitoring Tools: Clara et al. (2020)

Clara et al. (2020) described the development and application of monitoring and evaluation tools for event-based surveillance in Vietnam. The approach included supervisory checklists, document review, interviews, focus groups, timeliness forms, and an acceptability survey. Quantitative information documented reported signals, verified events, and reporting intervals, while qualitative findings helped explain implementation experiences and departures from established guidance. The publication contributes an evaluation approach rather than an independent controlled estimate of programme effectiveness. It also relates to the Vietnamese pilot discussed in earlier publications, requiring care when interpreting the apparent volume of supporting evidence. For the present review, the study demonstrates the value of combining process measures with explanations of how a system operates. A multidisciplinary framework should therefore examine communication quality, acceptability, and implementation fidelity alongside timing. Such evaluation can reveal whether observed difficulties arise from unclear procedures, limited resources, or the practical conditions of service delivery. pubmed.ncbi.nlm.nih.gov

2.9. Hospital Reporting Barriers: Do et al. (2020)

Do et al. (2020) examined facilitators and barriers to reporting unusual events from hospitals to the preventive medicine sector in Vietnam. The qualitative study used 18 in-depth interviews and nine focus group discussions across four provinces. Participants identified inconsistent reporting arrangements, uncertainty about institutional responsibilities, limited resources, and hesitation to report before laboratory confirmation. Leadership support and designated reporting focal points were described as enabling conditions. These findings represent professional accounts and thematic interpretation rather than measured effects on outbreak incidence or response speed. Their contribution to the present review is the identification of organizational boundaries that can interrupt information exchange. In particular, uncertainty about whether reporting belongs to clinical services can delay the transition from patient care to public health assessment. The proposed framework consequently emphasizes explicit notification responsibilities, accessible advice, and procedures that distinguish reporting a concern from confirming its diagnosis. Western Pacific Surveillance and Response

2.10. Observed Contact-Tracing Performance: Bi et al. (2020)

Bi et al. (2020) conducted a retrospective cohort study of 391 COVID-19 cases and 1,286 close contacts identified in Shenzhen, China. The analysis compared cases detected through symptom-based surveillance with those identified through contact tracing. Contact tracing was associated with a reduction of approximately 1.9 days in the interval from symptom onset to isolation. Household contacts and individuals travelling with a case experienced higher infection risks than other close contacts. Because the study was observational and undertaken during the early pandemic response, its findings reflect the local surveillance arrangements and control measures operating at that time. It does not isolate the contribution of individual professional groups. Nevertheless, it provides empirical support for examining the connection between surveillance information and clinical action. The present review uses this evidence to distinguish the availability of contact information from the coordinated assessment and follow-up required to make that information operationally useful. pubmed.ncbi.nlm.nih.gov

2.11. Isolation and Contact-Tracing Feasibility: Hellewell et al. (2020)

Hellewell et al. (2020) used a stochastic transmission model to assess whether isolation and contact tracing could control outbreaks of a pathogen resembling early SARS-CoV-2. Scenarios varied the number of initial cases, transmissibility, tracing coverage, delay to isolation, and the proportion of transmission occurring before symptoms. The probability of control declined under more demanding epidemiological conditions, including greater presymptomatic transmission and larger initial outbreaks. These results are conditional model outputs, not observed effects of an implemented multidisciplinary service. Their contribution is to demonstrate that operational performance interacts with pathogen characteristics. A reporting system cannot be assessed independently of the time available to interrupt transmission. For the present framework, this study supports flexible escalation arrangements and timely exchanges between clinical and public health services. It also cautions against assuming that a coordination model effective for one outbreak will achieve comparable control across diseases with different transmission patterns. pubmed.ncbi.nlm.nih.gov

2.12. Testing and Tracing Delays: Kretzschmar et al. (2020)

Kretzschmar et al. (2020) modelled how delays in testing and contact tracing affected the potential effectiveness of COVID-19 control strategies. Their model explicitly represented intervals between infection, symptom onset, diagnosis, isolation, and the tracing of contacts. Findings indicated that testing delays could substantially reduce the benefit achievable through tracing, even when tracing coverage was extensive. The estimated effects depended on assumptions about transmission, physical distancing, and the completeness of intervention delivery. The study therefore supports a mechanism linking delay with reduced preventive opportunity, while not providing a direct evaluation of routine service coordination. Its relevance to this review is the need to consider laboratory reporting within a broader action pathway. A result must reach an accountable recipient and lead to an appropriate decision. Accordingly, the proposed framework distinguishes specimen processing, result communication, clinical interpretation, and public health follow-up as separate interfaces requiring coordination. pubmed.ncbi.nlm.nih.gov

2.13. Occupational Infection Risk: Nguyen et al. (2020)

Nguyen et al. (2020) conducted a prospective observational cohort study using smartphone application data from participants in the United Kingdom and the United States. The analysis compared reported COVID-19 outcomes among frontline healthcare workers and the general community. Frontline workers experienced elevated risks, and the study examined how exposure and the availability or adequacy of personal protective equipment related to those risks. Important limitations include self-reported information, differences in access to testing, and selection associated with application use. The study does not demonstrate the effect of a specific coordination intervention or establish equivalent risks across all professional roles. Nevertheless, it places workforce protection within the outbreak response discussion. The present review therefore treats staffing safety, protective resources, and supported reporting of occupational concerns as implementation conditions. Coordinating detection and response requires attention to the personnel who sustain those activities, including their exposure circumstances and ability to work safely. pubmed.ncbi.nlm.nih.gov

2.14. Infection Prevention Implementation: Houghton et al. (2020)

Houghton et al. (2020) conducted a rapid qualitative evidence synthesis examining barriers and facilitators to healthcare workers' adherence to infection prevention and control guidance for respiratory infectious diseases. The synthesis identified the influence of guideline clarity, training, management support, workplace culture, workload, and access to protective resources. It showed that implementing guidance involves organizational conditions as well as professional knowledge. The rapid search approach and variation in the underlying studies require consideration when applying findings to specific settings. This publication synthesizes experiences across studies and should not be interpreted as a quantitative estimate of intervention effectiveness. For the present framework, it provides an explanation for why issuing a procedure may be insufficient. Nursing, laboratory, clinical, educational, and operational personnel require guidance that is understandable and feasible within their responsibilities. The study consequently supports examining implementation support and conflicting demands when assessing whether coordinated outbreak arrangements can function in practice. PubMed

2.15. Community Engagement Functions: Gilmore et al. (2020)

Gilmore et al. (2020) undertook a rapid evidence synthesis examining community engagement during infectious disease epidemics. Thirty-two included articles described 37 initiatives involving actors such as community leaders, organizations, groups, and health facility committees. Engagement activities covered planning, trust building, communication, surveillance, tracing, and logistical support. The diversity of initiatives demonstrated that communities can participate in several stages of a response, although differences in context and study design limited comparisons of effectiveness. The review does not establish a single engagement model suitable for all outbreaks. Its relevance to the present research is the positioning of health education within a broader relationship between services and communities. Communication can help explain protective measures, while community feedback can identify misunderstandings and practical barriers. The proposed framework therefore considers two-way communication and locally appropriate engagement alongside formal professional exchanges, without assuming that distributing information alone produces participation or behavioural change. pubmed.ncbi.nlm.nih.gov

2.16. Public Understanding and Protective Behaviour: Seale et al. (2020)

Seale et al. (2020) surveyed 1,420 Australian adults during March 2020 to examine public perceptions and reported protective behaviours during the emerging COVID-19 pandemic. The cross-sectional online study investigated attitudes, perceived risk,

trust, and the perceived feasibility and effectiveness of recommended measures. Adoption of avoidance behaviours was associated with factors including trust in authorities and perceived ability to follow distancing guidance. Because exposure and behaviour were measured at one time, the findings cannot establish that changes in trust caused behavioural change. Self-reported behaviour also introduces potential measurement bias. The study nevertheless demonstrates the importance of considering how people interpret and act on public health instructions. For this review, its contribution is to connect health education with practical capacity and credibility. An outbreak communication pathway should assess whether messages are understandable and achievable, rather than evaluating success only through the number of messages delivered. journals.plos.org

2.17. Psychological Consequences of Quarantine: Brooks et al. (2020)

Brooks et al. (2020) rapidly reviewed 24 studies concerning the psychological effects of quarantine across several infectious disease emergencies. The literature described outcomes including distress, confusion, anger, and post-traumatic stress symptoms. Reported stressors included inadequate information, insufficient supplies, fear of infection, financial loss, and stigma. The review drew on heterogeneous studies, many from outbreaks preceding COVID-19, which limits direct prediction of effects in a particular contemporary setting. It also did not test the multidisciplinary framework proposed in this research. Its contribution is to broaden the interpretation of response quality beyond the implementation of restrictive measures. Instructions may impose substantial practical and emotional demands on affected individuals. The present framework therefore considers understandable explanations, routes for questions, and appropriate referral for support as relevant interfaces between family medicine, nursing, health education, and public health services. These remain responsibilities requiring locally defined arrangements and resources. pubmed.ncbi.nlm.nih.gov

2.18. Screening Frequency and Reporting Speed: Larremore et al. (2021)

Larremore et al. (2021) modelled repeated COVID-19 population screening while varying test sensitivity, testing frequency, and the interval between sampling and reporting. Under the conditions modelled, screening performance depended strongly on frequency and reporting speed, with analytical sensitivity offering more limited additional benefit. The analysis concerned population screening and should not be interpreted as a general ranking of diagnostic methods for individual clinical decisions. Its conclusions also depended on assumptions concerning viral dynamics and participation. For this review, the study provides a rationale for examining laboratory information as part of a time-sensitive operational process. A technically capable test does not automatically produce a timely public health response. The proposed framework therefore considers specimen transport, processing, communication, and subsequent action together. It also preserves the distinction between choosing an appropriate test and organizing the services required to use its result safely and effectively. pubmed.ncbi.nlm.nih.gov

2.19. Multicountry Detection-to-Response Performance: Bochner et al. (2023)

Bochner et al. (2023) retrospectively assessed 41 public health events across five countries using the 7-1-7 framework. Twenty-two events met the detection target, 29 met the notification target, and 20 met the target for completing specified early response actions. Eleven events met all three targets. The investigation identified bottlenecks at different health system levels, with detection difficulties frequently located in facilities and notification or response difficulties commonly occurring at intermediate public health levels. The observational design and selected events limit generalization and do not establish that monitoring alone improves outcomes. Nevertheless, the study provides an empirical basis for locating coordination problems along the response pathway. Its contribution to the present framework is the recognition that preparedness requires connected performance across stages. Strong notification performance cannot compensate fully for delayed detection or incomplete early action, making both overall pathway assessment and stage-specific accountability necessary considerations. pubmed.ncbi.nlm.nih.gov

2.20. Connecting Performance Review with Planning: Nakiire et al. (2025)

Nakiire et al. (2025) reported Uganda's implementation of the 7-1-7 approach during its first 15 months, from October 2021 to December 2022. The publication described workflows for gathering timing information, discussing performance through coordination structures, identifying bottlenecks, and informing operational planning. Seventeen percent of the 108 subactivities in the subsequent national operational plan aligned with recommended activities emerging from implementation. This is an implementation report rather than a controlled effectiveness study, and some experience relates to the country participation discussed in the multicountry literature. Its value lies in showing how measurement can be connected with institutional decisions. For the present review, it supports a feedback component through which response experience informs training,

procedures, and resource priorities. The findings do not demonstrate that every recommended activity was implemented or improved outcomes; they illustrate a practical link between identifying weaknesses and incorporating corrective actions into planning. pmc.ncbi.nlm.nih.gov

2.21. Critical Synthesis and Research Gap

Across these publications, coordination emerges as a relationship between information, professional judgment, operational capacity, and accountable action. Surveillance evaluations demonstrate the need to distinguish initial signals from verified events and to provide adequate assessment capacity. Notification research shows that delay can accumulate before and after formal reporting. Observational and modelling studies of contact tracing explain why timing matters, while offering different levels of evidence about achievable outcomes. Research on workforce protection and infection prevention identifies conditions that influence whether personnel can perform expected duties. Community engagement, behavioural, and quarantine research extends the pathway to include trust, feasibility, understanding, and support for affected populations.

These findings require interpretation because the evidence base is uneven. Publications arising from the same programmes provide different analytical perspectives but do not represent independent replications. Models explain plausible mechanisms under stated assumptions, whereas observational studies describe associations within particular responses. Evidence syntheses incorporate studies with differing populations, settings, and quality. The workplace violence intervention offers indirect support for operational safety planning, but it provides no direct evidence that healthcare security improves infectious disease surveillance or outbreak control.

Within the literature examined here, the principal gap is the absence of a directly evaluated framework that integrates all six professional domains across the complete surveillance-to-response pathway. This is a gap identified within the selected literature, rather than a claim that no such research exists anywhere. The present review addresses it by developing an evidence-informed conceptual framework linking recognition, verification, notification, diagnostic information, coordinated action, and feedback. Family medicine, epidemiological surveillance, laboratories, nursing, and health education are examined through their relevant clinical and public health interfaces. Healthcare security is included as a bounded operational support function whose proposed contribution requires explicit institutional definition and subsequent evaluation. The resulting framework will distinguish findings supported by the reviewed evidence from relationships proposed for future testing.

3. METHODOLOGY

3.1. Research Design and Analytical Purpose

This study adopts a theoretical integrative review design to examine how family medicine, epidemiological surveillance, clinical laboratories, nursing, health education, and healthcare security can contribute to a coordinated outbreak response pathway. The review combines findings from different research designs with relevant institutional guidance to develop an evidence-informed conceptual framework. It does not involve recruiting participants, accessing patient records, administering questionnaires, or collecting organizational performance data.

An integrative approach is appropriate because the research question concerns relationships between professional functions rather than the effectiveness of a single intervention. Torraco (2016) describes integrative reviewing as a means of critically combining existing knowledge to generate conceptual understanding. Snyder (2019) similarly emphasizes the importance of aligning the review approach with its purpose and explaining how evidence is selected and interpreted. These methodological principles inform the present study, although neither publication provides clinical evidence about outbreak response. journals.sagepub.com

The review uses a purposively selected body of literature. It is not presented as an exhaustive systematic review, a meta-analysis, or an empirical validation of the proposed framework. Its analytical purpose is to identify supported coordination requirements, examine contextual limitations, and formulate relationships that can subsequently be evaluated in practice.

3.2. Review Question and Scope

The review addresses the following question: How can the complementary responsibilities of family medicine, epidemiological surveillance, clinical laboratories, nursing, health education, and healthcare security be organized into an evidence-informed pathway connecting early outbreak signals with coordinated response?

The unit of analysis is the operational interface between activities. An interface is defined here as a point at which information, responsibility, or action passes between professional functions or organizational levels. Examples include communicating an unusual clinical presentation to surveillance personnel, transmitting a laboratory result to an accountable recipient, and converting public health instructions into understandable patient guidance.

The analytical scope includes recognition, reporting, verification, diagnostic information, escalation, early response, communication, operational support, and feedback. It excludes the development of disease-specific treatment protocols, laboratory assay validation, and the estimation of intervention effects. Healthcare security is considered specifically as a facility support function. Its inclusion does not imply responsibility for diagnosis, clinical triage, epidemiological classification, or decisions about public health restrictions.

3.3. Information Sources and Search Approach

Sources were identified through targeted web searches designed to locate relevant publications, followed by consultation of PubMed records, accessible PubMed Central articles, original journal pages, and official WHO publications. Searches combined topic terms with publication titles, author names, or institutional identifiers when necessary to verify a source. The process was iterative: relevant publications informed subsequent searches for related implementation studies, explanatory research, and methodological guidance.

Search concepts included event-based surveillance, infectious disease notification, outbreak detection, response timeliness, contact tracing, laboratory turnaround, healthcare worker protection, infection prevention, community engagement, risk communication, and hospital safety. Exact-title searches were also used to locate and verify publications discussed in the literature review.

The eligible publication window extended from January 2010 to the search cut-off of November 17, 2026. This window defined eligibility rather than requiring representation from every year. The 20 publications discussed in Chapter 2 were published between 2016 and 2025. Institutional guidance and review methodology publications form a supporting source group and are not included in that count.

The search was not a database-wide structured search of MEDLINE, Embase, Scopus, or Web of Science. Consequently, no comprehensive retrieval count, screening denominator, or systematic review flow diagram is reported. Some sources were available in full text, whereas others were assessed through indexed abstracts or publisher summaries. Interpretations are restricted to the information accessible in the consulted material.

Table 1. Source selection criteria and analytical boundaries

Dimension	Selection criterion	Boundary applied
Publication period	Published from 2010 to the search cut-off in 2026	Later publications are outside the review window.
Subject relevance	Addresses detection, notification, response, communication, workforce protection, or operational coordination	Sources without an identifiable connection to the review question are not used to support the framework.
Research design	Empirical research, modelling, evidence synthesis, or documented implementation experience	Different designs retain separate evidential interpretations.
Institutional material	Identifiable guidance from an authoritative health organization	Guidance supports normative or operational context, not an empirical effect estimate.
Source verification	Publication identity and relevant content can be checked through an indexed record, journal, or official institutional source	Unverifiable references are excluded.
Accessible information	Sufficient accessible content to support the specific statement made	Abstract-level access does not support unreported methodological details.
Indirect evidence	Offers a clearly explained connection to an operational function	Indirect evidence is labelled and cannot establish outbreak effectiveness.

Related publications	Reports additional analysis of a programme already represented	Publications are retained for distinct contributions but are not treated as independent replications.

3.4. Composition of the Review Corpus

The core corpus consists of the 20 publications presented individually in Chapter 2. Their distribution reflects the selected literature rather than the prevalence of research in the wider field. Surveillance and notification publications provide information about reporting pathways and implementation. Contact-tracing and screening studies explain the importance of timing through observational findings or modelled relationships. Workforce and communication publications address conditions affecting the delivery and acceptance of response activities.

An implementation report was included because the research question concerns how performance information can inform institutional action. A hospital violence prevention trial was retained as indirect operational safety evidence. Its inclusion does not establish a relationship between healthcare security and infectious disease outcomes.

The corpus contains related publications from the same surveillance programmes. These offer distinct accounts of implementation, performance, or evaluation methods. They are interpreted as connected sources, avoiding the assumption that agreement between publications necessarily represents independent confirmation.

3.5. Evidence Organization and Interpretive Assessment

Each publication was examined using a common set of analytical fields. These fields cover the research purpose, setting, design, relevant findings, professional interfaces, and limitations. Numerical findings are retained only where they clarify the original study and can be attributed to it. They are not combined across heterogeneous studies.

The assessment is narrative and design-sensitive. Observational findings are interpreted as associations within their reported settings. Modelling results are treated as conditional on model assumptions. Evidence syntheses are considered alongside their search limitations and the diversity of their included studies. Implementation reports are used to describe processes and institutional experience. No numerical quality score, formal certainty grade, or standardized risk-of-bias rating is assigned.

Table 2. Evidence organization and interpretation framework

Analytical field	Information examined	Rule governing interpretation
Publication identity	Authors, year, title, journal or issuing organization, and identifier	Citation details must correspond to a verifiable publication.
Research purpose	Question, intervention, programme, or process examined	Findings are interpreted in relation to the original purpose.
Setting and context	Country, service setting, outbreak, and institutional conditions	Transferability is considered rather than presumed.
Study design	Observational, qualitative, randomized, modelling, synthesis, or implementation report	Claims remain within the explanatory capacity of the design.
Relevant finding	Reported result or documented implementation observation	Original findings are distinguished from this review's interpretation.
Coordination interface	Information exchange, responsibility transfer, or action connection	Relevance to the proposed pathway is explained explicitly.
Limitations	Bias, access limitations, assumptions, missing comparisons, or contextual constraints	Limitations qualify the strength and scope of conclusions.
Programme overlap	Shared programme, setting, events, or implementation period	Related reports are not counted as independent demonstrations.
Evidence relationship	Directly relevant, indirectly relevant, or conceptual	Indirect support cannot be presented as direct effectiveness evidence.

3.6. Narrative Synthesis and Framework Development

The synthesis proceeds through comparison of findings across the operational pathway. The initial organizing categories are recognition, verification, notification, diagnostic information, coordinated action, and feedback. These categories provide a

structure for interpretation; they do not imply that response always occurs in a fixed sequence. Clinical care, laboratory assessment, communication, and public health action may overlap.

Within each category, the analysis examines the information required, the function receiving it, the responsibility for subsequent action, and the conditions that could interrupt the connection. For example, delayed notification may reflect uncertainty about reporting responsibilities rather than a technical failure of communication. Similarly, the availability of a laboratory result does not establish that it reached the appropriate recipient or informed a timely decision.

The analysis then compares the contribution of each professional domain across these interfaces. Roles are represented as functions that require local allocation, rather than universal job descriptions. Professional titles and responsibilities vary between institutions, and the proposed framework does not replace national regulations, institutional policies, or authorized scopes of practice.

Three levels of interpretation are maintained. Source findings describe what the original publications reported. Integrative interpretations explain relationships supported by comparison across sources. Conceptual propositions identify arrangements suggested by the review that require subsequent validation. This distinction prevents a plausible organizational proposal from being presented as an observed outcome.

Table 3. Professional interface framework used in the synthesis

Professional domain	Function examined	Principal coordination interface	Boundary retained
Family medicine	Recognition, initial assessment, documentation, referral, and continuity of care	Communication between patient-facing clinical services and surveillance or diagnostic services	Reporting a concern is distinguished from confirming an outbreak.
Epidemiological surveillance	Signal assessment, verification coordination, notification, and situation monitoring	Exchange between reporting sources and authorized public health decision structures	Decisions follow applicable authority and reporting procedures.
Clinical laboratories	Specimen-related information, testing processes, result communication, and biosafety	Connection between diagnostic information and accountable clinical or public health recipients	Screening evidence is not generalized to every diagnostic decision.
Nursing	Clinical observation, authorized procedures, documentation, education, and follow-up	Continuity between assessment, care delivery, and communication	Activities remain within competence and authorized practice.
Health education	Understandable messages, community feedback, and explanation of protective measures	Translation between technical guidance and patient or community understanding	Communication is aligned with approved advice and referral arrangements.
Healthcare security	Safe access, orderly movement, and facility operational support	Coordination with clinical and operational leadership	No diagnostic, clinical triage, or independent public health decision authority is assigned.

The table is an analytical construction developed for this review. It does not represent an established staffing standard or an evaluated intervention.

3.7. Treatment of Quantitative Findings and Visual Outputs

No pooled effect estimate is calculated because the selected publications address different questions, settings, populations, and outcomes. Combining their percentages, timing intervals, or effect estimates would create a misleading impression of comparability. Any numerical finding reproduced in the results chapter will therefore identify its original source and retain the relevant denominator and context.

The results will be presented principally through explanatory text and conceptual figures. These figures will illustrate professional interfaces, information movement, and feedback relationships. Arrows will indicate proposed connections rather

than measured causal effects. No invented performance scores, simulated improvement percentages, or unsupported comparisons between professions will be introduced.

The visual outputs will distinguish evidence-informed relationships from propositions requiring evaluation. Counts describing the selected corpus, if used, will describe only those publications and will not be interpreted as estimates of the wider literature.

3.8. Transparency and Analytical Limitations

The review provides transparency through explicit source attribution, separation of study designs, acknowledgment of overlapping programme reports, and disclosure of source-access limitations. However, it does not claim independent duplicate screening, duplicate extraction, reviewer agreement, or consensus procedures involving the named contributors. Such activities have not been documented.

The purposive search approach introduces selection limitations. Relevant publications may have been missed, and the accessible literature may overrepresent particular countries, outbreaks, and service arrangements. Several sources concern COVID-19 or Ebola, so their findings require contextual interpretation before application to other infectious threats. Evidence relating directly to the proposed healthcare security interface is particularly limited.

The framework should consequently be understood as an organized interpretation of selected evidence. It is intended to identify relationships and evaluation priorities, rather than establish completeness, universal applicability, or proven effectiveness.

3.9. Ethical Considerations

This review uses publicly available publications and institutional documents. It does not involve direct contact with human participants or access to identifiable clinical records, biological specimens, or confidential organizational datasets. No research ethics approval, exemption determination, or consent waiver is claimed. Any institutional requirement for a formal determination remains to be addressed through the relevant organization.

Ethical integrity also concerns the representation of evidence. Findings must remain attributable to their original sources, observational associations must not be described as proven causal effects, and modelled estimates must remain distinguishable from observed outcomes. Related publications must not be used to inflate the apparent independence of supporting evidence. These principles guide both the narrative synthesis and the proposed figures.

The contributors' names and affiliations do not establish institutional endorsement of the manuscript. Personal contact details supplied for manuscript preparation are not research data and should be included in a submission only with the relevant contributors' agreement. Authorship order, corresponding authorship, contributions, funding, and competing interests require confirmation from the contributors before submission; they cannot be inferred from professional titles.

The proposed framework also preserves boundaries between clinical, public health, and operational authority. Healthcare security personnel are not assigned clinical responsibilities through this review. Any later empirical evaluation involving staff, patients, institutional records, or identifiable operational information would require a separate protocol and the applicable ethical, administrative, consent, and data-protection arrangements.

3.10. Methodological Output

The methodological output is an evidence-informed conceptual framework connecting early signals with verification, notification, diagnostic information, coordinated action, and feedback. The results chapter will explain the relationships identified across these stages, the conditions supporting their operation, and the limits of the available evidence. Its conclusions will concern the interpretation of published knowledge and proposed organizational relationships, rather than newly measured improvements in outbreak performance.

4. RESULTS

4.1. Overview of the Integrative Findings

The synthesis of the 20 selected publications identified five connected analytical themes: continuity between recognition and notification; the operational value of timely diagnostic information; the organizational conditions supporting workforce performance; communication that accounts for community understanding and practical needs; and feedback linking response

experience with institutional improvement. These themes represent an interpretation of the selected literature rather than the results of a new intervention or field investigation.

The principal finding is that outbreak coordination depends on the connections between activities as well as the activities themselves. Recognition, reporting, verification, testing, communication, and response have different purposes and may involve different institutions. A delay or ambiguity at one connection can limit the usefulness of work completed elsewhere. Evidence supporting this interpretation includes notification research, surveillance programme evaluations, observational contact-tracing research, and conditional findings from mathematical models (Bi et al., 2020; Kretzschmar et al., 2020; Swaan et al., 2018, 2019). These sources do not demonstrate the effectiveness of the complete framework developed in this review. They provide a basis for specifying the interfaces that such a framework should address. pubmed.ncbi.nlm.nih.gov

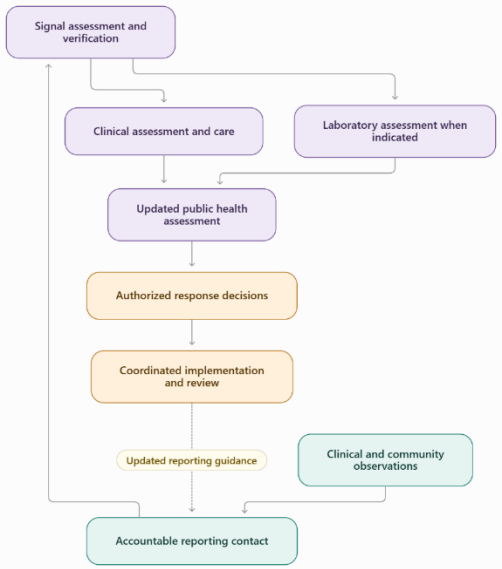
4.2. Recognition and Notification Require Distinct Responsibilities

The first analytical theme concerns the distinction between recognizing a concern and establishing its public health significance. Community surveillance evaluations demonstrated that reporting systems can generate substantial numbers of signals while identifying a much smaller number of verified events or confirmed cases. In Sierra Leone, Ratnayake et al. (2016) reported 12,126 community reports, of which 287 met the suspected case definition and 16 were confirmed as Ebola cases. In the Vietnamese pilot assessed by Clara, Do, et al. (2018), 176 of 2,520 reported signals were verified as events. These figures describe different programmes and classifications and should not be compared as equivalent measures of performance. Together, however, they demonstrate why signal generation and verification must remain distinguishable functions. wwwnc.cdc.gov

The resulting interpretation is that an early reporting pathway should enable concerns to reach an accountable assessment function without requiring the reporting professional to establish an outbreak diagnosis. This interpretation is reinforced by Do et al. (2020), whose participants described hesitation to report without laboratory confirmation and uncertainty about whether reporting belonged to the clinical sector. The relevant coordination requirement is therefore a clear distinction between communicating an unusual observation, assessing its credibility, and determining the response warranted. ojs.wpro.who.int

Within the proposed framework, family medicine and nursing contribute patient-facing observations within their respective responsibilities. Surveillance personnel coordinate assessment and notification according to applicable arrangements, while laboratories contribute diagnostic information where indicated. These are functional relationships proposed by the review; the selected evidence does not establish one universal allocation of duties across institutions.

Figure 1. Proposed interfaces between signal recognition, verification, and coordinated action



Note. This conceptual figure is developed from the review synthesis. Connections represent proposed information and responsibility interfaces, not measured causal effects. Care and public health action may begin before laboratory confirmation where applicable procedures require them.

4.3. Timeliness Is a Property of the Connected Pathway

The second theme concerns the accumulation of delays across organizational boundaries. Swaan et al. (2019) distinguished disease identification, notification, and subsequent reporting intervals. Their findings indicated that improvements in formal reporting could coexist with substantial delays before identification. This supports evaluating the complete pathway rather than relying on one administrative interval as a measure of overall readiness. pubmed.ncbi.nlm.nih.gov

The multicountry assessment by Bochner et al. (2023) provides a complementary perspective. Of 41 assessed events, 22 met the detection target, 29 met the notification target, and 20 met the target for completing specified early response actions. Eleven met all three targets. These findings show that performance at one stage does not establish satisfactory performance across the whole process. They do not identify a single cause for all delays or demonstrate that the proposed six-domain framework would eliminate them. pubmed.ncbi.nlm.nih.gov

The synthesis consequently identifies a need to distinguish the time at which information becomes available from the time at which someone accepts responsibility for acting on it. A notification may be transmitted promptly but remain unresolved if its recipient, urgency, or next action is unclear. This is an integrative interpretation of the reporting literature. It leads to a conceptual requirement for identifiable recipients, acknowledgement arrangements, and escalation procedures when expected actions do not occur.

No common numerical response threshold is derived from the reviewed studies. Appropriate timing depends on the suspected hazard, transmission characteristics, available information, and applicable public health requirements.

4.4. Diagnostic Information Must Be Connected with Action

Laboratory information contributes to response through both its technical meaning and its availability for appropriate decisions. Larremore et al. (2021) demonstrated, within a repeated COVID-19 screening model, that testing frequency and reporting speed strongly influenced screening performance. Kretzschmar et al. (2020) similarly showed that testing delays could limit the potential benefit of contact tracing under their modelled conditions. These findings concern specified scenarios; they do not justify reducing diagnostic standards or applying screening conclusions to every clinical situation. pubmed.ncbi.nlm.nih.gov

The analytical implication is that laboratory coordination extends beyond completing a test. The proposed framework distinguishes specimen-related communication, processing, release of results, receipt by an accountable professional, and interpretation within the clinical and epidemiological context. These interfaces are proposed areas for organizational examination rather than a tested package of procedures.

The observational findings of Bi et al. (2020) strengthen the relevance of connecting surveillance information with timely clinical action. Contact-based surveillance was associated with shorter intervals to isolation than symptom-based surveillance in the setting studied. However, the study does not permit the observed difference to be attributed independently to laboratories, clinicians, nurses, or surveillance personnel. Its contribution is evidence about the connected process rather than the relative effectiveness of individual professions. pubmed.ncbi.nlm.nih.gov

4.5. Workforce Readiness Depends on Organizational Support

The third theme identifies organizational support as a condition for carrying out coordinated responsibilities. Houghton et al. (2020) found that adherence to infection prevention guidance was influenced by clarity, training, management support, workload, workplace culture, and protective resources. Nguyen et al. (2020) documented elevated occupational infection risk among frontline healthcare workers in the circumstances examined. These publications address different questions, but together they caution against treating individual awareness as a sufficient measure of readiness. pubmed.ncbi.nlm.nih.gov

The resulting interpretation is that role allocation must be accompanied by the capacity to perform the assigned work. A procedure that expects prompt documentation, specimen handling, follow-up, and communication may be difficult to deliver if workload and resources are not considered. The review therefore proposes that institutional assessment examine whether assigned functions have appropriate staffing, guidance, access to advice, and practical support.

This finding also affects how nursing responsibilities are represented. Nursing contributes across several interfaces, but the synthesis does not establish that every nursing role should undertake every activity. Responsibilities must reflect competence,

authorized practice, and local service arrangements. The same principle applies to laboratory technicians, surveillance technicians, health educators, and family physicians.

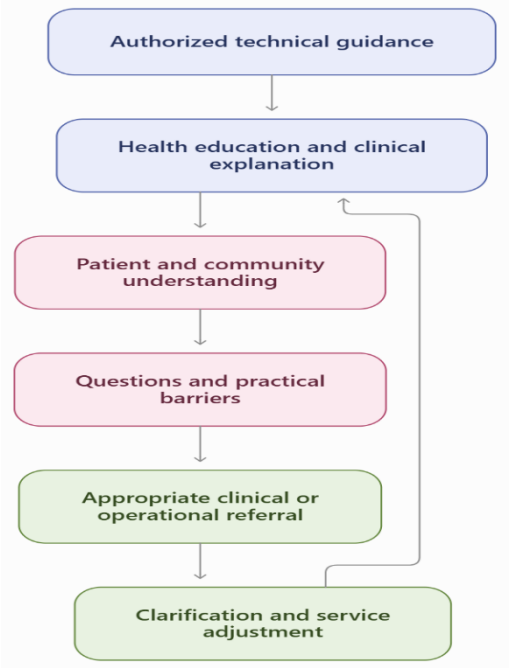
4.6. Community Communication Requires Understanding and Feasibility

The fourth theme connects communication with the circumstances in which people receive and use guidance. Gilmore et al. (2020) identified community engagement activities extending beyond message delivery to planning, trust building, surveillance, and logistical support. Seale et al. (2020) found associations between reported protective behaviours and factors including trust and perceived ability to follow recommendations. Brooks et al. (2020) identified inadequate information and supplies among the stressors associated with quarantine. These findings support examining both understanding and practical feasibility, while not establishing that a particular communication strategy will produce a specified behavioural effect. pubmed.ncbi.nlm.nih.gov

The framework consequently positions health education as an interface between technical advice and community interpretation. Questions and reported difficulties can identify where messages require clarification or where practical support needs referral. Clinical services remain responsible for patient-specific assessment within their authority, while public health structures determine applicable population guidance.

Figure 2 illustrates this proposed relationship. The return connection is important because communication is interpreted as an exchange through which services can learn about misunderstanding and implementation difficulties.

Figure 2. Proposed communication and feedback relationships



Note. This figure represents a conceptual communication loop. It does not imply that all reported barriers can be resolved or that service adjustment can occur without the relevant authority and resources.

4.7. Healthcare Security Has a Bounded Operational Position

The evidence supporting the inclusion of healthcare security differs from that supporting surveillance, notification, and contact-tracing interfaces. Arnetz et al. (2017) demonstrated benefits from a data-informed workplace violence prevention intervention. However, the intervention did not evaluate infectious disease outbreak coordination or isolate the contribution of security personnel. Its findings therefore provide indirect operational safety evidence only. pubmed.ncbi.nlm.nih.gov

The present review proposes a bounded role for healthcare security in supporting safe access, orderly movement, and implementation of facility arrangements established by authorized leadership. This is a conceptual extension requiring local assessment. It should not be presented as an evidence-established mechanism for reducing infection or accelerating notification.

The distinction has practical importance for framework interpretation. Security personnel may communicate an operational concern through designated channels, but the framework does not authorize them to classify suspected cases, conduct clinical triage, interpret laboratory findings, or determine restrictions independently. Their contribution concerns the conditions under which clinical and public health work takes place. Whether this contribution improves outbreak performance remains an empirical question.

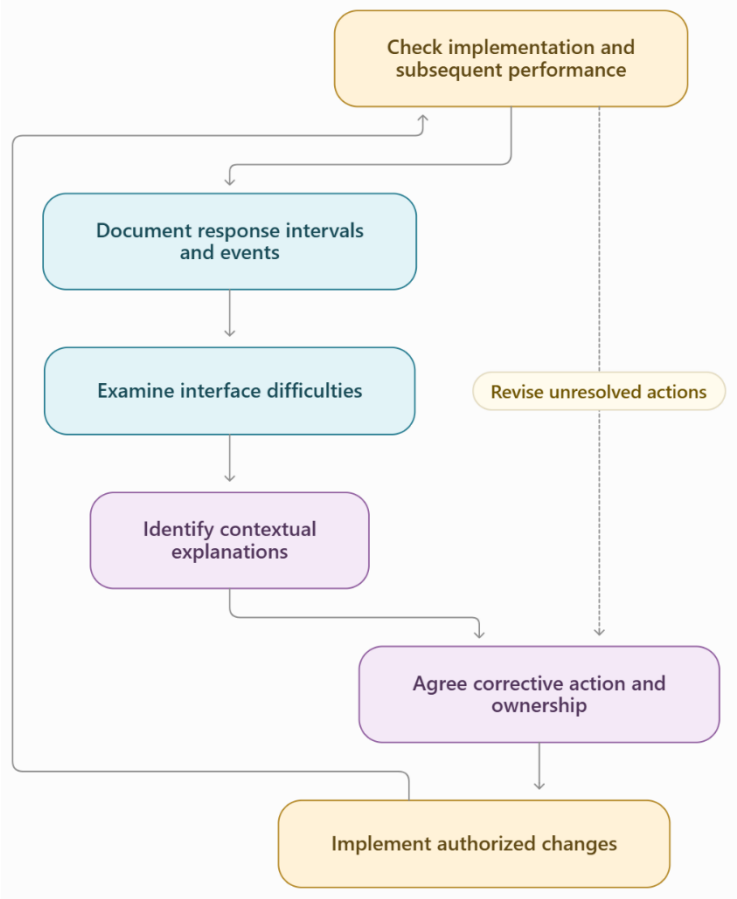
4.8. Feedback Connects Response Experience with Institutional Improvement

The fifth theme concerns the use of response experience to identify and address weaknesses. Clara et al. (2020) demonstrated how surveillance evaluation could combine timing information with staff experiences and implementation observations. Nakiire et al. (2025) described how Uganda's use of the 7-1-7 approach informed discussion of bottlenecks and operational planning. These publications support connecting measurement with organizational learning, although they do not establish that every identified corrective action was implemented or effective. pubmed.ncbi.nlm.nih.gov

The synthesis proposes that review should consider both what happened and why it happened. A prolonged interval may reflect unclear responsibility, unavailable resources, incomplete information, or difficulties applying procedures. Timing alone does not distinguish these explanations. Conversely, staff perceptions can identify possible barriers but require comparison with available records before being treated as established causes.

Figure 3 presents a proposed institutional learning cycle. It incorporates assessment of whether an agreed change was implemented, rather than assuming that discussion or planning constitutes improvement.

Figure 3. Proposed cycle for reviewing coordination and evaluating corrective action



Note. The cycle is a framework proposition informed by the reviewed evaluation and implementation literature. It has not been tested as an intervention in this study.

4.9. Integrated Interpretation and Limits of the Results

The framework integrates the five themes through a central proposition: coordination is supported when a relevant observation reaches an identifiable recipient, receives appropriate assessment, leads to an authorized decision, and generates feedback about the action taken. This proposition organizes the reviewed findings but remains subject to empirical evaluation.

The professional domains contribute at different points. Family medicine and nursing provide clinical interfaces; surveillance connects reports with public health assessment; laboratories supply diagnostic information; health education supports understanding and feedback; and healthcare security is proposed as an operational support function. These contributions are complementary, but the review does not demonstrate equal evidential support for each domain or quantify their relative importance.

Several boundaries limit interpretation. The selected publications are heterogeneous, some describe related programmes, and several concern particular phases of COVID-19 or Ebola responses. Models provide conditional estimates, observational studies remain vulnerable to confounding, and implementation reports primarily explain processes. The review therefore produces no pooled effect estimate, causal ranking of professions, or measured improvement attributable to the framework.

The contribution of the results is an explicit account of relationships that institutions can examine and researchers can test. Subsequent evaluation would need to determine whether the proposed interfaces are feasible, whether responsibilities are understood, whether procedures are implemented, and whether changes in coordination are associated with relevant outcomes. Those questions remain open rather than being resolved by the conceptual synthesis.

5. CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

This integrative review examined how family medicine, epidemiological surveillance, clinical laboratories, nursing, health education, and healthcare security can contribute to coordinated outbreak response. Across the selected literature, the central issue was the continuity of information, responsibility, and action between professional functions. Recognizing an unusual presentation, transmitting a notification, or producing a laboratory result does not establish an effective response. Each activity must connect with appropriate assessment, an accountable recipient, and decisions consistent with institutional authority. The synthesis identified five related themes: recognition and notification interfaces, timely diagnostic information, organizational support for personnel, understandable and feasible community communication, and feedback linking response experience with improvement. These themes informed a conceptual framework connecting early signals with verification, coordinated action, and review. Evidence supporting individual relationships varied. Surveillance evaluations and observational studies described performance within particular settings, mathematical models explained conditional relationships, and evidence syntheses identified implementation concerns. Related publications sometimes examined the same programmes, limiting their independence. Healthcare security occupied a bounded operational position, supported mainly through indirect evidence and conceptual interpretation. Consequently, the framework should be understood as an evidence-informed organizational proposition rather than a validated intervention. It establishes neither a numerical improvement in outbreak outcomes nor a universal allocation of professional duties. Its contribution is to make coordination interfaces explicit while preserving differences between empirical findings and proposed arrangements. Future research should evaluate feasibility, implementation, and outcomes within defined institutional contexts before attributing effectiveness to the integrated framework or recommending its adoption as an established standard across diverse healthcare settings.

5.2. Recommendations

Healthcare organizations should begin by examining how outbreak concerns move between clinical services, surveillance functions, laboratories, and operational leadership. Local procedures should identify reporting contacts, expected information, acknowledgement arrangements, and escalation routes, while distinguishing preliminary concerns from verified events. Responsibilities should reflect professional competence, institutional policies, and applicable authority. Laboratory coordination should address specimen communication, result availability, accountable receipt, and interpretation without substituting operational speed for appropriate diagnostic practice. Workforce preparation should combine clear guidance with training, protective resources, supervision, and realistic workload assessment. Joint exercises may help institutions examine these interfaces, but their value should be evaluated rather than presumed. Health education arrangements should provide

understandable explanations and opportunities for questions. Reported difficulties should inform appropriate clinical or operational referrals, with attention to the practical circumstances affecting participation in protective measures. Healthcare security duties should remain limited to authorized operational support, including safe access and orderly movement, without transferring clinical or public health decision authority. Institutions should review response intervals alongside contextual explanations, assign ownership of agreed corrective actions, and check whether changes are implemented. Future empirical research should assess framework feasibility before evaluating effectiveness. Prospective observational studies, qualitative investigations, and appropriately designed comparative evaluations could examine communication failures, role understanding, implementation fidelity, workforce experience, and patient implications. Evaluations should specify outcomes and account for pathogen characteristics, baseline capacity, concurrent interventions, and resource differences. Before submission, contributors should confirm authorship, affiliations, institutional requirements, funding, and competing interests. Further development should remain transparent about uncertainty and preserve patient confidentiality throughout.

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