SHORT REPORT

Do peripheral blood cultures taken in the emergency department influence clinical management?

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Background: Blood cultures are routinely used to investigate suspected sepsis in the emergency department despite several studies demonstrating their limited influence on patient management.

Objectives: To quantify the use and clinical relevance of blood cultures obtained in the emergency department.

Methods: A retrospective study of blood cultures taken in the emergency department between 1 January 2003 and 31 December 2004. Microbiology results and patient records were reviewed to determine the influence of positive cultures on subsequent patient management.

Results: 2213 blood cultures were taken in the emergency department over the study period. 132 (6%) yielded a positive result. Three positive cultures cases had incomplete information. Of the remaining 129 positive cultures, 30 (1.4% of all cultures) were "true positives" and 4 (0.18%) influenced subsequent patient management.

Conclusions: Blood cultures taken in our emergency department rarely yield bacterial growth and over 2 years, only four seemed to directly influence patient management. Better guidelines are required for targeted use of blood cultures in the emergency department.

Blood cultures are routinely used for initial investigation of suspected sepsis in the emergency department. Studies from Europe, North America and Australasia show that blood cultures obtained in an emergency department have little influence on clinical management.^{1–4} A pilot study in our emergency department by JFG suggested similar findings and was therefore extended to include 2 years of data.

Methods

The emergency department of the Southern General Hospital, Glasgow, UK, has about 47 000 new attendances annually. We identified all blood cultures taken in the emergency department between 1 January 2003 and 31 December 2004 from computerised records of the microbiology department. Ethical approval was sought and waived as there were no patient interventions and only anonymised retrospective data was involved. Where cultures produced bacterial growth, the result were reviewed along with the consultant microbiologist's report, by NH. We categorised those reported as "significant" or "significance uncertain" as "true positive" and those assessed as "doubtful significance" were designated "false positive" (eg, thought to result from skin contaminants). The study aimed to examine indications for blood cultures, their yield and influence on patient management. We reviewed clinical records of true positive cases comparing the organism isolated with the diagnosis, to ascertain whether the microbiology report was acknowledged and whether clinical management was influenced (eg, a change in the antibiotic regimen).

RESULTS

A total of 2213 paired peripheral blood cultures were obtained in the emergency department during the study period. In all, 132 (6%) yielded growth; for the remaining 94%, no growth was detected after prolonged incubation. Three patients' case records had incomplete information and were excluded from further study. Of the remaining 129 patients, only 30 (1.4% of all cultures obtained) yielded true-positive results. The remaining 99 blood cultures were false positive.

Table 1 lists the organisms grown from true-positive blood cultures; the most common organism was *Escherichia coli*.

Of the 30 patients with true-positive blood cultures, four had evidence that their management had been altered as a direct result. In three cases, antibiotic regimens were changed because of organisms' resistance to initial antibiotics. In the fourth case, blood culture results prompted urine culture and renal ultrasound, confirming *E coli* pyelonephritis. Therefore, of 2210 blood cultures with complete information, only 4 (0.18%) resulted in altered patient management. Sixteen patients with a true-positive culture result had no acknowledgement in their case records. Table 2 shows the emergency department diagnoses for true-positive cases.

DISCUSSION

Our results demonstrate a poor yield for blood cultures taken in our emergency department. Only 6% of all cultures taken over 2 years producing any growth and only 1.4% of all cultures were clinically relevant. Our results are consistent with studies from Europe, North America and Australasia.^{1–4} In our hospital, a consultant microbiologist personally contacts the ward medical staff for each true-positive blood culture along with relevant sensitivities. Despite this, results were acknowledged in case records on only 14 of 30 occasions and by supervising consultants in only 3. Confirming the sensitivities of organisms to existing antibiotic treatment is useful, but we found no evidence that this information was recorded.

This study was not designed for economic analysis, but the overall costs of consumables alone per true positive blood

Table 1 Results of "true-positive" cultures

Organism cultured	Number
<i>Escherichia coli</i>	13
Streptococci	5
Enterococci	3
Aerobic Gram negative	2
Aerobic Gram positive	2
<i>Bacteroides</i>	1
<i>Clostridium</i>	1
Multiple resistant <i>Staphylococcus aureus</i>	1
<i>Proteus</i>	1
Staphylococci	1
Total	30

Table 2 Initial emergency department diagnosis for patients with "true-positive" cultures

Emergency department diagnosis	n (% true positives)	Management change
Pneumonia	7 (23)	1
Abdominal sepsis	5 (17)	1
Urinary tract infection	5 (17)	
Neutropenic sepsis	2	
Pyelonephritis	2	
Subacute bacterial endocarditis	2	
Aspiration pneumonia	1	
Blocked ventriculo-peritoneal shunt	1	1
Decompensated alcoholic liver disease/ spontaneous bacterial peritonitis	1	
Diarrhoea and vomiting	1	
Groin abscess	1	
Ischaemic foot	1	
Septic arthritis	1	1
Total	30	4

culture was £469 and per blood culture affecting patient management was £3517.50.

Kelly¹ recommended that blood cultures should only be taken if there is likely to be a bacterial origin for the illness, no "direct" specimen is available for culture (eg, urine, cerebrospinal fluid and joint aspirate) and inpatient treatment is required. Direct samples for culture are often readily available and have been shown to produce a greater yield in terms of causative organism.¹ In our study population, direct samples were possible in 17 of the 30 patients with true-positive cultures. Kelly also recommends that blood cultures should not be taken from immunocompetent patients with common infections (eg, cellulitis, orchitis and community-acquired pneumonia), a finding confirmed by subsequent studies.⁶⁻⁸

Applying Kelly's recommendations to our population, only 10 of the 30 true-positive patients would have had blood cultures sent. This probably reflects differences in patient populations and acuity between patient populations. Despite this, there is clear potential to develop guidelines to considerably reduce the number of true-negative cultures obtained in the emergency department without missing true-positive results.

Conclusion

Blood cultures taken in our emergency department seldom generate clinically relevant results and seem to have little effect on subsequent patient management. Guidelines resulting in more targeted use of emergency department blood cultures are needed.

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JFG completed and wrote the original pilot study. NH undertook the data collection and analysis of the main study. PM developed the original idea and wrote the paper along with JFG and NH. PM is the guarantor.

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