Understanding Intermittent Detection of Multidrug-Resistant Organisms (MDROs) in Rectally Colonized Patients

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Background

MDRO detection in colonized patients may be intermittent for reasons that are incompletely understood.

Methods

Rectal or fecal swab samples were collected daily from MICU patients 1/11/2017-1/11/2018. First MICU admissions of patients with ≥2 swabs and MICU stays ≥3 days were studied. Samples were cultured for the following organisms using selective media:

- VRE: vancomycin-resistant enterococci
- CRE: carbapenem-resistant *Enterobacteriaceae*
- CRPA: carbapenem-resistant *Pseudomonas aeruginosa*
- ESBL: extended-spectrum β-lactamase-producing *Enterobacteriaceae*

Operational taxonomic unit (OTU) categories corresponding to MDRO species were identified by taxonomy and BLAST of 16S rRNA gene sequences of the V4 region. Multilevel regression models estimated the association between MDRO detection in subsequent samples and relative abundance of the corresponding OTU.

Results

796 unique patients with 3519 rectal swab samples were studied.

- Patterns of MDRO detection and OTU relative abundance in samples were dynamic [**Figure 1].**
- Following initial MDRO detection, the probability of subsequent detection varied by MDRO type, highest for VRE and lowest for CRPA [**Figure 2].**
- Within each sample, we found a significant association between MDRO detection and relative abundance of the corresponding OTU [**Figure 3**].
- Relative OTU abundance in the first sample with MDRO detection was not predictive of odds of future MDRO detection (p>0.05 for all comparisons).
- Carriage of >1 MDRO did not affect the odds of MDRO detection in later samples.

Figure 1: Daily Patterns of MDRO Detection and OTU Relative Abundance Are Dynamic

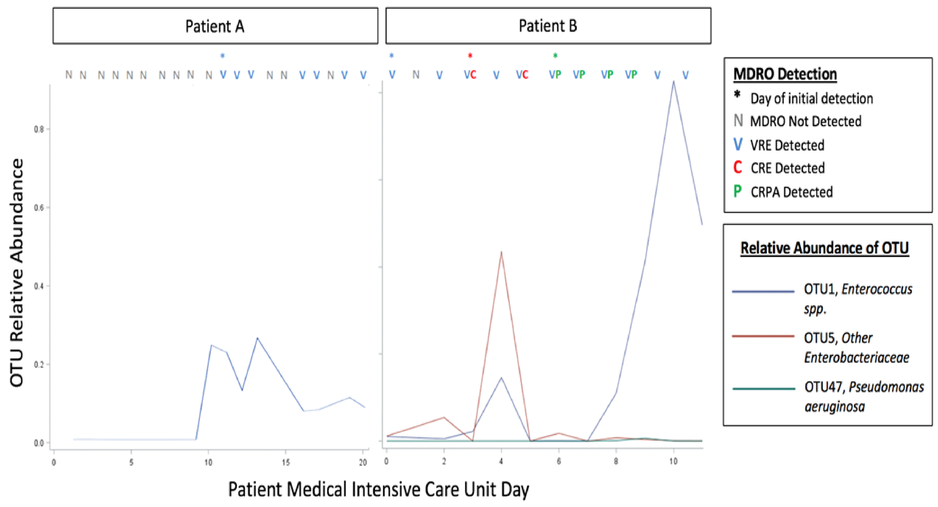
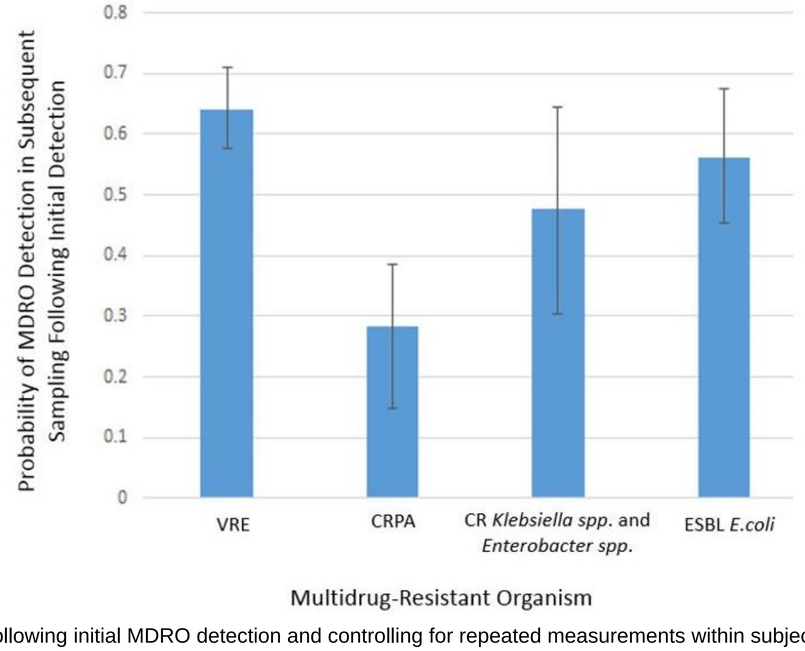
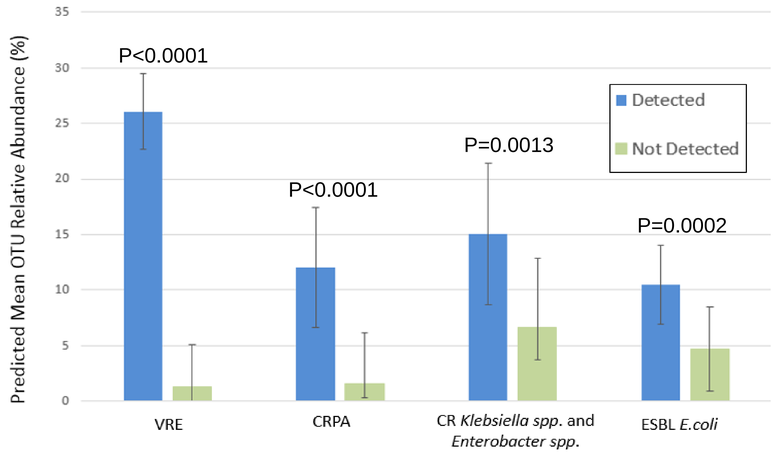


Figure 2: Probability of Subsequent MDRO Detection after First Positive Varies by MDRO Type



Following initial MDRO detection and controlling for repeated measurements within subject, the estimated probability of MDRO detection in subsequent sampling varied by MDRO type. 95% confidence intervals are represented by black-capped bars.

Figure 3: Higher Mean Corresponding OTU Relative Abundance Within Each Sample is Associated with MDRO Detection



Following initial MDRO detection, comparison of predicted mean relative abundance in subsequent MDRO-detected samples compared to negative samples by multilevel linear model with sample nested within each subject. 95% confidence intervals are represented by black-capped bars.

Limitations

The results are from a single center MICU with limited sample numbers, which may limit generalizability. Statistical modeling utilized a combination of rectal and stool swabs, which may affect detected OTU relative abundance.

Conclusions

Serial daily detection varied by MDRO type, and culture positivity was associated with higher relative abundance of the corresponding OTU in the same sample. Intermittent failure to detect MDROs could result in misattribution of MDRO acquisition, resulting in inappropriate investigation or intervention.

Acknowledgements

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