สถาบันสุขภาพเด็กแห่งชาติมหาราชินี
Queen Sirikit National Institute of Child Health

Salvage Antibiotic Options Against Resistant Gram-Negative Bacteria in a Paediatric Tertiary Care Centre: Comparative Analysis of CAZA, CZT, Tigecycline, Colistin & Netilmicin

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Background

Multidrug-resistant and carbapenem-resistant (CR) Gram-negative bacteria present critical therapeutic challenges in paediatric intensive care. WHO designates CR Enterobac-terales (CRE), CR P. aeruginosa (CRPA), and CR A. baumannii as critical-priority pathogens urgently requiring new antibiotics. Ceftazidime-avibactam (CAZA) and ceftolozane-tazobactam (CZT) are key novel beta-lactam/BLI combinations. Direct comparative susceptibility data from paediatric clinical isolates remain scarce — particularly in Southeast Asia.

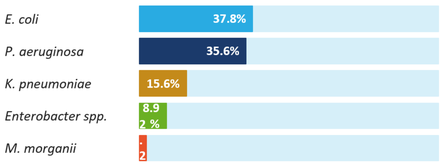
45
Pilot isolates
Jan–Feb 2026

48.9%
Overall CR
22/45 isolates

72.7%
CR in 3 ICUs
PCICU/SICU/PICU

37.8%
ESBL-producing
isolates

Organism Distribution (n=45)



† 37.8% ESBL · 48.9% overall CR · 86.7% of CRPA were XDR (13/15)

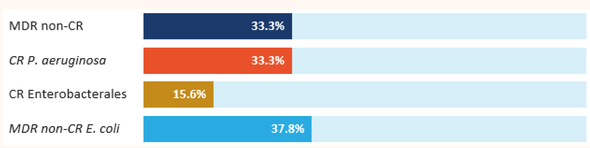
Methods

Cross-sectional analysis of 45 consecutive non-duplicate Gram-negative clinical isolates pre-selected by institutional criteria (ESBL-producing, ceftazidime-resistant, or CR phenotypes) from QSNICH, Bangkok, January–February 2026.Susceptibility to ceftazidime-avibactam (CAZA), ceftolozane-tazobactam (CZT), tigecycline (TGC), colistin (CL), and netilmicin (NET) was determined by disk diffusion ± E-test per CLSI M100 2024. Salvage therapy options were mapped per isolate. XDR classification per Magiorakos et al. 2012. De-identified laboratory data only — no patient identifiers.

Study Limitations

- Pilot cross-sectional data (n=45); prospective collection ongoing (target n=250)
- Phenotypic XDR; carbapenemase gene type not determined
- Single tertiary paediatric centre — findings may not generalise beyond QSNICH
- CL intermediate in all dual-fail; clinical pharmacodynamics not assessed

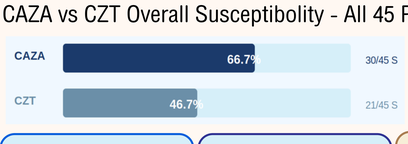
Resistance Phenotypes (n=45)



† 86.7% of CRPA were XDR (13/15 isolates) · Overall CR 48.9% · 72.7% of CR in 3 ICUs

Primary Outcome: CAZA vs CZT — All 45 Isolates

CAZA vs CZT Overall Susceptibility - All 45 Pre-selected Isolates



Discordant
20%
CAZA-S / CZT-R
All Enterobacterales/CRE only

Revere
0%
CAZA-S / CZT-R
No isolate favoured CZT

TGC vs Enterobacterales
96.6%
near-complate activity
inactive vs P. aeruginosa

Tigecycline (TGC) vs Enterobacterales

37.8%
susceptible
28/29 Enterobacterales

Near-complete TGC activity among Enterobacterales. Useful dual salvage alongside CRE-active agents. Note: TGC has no intrinsic activity against P. aeruginosa.

CAZA-Resistant Isolates by Specimen Source

ICU concentration: 72.7% of all CR isolates in PCICU, SICU, and PICU combined.

VAP predominates as the clinical syndrome driving resistant P. aeruginosa isolates in this cohort.

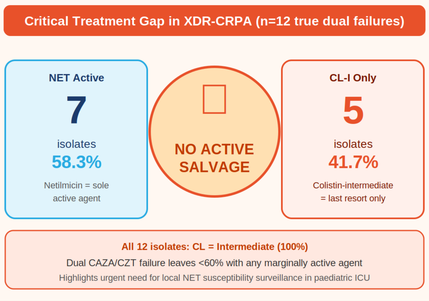
Salvage Landscape by Organism Group

Organism group	CAZA	CZT	TGC	NET
MDR non-CR Enterobacterales	✓✓	±	✓✓	±
CRE	±	✗	✓✓	±
MDR-PA (non-CR)	✓	✓✓	✗	±
⚠ XDR-CRPA	✗	✗	✗	✓*

✓✓high / ✓moderate / ± variable / ✗ no activity · *NET sole active in 58.3% (7/12) dual failures

Critical Treatment Gap: XDR-CRPA

Among 12 XDR-CRPA with true dual CAZA/CZT failure:



Over one-third of XDR-CRPA face colistin-only options — netilmicin retains critical activity in 58.3% (7/12) of true dual CAZA/CZT failure, underscoring urgent stewardship priorities in paediatric tertiary ICUs

Secondary Outcomes — Key Findings

- CAZA susceptibility (66.7%) substantially exceeds CZT (46.7%) across all organism groups
- CAZA-S/CZT-R discordance in 20% — confined entirely to Enterobacterales /CRE; no XDR-CRPA favoured CZT
- 72.7% of all CR isolates concentrated in 3 paediatric ICUs (PCICU, SICU, PICU)
- Tracheal/respiratory source accounts for 53.3% of CAZA-resistant organisms (all XDR-CRPA, VAP)
- NET retained activity in 58.3% (7/12) of XDR-CRPA where both novel agents failed
- TGC near-complete activity vs Enterobacterales (96.6%); intrinsically inactive against P. aeruginosa
- All 12 true dual-fail isolates: CL = Intermediate (100%) — no fully active conventional salvage available

Conclusions

In this pre-selected resistant paediatric cohort, CAZA (66.7%) substantially outperforms CZT (46.7%) with zero isolates favouring CZT — CAZA is the preferred novel beta-lactam/BLI.

Discordant phenotype (CAZA-S/CZT-R) in 20% — exclusively in Enterobacterales/CRE, supporting pathogen-directed selection over CZT outside confirmed MDR-PA.

Among 12 XDR-CRPA with true dual CAZA/CZT failure, 41.7% face colistin -intermediate only — netilmicin retains critical activity in 58.3% (7/12).

Keywords: extensively drug-resistant, carbapenem resistance, ceftazidime-avibactam, ceftolozane-tazobactam netilmicin, tigecycline, colistin, salvage therapy, paediatric, AMR stewardship

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