

# Telemetry leads as reservoir for nosocomial pathogens

Nasia Safdar<sup>1</sup>, Jennifer Drayton<sup>2</sup>, Jessica Dern<sup>2</sup>, Simone Warrack<sup>1</sup>, Megan Duster<sup>1</sup>, Michelle Schmitz<sup>2</sup>

<sup>1</sup>Department of Medicine, University of Wisconsin-Madison School of Medicine, Madison, Wisconsin, USA

<sup>2</sup>University of Wisconsin Hospital and Clinics, Wisconsin, USA

doi: 10.3396/ijic.v8i2.012.12

## Abstract

The healthcare environment is recognized as an increasingly important source of healthcare-associated infection. We undertook a microbiologic survey of patient-ready, cleaned telemetry leads at our institution and recovered pathogenic multidrug resistant bacteria, such as methicillin-resistant *Staphylococcus aureus* and vancomycin-resistant *Enterococcus* from the leads. Telemetry leads are difficult to clean and disposable leads are preferable.

## Key words

EQUIPMENT CONTAMINATION; TELEMETRY – instrumentation; CROSS INFECTION

## Introduction

Increasing evidence suggests that the healthcare environment plays an important role in the transmission of nosocomial pathogens causing infection in healthcare settings.<sup>1-4</sup> A large proportion of these pathogens are multidrug resistant, and are associated with considerable morbidity, mortality and costs.<sup>5-8</sup> A major component of the healthcare environment is reusable medical equipment such as stethoscopes, thermometers, cellular phones, ultrasound units and blood pressure cuffs which have been found to harbor

resistant nosocomial pathogens.<sup>9-13</sup> In this category of frequently used reusable medical equipment are telemetry leads. Scant data exists regarding microbiologic contamination of telemetry leads. We undertook a cross-sectional study to examine microbial contamination of telemetry leads at our institution.

## Methods

We undertook culturing of 50 randomly selected leads to determine the presence of methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin resistant

## Corresponding Author

Nasia Safdar

Department of Medicine, University of Wisconsin-Madison School of Medicine, Madison, WI

Email: ns2@medicine.wisc.edu

*Enterococcus* (VRE), fluoroquinolone resistant gram negative bacilli (FQRGNB), and *Clostridium difficile*.

### Setting

The University of Wisconsin Hospital is a 493 bed, tertiary health care organization that provides care in all major specialties, located in Madison, Wisconsin. Reusable telemetry leads are the standard of care, which are cleaned in between patients and as needed as described below. The leads were collected from hospital units that house ICU patients as well as general medical and surgical patients.

### Cleaning procedure for telemetry leads

The telemetry leads are cleaned by housekeeping when the patient is discharged using the hospital quaternary ammonium compound. Occasionally, leads will be cleaned by nursing assistant staff. Housekeeping, or the nursing assistants, wipe the leads down carefully with the above referenced cleaning solution and the leads are stored in a cabinet, each in a separate cell.

Fifty leads and five lead storage containers were swabbed in five different units. Swabs were vortexed in 0.9% saline solution. From this suspension, 100 µL was inoculated onto Mannitol Salt Agar supplemented with 4 µg/mL cefoxitin (MSFOX), Bile Esculin Azide Agar supplemented with 6 µg/mL vancomycin (BEAAV) and MacConkey's Agar supplemented with 4 µg/mL ciprofloxacin (Mac+CIP) plates for the detection of MRSA, VRE, and FQRGNB respectively. To further enrich for MRSA and *Enterococcus*, 100 µL of the original suspension was also inoculated into tubes of 6.5% NaCl TSB and bile esculin azide broth. Enrichment tubes were incubated overnight and 50 µL was plated onto MSFOX and BEAAV. Suspicious colonies were subcultured to Tryptic Soy Agar supplemented with 5% Sheep's blood (BAP) and subsequently identified using gram stain, catalase, coagulase, and PYR testing. Resistance to meticillin or vancomycin was confirmed using susceptibility testing (Kirby-Bauer or ETEST method).

Separate swabs were collected for *C. difficile* culture. These were inoculated directly into pre-reduced anaerobic Brain Heart Infusion (BHI) broth (Anaerobe Systems, Morgan Hill, CA), incubated anaerobically overnight and plated onto pre-reduced anaerobic

Cycloserine, Cefoxitin, Fructose Agar (CCFA) (Anaerobe Systems, Morgan Hill, CA). Suspicious colonies (colonies with a gray, irregular, rough morphology) were subcultured to BAP and subsequently identified using gram stain. All microbiology testing was performed using standard methods.

### Results

We found that one lead (1/50, 2%) was positive for MRSA and three leads (3/50, 6%) harbored VRE. No FQRGNB were detected on any of the leads. One lead storage container was also found to be positive for VRE. Multiple other organisms were recovered from the leads, including organisms with morphology consistent with *Staphylococcus* coagulase negative (CoNS) and 16 leads were positive for non-enterococcal organisms.

We did not recover *C. difficile* from any leads; however four leads had growth of a non-*C. difficile* spore forming (or possible spore forming) organism and twelve leads had growth of a non-spore forming organism.

### Discussion

Nosocomial infections are associated with considerable morbidity and costs. Moreover, about 100,000 people each year die of a nosocomial infection. In recent years, the role of the healthcare environment has come under study as an important factor in nosocomial transmission of microorganisms. In our study, we found that cleaned, patient-ready telemetry leads harbored microorganisms, including multidrug-resistant MRSA and VRE.

Our results confirm those of previous studies. In an earlier study, published in abstract form from our institution that examined telemetry leads as reservoirs of resistant bacteria, Maki et al. found that out of 50 leads cultured, nine were positive for VRE (18%), and four for *S. aureus* (8%). Gram-negative bacteria, such as *Pseudomonas* species (4), *Acinetobacter* species (3), and *Serratia* species (1) were also recovered.<sup>14</sup>

Albert et al. undertook a multisite study of 320 cleaned patient-ready leads from critical care and telemetry units, emergency departments and operating rooms of four hospitals. Of 226 cultures from 201 wires (62.8%) with bacterial growth, 37.8% were

potentially pathogenic organisms posing risk of infection. Urban hospitals had less growth ( $P \leq 0.001$ ) and fewer bacterial species per wire ( $P \leq 0.001$ ) than did community hospitals. Presence of any bacteria ( $P = 0.02$ ) and number of bacterial species per wire ( $P = 0.002$ ) were lowest in operating rooms. Emergency departments and telemetry units had more growth than did critical care units.<sup>15</sup> These findings are not surprising, because telemetry leads are very difficult to clean adequately. The multiple surfaces, nooks and crannies are not easily accessible for cleaning and lend themselves to supporting the growth of bacteria. Our study has several limitations. We did not correlate lead contamination with nosocomial infection or colonization in patients by the recovered microorganisms. In an epidemiological study of a VRE outbreak in a burn unit, Falk *et al.* found that a contaminated electrocardiogram lead was responsible for the recurring outbreak, which was eventually contained using barrier isolation and a very aggressive environmental decontamination program.<sup>16</sup>

In conclusion, telemetry leads may serve as reservoirs for nosocomial bacteria. At our institution, this data provided the impetus to switch to disposable leads.

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