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 showing 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 patients' 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 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 (Southern General Hospital, Glasgow, UK) rarely yield bacterial growth, and over 2 years only four cultures 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 investigations 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 (Southern General Hospital, Glasgow, UK) by JFG suggested similar findings and was therefore extended to include 2 years of data.

METHODS

Our emergency department has approximately 47 000 new attendances annually. We identified all blood cultures taken there 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 were involved. Where cultures produced bacterial growth, the result was 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 to determine whether clinical management was influenced (eg, a change in the antibiotic regimen).

RESULTS

In all, 2213 paired peripheral blood cultures were obtained in the emergency department during the study period; 132 (6%) yielded growth and, in 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 was *Escherichia coli*.

Of the 30 patients with true positive blood cultures, 4 showed evidence that their management had been altered as a direct result. In three cases, antibiotic regimens were changed because of the organism's resistance to initial antibiotics. In the fourth case, blood culture results prompted urine culture and renal ultrasound, confirming *E coli* pyelonephritis. Therefore, of the 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 diagnoses in the emergency department for patients with true positive cultures.

DISCUSSION

Our results show a poor yield for blood cultures taken in our emergency department. Only 6% of all cultures taken over 2 years produced any growth and only 1.4% of all cultures were clinically important. 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 arguably 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

Organisms cultured	n
<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
Multiply resistant <i>Staphylococcus aureus</i>	1
<i>Proteus</i>	1
<i>Staphylococci</i>	1
Total	30

Table 2 Initial diagnosis in the emergency department 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 ventriculoperitoneal 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, joint aspirate) and inpatient treatment 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.^{5–7}

Applying Kelly's recommendations to our population, only 10 of the 30 patients with true positive results would have had blood cultures sent. This probably reflects the 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.⁸

CONCLUSION

Blood cultures taken in our emergency department seldom generate clinically important results and seem to have little effect on subsequent patient management. Guidelines resulting in more targeted use of blood cultures from emergency departments 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. PTM developed the original idea and wrote the paper along with JFG and NH. PTM is the guarantor.

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REFERENCES

- 1 Kelly AM. Clinical impact of blood cultures taken in the emergency department. *J Accid Emerg Med* 1998;**15**:254–6.
- 2 Leonard P, Beattie TF. How do blood cultures sent from a paediatric accident and emergency department influence subsequent clinical management? *Emerg Med J* 2003;**20**:347–8.
- 3 Sturmann KM, Bopp J, Molinari D, et al. Blood cultures in adult patients released from an urban emergency department: a 15-month experience. *Acad Emerg Med* 1996;**3**:768–75.
- 4 Cisneros-Herreros JM, Sanchez-Gonzalez M, Prados-Blancos MT, et al. Blood cultures in the emergency department. *Enferm Infecc Microbiol Clin* 2005;**23**:135–9.
- 5 Corbo J, Friedman B, Bijur P, et al. Limited usefulness of initial blood cultures in community acquired pneumonia. *Emerg Med J* 2004;**21**:446–8.
- 6 Kennedy M, Bates DW, Wright SB, et al. Do emergency department blood cultures change practice in patients with pneumonia? *Ann Emerg Med* 2005;**46**:393–400.
- 7 Mills AM, Barros S. Are blood cultures necessary in adults with pyelonephritis? *Ann Emerg Med* 2005;**46**:285–7.
- 8 Stuart PJ, Crooks S, Porton M. An interventional program for diagnostic testing in the emergency department. *Med J Aust* 2002;**177**:131–4.