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Editorial

How to awaken systems thinking in infection prevention and control? Psychology must meet practice

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Infection prevention and control (IPC) is often reduced to checklists, audits, and compliance scores. Yet anyone who has led an IPC program knows that sustainable prevention depends less on surveillance and more on whether people have internalized purpose. Compliance frequently declines when oversight fades—not because of defiance, but because staff have not fully absorbed the "*why*" behind the guidance [1]. IPC, therefore, is not simply a technical discipline; it is a cognitive and leadership challenge.

Traditional top-down models can produce short-term gains but risk creating what might be called "*compliance machines*"—teams that perform well under scrutiny yet revert when supervision rotates. Enduring performance requires psychological empowerment. When frontline clinicians feel ownership, understand system interconnections, and perceive psychological safety, standards persist beyond the presence of any single leader.

Evidence from Advanced Leadership Certification in Infection Prevention and Control (AL-CIP)–certified professionals illustrates this shift [2]. In the qualitative study of thirty AL-CIP–certified leaders, participants described a marked transition from task-based oversight toward systems-level leadership. Rather than focusing narrowly on audits and checklists, they reported using data more strategically, applying structured improvement models, and prioritizing communication and psychological safety as central leadership tools. Leaders spoke openly about confronting entrenched structural barriers, intentionally engaging under-represented teams whose perspectives had previously been peripheral, and shifting from reactive problem-solving to proactive risk anticipation. Importantly, certification did not merely expand technical knowledge; it strengthened professional identity, confidence, and credibility. Participants described feeling more capable of influencing multidisciplinary teams and sustaining change beyond episodic compliance efforts [2]. Leadership training, in this sense, does more than teach guidelines—it cultivates systems thinking and anticipatory responsibility.

This broader leadership lens becomes especially important as IPC evolves technologically. A recent review of 1520 citations (17 studies included) identified three main domains in hospital IPC innovation: hand hygiene and personal protective equipment compliance, automated infection cluster detection, and environmental cleaning (including air quality control and sterilization) [3]. Yet despite the promise of automation and "Health 4.0" technologies, uptake remains limited. Technology alone cannot compensate for fragmented systems or disengaged staff. Leaders must actively involve healthcare workers in design, implementation, and adaptation—particularly in resource-constrained settings. Without cognitive integration across disciplines, even sophisticated tools fail to achieve their potential.

Persistent gaps between executive endorsement and frontline execution further highlight the leadership challenge. Mapping of IPC leadership structures has demonstrated that while senior leaders often endorse hand hygiene and device-related protocols, insufficient integration of nursing, laboratory, environmental services, and stewardship perspectives can fragment implementation [4]. Policies become vertical; transmission is horizontal. IPC effectiveness depends on interlacing these perspectives into a coherent, interactive system.

As an example, consider the management of a recurrent nosocomial scabies outbreak. When the outbreak was initially analyzed using traditional root cause analysis (RCA), periods of apparent control were followed by relapse within 180 to 270 days. A subsequent reanalysis using a systems-oriented event analysis (SOEA) model reframed the problem: instead of focusing on discrete lapses, it examined feedback loops, workflow interdependencies, and communication gaps across units [5]. Following implementation of SOEA-derived recommendations, no new nosocomial scabies cases were reported for more than 1975 days. The contrast is striking. The improvement did not result from a new checklist but from a shift in analytic mindset—from isolated causes to systemic interrelationships. Such outcomes reflect principles long articulated in systems theory: the whole is not merely the sum of its parts, and sustainable change emerges when interconnections are understood and redesigned.

Leadership behaviors that reinforce this systems orientation need not be complex or resource-intensive. Mentoring frontline autonomy—training link nurses to audit independently while providing structured guidance—fosters durable change. Framing protocols in terms of patient safety and antimicrobial resistance creates intrinsic motivation rather than rule-following.

Brief, regular cross-disciplinary huddles can illuminate how hand hygiene trends, environmental cleaning performance, and device

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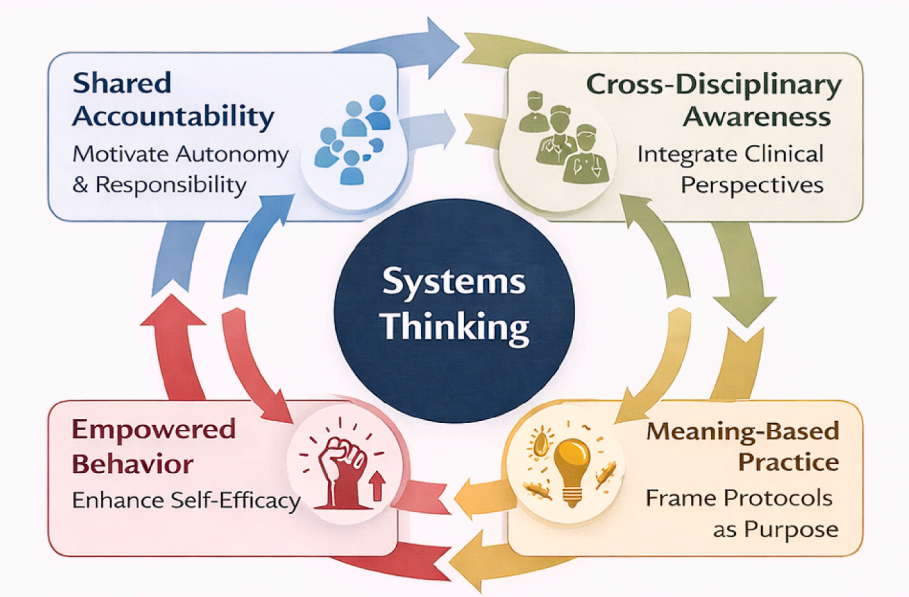

Fig. 1. Systems-Oriented IPC Leadership Model
Conceptual schematic illustrating cross-disciplinary systems thinking in infection prevention and control. The model demonstrates how leadership integrates laboratory surveillance, nursing vigilance, environmental cleaning, and medical stewardship through cognitive huddles, mentorship, and psychological empowerment. Arrows indicate bidirectional feedback loops, highlighting the interconnections that sustain compliance and reduce healthcare-associated infections.

utilization interact to shape device-associated infections and antimicrobial resistance patterns. Succession planning—intentionally developing multiple capable leaders per ward—ensures continuity despite rotation [6]. Indeed, a systematic review examining head nurses' leadership found that authentic and transformational styles, when supported by the organization, were associated with improved nurse performance and reduced device-associated infections [7].

Psychological safety is central to this transformation. In one survey, hospitals reporting high psychological safety were significantly more likely to use catheter reminders or stop-orders and nurse-initiated catheter removal for catheter-associated urinary tract infection (CAUTI) prevention (odds ratio 2.37, P = .002), as well as sedation vacations for ventilator-associated pneumonia (VAP) prevention (odds ratio 1.93, P = .04) [8]. When staff feel safe to question, suggest, and correct, prevention becomes anticipatory rather than reactive.

In practical terms, a weekly 15–20-min cognitive huddle can anchor this approach. As illustrated in Fig. 1, leadership functions as the integrating force that connects surveillance data, frontline practice, environmental systems, and psychological safety into a predictive, self-regulating IPC framework. Teams briefly examine trends, connect them to environmental or workflow factors, and anticipate emerging risks. Such structured reflection enhances awareness of interdependence, strengthens hazard anticipation before infection manifests , and shifts ownership from surveillance-driven compliance to self-regulation. Over time, maturity becomes visible: teams sustain standards without direct supervision, identify vulnerabilities proactively, and correct processes collaboratively.

IPC challenges are universal: resource constraints, workforce turnover, and rising patient acuity test every system. Yet leadership strategies grounded in systems thinking and psychological empowerment are scalable and adaptable. They rely less on capital investment and more on cognitive architecture. Leaders become architects of understanding, aligning perspectives across disciplines and cultivating shared responsibility.

IPC success cannot be measured merely by transient spikes in audit compliance. True sustainability emerges when teams anticipate, adapt, and act autonomously within complex clinical environments. Lasting infection prevention arises not from enforcement alone, but from leadership that forges resilient integration across minds, disciplines, and systems.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. The auhtor is an associate editor of New Microbes New Infection

References

[1] Keil V, Schaumburg T, Buchta F, Katrin Luz J, Kolbe-Busch S, Chaberny IF, et al. Improving leadership skills of infection prevention and control teams by psychological empowerment: study protocol for a cluster randomised controlled trial (IP-POWER). BMJ Open 2024;14:e083806. https://doi.org/10.1136/bmjopen-2023-083806.
[2] Ruch KE, Al Mohajer M, Author Affiliations F. Leadership experiences of infection prevention and control professionals: findings from the leadership evaluation and development for infection preventionists (LEAD-IP) Study. Am J Infect Control 2026. https://doi.org/10.1016/j.ajic.2026.01.023.
[3] Piaggio D, Zarro M, Pagliara S, Andellini M, Almuhini A, Maccaro A, et al. The use of smart environments and robots for infection prevention control: a systematic literature review. Am J Infect Control 2023;51:1175–81. https://doi.org/10.1016/j.ajic.2023.03.005.
[4] Gould DJ, Gallagher R, Allen D. Leadership and management for infection prevention and control: what do we have and what do we need? J Hosp Infect 2016;94:165–8. https://doi.org/10.1016/j.jhin.2016.07.005.
[5] Chuang S, Howley PP, Lin SH. Implementing systems thinking for infection prevention: the cessation of repeated scabies outbreaks in a respiratory care ward. Am J Infect Control 2015;43:499–505. https://doi.org/10.1016/j.ajic.2015.02.002.
[6] Richards A. Developing ward leadership skills. Nurs Manag 2023;30. https://doi.org/10.7748/nm.2023.e2043.

[7] Cappelli E, Zaghini F, Fiorini J, Sili A. Healthcare-associated infections and nursing leadership: a systematic review. J Infect Prev 2025;26:78–90. https://doi.org/10.1177/17571774241287467.
[8] Greene MT, Gilmartin HM, Saint S. Psychological safety and infection prevention practices: results from a national survey. Am J Infect Control 2020;48:2–6. https://doi.org/10.1016/j.ajic.2019.09.027.

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