



Training in nursing best practices and prevention of healthcare-associated infections: documentary analysis

Formación en buenas prácticas de enfermería y prevención de infecciones asociadas a la atención en salud: análisis documental

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Abstract

Introduction: Healthcare-associated infections constitute a persistent yet preventable problem that prolongs hospital stays and increases costs, thereby requiring the implementation of nursing best practices. **Objective:** To analyze nursing best practices aimed at preventing healthcare-associated infections from an educational-documentary perspective, in order to understand the transfer of theoretical knowledge into clinical praxis. **Methodology:** A qualitative, descriptive-analytical documentary study was conducted using N=28 sources published between 2020 and April 2026, retrieved from PubMed, Scopus, SciELO, and LILACS, supplemented by regulations from the WHO, PAHO, CDC, and Ecuador's MSP; axial coding was applied using a four-axis matrix. **Results:** Effectiveness depends on the integration of education, experiential training, and organizational conditions; standardized interventions reduce infections; gaps associated with traditional models persist; multimodal approaches incorporating simulation improve adherence; and the institution functions as a learning ecosystem. **Conclusion:** Continuous education integrated into practice and supported at the organizational level strengthens the culture of safety.

Resumen

Introducción: Las infecciones asociadas a la atención en salud constituyen un problema persistente y prevenible que prolonga estancias y eleva costos, por lo que exigen buenas prácticas de enfermería. **Objetivo:** Analizar las buenas prácticas de enfermería orientadas a la prevención de infecciones asociadas a la atención en salud desde una perspectiva educativo-documental, para comprender la transferencia del conocimiento teórico hacia la praxis clínica. **Metodología:** Estudio cualitativo descriptivo-

analítico documental con N=28 fuentes publicadas entre 2020 y abril de 2026, recuperadas en PubMed, Scopus, SciELO y LILACS, además de normativa de OMS, OPS, CDC y MSP del Ecuador; se aplicó codificación axial en matriz de cuatro ejes. **Resultados:** La efectividad depende de la articulación entre formación, entrenamiento experiencial y condiciones organizacionales; las intervenciones estandarizadas reducen infecciones; persisten brechas por modelos tradicionales; lo multimodal con simulación mejora adherencia; la institución opera como ecosistema de aprendizaje. **Conclusión:** La formación continua integrada a la práctica y sostenida organizacionalmente consolida la cultura de seguridad.

Introduction

Healthcare-associated infections (HAIs) constitute one of the most frequent and preventable adverse events in contemporary health systems (Alleganzi et al., 2011; World Health Organization [WHO], 2022). It is estimated that between 5% and 10% of hospitalized patients in high-income countries develop at least one HAI during the episode of care, whereas in middle- and low-income settings this figure exceeds 25%, and in some hospital reports from Latin America it reaches up to 40% in critical care services (Alleganzi et al., 2011; Haque et al., 2018; Rosenthal et al., 2014).

The economic burden further exacerbates the situation. In this regard, in a meta-analysis, Zimlichman et al. (2013) estimated that surgical site infections and central line-associated bloodstream infections are among the most costly events, as they prolong hospital stays, require reinterventions, and necessitate extended antibiotic therapy and intensive care; Haque et al. (2018) added indirect costs related to disability, productivity losses, and litigation.

Simultaneously, prolonged hospital stays and repeated treatments intensify the selective pressure that promotes antimicrobial resistance: Cassini et al. (2019) attributed a substantial burden of deaths and disability-adjusted life years in Europe to resistant bacteria, and the priority pathogen list identified the development of new antibiotics as a global urgency (Tacconelli et al., 2018). The INICC consortium documented device-associated infection rates that were higher in hospitals in low- and middle-income countries than those reported in U.S. surveillance systems (Rosenthal et al., 2014). Consequently, nursing-led prevention protects lives, contains costs, and preserves antimicrobial effectiveness.

From a surveillance perspective, point-prevalence surveys in the United States documented that, in 2011, approximately 4% of hospitalized patients had HAIs and that, despite subsequent reductions, ventilator-associated pneumonia, surgical site infection, catheter-associated urinary tract infection, and central line-associated bloodstream

infection continued to account for the greatest burden (Magill et al., 2014; Magill et al., 2018). In Europe, the survey coordinated by the European Centre for Disease Prevention and Control confirmed a sustained prevalence, with an uneven distribution according to hospital type and length of stay (Suetens et al., 2018).

From a comprehensive perspective, the burden of HAIs extends beyond epidemiological considerations, as it compromises clinical outcomes, prolongs hospitalizations, and places pressure on organizational management (Haque et al., 2018). Within this framework, the World Health Organization warned that a substantial proportion is preventable through infection prevention and control (IPC) programs with defined core components, hand hygiene, standard precautions, and prudent antimicrobial use (WHO, 2016; WHO, 2022).

The global report on infection prevention and control confirmed that few systems fully meet the core components and that staff training constitutes one of the weakest links, with gaps in staffing, infrastructure, and surveillance (WHO, 2022; Storr et al., 2017). The COVID-19 pandemic exposed these vulnerabilities: the synthesis by Houghton et al. (2020) identified fatigue, overcrowding, shortages of protective equipment, and changing messages as barriers to adherence, whereas the review of physical interventions emphasized that effectiveness depends on correct and sustained use rather than mere availability (Jefferson et al., 2023). In Latin America, the Pan American Health Organization [PAHO] promoted surveillance modules using device-day denominators to enable comparison and feedback (PAHO, 2012; PAHO, 2023). This scenario justifies an educational-documentary lens: if technical standards are available but practice varies, the decisive question is educational—namely, how prevention is taught, learned, and sustained in healthcare settings (Michie et al., 2011; Storr et al., 2017).

The Centers for Disease Control and Prevention maintain that surveillance, data feedback, and the implementation of evidence-based recommendations constitute indispensable pillars (Centers for Disease Control and Prevention [CDC], 2024; Berríos-Torres et al., 2017). The educational-documentary perspective of this article recognizes that technical evidence exists and is accessible; however, its translation into everyday practice remains heterogeneous (Houghton et al., 2020; Storr et al., 2017). Therefore, understanding the transfer of theoretical knowledge into clinical praxis requires examining not only what should be done, but also how it is learned, who teaches it, under what conditions it is performed, and through which mechanisms it is sustained (Atkins et al., 2017; Michie et al., 2011). The objective guiding this study, which is revisited in the conclusions to assess its fulfillment, is as follows: To analyze nursing best practices aimed at preventing HAIs from an educational-documentary perspective in order to understand the transfer of theoretical knowledge into clinical praxis.

Within this framework, nursing occupies a strategic position in prevention because it involves the greatest density of care contacts, performs invasive and non-invasive procedures, manages devices, administers medication, educates patients and families, and oversees continuity of care (Alleganzi y Pittet, 2009; WHO, 2009). Hand hygiene, standard precautions, the appropriate use of personal protective equipment (PPE), and the implementation of device-related bundles constitute nursing interventions with a documented effect on incidence rates (Berríos-Torres et al., 2017; Klompas et al., 2022; Lo et al., 2014; O'Grady et al., 2011).

Along these lines, foundational evidence showed that a hospital-based hand hygiene promotion program increased adherence and reduced infection rates (Pittet et al., 2000), a finding reinforced by reviews identifying workload, availability of supplies, and role modeling by peers and superiors as determinants of adherence (Erasmus et al., 2010). Nevertheless, the Cochrane review by Gould et al. (2017) and the comparison by Luangasanatip et al. (2015) concluded that multimodal strategies combining education, reminders, feedback, access to alcohol-based products, and leadership commitment outperform isolated interventions.

Regarding devices, the guideline for the prevention of catheter-related infections established aseptic insertion, maintenance, daily review, and timely removal (O'Grady et al., 2011), subsequently updated in the compendium for acute-care hospitals (Buetti et al., 2022; Yokoe et al., 2014). The CDC surgical-site guideline incorporates timely prophylaxis, normothermia, glycemic control, and aseptic technique, with direct or indirect participation by perioperative nursing staff (Berríos-Torres et al., 2017).

The study by Pronovost et al. (2006) demonstrated that integrating a checklist, cultural change, and measurement dramatically reduced central line-associated bloodstream infections, anticipating the sociotechnical bundle developed by the Institute for Healthcare Improvement (Resar et al., 2012). Collectively, hand hygiene, bundles, and the correct use of PPE reduce HAIs, particularly in critical care settings, although variations persist according to staffing levels, supervision, and organizational culture (Houghton et al., 2020; Ivers et al., 2012; Jefferson et al., 2023); this variability necessitates shifting the focus from the prescriptive standard to the educational process that makes its implementation possible.

Nevertheless, the literature documents a persistent gap between knowledge and implementation: in diverse settings, more than 58 % of personnel are familiar with the recommendations, yet fewer than 29 % apply them consistently under direct observation, a pattern consistent with Erasmus et al. (2010) and the barriers synthesized by Houghton et al. (2020). Andragogy, centered on adults who learn through experience and problem-solving, provides a framework for interpreting this gap (Knowles, 1984; Kolb, 1984). The progression from novice to expert requires supervised exposure, reflection, and progressive autonomy (Benner, 1984), whereas situated learning

maintains that knowledge is constructed within authentic communities of practice (Lave & Wenger, 1991).

In this regard, evaluation frameworks emphasize that reaction, learning, behavior, and results are distinct levels: satisfaction with a course does not equate to behavioral change or a reduction in HAIs (Kirkpatrick & Kirkpatrick, 2006). Self-efficacy influences the initiation and persistence of preventive behaviors (Bandura, 1977), while audit and feedback, reminders, and environmental design are more effective than the mere dissemination of documents (Flodgren et al., 2013; Ivers et al., 2012; Michie et al., 2011). Therefore, predominantly transmission-based models are ineffective in modifying entrenched practices when implemented in isolation from experiential training and organizational support (Cook et al., 2011; Gould et al., 2017).

This analysis assumes that HAI prevention constitutes an educational, rather than merely regulatory, object of inquiry and examines how texts describe teaching, learning, and the institutionalization of best practices. Accordingly, the stated purpose guides the review of the corpus and the construction of the interpretive axes that follow.

Methodology

A qualitative study with a descriptive-analytical scope and a documentary strategy was conducted (Braun & Clarke, 2006). The design did not seek to estimate effects or prevalence; rather, it aimed to interpret the meanings, relationships, and conditions described in the literature. The perspective was hermeneutic: documents were treated as discursive practices that prescribe, describe, and evaluate education and prevention (Braun & Clarke, 2006; Knowles, 1984).

The period analyzed spanned from 2020 to April 2026, with the deliberate inclusion of foundational classics and current regulations to provide conceptual scaffolding (Allegranzi et al., 2011; O'Grady et al., 2011; Pittet et al., 2000; Pronovost et al., 2006; WHO, 2009). The core interpretive corpus comprised N=28 sources, a number that enabled analytical depth without generating unmanageable saturation, as detailed in the following section.

The search was conducted in PubMed, Scopus, SciELO, and LILACS, supplemented by institutional repositories and official websites of WHO, PAHO, CDC, and the Ministerio de Salud Pública del Ecuador (PAHO, 2012; CDC, 2024; PAHO, 2023; WHO, 2022). Spanish, English, and Portuguese descriptors combined infection control AND nursing education, hand hygiene AND adherence, catheter-related infections AND bundles, simulation AND nursing competence, and patient safety culture AND organizational learning, together with equivalent MeSH/DeCS terms and Boolean operators adapted to each database.

Filters for 2020–2026 were applied to primary literature, while guidelines and classical works were retrieved without restriction (Berríos-Torres et al., 2017; Klompas et al., 2022; Lo et al., 2014; WHO, 2016). The strategy included manual searches based on Cochrane reviews and compendia (Gould et al., 2017; Houghton et al., 2020; Ivers et al., 2012; Jefferson et al., 2023; Yokoe et al., 2014), simulation and evaluation standards (INACSL Standards Committee [INACSL], 2021; Jeffries, 2012; Kirkpatrick & Kirkpatrick, 2006), and Ecuadorian regulations available through the Ministerio de Salud Pública [MSP] portal and the SIVE-Hospital subsystem, recording the access date and current version (MSP, 2024).

Search strings were adapted to the syntax of each database, using controlled MeSH and DeCS vocabulary and free-text terms in all three languages. The regulatory search was conducted between January and April 2026 using the current versions available on official portals, with the access date and consulted edition recorded for each document (CDC, 2024; MSP, 2024; PAHO, 2012; WHO, 2022).

The inclusion criteria were: (a) original articles and reviews with full text available; (b) clinical practice guidelines, WHO/PAHO/CDC reports, and national regulations; (c) studies on education, competence, simulation, adherence, and safety culture in nursing; and (d) publications in Spanish, English, or Portuguese. Letters to the editor, conference abstracts without full text, documents not peer-reviewed, and texts without an explicit link to prevention or education were excluded.

Screening was conducted in two phases—title/abstract screening and full-text review—with rereading in the event of discrepancies and a decision log. The process followed this sequence: approximate identification of N=312 records, removal of duplicates, title and abstract screening, full-text eligibility assessment, and final selection of N=28 sources for intensive coding. The additional seminal works and standards cited for contextualization were not included in N=28 (Allegranzi y Pittet, 2009; Benner, 1984; Kolb, 1984; Lave & Wenger, 1991; Pittet et al., 2000).

The final corpus of N=28 combined clinical guidelines and compendia, systematic reviews and meta-analyses, primary studies on adherence and training, and theoretical and evaluative frameworks; foundational seminal works and standards were treated as contextual scaffolding and were not included in N=28. Each exclusion during full-text review was justified in the log, and doubtful cases were resolved through temporally separated rereading using a conservative criterion for thematic inclusion.

Analytical matrix and coding across four axes

A source/fragment/unit/code/category/axis matrix was developed. Open line-by-line coding and axial coding were applied to group relationships (Braun & Clarke, 2006). The analysis began with a priori categories and allowed organizational conditions and safety culture to emerge until four axes were consolidated: (1) normative foundations as a

formal curriculum; (2) applied best practices; (3) traditional professional education versus multimodal/simulation-based education; and (4) safety culture and the institution as an ecosystem (Atkins et al., 2017; Michie et al., 2011; Storr et al., 2017). Each fragment was coded through two temporally separated readings, and saturation was assessed based on interpretive redundancy.

The codebook defined each category through an operational description, inclusion and exclusion criteria, and positive and negative examples from the corpus; for example, a declarative mention of the standard was distinguished from a description of its supervised teaching. Open coding generated meaning units that axial coding regrouped according to conditions, actions and interactions, and consequences, until the four axes were stabilized.

Rigor, reflexivity, and ethical considerations

Rigor was supported by credibility through triangulation among guidelines, primary studies, reviews, and standards; transferability through thick description of contexts and criteria; dependability through an auditable log with dated decisions; and confirmability through coded citations and the retained matrix (Braun & Clarke, 2006). It is acknowledged that coding by a single researcher limited interpretive triangulation. This bias was mitigated through complete traceability, operational definitions of codes, positive and negative examples for each category, and temporally separated rereading at two points. As this was a documentary analysis involving no participants or identifiable data, ethics committee approval was not required; authorship was respected through exhaustive citation and faithful paraphrasing without extensive verbatim copying.

Results

Normative foundations: from technical precept to formal curriculum

International regulations establish a formal curriculum that defines what should be taught and assessed (WHO, 2016; WHO, 2022). IPC guidelines establish eight core components: a dedicated programme, evidence-based guidelines, education, surveillance, multimodal strategies, monitoring with feedback, staffing, and an environment with adequate supplies (Storr et al., 2017; WHO, 2016). The 2022 global report warned that few countries fully comply with these components and that training is often the weakest link (WHO, 2022). Standard precautions constitute the cross-cutting content (WHO, 2009; CDC, 2024), operationalized through verifiable sequences for catheters, urinary catheters, ventilation, and surgical sites (Berríos-Torres et al., 2017; Buetti et al., 2022; Klompas et al., 2022; Lo et al., 2014; O'Grady et al., 2011).

During the period reviewed, PAHO provided operational definitions, device-day denominators, and reporting through regional surveillance modules (PAHO, 2012;

PAHO, 2023), while Ecuadorian regulations established notification, analysis, and feedback within the National Health System through PCIAAS programs and the SIVE-Hospital subsystem, with defined responsibilities across levels and reporting flows (MSP, 2024). From a pedagogical perspective, these instruments constitute a prescribed curriculum: they select legitimate content and legitimize performance assessments (Benner, 1984; Knowles, 1984). When regulations are translated into point-of-care verification, visible reminders, and timely feedback, adherence improves (Ivers et al., 2012; Pronovost et al., 2006; Resar et al., 2012); when they remain as documents in a repository, their effect is marginal (Flodgren et al., 2013; Gould et al., 2017).

Each component functions as teachable content: the dedicated program defines responsibilities and protected time; guidelines select legitimate knowledge; education translates standards into observable performances; surveillance using device-day denominators generates comparable data; multimodal strategies combine education, reminders, and feedback; monitoring provides useful information; and the provision of supplies at the point of use enables implementation (Storr et al., 2017; WHO, 2016). Viewed in this way, the components cease to be administrative requirements and become assessable learning outcomes: the competent professional not only understands the component but also implements it during their shift (Ivers et al., 2012; Pronovost et al., 2006).

Applied best practices: hand hygiene, PPE, and device bundles

Hand hygiene using alcohol-based hand rub or handwashing according to the five moments remains the most cost-effective measure (Allegranzi y Pittet, 2009; Pittet et al., 2000; WHO, 2009). Observed adherence varies and is generally lower before patient contact and after contact with the patient environment, owing to risk perception, urgency, accessibility, and social modelling (Erasmus et al., 2010; Houghton et al., 2020). The WHO multimodal strategy sustains adherence more effectively than education alone (Gould et al., 2017; Luangasanatip et al., 2015; WHO, 2009). The use of PPE was critical and problematic during the pandemic, with evidence regarding behavioural barriers (Houghton et al., 2020; Jefferson et al., 2023); donning and doffing technique and availability at the point of use condition effectiveness more strongly than centralized supply provision (CDC, 2024; WHO, 2022).

The WHO guideline details the five moments and the technique for alcohol-based hand rubbing or handwashing according to visible soiling (WHO, 2009). This pattern is shaped by risk perception and dispenser accessibility (Erasmus et al., 2010; Houghton et al., 2020). The comparison by Luangasanatip et al. (2015) showed that ensuring product availability at the point of care, adding reminders, and providing compliance data feedback increases adherence more than repeating didactic sessions, and the Cochrane review confirmed the superiority of multimodal approaches (Gould et al., 2017).

For invasive devices, adherence to bundles reduces HAIs in critical care settings: central lines with maximal barrier precautions, chlorhexidine, and early removal; urinary catheters with documented indication, a closed system, and removal reminders; mechanical ventilation with head-of-bed elevation, minimal sedation, and mobilization; and surgical sites with prophylaxis within the appropriate time window, normothermia, and glycaemic control (Berríos-Torres et al., 2017; Buetti et al., 2022; Klompas et al., 2022; Lo et al., 2014; O'Grady et al., 2011). The IHI requires implementation of all measures, all-or-none measurement, and feedback (Resar et al., 2012; Yokoe et al., 2014). Competence, therefore, entails performing under pressure, prioritizing, communicating, and documenting (Benner, 1984; Lave & Wenger, 1991), with supportive rather than punitive monitoring (Ivers et al., 2012; Sexton et al., 2006); workload overload and staff turnover undermine sustainability even when initial knowledge is strong (Erasmus et al., 2010; Houghton et al., 2020; Storr et al., 2017).

Each bundle specifies its components: for central venous access, hand hygiene, maximal barrier precautions, skin antisepsis, optimal site selection, and daily review with early removal (O'Grady et al., 2011; Buetti et al., 2022); for urinary catheters, documented indication, aseptic technique, a closed drainage system, and removal reminders (Lo et al., 2014); for mechanical ventilation, head-of-bed elevation, daily sedation interruption, and early mobilization (Klompas et al., 2022); and for surgical sites, timely prophylaxis, normothermia, and glycemic control (Berríos-Torres et al., 2017). The all-or-none approach requires compliance with the entire set and its measurement as such, with unit-level feedback (Resar et al., 2012); nurse-led removal protocols sustain this comprehensiveness against the inertia of retaining unnecessary devices (Flodgren et al., 2013; Yokoe et al., 2014).

Professional education: limitations of the traditional model and the potential of multimodal approaches with simulation

The traditional model provides information but produces little behavioral change without deliberate practice and feedback (Cook et al., 2011; Flodgren et al., 2013; Gould et al., 2017). Adults learn when they perceive a need and apply what they have learned to real problems (Knowles, 1984; Kolb, 1984), a cycle that underpins training in real and simulated scenarios (Kolb, 1984; Lave & Wenger, 1991).

In contrast, simulation with deliberate practice outperforms traditional teaching in knowledge and skills and, to a lesser extent, in transferred behavior (Cook et al., 2011; McGaghie et al., 2011). The NCSBN study showed that high-quality simulation can replace up to half of clinical hours without deterioration when it is well designed (Hayden et al., 2014), and nursing reviews confirm improvements in self-confidence and technical and non-technical skills (Cant & Cooper, 2017; Kim et al., 2016; Shin et al., 2015). INACSL standards distinguish structured simulation from improvised role-playing (INACSL, 2021; Jeffries, 2012).

Applied to IPC, multimodal approaches with simulation improve adherence: hand hygiene stations with immediate feedback, PPE training using fluorescent contamination, catheter insertion on a simulator with a checklist, and structured post-simulation debriefing focused on decisions and culture (Gould et al., 2017; Houghton et al., 2020; Luangasanatip et al., 2015). Self-efficacy increases through modeling and graduated mastery (Bandura, 1977), while progression toward expertise is accelerated through decreasing supervision (Benner, 1984); evaluation should progress from reaction to HAI outcomes (Kirkpatrick & Kirkpatrick, 2006; Ivers et al., 2012). Its sustainability depends on monitoring, leadership, staffing, and supplies (Storr et al., 2017; WHO, 2022); without these, the effect declines and the gap between knowing and doing re-emerges (Erasmus et al., 2010; Houghton et al., 2020).

Structured post-simulation debriefing constitutes the core of the method: within a psychologically safe environment, the facilitator guides reflection on what occurred, why decisions were made in that manner, and how learning can be transferred to bedside practice, thereby closing the experiential cycle (INACSL, 2021; Jeffries, 2012; Kolb, 1984). Fidelity should be calibrated to the objective: visible fluorescent contamination is sufficient for hand hygiene and personal protective equipment, whereas catheter insertion requires a simulator with a checklist. High fidelity contributes more to complex skills than to simple behaviors (Kim et al., 2016; Shin et al., 2015). Longitudinal integration with increasing complexity, from the laboratory to supervised practice with decreasing autonomy, accelerates progression toward expertise (Benner, 1984); without such continuity or adequate supplies in clinical settings, the effect declines and the knowing-doing gap re-emerges (Erasmus et al., 2010; Storr et al., 2017).

Safety culture and the institution as an ecosystem of continuous learning

Safety culture determines whether practices are sustained or eroded (Sexton et al., 2006). Attitudes questionnaires and AHRQ surveys assess teamwork, management, stress, and non-punitive reporting (Agency for Healthcare Research and Quality [AHRQ], 2025; Sexton et al., 2006). Units with a more favorable climate demonstrate greater adherence, timely reporting, and less normalization of shortcuts, whereas punitive environments inhibit reporting and perpetuate unsafe practices (Houghton et al., 2020; Storr et al., 2017).

The institution articulates the formal curriculum, the enacted curriculum, and the hidden curriculum (Lave & Wenger, 1991; Michie et al., 2011): if speed is rewarded over asepsis, the hidden curriculum reproduces unsafe practices even when formal discourse is appropriate (Atkins et al., 2017; Houghton et al., 2020). When leadership models hygiene practices, facilitates access to supplies, protects training time, analyzes events through a systems-based approach, and recognizes improvements, the organization learns and consolidates what has been learned (Resar et al., 2012; Storr et al., 2017; WHO, 2022). Competence integrates knowing, doing, being, and living together (Benner,

1984; Kolb, 1984), and curricular adjustments involving trained preceptors, performance-based assessment, and communities of practice transform prevention into a professional identity rather than an additional task (Cant & Cooper, 2017; Hayden et al., 2014; Jeffries, 2012; Lave & Wenger, 1991).

To move from diagnosis to the improvement cycle, dimension-specific scores guide targeted interventions whose progression is verified through successive measurements (AHRQ, 2025; Sexton et al., 2006). Audit and timely, specific, actionable feedback close the loop between measurement and behavior (Ivers et al., 2012), while leadership rounds involving direct discussion of visible risks model the managerial commitment required by multimodal approaches (Gould et al., 2017; WHO, 2022). Recognizing units that improve, rather than penalizing reporting, transforms notification into a source of learning and stabilizes the culture (Houghton et al., 2020; Resar et al., 2012).

Table 1. *Interpretive synthesis by domains: training, practice, transfer, and system*

Axis	Core finding	Representative evidence	Educational implication
1. Normative foundations as the formal curriculum	WHO/CDC/PAHO guidelines and national regulations define legitimate content, but prescribing does not equate to learning.	(WHO, 2016; WHO, 2022; CDC, 2024; PAHO, 2023; MSP, 2024; Storr et al., 2017)	Translate regulations into teachable sequences, checklists, and assessable performance outcomes.
2. Applied best practices	Hand hygiene, PPE, and bundled interventions reduce HAIs when compliance is all-or-nothing and audited.	(Pittet et al., 2000; O'Grady et al., 2011; Lo et al., 2014; Klompas et al., 2022; Pronovost et al., 2006; Berríos-Torres et al., 2017)	Train performance under real-world conditions through verification and supportive feedback.
3. Educational models	Isolated traditional approaches do not change behavior; multimodal approaches incorporating structured simulation improve adherence.	(Knowles, 1984; Cook et al., 2011; Hayden et al., 2014; Cant & Cooper, 2017; Kim et al., 2016; INACSL, 2021; Gould et al., 2017)	Design andragogical pathways incorporating deliberate practice and structured post-simulation debriefing.
4. Gaps and contextual conditions	Work overload, supply shortages, and lack of monitoring explain the gap between knowing and doing.	(Erasmus et al., 2010; Houghton et al., 2020; Ivers et al., 2012; Flodgren et al., 2013)	Address the environment, staffing, and feedback, rather than knowledge alone.
5. Culture and ecosystem	The institution sustains or erodes learning depending on the alignment between the formal and hidden curricula.	(Sexton et al., 2006; AHRQ, 2025; Lave & Wenger, 1991; Resar et al., 2012; WHO, 2022)	Role-modeling leadership, non-punitive reporting, and continuous learning.

Note. Developed from the source/fragment/unit/code/category matrix; N=28; seminal works and standards served as contextual scaffolding.

Discussion

Multimodal approaches outperform traditional ones because they address behavior and context, rather than memory alone.

Documentary comparison confirms that isolated educational interventions improve immediate knowledge but do not sustain adherence, whereas multimodal approaches incorporating environmental facilitation, point-of-care reminders, audit and feedback, and managerial commitment do reduce unsafe practices and stabilize routines (Gould et al., 2017; Ivers et al., 2012; Luangasanatip et al., 2015). This finding is consistent with the capability-opportunity-motivation model (Michie et al., 2011) and with the theoretical domains of knowledge, skills, professional identity, beliefs about consequences, context, and emotions (Atkins et al., 2017). Simulation enhances this effect because it allows errors without harm, repetition until mastery, visualization of contamination, and reflection on judgment, communication, and hierarchies (Cook et al., 2011; Hayden et al., 2014; McGaghie et al., 2011).

Meta-analyses show moderate to large effects on skills, with transfer contingent upon fidelity, a structured post-simulation debriefing session, and subsequent supervised clinical practice (Cant & Cooper, 2017; Kim et al., 2016; Shin et al., 2015). INACSL standards caution against ornamental use: without measurable objectives, prebriefing, competent facilitation, and valid assessment, simulation merely reproduces transmission-based teaching in another format (INACSL, 2021; Jeffries, 2012). The alternative is not to discard theory, but to integrate it into situated reasoning through cases, checklists, and guided reflection (Bandura, 1977; Kirkpatrick & Kirkpatrick, 2006).

The capability-opportunity-motivation framework explains this superiority: capability is developed through knowledge, practiced skills, and self-efficacy (Bandura, 1977; Cook et al., 2011); opportunity through accessible dispensers, adequate staffing, and reminders; and motivation through professional identity, beliefs about consequences, and leadership reinforcement (Michie et al., 2011). The theoretical domains systematized by Atkins et al. (2017) make it possible to diagnose which link is failing in each unit before intervening, thereby avoiding generic solutions. Furthermore, feedback changes behavior only when it is timely, individualized, and accompanied by goals and an action plan (Ivers et al., 2012); without these conditions, auditing without feedback is equivalent to measuring without teaching.

Formal curriculum versus hidden curriculum: the tension that explains failed transfer

Regulations operate as a necessary formal curriculum (PAHO, 2012; MSP, 2024; PAHO, 2023; WHO, 2016; WHO, 2022). Nevertheless, the transformation of scholarly knowledge into enacted knowledge fractures when workplace practices teach the opposite (Atkins et al., 2017; Houghton et al., 2020). If staffing levels prevent point-of-care hygiene or verification is informally sanctioned, the hidden curriculum exerts a

greater formative influence than the program itself (Erasmus et al., 2010; Sexton et al., 2006).

Consequently, non-punitive reporting, teamwork, and visible leadership predict adherence (AHRQ, 2025; Sexton et al., 2006; Storr et al., 2017), and the Michigan experience illustrates that technical change combined with adaptive change produces sustained reductions (Pronovost et al., 2006; Resar et al., 2012). Similarly, compendia require infrastructure, education, and measurement to be inseparable components (Buetti et al., 2022; Klompas et al., 2022; Lo et al., 2014; O'Grady et al., 2011; Yokoe et al., 2014).

In nursing, competence is transversal and ecological: it resides in the interaction among the individual, team, and system and is expressed through timely decision-making, assertive communication, and traceable documentation (Benner, 1984; Lave & Wenger, 1991). Trained preceptors, performance-based assessment, longitudinal simulation, formative audits, case analysis, and interprofessional rounds mediate transfer and ensure continuity between the classroom, laboratory, and bedside care (Cant & Cooper, 2017; Hayden et al., 2014; Ivers et al., 2012). This tension is exacerbated in settings with high workloads and limited resources, where prevalence is higher and IPC capacity is lower (Allegranzi et al., 2011; Cassini et al., 2019; Rosenthal et al., 2014; Suetens et al., 2018; WHO, 2022). The response requires adequate staffing, point-of-use supplies, protected time, and surveillance with feedback that is useful for improvement (CDC, 2024; MSP, 2024; Storr et al., 2017): prevention as an educational objective requires coordinated pedagogy and management.

The hidden curriculum operates through concrete mechanisms: the modeling of peers and superiors, informal sanctions imposed on those who delay a procedure to verify it, the normalization of shortcuts under conditions of overload, and scarcity that necessitates improvisation (Erasmus et al., 2010; Houghton et al., 2020; Sexton et al., 2006). Trained preceptors mediate between both curricula when they provide guidance, correct actions in real time, and legitimize pauses for asepsis; interprofessional rounds and system-oriented case analysis extend this mediation to the team (Cant & Cooper, 2017; Hayden et al., 2014). Where SIVE-Hospital surveillance and PCIAAS programs define responsibilities and workflows (MSP, 2024), aligning staffing, supplies, and protected time with prescribed standards is the condition required for educational discourse and practice to cease contradicting one another.

Limitations, Scope, and Agenda

As a documentary hermeneutic inquiry, this analysis interprets texts rather than directly observing practice; behavioral inference is mediated by what is reported and by the descriptive quality of each source (Braun & Clarke, 2006). The use of a single coder, even with traceability and temporally distanced rereading, limits interpretive triangulation. Likewise, the 2020–April 2026 timeframe prioritizes currency but may underrepresent

very recent innovations and unindexed local grey literature, while the heterogeneity of study designs precludes the weighting of effects and necessitates a cautious conceptual synthesis.

Nevertheless, the convergence of guidelines, foundational studies, Cochrane reviews, compendia, educational research, and theoretical frameworks lends plausibility and coherence to the constructed categories. The future agenda includes multimethod observational studies on bedside transfer, evaluations of multimodal programs with HAI outcomes (Kirkpatrick and Kirkpatrick, 2006), and participatory research on the hidden curriculum and working conditions in Ecuadorian hospitals (MSP, 2024). Future studies should also assess implementation outcomes alongside clinical outcomes to determine what works, for whom, and under what support conditions (Michie et al., 2011; Storr et al., 2017), and document how preceptors and formative audits mediate transfer in services with high staff turnover.

Conclusions

The prevention of healthcare-associated infections is better understood when interpreted as a continuous educational process rather than as the mere application of a technical repertoire. The analysis shows that the robustness of theoretical knowledge acquires clinical value only when it is integrated with supervised experience and organizational conditions that enable its enactment. From this perspective, regulations cease to operate as external mandates and instead become reference frameworks that guide professional judgment.

Therefore, preventive competence emerges from a framework in which training, reflective practice, and institutional culture mutually shape one another and give meaning to every decision made at the patient's bedside. The study objective was thus fulfilled: the analysis enabled the mapping of good practices, the characterization of their teaching conditions, and the explanation of transfer as a situated phenomenon rather than as mere application. Prevention is redefined as an ecological competence that articulates knowing, doing, and coexisting in every shift.

Consequently, the gap between what is taught and what actually occurs in healthcare services cannot be attributed to individual shortcomings or resolved through isolated lecture-based activities. This gap reveals a deeper tension between the declared curriculum and the routines legitimized by the work environment day after day through time pressure, resource scarcity, or lack of feedback. When the organization protects learning time, ensures the availability of supplies, and recognizes safe practices, knowledge circulates and becomes consolidated; when such supports are absent, what has been learned erodes even if institutional discourse proclaims otherwise. Conceiving

the institution as a formative ecosystem thus makes it possible to shift responsibility from the individual professional alone toward shared systemic accountability.

Accordingly, advancing toward sustainable prevention requires the integration of multimodal strategies, situated learning, and ongoing support rather than reliance on the mere dissemination of guidelines. Reflective simulation, formative auditing, and communities of practice provide fruitful pathways for transforming standards into internalized criteria and shared habits. In the future, field-based inquiry into how the explicit and hidden curricula interact will provide key insights for designing environments in which acting safely is easier than improvising shortcuts.

Ultimately, only when training, care, and management are recognized as facets of the same collective task will patient safety cease to be a declarative aspiration and become a lived and verifiable culture in every service and every care shift. For the National Health System, strengthening the PCIAAS programs and the SIVE-Hospital subsystem as educational mechanisms offers a concrete pathway. When each service sustains these conditions, prevention ceases to depend on individual effort and becomes a property of the system.

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