

Rapid detection of health-care-associated bloodstream infection in critical care using multipathogen real-time polymerase chain reaction technology: a diagnostic accuracy study and systematic review

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Plain English summary

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Plain English summary

Infection is a major cause of illness and death in patients admitted to NHS hospitals, and improving prevention and treatment of infection are among the highest priorities of the Department of Health. Life-threatening infections often occur in critically ill patients, who are particularly vulnerable. Early therapy with the correct antibiotic is the key to effective treatment, but current techniques for identifying the specific bacteria responsible involve trying to grow the organism in an incubator (culture). This process takes up to 5 days, and during this time patients are treated by 'educated guesswork' involving prescription of powerful 'broad-spectrum' antibiotics, usually reserved for hard-to-treat infections. These drugs are effective against a wide range of organisms but their use, unfortunately, encourages development of multiresistant bacteria, for example methicillin-resistant *Staphylococcus aureus*, which is becoming a major problem.

New molecular techniques that detect minute amounts of bacterial deoxyribonucleic acid in a patient's blood within a few hours have the potential to provide much more rapid and precise diagnosis and treatment of bloodstream infection. This technology is currently being marketed commercially, but independent studies are needed to be sure that these techniques are sufficiently accurate to justify their routine clinical use. A large clinical trial of this technology has been undertaken by a team of clinicians and scientists in over 1000 patients suspected of having bloodstream infection from four large critical care NHS services in the north-west of England. Following permission from patients and their families, blood from each patient was analysed by the molecular test and by conventional blood culture. Before commencing the study, it was agreed with an independent ethics committee and a National Institute for Health Research Trial Steering Committee, which included patient representatives, that the results of blood culture, but not of the molecular test, would be used to guide care for patients in this study because we did not know how the new molecular test would perform.

Comparison of the results of the two tests showed that the molecular test was able to detect bloodstream organisms twice as often as conventional culture, suggesting that the new test might uncover more infections in patients. However, on occasion, the molecular test missed some important infections compared with conventional culture and, therefore, is not ready for routine introduction to frontline NHS care. The reasons for these results are currently being carefully investigated by the project team, as they were able to store extra clinical blood samples, with permission from each patient, allowing them to perform additional scientific investigations that will help them uncover how to improve the molecular test. This means that when a better molecular test is developed, the team will be able to rerun this study quickly on the stored samples without the need for further patient blood sampling allowing rapid transfer from laboratory scientific discovery to help deliver the safest care for patients being treated within the NHS.

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