



Antibiotics 2026: Advances in Antimicrobial Action and Resistance

SESSION : ANTIMICROBIAL RESISTANCE MECHANISMS.

Silent Invaders: When Neonatal Devices Become Gateways to Antibiotic Resistance.

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BACKGROUND, AIM AND OBJECTIVES

Peripheral venous catheters (PVCs) are widely used in neonatal intensive care units, but in this highly vulnerable population they may serve as a gateway for microbial colonization and bloodstream infections.

Staphylococcus aureus, particularly methicillin-resistant strains (MRSA), is a key pathogen in catheter-related infections in neonates. Methicillin resistance is mediated by the *mecA* gene carried on the SCCmec element, which shows marked genetic variability.

Characterizing bacterial colonization of PVCs and the molecular profiles of *S. aureus* is essential to strengthen infection prevention strategies in neonatal care.

AIM AND OBJECTIVES

To assess PVC colonization in neonates and to characterize *S. aureus* isolates using phenotypic methods, *mecA* detection, and SCCmec typing.

METHODS

1 CATHETER TIP COLLECTION

- Collection of catheter tips from peripheral venous catheters.

2 BACTERIAL CULTURE

- Semi-quantitative culture to determine bacterial load (CFU_{≥10³/mL).}

3 ANTIMICROBIAL SUSCEPTIBILITY TESTING

- Antibiogram by disk diffusion.
- MRSA screening and D-test.

4 PCR DETECTION (*mecA*)

- Detection of the *mecA* gene by PCR.

5 SCCmec TYPING

- Molecular typing of SCCmec to identify the SCCmec type (I, II, III, IV, V, ...).

From catheter tip to molecular characterization: a comprehensive approach to identify and characterize MRSA and its genetic backgrounds.

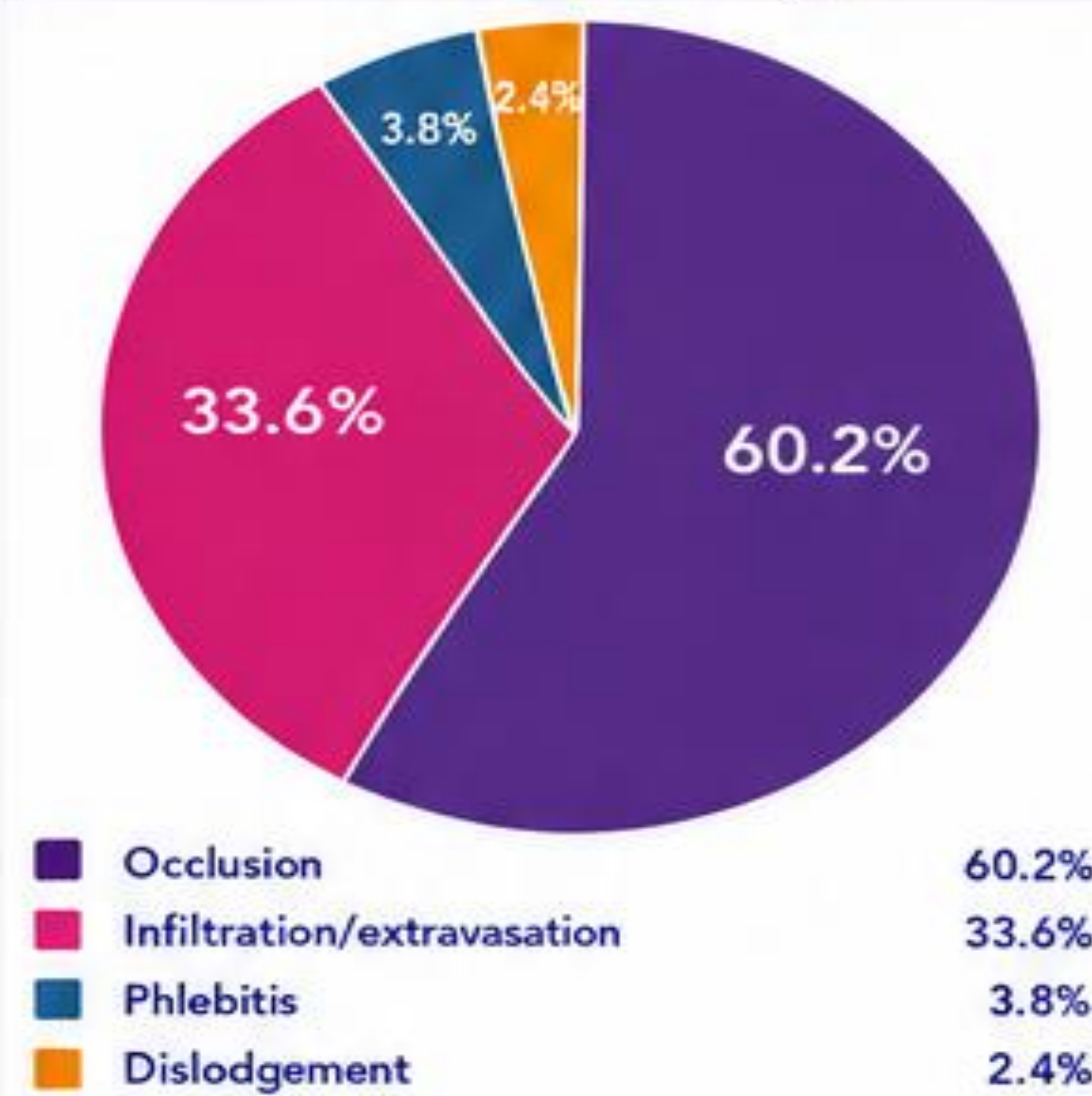
STUDY DESIGN

- Prospective NICU study (2023–2024)
- 500 PVCs from 323 neonates
- Catheter tip culture (Brun-Buisson method, $\geq 10^3$ CFU/mL)
- Phenotypic and molecular characterization of isolates

RESULTS

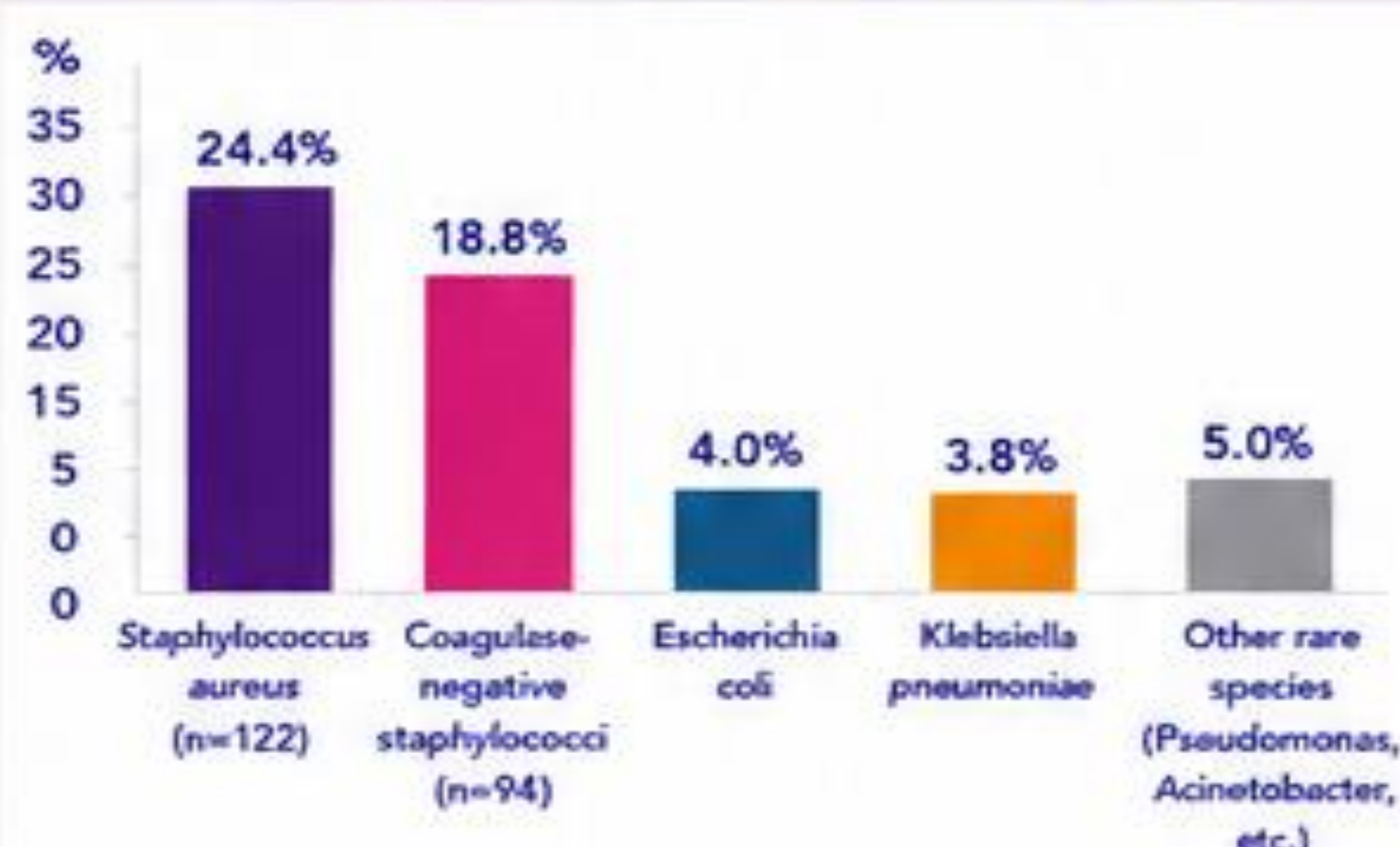
PVC FAILURE TYPES

GRAPH 1 — PVC Failure Types



MICROBIAL DISTRIBUTION IN CATHETER TIPS

GRAPH 2 — Microbial Distribution in Catheter Tips



RESULTS

PVC failure was frequent in neonates and mainly driven by mechanical complications. Catheter colonization was predominantly due to skin flora, with *Staphylococcus aureus* and coagulase-negative staphylococci as the most frequent organisms.

Among *S. aureus*, MRSA accounted for 22.5% (n=27) and MSSA for 77.5% (n=93). SCCmec types were mainly IV and III, with less frequent type II and rare type I.

Erythromycin resistance was 41.67%. D-test results showed constitutive MLSB (25.83%), inducible MLSB (4.17%), and MS phenotype (11.66%). Inducible resistance was observed exclusively in MSSA.

DISCUSSION

PVC failure in neonates was predominantly associated with mechanical complications, mainly occlusion and infiltration/extravasation.

Significant catheter colonization supports the role of skin flora migration as an early step preceding catheter-related infection.

Staphylococcus aureus and coagulase-negative staphylococci predominated, likely due to their strong adhesive and biofilm-forming capacity.

MRSA isolates were mainly associated with SCCmec types III and IV, suggesting circulation of mixed epidemiological lineages.

Inducible clindamycin resistance (positive D-test) was observed exclusively in MSSA isolates, unlike patterns commonly reported in MRSA-associated resistance.

These findings highlight the combined mechanical and microbiological nature of PVC failure and reinforce the importance of targeted prevention strategies in NICUs.

CONCLUSION

PVC colonization in neonates reveals the silent presence of pathogens in critical care settings. These findings highlight the essential role of microbiology in uncovering hidden threats and protecting the most vulnerable lives.

“Born into fragility, premature infants remind us that in the NICU, even the unseen can determine survival.”

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