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Blood pressure cuffs: friend or foe?

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Summary A study to assess the level of bacterial contamination of blood pressure cuffs in use on hospital wards was performed. Viable organisms were recovered from all the 24 cuffs sampled at a density of between 1000 and >25 000 colony-forming units/100 cm^2. Potential pathogens were isolated from 14 cuffs (58%). Eleven cuffs grew a single pathogen and three cuffs grew a mixture, yielding a total of 18 isolates. Meticillin-susceptible *Staphylococcus aureus* was isolated from eight (33%) cuffs, meticillin-resistant *S. aureus* was isolated from two (8%) cuffs and *Clostridium difficile* was isolated from eight (33%) cuffs. This study serves as a reminder that hands are not the only fomite to go from patient to patient on hospital wards, and that measures should be taken to reduce the risks posed by blood pressure cuffs.

Introduction

Much attention has recently been focused on 'dirty hospitals' as a key factor in the widespread high rates of meticillin-resistant *Staphylococcus aureus* (MRSA) infection found in the UK.[1] While the evidence for an environmental reservoir being important is scant, transmission by equipment that comes into direct skin contact with many patients is difficult to dismiss. Previous investigations have identified blood pressure cuffs as potential vehicles for transmission of nosocomial infection in selected patient populations.[2]

This study examined the level of viable bacterial contamination of blood pressure cuffs in general use, and checked for the presence of typical nosocomial pathogenic organisms amongst this flora.

Methods

Study sample

Twenty-four blood pressure cuffs representative of various medical and surgical wards at the Royal

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Preston Hospital were selected for inclusion in the study.

Microbiology

Using sterile gloves, a disposable sterile template measuring 10 × 10 cm was placed on to the part of the cuff material coming into direct contact with patients' skin during blood pressure measurement. A dry gauze swab, moistened with a neutralizing buffer (Technical Service Consultants Limited, Lancashire, UK), was rubbed vigorously on to the defined 100-cm^2 area for 1 min. The swab was then placed in a sterile container with 10 mL of the neutralizing buffer and transported to the laboratory within 1 h. From each sample, duplicate 0.5-mL samples were inoculated on to six different media, comprising a non-selective agar medium for a total viable count (TVC) and selective media for *S. aureus*, MRSA, *Clostridium difficile*, coliforms and vancomycin-resistant enterococcci (VRE). All plates were read after 48 h except the plates for coliforms and VRE, which were read after 24 h. All plates were incubated aerobically except those for *C. difficile*. Pathogenic organisms were identified and confirmed by standard operating procedures approved by the Health Protection Agency. Cuffs from which *S. aureus* was isolated, without any growth on the MRSA selective plates, were deemed to be positive for meticillin-susceptible *S. aureus* (MSSA). Sensitivities were checked on four colonies of *S. aureus* picked from the non-selective plate when MRSA was grown to check for mixed growth. The TVC plate colonies were counted using a video-camera-based image analysis system (Sorcerer, Perceptive Instruments, Haverhill, UK). The TVC from each blood pressure cuff was taken as the mean number of colonies on the duplicate plates multiplied by 20 to give a count per 100 cm^2 of cuff material.

Results

All cuffs grew viable microbes, predominately Gram-positive skin or environmental flora. Potentially pathogenic organisms were isolated from 14 of the 24 cuffs. A single pathogen was isolated from 11 cuffs: MSSA from five cuffs, MRSA from one cuff and *C. difficile* from five cuffs. More than one pathogenic organism was isolated from three cuffs: one cuff harboured MSSA, MRSA and *C. difficile*, while two cuffs harboured both MSSA and *C. difficile*. Coliforms and VRE were not isolated from any of the cuffs. The range of total viable counts recovered per 100 cm^2 and its relationship with the presence of any potential pathogen is shown in Figure 1. While the cuffs with the highest total counts tended to have more pathogens present, pathogens were found within this flora at all levels of contamination.

There was no clear correlation between the isolation of *C. difficile* from cuffs and the frequency of recognized cases of *C. difficile*-associated diarrhoea on the ward.

Discussion

The frequency of pathogenic organisms isolated in this study was high, with 14 of 24 (58.3%) cuffs harbouring one or more of MSSA, MRSA and *C. difficile*. No coliforms were recovered, possibly reflecting their poor tolerance of desiccation compared with staphylococci. The pathogens isolated are sources of nosocomial infection with serious consequences and cost implications.[3]

The actual importance of this route of transmission remains unclear. While the recovery of organisms at a count of greater than 25 000 colony-forming units (cfu)/100 cm^2 from some cuffs suggests that this is a realistic possibility, the count of the recognized pathogens within this flora never exceeded 200 cfu/100 cm^2. While handwashing remains the most important measure in decreasing the spread of nosocomial pathogens, the disinfection of hospital equipment and the use of disposable items is also important.[4,5] Disinfecting blood

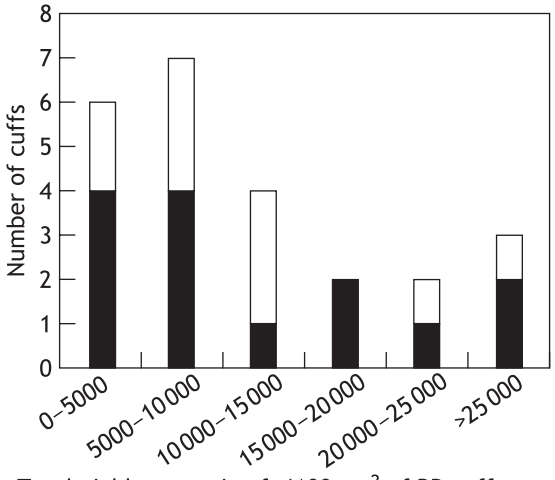

Figure 1 The distribution of the total viable bacterial count recovered from 24 blood pressure (BP) cuffs and its relationship with the recovery of any pathogen. cfu, colony-forming unit; open bars, no pathogen isolated; solid bars, any pathogen isolated.

pressure cuffs alone will not eliminate all microbial life, particularly *C. difficile* whose spores survive for a long time in the environment and are resistant to commonly used disinfectants.[6]

Educating nurses about disinfection procedures could be beneficial in decreasing infection rates.[7] However, the current practice of nursing observation rounds in which equipment goes from patient to patient affords little time for decontamination. Cuffs for single-patient use, which stay with the patient throughout their hospital stay, or disposable (single-use) covers to protect the cuff are more viable options and should be backed up by a regular disinfection programme where multi-use cuffs are used. Disposable blood pressure cuffs should be an effective approach but their uptake is likely to be constrained by cost.[8] The wider use of disposable cuffs or cuffs for single-patient use would reduce the risk of transmission of pathogens by this route.

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