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Letter to Editor

Silent Spreaders in NICUs: Novel Surveillance for Neonatal Infection Control

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Dear Editor,

Neonatal Intensive Care Units (NICUs) face a persistent challenge in controlling healthcare-associated infections (HAIs), with reported rates ranging from 6% to 25% globally.[1] While traditional infection control strategies have focused on symptomatic patients and high-risk groups, a growing body of evidence suggests that "silent spreaders," asymptomatic carriers of multidrug-resistant organisms (MDROs) among healthcare workers, parents, and neonates themselves may represent a critical blind spot in current surveillance paradigms.[2] If this is the case, then fundamental assumptions underpinning NICU infection control may warrant reexamination. We argue that existing approaches, which rely heavily on active surveillance cultures (ASCs) and hand hygiene compliance, are structurally ill-suited to detect asymptomatic transmission. Emerging genomic, environmental, and data-driven methodologies offer not merely incremental improvements but a necessary reconceptualization of surveillance itself.

The core limitation of conventional surveillance is its reactive orientation. ASCs typically target pathogens such as methicillin-resistant *Staphylococcus aureus* (MRSA) or vancomycin-resistant *Enterococcus* (VRE) in symptomatic or high-risk neonates.[3] They are constrained by narrow pathogen panels, intermittent sampling, and significant resource demands.[1] Hand hygiene adherence, while foundational, remains highly variable; a 2024 study reported compliance rates as low as 40% in some NICUs.[4] Environmental sampling, where conducted, lacks standardization and temporal resolution. These gaps are not minor; they are structural. Because silent spreaders, by definition, do not trigger symptom-based protocols, they can evade detection for weeks or months, colonizing surfaces, equipment, and individuals without clinical indicators of risk.[2]

Emerging evidence suggests that novel surveillance strategies may address these blind spots in fundamentally different ways. Whole-genome sequencing (WGS), for instance, has demonstrated the capacity to map transmission networks with high resolution. A 2025 pilot study identified silent MRSA transmission from an asymptomatic healthcare worker to three neonates, a transmission that conventional ASCs had not detected.[5] Metagenomic next-generation sequencing (mNGS) offers broader pathogen-agnostic surveillance. In a 2024 European trial, asymptomatic *Klebsiella pneumoniae* colonization was detected in 15% of sampled neonates, prompting revisions to cohorting protocols.[6] Real-time environmental monitoring using ATP bioluminescence or air sampling has been associated with HAI reductions of up to 30% when paired with targeted cleaning.[7] Artificial intelligence models integrating electronic health record data, staff movement, and microbial sampling have, in preliminary implementation, reduced *Enterococcus* infections by 25% in a Canadian NICU.[8]

These findings, while promising, remain preliminary. The evidence base for WGS and mNGS in routine NICU surveillance is largely derived from pilot studies and single-center implementations; generalizability to diverse resource settings is unestablished. Cost and infrastructural barriers are substantial, and ethical considerations, particularly regarding routine screening of asymptomatic healthcare workers and parents, require careful navigation.[9] Conditional interpretation is therefore essential: early evidence suggests that these technologies may enable a shift from reactive to proactive surveillance, but this shift is neither automatic nor uniformly achievable.

What would such a reconceptualization require? First, a move away from pathogen-specific, symptom-triggered sampling towards systematic, intermittent surveillance of human and environmental reservoirs. Second, integration of microbial genomic data with epidemiological and spatial data to enable real-time risk stratification. Third, explicit acknowledgment that surveillance is not merely a technical problem but a socio-technical one: implementation

depends on trust, transparency, and protection of colonized individuals from stigma or occupational penalty.

The central argument, then, is not that novel technologies should simply be added to existing infection control toolkits. It is the silent spreader phenomenon that exposes a fundamental mismatch between the structure of current surveillance and the ecology of transmission in NICUs. Addressing this mismatch requires not augmentation but reconfiguration. The question is whether NICU infection control can evolve from a discipline of response to a discipline of anticipation. Early evidence suggests it might. Whether that potential is realized will depend on investment, interdisciplinary collaboration, and a willingness to question whether the ways we have always surveyed are adequate to the threats we now face.

Conflict of Interest Disclosures

The author declares no conflict of interest.

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