CORRESPONDENCE

Reduction of blood culture contamination rate by an educational intervention

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We read with considerable interest the recent article in *CMI* by Eskira *et al.* [1], in which the authors described the use of an educational intervention to significantly reduce blood culture contamination (BCC) rates. We agree that this protocol should be considered in settings where BCC rates are a major difficulty, such as the intensive care unit (ICU). Particularly in the ICU, favourable evolutions in healthcare have resulted in a change in the profile of critically-ill patients, making them highly susceptible to infection by opportunistic pathogens. The risk of severe infection means that broad-spectrum empirical antimicrobial agents are administered frequently (and often incorrectly), thereby increasing selection pressure and drug resistance [2]. To focus empirical treatment, site-specific surveillance cultures are taken in our hospital on a routine, thrice-weekly basis [3]. As colonisation with resistant pathogens often precedes infection, these surveillance cultures have proven to be useful in the choice of empirical regimen [4,5]. Eskira *et al.* [1] reported that 1420 pre-intervention blood cultures and 1618 post-intervention blood cultures were retained for analysis, from which bloodstream infection was diagnosed in 30 (3.6%) and 36 (4.5%) patients, respectively, but no information was provided concerning the pathogens isolated or the number of patients already receiving antimicrobial agents when the blood cultures were obtained.

Furthermore, although blood cultures should be taken at the time of spiking fever, they are often negative at this point. Therefore, the collection of blood cultures should be spread over time to increase the likelihood of microbiological confirmation of bacteraemia or candidaemia [6]. Because of the low sensitivity of blood cultures for detection of microorganisms, this strategy can also be useful in distinguishing true from contaminant bloodstream infection. With these suggestions in mind, we would be interested to know if Eskira and colleagues can elaborate on the indications for which blood cultures were performed.

D. M. Vandijck[1,2], S. I. Blot[1,2] and J. M. Decruyenaere[1]

[1]Department of Intensive Care Medicine, Ghent University Hospital and [2]Hogeschool Gent, Department of Health Care 'Vesalius', Ghent, Belgium
E-mail: Dominique.Vandijck@UGent.be

REPLY FROM DR GILAD

We appreciate the comments of Vandijck and colleagues. The performance of surveillance cultures in the intensive care setting is indeed of great value in directing empirical antimicrobial therapy. However, our study was performed in the internal medicine setting, in which routine microbiological surveillance is not common practice because of a lower colonisation pressure and questionable cost-effectiveness. Moreover, it should be noted that skin colonisation with nosocomial pathogens can also lead to blood culture contamination, especially if inadequate techniques are employed, and thus knowledge of pre-existing colonisation may not always be helpful in the interpretation of blood culture results. As for the species distribution of true bloodstream infection in our study population, the rates of isolation, in decreasing order of frequency, were: *Escherichia coli* (28.8%); *Staphylococcus aureus* (24.2%); *Streptococcus* spp. (7.6%); *Acinetobacter* spp. (7.6%); *Klebsiella pneumoniae* (6%); *Enterobacter* spp. (6%); *Pseudomonas aeruginosa* (4.5%); *Proteus mirabilis* (4.5%); *Candida albicans* (3%); *Bacteroides* spp. (3%); *Brucella melitensis* (3%), and *Enterococcus* spp. (1.5%). Of 66 true bloodstream infections, 6% were hospital-acquired.

Vandijck and colleagues also discuss the limited sensitivity and specificity of blood cultures and stress the importance of obtaining blood cultures over time. Undoubtedly, interpretation of blood culture results should be based not only on the identity of bacterial isolates, but also on additional parameters such as the proportion of positive blood culture sets, the number of positive bottles within each set and the time to positivity. In our study, blood cultures were obtained at the discretion of attending doctors when infection was suspected, either upon admission or during a hospital stay. According to our institutional guidelines (unrelated to the current intervention), more than one blood culture set should be obtained in such cases. Although, for the sake of sample

homogeneity, only the first culture set from each patient was analysed, we did consider the results of additional culture sets that had been obtained during the same febrile episode in order to determine the significance of growth.

J. Gilad
Clinical Microbiology Laboratory, Tel Aviv Sourasky Medical Center, Tel Aviv, Israel

REFERENCES

1. Eskira S, Gilad J, Schlaeffer P *et al*. Reduction of blood culture contamination rate by an educational intervention. *Clin Microbiol Infect* 2006; **12**: 818–821.
2. Colardyn F. Appropriate and timely empirical antimicrobial treatment of ICU infections – a role for carbapenems. *Acta Clin Belg* 2005; **60**: 51–62.
3. Blot S, Vandewoude K. Early detection of systemic infections. *Acta Clin Belg* 2004; **59**: 20–23.
4. Depuydt PO, Blot SI, Benoit DD *et al*. Antimicrobial resistance in nosocomial bloodstream infection associated with pneumonia and the value of systematic surveillance cultures in an adult intensive care unit. *Crit Care Med* 2006; **34**: 653–659.
5. Langer M, Carretto E, Haeusler EA. Infection control in ICU: back (forward) to surveillance samples? *Intens Care Med* 2001; **27**: 1561–1563.
6. Marik PE. Fever in the ICU. *Chest* 2000; **117**: 855–869.

Contamination of catheter-drawn blood cultures

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We read with interest the recent article in *CMI* by Eskira *et al*. [1] reporting a change in the rate of blood culture contamination following an educational intervention. The authors concluded that this programme of training, in which a number of instructions for obtaining blood via venepuncture were outlined, significantly reduced the rate of blood culture contamination.

Although most blood samples for culture are obtained via the percutaneous route, blood is often obtained from existing intravascular catheters for reasons such as poor venous access, a requirement for frequent blood sampling, and as an aid to the diagnosis of catheter-related bloodstream infection (CR-BSI) using paired blood cultures. The use of percutaneously acquired blood samples has been demonstrated to be more sensitive for the diagnosis of bacteraemia in comparison with catheter-drawn specimens [2,3]. Catheter-drawn blood cultures may be positive because of true bacteraemia, catheter colonisation or catheter contamination, with the latter being responsible for this reduced sensitivity.

The main routes of entry for microorganisms implicated in CR-BSI have been outlined previously [4], and include intra-luminal migration of microorganisms from the hub. Indeed, microbial colonisation of the catheter hub has been described as the initial step in the pathogenesis of CR-BSI acquired via the intra-luminal route, and is responsible for the highest proportion of CR-BSI in patients with long-term central venous catheters [4,5]. A previous study has demonstrated that 22% of stopcock entry ports and 31% of arterial line hubs were contaminated with microorganisms after 72 h *in situ*, although none of the study patients exhibited clinical evidence of CR-BSI [6]. This highlights the potential of the hub as a source for microbial contamination of catheter-drawn blood samples.

Skin antisepsis used before venepuncture in order to reduce the risk of blood culture contamination has been investigated widely in comparison with research into the prevention of catheter-drawn blood sample contamination. This may, in part, be a consequence of a general discouragement of using catheter-drawn blood for culture because of its reduced sensitivity in aiding the diagnosis of true bacteraemia, and the possibility of increasing the chance of microbial colonisation within the catheter lumen following increased fibrin deposition.

Several strategies to reduce microbial contamination of catheter hubs have been developed. These include the development of a highly porous cleaning swab to remove microorganisms from access ports, frequent heating of metallic hubs, the application of disinfectants, and the use of needle-less connectors [6,7]. With the exception of the application of disinfectants, none of these methods has, to date, been implemented widely in the clinical setting. A previous study [7] demonstrated that chlorhexidine gluconate 0.5% w/v in isopropyl alcohol 70% v/v was more efficacious than isopropyl alcohol 70% v/v or aqueous povidone-iodine 10% w/v for the decontamination of intravenous connections. This is consistent with the recommendation by Eskira *et al*. [1] for disinfection of skin and bottle injection ports. Another potential method of reducing the risk of contamination is to replace access ports immediately before blood samples are drawn from the catheter.