Seek and you will find. Vancomycin-resistant *E. faecium* in the intensive care unit (ICU)

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INTRODUCTION

Ireland has the highest rate of invasive vancomycin-resistant enterococci (VRE) in Europe at 46% as reported to EARS-Net. To limit VRE transmission, active surveillance screening of patients on admission to the ICU is conducted in Beaumont Hospital, Dublin. However, the ICU environment is rarely sampled nor isolates typed outside of outbreaks, limiting our ability to track transmission.

AIMS

To investigated possible VRE transmission events in an ICU, outside of outbreaks based on clinical and molecular epidemiological relationships between recovered isolates.

METHODS

The study setting was the 12-bedded general ICU of Beaumont Hospital Dublin (Figure 1.A.)

Six 'high touch' areas (patient monitor, drip stand control panel, bed control panel, bed mattress, computer keyboard and unit sink) of occupied bed spaces in the ICU were sampled using Copan eSwabs™, twice weekly over seven, three-week periods (October 2012-June 2014)

Presumptive identification of enterococci was made using Brilliance UTI clarity agar. VRE was isolated using VRE Select agar (Biorad) and confirmed using MALDI-TOF.

Patient VRE isolates obtained from routine screening were collected.

Genetic relatedness of vancomycin resistant *Enterococcus faecium* (VRE*fm*) was based on pulsed field gel electrocrophoresis (PFGE) using GelCompar®II software.

RESULTS

Table 1 VRE-positive environmental and patient isolates

Contamination detected at environmental sites in the ICU (total sites sampled=1722)	n (%)
Sites positive for bacterial growth	1206 (70)
Bacteria detected	
Sites positive for VRE	**108 (6.3)**
Sites positive for other microorganisms	1098 (63.7)
Sites negative for bacterial growth	516 (30)
Patient colonized/infected with VRE in the ICU (total patients sampled=157)	**n (%)**
Patients colonised with VRE	30 (19.1)
Enterococcus faecium	22 (14.0)
Enterococcus faecalis	8 (5.1)

Figure 1A. ICU layout indicating beds in 6 bed open plan and isolation rooms

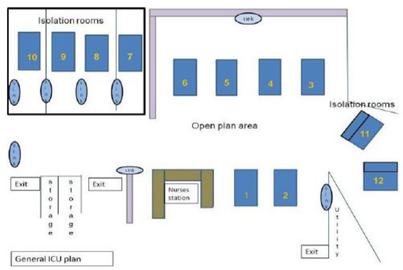

Figure 1B. VRE detection in the ICU environment
Significantly more VRE contamination was detected in isolation rooms (beds 7-12) than open plan bed spaces (beds 1-6).

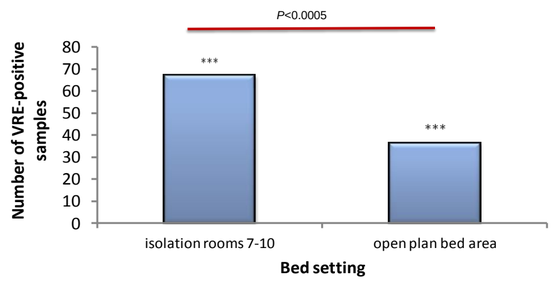

Figure 2. PFGE analysis of Environmental and patient VRE*fm*
More diversity in PFGE types was found for patient isolates than environmental isolates. Two of three PFGE clusters (A and B) identified contained environmental isolates only. The remaining cluster (C) contained patient and environmental isolates.

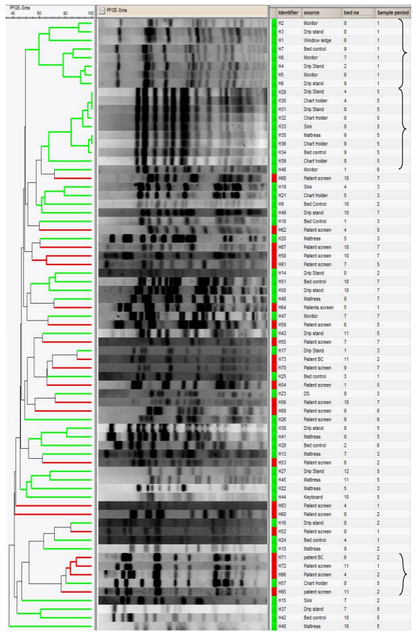

Table 2. Possible transmission events based on clinical epidemiology

Transmission direction	Number of cases[a] (n=189)	rationale
No evidence of transmission	**58**	The patient or their environment was positive for VRE and the environment remained positive and the patient remained negative or *vice versa*.
Patient to environment	**4**	A change in bed-space environmental site from VRE-negative to -positive after a VRE-positive patient occupied the space
Environment to patient	**2**	Sequential recovery of VRE from the bed-space environment and a change in the occupying patients status from VRE-negative to -positive [b]
n/a	**125**	No VRE identified from patient or environment

[a]In total, 189 unique patient and bed number associations were identified and investigated from 157 patients.
[b]In one case the patient became VRE-positive nine days after admission and placement in an environment positive for VRE. The other, involved a patient acquiring VRE having spent 48 hours in a room in which the environment had sampled VRE-positive. However the acquisition arose after the patient left the ICU

CONCLUSIONS

Different clonal patterns amongst patient and environmental VRE highlights the complexity of VRE transmission.

Environmental persistence of VRE, or recontamination with the same strain was evident from PFGE clusters.

The greater proportion of environmental VRE are detected in isolation rooms where VRE-positive patients are most often accommodated.

Further investigation of the epidemiology of VRE outside of outbreaks is needed to better inform infection prevention and control policy.

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