

Interprofessional Governance Of Infection Risks Across The Patient Journey: A Critical Narrative Review Integrating Clinical, Diagnostic, Sterile Processing, Biomedical Equipment, And Administrative Responsibilities

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Abstract:

Healthcare-associated infection prevention depends on coordinated work across services that frequently operate with separate policies, information systems, and reporting relationships. Infection risks can accumulate when patients, specimens, diagnostic results, reusable devices, and responsibility move

between departments. This review examines how interprofessional governance can connect nursing, pharmacy, laboratory medicine, radiology, sterile processing, biomedical equipment services, and health administration across the patient journey.

A targeted critical narrative review was undertaken using twenty publications from 2022–2025, supplemented by World Health Organization guidance and methodological literature. Bibliographic records and abstracts were verified through indexed sources; accessible full texts informed interpretation where available. Evidence was examined according to journey stage, professional responsibility, communication requirements, organizational conditions, and the distinction between process measures and clinical outcomes. The review involved no participant recruitment, institutional dataset, intervention, statistical testing, or quantitative pooling.

The synthesis generated a proposed governance framework linking risk recognition, explicit ownership, acknowledged communication, action, closure, and organizational learning. Four connected analytical domains organize the findings: diagnostic information and antimicrobial decisions; device use, decontamination, and technical readiness; workforce capability and local work conditions; and leadership, resources, and escalation. The literature supports attention to these domains, but does not establish the effectiveness of the proposed cross-professional framework. Microbial contamination, compliance, diagnostic turnaround, and clinical infection are treated as distinct outcomes rather than interchangeable measures of success.

The review concludes that infection prevention should be governed at the interfaces between services as well as within individual departments. Recommendations concern shared handover requirements, coordinated education, equipment and reprocessing compatibility, protected escalation, patient participation, and proportionate information access. The framework provides an evidence-informed basis for policy discussion and subsequent evaluation; it does not justify a numerical prediction of infection reduction or a claim of demonstrated institutional improvement.

Keywords: interprofessional governance; infection prevention and control; patient journey; diagnostic stewardship; sterile processing; biomedical equipment; health administration

1..INTRODUCTION

Infection prevention as a responsibility distributed across care

Healthcare-associated infection is a problem of care organization as well as microbial exposure. A patient may encounter a nurse collecting a specimen, a laboratory professional identifying an organism, a pharmacist reviewing antimicrobial treatment, a radiology technologist preparing an examination, and a sterile processing team releasing equipment for reuse. Each encounter can be individually competent while the connections between them remain unreliable. The question addressed here is how those connections should be governed so that relevant information and responsibility continue to follow the patient. The World Health Organization places infection prevention and control within the wider requirements of safe, dependable healthcare rather than treating it as a departmental activity (World Health Organization [WHO], 2024b).

The distinction between a policy and a functioning system is central. Minimum requirements identify the conditions that should exist before an infection prevention programme can operate reliably, including dedicated responsibility, appropriate training, surveillance, and suitable resources. Their presence on paper, however, does not establish whether a clinician receives a result, whether a contaminated device is withheld, or whether a resource shortage reaches someone empowered to resolve it. This review therefore uses governance to mean the allocation of decision authority, professional obligations, information access, and accountability across connected services (WHO, 2019).

Professional competence remains essential within this broader approach. An infection prevention specialist requires capabilities that differ from those of an equipment technician or laboratory specialist. Integration should connect these capabilities without suggesting that a short shared training session makes professional roles interchangeable. WHO competency guidance supports a defined specialist contribution, making it important that a model involving multiple departments retains access to infection prevention expertise and appropriate medical decision makers (WHO, 2020).

The patient journey provides an organizing perspective because infection risk does not stop at the boundary of a department. Human factors work on SEIPS 3.0 describes care as movement through interacting work systems over time. Applied to infection prevention, this perspective draws attention to what crosses an interface, who receives it, what context is lost, and how the next team knows that action has occurred. These are questions about the design of work, rather than assumptions about individual motivation or awareness (Carayon et al., 2020).

Implementation gaps and organizational responsibility

International implementation research shows why a journey perspective requires attention to

organizational conditions. Tomczyk et al. (2022) identified important gaps in facility infection prevention

programmes despite comparatively strong aggregate assessment scores. The implication for this review is not that a global score predicts an individual institution's performance. Rather, broad programme descriptions can conceal weaknesses in specific components that matter when a patient moves between services. Staffing, training, and operational readiness therefore need to be examined as conditions of coordination, not merely as background characteristics.

Hand hygiene illustrates the same distinction between a technical intervention and the environment supporting its use. De Kraker et al. (2022) found that the institutional safety climate lagged behind some other aspects of implementation. The availability of a product and the reliability of its use are consequently different questions. In a patient journey, the practical opportunity to clean hands depends on task sequencing, available time, accessible supplies, and the expectations of the surrounding team. This reasoning extends to specimen collection and the preparation of equipment without assuming that all practices share identical determinants.

National commitments also require translation into local capability. Tartari et al. (2024) documented substantial shortfalls in meeting national infection prevention minimum requirements. Such findings caution against equating a national strategy with complete implementation at every site. For institutions, a useful question is how national expectations become funded responsibilities at the interface between clinical and technical services. A governance framework should make this translation visible while allowing local arrangements to reflect the complexity and scope of care actually provided.

WHO's global strategy establishes infection prevention as a continuing health system priority, connecting everyday service delivery with preparedness for infectious threats. Its corresponding action plan provides an implementation and monitoring orientation through 2030. Together, these documents support examining leadership, coordination, and resource provision as integral to infection prevention, although neither document validates the particular framework developed in this manuscript (WHO, 2023, 2024a).

Patient safety policy supplies the ethical direction for this work. Avoidable harm should be approached through responsible system design and meaningful participation, including the perspectives of people receiving care. A journey-based approach should therefore improve continuity of protection without making patients responsible for correcting failures created by healthcare organizations. Patient participation is a contribution to governance, not a substitute for professional accountability (WHO, 2021).

Linking clinical information with technical safety

Infection prevention within imaging shows why technical and clinical responsibilities must be considered together. Jimenez and Lewis (2023) organized imaging-related infection prevention evidence through interacting work-system factors. Their review supports examining personnel, tasks, equipment, environment, and organizational arrangements together. An imaging department may depend on nursing handover, a functioning disinfection process, available protective materials, and a documented response to a damaged probe. Assigning the entire problem to the person operating the machine would overlook those dependencies.

Medical device decontamination similarly spans several locations and professional groups. WHO guidance describes a sequence that includes the receipt, processing, storage, and distribution of devices. The sequence should remain connected to the place where a device was used and the place where it will next be required. For governance, this means that a release decision must reflect a valid process and identifiable device status; it cannot be inferred solely from the appearance of packaging or the urgency of a clinical request (WHO, 2022).

The beginning of that sequence deserves particular attention. Eberhardt et al. (2024) examined point-of-use treatment and emphasized the difficulties created by complex devices, unclear policies, and gaps in staff competence. This review draws a boundary-spanning implication: sterile processing personnel cannot independently correct every upstream failure. Clinical users, transport staff, processing services, and technical personnel require an agreed description of what must accompany an item, what makes it unsuitable for routine handling, and who may authorize the next step.

Diagnostic information constitutes a parallel pathway. Bowler and Brown (2024) describe nursing contributions to recognizing infection, supporting diagnosis, and reviewing results, alongside barriers to participation. In the present framework, collection is connected to interpretation and action. A correctly labelled specimen is necessary, but the safety of the overall process also depends on whether the resulting

information reaches a responsible decision maker with sufficient clinical context.

Pharmacy provides an important connection between microbiological information and treatment

decisions. Nampoothiri et al. (2025) describe the development of pharmacist participation in antimicrobial stewardship across different settings. Their evidence supports a substantive pharmacy contribution rather than a purely dispensing role. Nevertheless, contributions from pharmacists, nursing personnel, and technicians must remain consistent with professional authorization, institutional policy, and access to the clinicians responsible for diagnosis and prescribing

Problem statement and purpose of the review

The organizational problem examined in this paper is the possibility that infection prevention responsibilities are locally specified but incompletely connected across the patient journey. Separate departments may each possess an appropriate procedure while no shared process establishes who acknowledges a concern, who decides what happens next, and how closure is communicated. A specimen concern may be documented in one system, a device fault in another, and a treatment decision in a third. The risk lies in the relationships between those actions. This formulation is an analytical problem statement rather than a report that such failures were observed at a named institution.

The purpose of the review is to develop an evidence-informed account of interprofessional governance linking clinical, diagnostic, sterile processing, biomedical equipment, and administrative responsibilities. Nursing, pharmacy, laboratory services, radiology, sterile processing, biomedical equipment services, and health administration constitute the central professional domains. Infection prevention specialists, physicians, environmental services, transport personnel, patients, and caregivers remain necessary participants where the activity requires them. The framework is intentionally inclusive rather than an assertion that seven professions alone constitute a complete care team.

The central review question asks how responsibilities and information can be organized across these services to address infection risks during patient movement, diagnostic testing, device use, treatment, and follow-up. Subsidiary questions concern the types of interface failures described in recent literature, the distinction between clinical outcomes and supporting process measures, and the conditions under which recommendations from one service might reasonably inform another. These questions guide interpretation without presupposing that all relevant relationships have been tested.

The intended contribution is a conceptual framework with explicit boundaries. It connects risk recognition to accountable action and learning while preserving differences between published findings, cross-study interpretation, and new proposals. No claim is made that a newly named framework is an established intervention, that interprofessional coordination always improves every outcome, or that professional integration can compensate for inadequate infrastructure. Those propositions would require evidence beyond a theoretical narrative review.

The following section examines twenty recent publications individually before drawing them together. The methodology then explains how sources were identified and interpreted, the results present the conceptual synthesis, and the discussion considers transferability, limitations, recommendations, and conclusions. This structure makes the origin of the framework assessable and keeps the interpretation of published literature distinct from the empirical work that future evaluation would require.

2 LITERATURE REVIEW

Programme implementation and the limits of aggregate readiness

Tomczyk et al. (2022) conducted the first WHO global facility survey using the Infection Prevention and Control Assessment Framework. Responses from 81 countries revealed important differences across income groups and facility characteristics, with staffing and training among the weaker components. The study matters because apparent programme maturity did not mean that every minimum requirement was met. Its cross-sectional, self-reported design limits causal interpretation and may favor facilities with sufficient capacity to participate. For the present review, its contribution is to identify organizational prerequisites that a cross-departmental model must acknowledge. It does not show that the proposed patient-journey framework reduces infection, nor does it provide a substitute for examining local capacity.

De Kraker et al. (2022) examined hand hygiene implementation through a global self-assessment survey involving facilities from 90 countries. The authors reported comparatively weak institutional safety

climate and an association between implementation and resource-related characteristics. Their work extends the discussion beyond the presence of alcohol-based hand rub to the organizational support required for sustained practice. Because self-assessment measures implementation rather than directly observing every clinical encounter, the results should not be treated as measured adherence during individual procedures. The conceptual lesson is that reliable prevention depends on supportive working conditions and shared expectations, not simply on issuing instructions or supplying a product.

Tartari et al. (2024) evaluated national infection prevention minimum requirements using global surveys from 2017–2022. Only a small minority of participating countries met every requirement, although some programme and budget indicators improved between surveys. This provides a policy-level counterpart to the facility evidence: formal progress can coexist with incomplete implementation. National reporting and the limitations of survey comparisons prevent straightforward conclusions about individual hospitals. Within the current synthesis, the study supports treating the connection between policy, financing, and operational responsibility as an explicit governance issue. It does not establish how a particular configuration of professional relationships performs at the bedside.

Together, these three studies establish an important boundary for interpretation. Readiness is multidimensional, and a favorable overall description can conceal a weak link. The proposed framework consequently treats the completion of each interface obligation as a separate organizational question instead of assuming that a facility-level label guarantees continuity of protection.

Leadership and contextual conditions for prevention

Hansen et al. (2023) investigated a multimodal educational intervention for hospital leadership in German acute care hospitals. The controlled cohort design included a workshop, online learning, and a final meeting. Respondents described changes in collaboration, while hand-rub use and *Clostridioides difficile* indicators changed in both intervention and comparison groups. Low participation and incomplete follow-up constrain attribution. The study therefore supports the feasibility and potential relevance of engaging leaders, but should not be presented as decisive proof of an intervention-specific infection reduction. Its contribution to this review is the recognition that managerial competence must connect with the work of relevant professional stakeholders.

Fabre et al. (2024) combined facility assessment with interviews in hospitals across four Latin American countries. Their mixed-methods evaluation identified staffing constraints, technical resource shortages, limited leadership support, and cultural influences as barriers to implementation. The qualitative component was particularly useful for explaining why formal programme scores might not capture practical difficulties. The participating hospitals do not represent every healthcare setting in the region, and the study cannot establish the effect of a newly proposed governance arrangement. It nevertheless illustrates why examining task ownership without examining resources would produce an incomplete model. A responsibility is meaningful only when the responsible person has a feasible route to action.

Sonpar et al. (2025) updated the evidence on multimodal infection prevention interventions at facility level. The review included controlled studies, interrupted time series, and before-and-after studies addressing several infection and hand hygiene outcomes. Many studies reported improvement, but evidence quality and the concentration of studies in higher-income settings limited confidence and transferability. Multimodal programmes contain interacting elements, making it difficult to isolate the effect of any single component. For this manuscript, the review supports linking education with changes in the work system, monitoring, feedback, and organizational support. It does not justify assigning a common numerical benefit to all programmes or every institution.

These publications shift leadership from a general endorsement of safety toward a responsibility for making work possible. The resulting conceptual emphasis is on authority, resources, and feedback at the point where professional tasks depend on one another. That emphasis is a synthesis across sources rather than an intervention directly evaluated by all three studies

Workforce behavior and diagnostic participation

Abalkhail and Elbehiry (2025) reviewed barriers and facilitators affecting healthcare workers' compliance with infection prevention practices. They identified knowledge and training, time pressure, workload, resource availability, and cultural or behavioral influences, alongside the facilitating roles of leadership and feedback. The breadth of settings strengthens the relevance of these categories but limits the

assumption that any one factor operates identically everywhere. The review supports a balanced explanation of compliance: individuals require capability, while organizations must provide realistic conditions for

performance. Within the proposed framework, a missed action is therefore examined both as a professional event and as a possible signal of an unresolved system constraint.

Mutsonziwa et al. (2024) synthesized research on healthcare workers' behavior in coronavirus-related clinical settings. Twenty studies informed knowledge-oriented, person-oriented, and environment-oriented explanations. Their findings are useful for distinguishing awareness from practical opportunity and perceived risk. However, pandemic conditions and the focus on coronavirus limit direct transfer to routine sterile processing, imaging, or long-term care. The present review uses these categories as sensitizing concepts rather than a universal behavioral model. Their relevance lies in prompting questions about the task environment, confidence, and available support when professionals are expected to recognize and communicate infection risks.

Bowler and Brown (2024) reviewed primary research concerning the diagnostic stewardship role of adult hospital nurses. Seven studies informed themes of recognizing infection, assisting diagnosis, reviewing results, and improving education and confidence. The synthesis describes an underused nursing contribution while acknowledging gaps in the evidence. Its scope does not authorize nurses or nursing technicians to independently assume responsibilities outside their competence or legal authority. Instead, it supports clarifying participation in collection quality, observation, result awareness, and escalation. For the current framework, this is the bridge between bedside information and the diagnostic decisions made elsewhere in the patient journey.

These studies collectively discourage an education-only explanation of safety failures. Training can improve understanding, but communication routes, permission to speak, accessible information, and time to complete a task also shape what occurs. The framework retains this distinction when linking competence to accountability.

Pharmacy participation and laboratory decision pathways

Nampoothiri et al. (2025) systematically reviewed pharmacist-led or pharmacist-driven antimicrobial stewardship over a twenty-year evidence period. The review included 111 papers and described audit and feedback as a frequent contribution, with improvements in antimicrobial appropriateness and use reported across studies. A predominance of high-income settings and a search period ending in 2020 limit conclusions about the most recent technologies or underrepresented contexts. Publication in 2025 should therefore not be confused with evidence collected entirely in 2025. The review supports the pharmacy role in coordinated stewardship while leaving open how that role should be adapted to local staffing, authority, and diagnostic access.

Peri et al. (2024) compared rapid diagnostic testing and antimicrobial stewardship arrangements for bloodstream infection through systematic review and network meta-analysis. The combination of rapid testing and stewardship was associated with better outcomes than some alternatives, whereas rapid testing alone did not show the same pattern of benefit. Heterogeneity and indirect comparisons require caution. The important conceptual contribution is that the technical production of information and the professional response to it are connected. The present paper does not reproduce the pooled estimates or claim equivalent benefits in a new setting; it uses the study to examine the organizational conditions between a result and a treatment decision.

Sautter et al. (2024) synthesized interventions for reducing blood culture contamination in evidence-based laboratory practice guidance. The review addressed collection practices, antisepsis, devices, dedicated teams, and education, emphasizing that implementation affects results. It demonstrates how specimen quality crosses nursing, laboratory, infection prevention, and managerial responsibilities. The range of interventions and study designs makes a single device-centered interpretation inappropriate. For the current framework, the study contributes the idea that preventing an avoidable diagnostic error requires coordination before analysis begins. It also supports separating contamination as a specimen-quality outcome from the later clinical consequences of treatment based on that specimen.

Across these three publications, diagnostic safety emerges as a sequence. A specimen must be appropriate, its analysis dependable, its result communicated, and the response clinically accountable. The

proposed framework uses that sequence to connect professional roles without collapsing diagnostic and prescribing authority into a single shared task

Rapid results and infection prevention in imaging

Wolk et al. (2025) developed evidence-based guidance on rapid testing for bloodstream infections through a systematic review and expert assessment. Their recommendations explicitly connect rapid diagnostic testing with active communication. They also distinguish evidence concerning targeted therapy,

length of stay, and mortality, noting limitations in certainty. This matters because a reduced laboratory processing interval is not the same outcome as a documented clinical response or improved survival. The current review draws on that distinction to propose acknowledged communication and explicit ownership of results. It does not claim that a communication platform or laboratory technology will independently produce the outcomes described in the source literature.

Jimenez and Lewis (2023) conducted a scoping review of infection prevention within medical imaging. Forty-six publications were considered through the SEIPS work-system domains, highlighting interactions between personnel, organizations, tools, tasks, and environments. Hand hygiene and contrast-related processes featured in the evidence. As a scoping review, the study maps a heterogeneous field rather than providing a pooled estimate of intervention effectiveness. Its direct contribution is to prevent radiology from being treated as an isolated equipment function. Imaging safety depends on clinical handover, device handling, materials, task design, and organizational arrangements, all of which connect to the broader patient journey.

Ferrara et al. (2024) examined ultrasound probe disinfection through a narrative review of sixteen studies. The review described differences in antimicrobial performance and compatibility concerns across methods, including automated approaches. Laboratory efficacy and changes in contamination do not establish that a method will reduce clinical infection in every context. Its conclusions therefore require interpretation alongside the type of probe, intended use, device instructions, occupational exposure, and local processing capacity. For the present synthesis, the central contribution is the need for joint decisions between imaging users, reprocessing personnel, infection prevention expertise, and biomedical equipment services rather than unrestricted selection of a disinfectant by one department.

The relationship between these studies is organizational rather than a claim that bloodstream testing and ultrasound disinfection involve identical risks. Both show why a technically valid output must be connected to an appropriate context of use, clear responsibility, and a record that the next necessary action occurred

Reprocessing boundaries and nursing leadership

Eberhardt et al. (2024) undertook an integrative review of point-of-use treatment for reusable instruments and endoscopes, including implications for military healthcare. Their analysis described practical barriers such as complicated instruments, ambiguous procedures, and insufficient competence. The source contributes a clear boundary-spanning insight: safe reprocessing begins before an item reaches the processing department. The military and austere-care orientation requires care when transferring recommendations to routine civilian services. This paper uses the review to examine upstream responsibilities, transport information, and escalation when preparation is inadequate; it does not treat the authors' stepwise guides as universally validated protocols for all devices.

McGrath et al. (2025) systematically reviewed reprocessing of high-risk single-use devices, with evidence concerning selected cardiac devices. Their certainty assessments were very low, and the review did not establish general cost-effectiveness or environmental benefits. A lack of clear evidence of additional harm must not be interpreted as proof that all reprocessing is safe or permissible. The study provides a necessary counterweight to proposals driven by procurement savings or sustainability alone. Within this review, it supports maintaining a distinction between reusable devices and devices labelled for single use, and requiring device-specific technical, clinical, and regulatory assessment before any institutional decision.

Cappelli et al. (2025) examined the relationship between nursing leadership and healthcare-associated infection in a systematic review of eight articles. The findings suggested potential benefits of supportive leadership, while the limited evidence base restricts causal confidence. Leadership style should not be treated as a substitute for adequate staffing, materials, or clear clinical processes. The review contributes to the current framework by locating nursing leadership between organizational support and the conditions of

everyday care. Its publication date also exceeds the search endpoint of its included evidence, illustrating why a recent review cannot automatically be assumed to summarize the newest primary studies.

These publications connect work before, during, and after device use. Their combined implication is that assigning tasks by departmental location alone can obscure the actual sequence of prevention. Governance needs to follow the activity while retaining professional boundaries and the authority to stop an unsafe process

Bundle adherence and the interpretation of contamination outcomes

Bou Hamdan et al. (2025) systematically reviewed strategies to improve nurses' adherence to central line infection prevention bundles in intensive care. Seven studies, including quality improvement and quasi-experimental designs, described education, leadership, auditing, and feedback. The review reported improvements in adherence, but the absence of randomized trials and uncertainty about long-term sustainability limit stronger conclusions. Bundle adherence is an important process measure rather than an automatic proxy for a particular reduction in infection. The present paper uses this distinction to emphasize that responsibility for implementation should be accompanied by realistic documentation, supportive supervision, and feedback that helps staff understand the clinical purpose of their work.

Chen et al. (2024) compared external-use ultrasound probe disinfection methods across ten hospitals. The study measured microbial contamination before and after processing and reported greater microbial reduction with the investigated ultraviolet device than with the comparison methods. Those findings concern the organisms recovered under the study conditions; they do not directly establish fewer patient infections, suitability for every probe, or equivalence to every recommended disinfection process. This distinction is important for biomedical equipment and radiology governance. A purchase or protocol decision must consider the intended use, technical compatibility, validated process, and relevant clinical requirements rather than a favorable laboratory endpoint alone.

Cross-study gap and direction of synthesis

The twenty publications offer substantial evidence about components of prevention but uneven evidence about their connection across an entire patient journey. Programme surveys describe implementation; behavioral studies explain constraints; stewardship reviews connect information with treatment; device studies examine processing and contamination; and leadership reviews address the conditions of practice. These bodies of work operate at different analytical levels. Their agreement on the importance of organization and communication does not make them interchangeable or independent replications of the same intervention.

The gap addressed here is therefore integrative and conceptual. A model is needed that makes the receiving professional, required information, action authority, and closure obligation explicit at each relevant boundary. This review proposes such a model while preserving uncertainty about effectiveness. Overlapping primary evidence within the included reviews is acknowledged; the number of publications is not used as a measure of the volume of independent clinical evidence. The methodology that follows specifies how this interpretive task was undertaken and how the limits of source access and study design were handled

3 METHODOLOGY

Review design and epistemic position

This study used a critical narrative review to examine relationships between professional responsibilities across infection prevention activities. The unit of analysis was the responsibility interface: an episode in which information, a patient, a specimen, a device, or decision authority moves between professional groups. The purpose was explanatory synthesis and framework development, rather than estimating intervention effectiveness. Narrative review quality principles informed the emphasis on a clear aim, transparent source identification, appropriate referencing, and reasoned interpretation (Baethge et al., 2019).

The design combined deductive and interpretive reasoning. WHO programme requirements and the SEIPS patient-journey perspective supplied initial concepts concerning resources, professional work, and coordination. The selected publications were then examined for mechanisms and limitations relevant to

those concepts. New relationships were proposed only as conceptual interpretations. The approach did not involve interviews, observations, surveys, patient records, expert panels, Delphi rounds, or statistical analysis. No empirical validation of the proposed framework took place.

Source identification and temporal scope

Targeted internet searches were conducted on 16 October 2026 using combinations of infection prevention, interprofessional governance, nursing, laboratory, pharmacy, radiology, sterile processing, medical device reprocessing, biomedical equipment, leadership, and diagnostic stewardship. Searches prioritized PubMed-indexed publications and official WHO material. Europe PMC record retrieval was used to verify publication titles, authors, publication years, journal details, identifiers, and abstracts. This was a

focused search of publicly retrievable records, not a documented exhaustive search of Scopus, Web of Science, CINAHL, or subscription databases.

For the central evidence set, publications from 2022–2025 were deliberately prioritized as a recent completed publication period. Older sources were retained only for methodological or policy foundations. Twenty relevant studies and evidence reviews were selected for detailed narrative examination across the required professional domains. This fixed selection served breadth and interpretive manageability; it was not the endpoint of a reproducible systematic screening process. Consequently, no PRISMA retrieval counts, duplicate-removal totals, or comprehensive coverage claim is reported. Table 1 specifies the operational scope and the boundaries used to prevent overstatement.

Eligibility and the boundaries of the evidence set

Table 1 distinguishes relevance to the conceptual question from eligibility to support an effectiveness claim. A review article was eligible to explain a mechanism, summarize a professional contribution, or identify an implementation gap. Its inclusion did not imply that the current review adopted every recommendation or independently reassessed all underlying studies. Likewise, a device experiment could inform a discussion of technical readiness without establishing a change in patient infection outcomes.

Table 1 Operational eligibility and interpretive boundaries

Dimension	Included material	Boundary
Publication period	Core evidence published in 2022–2025	Earlier sources limited to policy and methodological foundations
Professional relevance	Nursing, pharmacy, laboratory, radiology, sterile processing, biomedical equipment, administration	A source need not cover all seven domains
Design	Primary empirical studies and systematic, scoping, integrative, or narrative reviews	Designs retained as distinct forms of evidence
Setting	Healthcare delivery, programme implementation, diagnostic or device-related processes	No claim of national or institutional representativeness
Outcome relevance	Clinical infection, contamination, implementation, adherence, communication, stewardship	Process endpoints do not establish clinical effectiveness
Verification	Indexed bibliographic record and readable abstract; full text where available	Unverified titles and unsupported numerical claims excluded

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Dimension	Included material	Boundary
Exclude inference	No new patient or staff dataset and no pooled outcome estimation	No causal validation or predicted effect of the framework

The selection intentionally included primary empirical studies alongside systematic, scoping, integrative, and narrative reviews. This breadth was useful because the professional domains have different evidence traditions. It also prevents treating the source set as a homogeneous sample. Publication year, the search endpoint of a review, and the period in which primary data were collected were kept conceptually separate. A study published recently may still describe practice or evidence from several years earlier.

English-language indexed records were the main route to the research literature. This introduces a language limitation and may underrepresent locally published work. The framework is therefore offered as an internationally informed conceptual contribution rather than a complete account of any national healthcare system. It contains no claim that the selected institutions, professions, or settings are statistically representative of all healthcare organizations.

Record verification and structured interpretation

Each selected publication was identified by its PubMed record and DOI, with duplicate descriptions linked to the same underlying publication. Bibliographic verification was completed for all twenty publications. Available abstracts were read to establish the design, stated objective, reported findings, and principal cautions. Accessible full text was consulted where it could be retrieved. An abstract-supported source was not represented as a full-text appraisal. Table 2 describes the extraction fields and the interpretive questions used to organize the review.

Table 2 Structured source extraction and interpretation

Field	Information recorded	Purpose
Source identity	Authors, title, year, journal, DOI, PubMed identifier	Keep one record per publication
Evidence currency	Publication year and reported search or data period	Separate recent publication from recent underlying evidence
Design and setting	Review type or primary design; country or service context	Assess relevance and transferability
Professional interface	Sender, receiver, object transferred, decision boundary	Locate the coordination problem
Outcome	Infection, contamination, adherence, process, or organizational assessment	Avoid treating unlike endpoints as equivalent
Main finding	Source-supported conclusion and stated limitations	Keep attribution proportionate
Access status	13 accessible full texts and 7 abstract-supported publications	Do not imply full-text appraisal for abstract-only sources

Field	Information recorded	Purpose
Synthesis status	Direct finding or newly proposed conceptual relationship	Distinguish evidence from interpretation

This extraction structure was a practical reading framework rather than a measurement instrument. No numerical score was assigned to a profession, study, or proposed relationship. The process documented the distinction between what a publication investigated and what this manuscript infers from it. For example, an observed reduction in organisms recovered from a probe supported a statement about contamination; any implication for patient infection remained conditional unless measured in that study.

The present review did not use independent duplicate screening or independent double extraction. It therefore does not claim reviewer agreement, adjudication statistics, or a formally validated coding procedure. The consequence is an increased risk of selection and interpretive bias. To reduce avoidable overstatement, source-specific descriptions were kept close to verified records, limitations were retained in the narrative, and the proposed framework was explicitly separated from directly reported outcomes.

Critical synthesis and ethical considerations

The synthesis connected evidence through responsibility interfaces rather than pooling numerical results. Initial categories concerned the movement of patients, information, specimens, and devices. Reading then examined the required sender, receiver, authority, resource, action, and closure condition at each boundary. Table 3 shows how those questions translated into conceptual propositions and the checks used to keep inference proportionate.

Table 3 Synthesis questions and safeguards against overinterpretation

Analytical step	Question applied	Interpretive safeguard
Locate a boundary	What patient, information, specimen, or device crosses a service boundary?	Do not invent observed failures
Specify responsibility	Who receives the concern and has authority to respond?	Preserve professional scope
Examine conditions	What resources and technical readiness are required?	Do not attribute every gap to knowledge
Connect action	How are acknowledgment, action, and closure linked?	Label the full cycle as proposed
Compare evidence	Are endpoints, settings, and study designs comparable?	No numerical pooling or vote counting
Retain uncertainty	What bias, access, overlap, or currency limits interpretation?	No new certainty score or validation claim

Interpretation considered design, setting, endpoint, source access, and evidence currency. No formal risk-of-bias score or GRADE rating was generated by this review. When an included review reported a certainty assessment, that assessment was attributed to the source and not extended to unrelated domains. Conflicting or limited evidence was retained, particularly for single-use device reprocessing and the translation of contamination outcomes into clinical benefit. Multiple reviews were not counted as independent confirmations when overlap of their underlying evidence could not be excluded.

The study used publicly available literature and recruited no human participants. It involved no personal health data, identifiable institutional records, or contact with patients or staff. Accordingly, informed consent was not sought, and no claim of approval or exemption from a named ethics committee is made. Any submission-specific institutional determination remains the responsibility of the submitting authors. Ethical priorities in the proposed framework include patient dignity, proportionate information access, fair allocation of safety resources, and escalation that protects staff from inappropriate blame.

All figures and governance matrices are original conceptual syntheses rather than reproduced outcome data. References acknowledge intellectual sources, and no effectiveness results, participant totals, or statistical tests were generated for this paper. Responsible authorship requires substantive intellectual contributions, accountability for the accuracy of the work, and transparent disclosure of relevant interests and assistance. Professional inclusion in the framework does not, by itself, determine authorship eligibility.

4 RESULT

An interface model of infection risk governance

The principal result is a proposed model that organizes prevention around six linked responsibilities: recognizing a concern, assigning ownership, communicating with acknowledgment, taking an authorized action, recording closure, and learning from recurrence. These are analytical components, not measured stages observed in a new dataset. Their value is to make explicit what may otherwise remain implicit between services. Figure 1 presents their relationship to the professional domains and the patient journey.

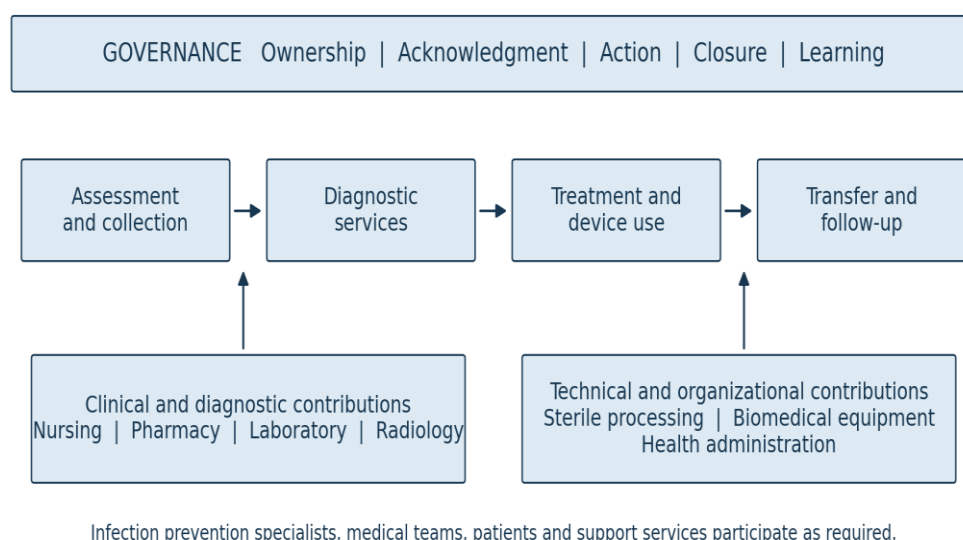


Figure 1 Proposed governance architecture across the patient journey. Original conceptual synthesis informed by Carayon et al. (2020), Bowler and Brown (2024), Eberhardt et al. (2024), and Wolk et al. (2025). Arrows indicate proposed relationships, not measured effects.

The horizontal patient journey represents changes in location and activity, while the professional domains provide capabilities that may be required at several stages. The surrounding governance functions connect those contributions. The diagram does not imply that patients follow one fixed sequence or that every encounter requires all professions. A short outpatient visit may involve only a few of the depicted relationships, whereas a hospital admission may repeatedly return to diagnostic testing and device-supported care.

The figure's central inference is that prevention can fail through an incomplete connection even when individual tasks are technically sound. A laboratory can release a valid result without knowing whether a treatment decision followed. A processing service can complete a cycle without receiving sufficient information about an upstream handling problem. The model therefore adds a closure obligation to the handover itself. This obligation is a conceptual proposal derived from the combined literature, not a

demonstrated intervention effect (Bowler & Brown, 2024; Eberhardt et al., 2024; Wolk et al., 2025).

Professional responsibilities and their necessary connections

The synthesis distinguishes task competence from governance responsibility. The professional completing a technical activity needs the competence and authorization appropriate to that activity. The organization must separately ensure that the result or concern enters a dependable decision process. Table 4 applies this distinction to the seven central domains while retaining the need for medical and infection prevention expertise.

Table 4 Proposed service responsibilities and interface obligations

Service	Principal contribution	Required connection
Nursing	Observation, authorized specimen collection, device care, and escalation	Clinical context and concerns passed to responsible diagnostic and medical staff
Pharmacy	Antimicrobial review and stewardship within authorized scope	Microbiology and clinical information linked to the prescribing team
Laboratory	Specimen acceptability, analysis, interpretation support, and result release	Collection guidance and important results communicated with context
Radiology	Safe examination preparation, equipment use, and procedure-related precautions	Patient status, probe processing, and technical concerns coordinated
Sterile processing	Validated handling, processing, traceability, and release procedures	Point-of-use preparation and device status linked to clinical users
Biomedical equipment	Compatibility, maintenance, fault assessment, and technical readiness	Device problems coordinated with users, processing staff, and procurement
Health administration	Resources, policy ownership, escalation routes, and organizational follow-through	Professional safety requirements linked to decisions and feasible action

These relationships do not create new prescribing, diagnostic, engineering, or release authority. In particular, a pharmacy technician's contribution differs from a pharmacist's, and a nursing technician's scope may differ from that of a registered nurse or nursing specialist. The framework assigns responsibilities to services at a conceptual level; implementation would require mapping them to locally authorized personnel. A role title alone is not evidence that a person can undertake every activity associated with the broader profession.

The administrative contribution is also substantive. Management controls staffing arrangements, procurement processes, escalation routes, and the resolution of resource constraints that can prevent clinical and technical teams from completing their duties. Yet administrative oversight should not replace specialist judgment about device safety, microbiological interpretation, or patient treatment. The proposed arrangement is reciprocal: specialists provide the basis for decisions, while management ensures that identified requirements can receive an accountable organizational response (Fabre et al., 2024; Hansen et al.,

2023).

Journey stages and the distribution of coordination needs

Figure 2 presents an illustrative matrix of professional participation across five journey stages. The shading identifies proposed routine involvement, context-dependent consultation, or enabling support. It does not measure frequency, importance, competence, workload, or performance. Its purpose is to make the distribution of responsibilities visible and to prevent an interpretation in which each profession owns only one isolated stage.

Nursing	Direct	Direct	Direct	Support	Direct
Pharmacy	Support	Direct	Direct	—	Support
Laboratory	Support	Direct	Support	—	Support
Radiology	Support	Direct	Direct	Support	Support
Sterile processing	—	Support	Support	Direct	—
Biomedical equipment	Support	Support	Support	Direct	Support
Health administration	Support	Support	Support	Support	Support
	Assessment and collection	Diagnostics and results	Treatment and procedures	Device return and readiness	Transfer and follow-up

Figure 2 Illustrative participation matrix. Direct denotes a proposed routine contribution, Support denotes consultation or enabling work, and a dash denotes no routine assignment in this illustration. The matrix is author-developed and is not an empirical score or staffing standard.

For example, laboratory involvement is most direct during specimen testing and result interpretation, but its contribution also shapes collection instructions and the response to possible contamination. Sterile

processing contributes most directly to device preparation and reuse, although device choice and point-of-use handling occur outside the processing department. Biomedical equipment personnel provide technical support across selection, use, maintenance, and safe return to service. These allocations are proposed for discussion and must be adapted to the service configuration.

The matrix highlights an important result of the conceptual analysis: supporting roles can remain necessary even when they are not continuously patient-facing. Procurement, maintenance, and processing capacity may determine what a clinical team can safely do. Conversely, a technically ready device cannot produce safe care without appropriate use and timely communication. The figure therefore organizes dependencies rather than ranking professions. It draws on the interacting work-system perspective without converting that perspective into a validated staffing model (Carayon et al., 2020; Jimenez & Lewis, 2023).

Communication closure and proportionate escalation

A second result concerns the distinction between sending information and completing a safety-relevant exchange. Figure 3 describes a proposed communication cycle that begins with a trigger and ends with documented closure and learning. Its branching structure allows the receiver either to act within authority or to escalate a concern that exceeds that authority or available capacity. The cycle is intended to expose missing responsibility rather than prescribe a universal response time.

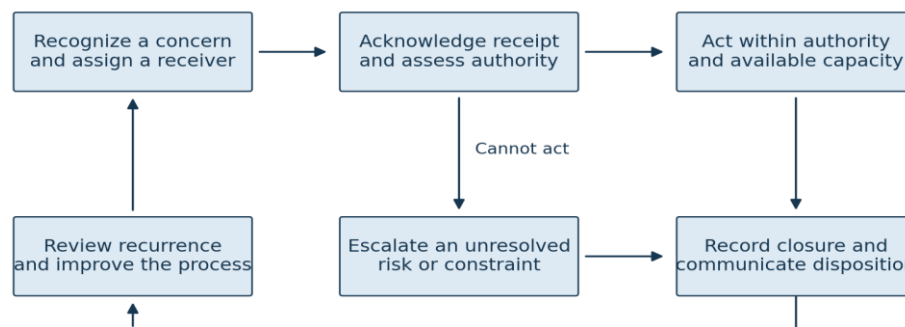


Figure 3 Proposed communication and escalation cycle. The branch distinguishes authorized action from escalation of unresolved constraints. Original conceptual synthesis; no response times, outcome rates, or intervention effects are represented.

Acknowledgment confirms that a concern reached an identified receiver; it does not establish that an appropriate clinical decision has occurred. Action then requires professional judgment, relevant context, and access to necessary resources. Closure records the disposition and returns information to those who need it. If action is not feasible, escalation should identify both the unresolved risk and the authority needed to address it. The conceptual model is therefore different from a system that counts electronic messages as completed care.

Different triggers require different pathways. A possible contaminated specimen, a failed processing indicator, a damaged probe, and an antimicrobial review concern cannot share one automatic decision rule. A governance policy should specify the correct professional destination and protect the ability to stop or defer an unsafe activity. Evidence concerning active communication in rapid diagnostics supports attention to the connection between information and response, while the extension to the whole cycle remains an untested proposal (Sautter et al., 2024; Wolk et al., 2025).

Interpreting the framework without overstating its evidence

The framework integrates relationships that are dispersed across the literature rather than introducing a newly proven infection prevention intervention. It is consistent with the broad importance of work-system conditions, professional participation, and organizational support. However, consistency with several research traditions is not equivalent to empirical validation. The present contribution is an organized explanation of where responsibility should be specified and how evidence from different services can be connected.

A useful distinction is between the strength of a local component and the strength of the complete pathway. A technically effective disinfectant may address one hazard while leaving uncertainties about cleaning, compatibility, contact time, storage, and subsequent use. Likewise, rapid organism identification may improve information availability while leaving unresolved who reviews the result or changes treatment. The proposed model makes those remaining questions explicit. It does not assume that adding every component together produces the sum of benefits reported in separate studies.

Outcome interpretation is particularly important. Microbial reduction concerns the organisms measured under specified conditions; clinical infection concerns a patient event requiring an appropriate case definition. Adherence concerns whether an action was completed; readiness concerns whether conditions for that action existed. Organizational maturity scores describe another level of analysis. Combining these into a single success label would obscure their differences and could encourage claims unsupported by the underlying evidence. The framework therefore retains a pathway from conditions to actions to potential outcomes without quantifying the links (Chen et al., 2024; Sonpar et al., 2025).

The model also helps interpret the limits of education. A training course can explain the importance of a procedure, but a worker cannot complete that procedure reliably if the correct supplies, processing capacity, or authorized support are unavailable. Conversely, additional resources may have limited value if their use is unclear or staff cannot raise concerns. These propositions arise from the relationship between evidence on behavior, leadership, and implementation; they should be evaluated in future research rather

than treated as causal findings of this review (Abalkhail & Elbehiry, 2025; Mutsonziwa et al., 2024).

The practical implication is to assess an interface through a specific question: when a concern leaves one service, is there an identifiable and feasible route to a completed response? This keeps organizational accountability close to the work rather than reducing collaboration to an abstract statement of shared values.

Transferability and limitations

Application should reflect the type of care, available expertise, infrastructure, and regulatory setting. A primary care center, a hospital imaging unit, and a complex sterile processing department have different activities and resource requirements. Services that refer patients or send specimens externally need particular clarity about what accompanies the transfer, who receives the information, and how a response returns. These are conceptual applications of the framework; no participating institution or healthcare center was evaluated in this review.

The framework should also be used cautiously where information systems are fragmented. A digital platform may support traceability and acknowledgment, but the underlying governance still requires agreed authority, responsibility, and workable escalation. Paper-based arrangements can implement the same conceptual requirements if they are reliable and accessible. Technology should be assessed for its contribution to continuity, usability, privacy, and technical support rather than presumed to solve coordination merely because it integrates records.

Several review limitations affect confidence. Source selection was targeted rather than systematic and was shaped by the objective of representing seven professional domains. Relevant studies may have been missed. Reliance on English-language records and variable full-text availability may have narrowed interpretation. Some included reviews covered older primary research despite recent publication dates. The evidence also spans countries and levels of care that differ from the settings in which the framework might eventually be applied.

No independent duplicate selection, formal risk-of-bias assessment, overlap matrix, or stakeholder validation was conducted. The review therefore cannot establish the independence of all underlying observations or provide a graded estimate of certainty for the complete framework. Review articles are not treated as twenty separate primary clinical experiments. The inclusion of both empirical studies and evidence syntheses improves conceptual breadth while increasing the need to avoid double counting and inappropriate comparisons.

The treatment of single-use devices illustrates the necessity of those boundaries. Evidence with very low certainty cannot justify a general institutional policy of reuse. Device-specific instructions, authorization, clinical requirements, and technical validation remain essential considerations. The framework supports making that decision process explicit; it does not authorize reprocessing practices or override specialist and regulatory requirements (McGrath et al., 2025).

Finally, the synthesis addresses governance and does not provide device-processing protocols, antimicrobial prescribing algorithms, or patient-specific advice. Its next step would be contextual assessment and stakeholder review before any empirical evaluation. Those activities are future work and have not been represented as completed in the present study.

5 RECOMMENDATIONS AND CONCLUSIONS

Recommendations for policy and professional practice

Healthcare organizations should specify responsibility interfaces in the same detail that they specify departmental procedures. A handover policy should identify the information required, the receiving role, the limits of that role's authority, and how completion or inability to act is communicated. The policy should cover relevant movements of patients, specimens, results, reusable devices, and unresolved concerns. Its purpose is continuity of accountability rather than additional documentation for its own sake.

Education should connect adjacent professional tasks. Specimen collection teaching should explain how contamination affects interpretation and treatment; device-use training should explain the implications of point-of-use preparation for downstream processing. Imaging, sterile processing, infection prevention, and equipment personnel should contribute to decisions about compatible processes and safe equipment readiness. Training should remain specific to the professional scope of the participant while making the

wider consequences of each task understandable.

Leadership should provide a workable response to constraints that individual staff cannot resolve. This includes staffing and material shortages, maintenance needs, processing capacity, and uncertainty about authority. Escalation should identify an accountable destination and support proportionate action without discouraging reporting. Information access should be limited to what the receiving role needs, and patients should be offered understandable explanations of infection prevention arrangements without being made responsible for supervising professional practice.

Future evaluation should first examine whether the framework accurately represents local work and whether relevant professionals and patients find its responsibilities clear. Any subsequent observational or intervention study would need a separate protocol, appropriate ethical review, defined outcomes, and attention to unintended consequences. Clinical infection, contamination, adherence, communication completion, and resource adequacy should remain distinct measures. This review supplies no predicted effect size or numerical performance target.

CONCLUSIONS

Interprofessional governance of infection risk is best understood as a continuous relationship between clinical actions, diagnostic information, device processes, technical readiness, and organizational authority. The reviewed literature supports attention to these components but does not establish the effectiveness of the complete proposed model. The central contribution is a framework that makes recognition, ownership, acknowledgment, authorized action, closure, and learning visible across the patient journey. Its professional relevance depends on preserving specialist competence, providing feasible conditions for action, and interpreting evidence proportionately. Further contextual and empirical work is required before claims can be made about measurable reductions in infection or improvements in institutional performance

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