

Commentary

Extending the role of lactate measurement into the prehospital environment

Rupert M Pearse

Intensive Care Unit, Royal London Hospital, Barts and The London School of Medicine and Dentistry, Queen Mary's University of London, London E1 1BB, UK

Corresponding author: Rupert Pearse, rupert.pearse@bartsandthelondon.nhs.uk

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See related research by Jansen *et al.*, <http://ccforum.com/content/12/6/R160>

Abstract

Early identification of haemodynamic shock is widely acknowledged as a vital step towards improving survival. A report in the previous issue of *Critical Care* describes the relationship between lactate concentrations in blood samples analysed in the prehospital environment and subsequent hospital mortality. These preliminary data indicate a promising avenue of research into the treatment of haemodynamic shock. Larger observational and interventional trials are needed to confirm the clinical value of serum lactate measurement in the prehospital environment.

In the previous issue of *Critical Care* an interesting observational study suggests a promising avenue of research that has the potential to improve clinical outcomes [1]. The early identification and rapid treatment of haemodynamic shock is widely acknowledged as a vital step towards improving survival [2]. In prehospital care, this process is particularly challenging. Limitations of time, equipment, available skill set and environment render the objective diagnosis of haemodynamic shock difficult.

The utility of serum lactate as a tool to identify the most seriously ill patients and to monitor their response to treatment has long been recognised [3-5]. This latest investigation describes the prognostic value of peripheral venous or capillary blood lactate concentration, measured in 124 patients before hospital arrival by paramedic ambulance staff using hand-held battery-powered technology [1]. The findings confirm the expected relationship between the prehospital serum lactate concentration and subsequent hospital mortality. Similar findings in a much smaller investigation have been published previously [6]. These data should encourage further research into the prehospital use of serum lactate to facilitate prompt identification and treatment of haemodynamic shock and/or to indicate those patients who might benefit from advanced activation of medical staff in the destination hospital. Some important issues do, however, remain unresolved.

The authors suggest that a single value of serum lactate measured in the prehospital environment predicts hospital mortality in this population. This suggestion may, however, be a subtle overinterpretation of the findings. Whilst lactate levels are clearly much greater in those patients who die, this variable does not appear to have been included in the multivariate analysis. It is the change in serum lactate, between the first measurement in the community and the second on hospital arrival, that is independently associated with death. The importance of this distinction would depend upon how these findings are applied in clinical practice. If lactate measurement is incorporated into routine prehospital care, it would probably be as part of a specific treatment algorithm. Indeed, biomarkers can only be used to improve clinical outcome when used as a trigger for a specific intervention, or less commonly when used as a therapeutic target. Accurate data on threshold values are essential if lactate measurement is to be used in this way. In this study, receiver operator characteristic curve analysis suggests a lactate concentration of 3.5 mmol/l as the optimal cutoff value for mortality prediction. If lactate is not an independent predictor of outcome, however, then the utility of this threshold value may be limited. As the authors themselves suggest, larger trials are required to validate these findings. The sample population is also too small and too heterogeneous to support specific conclusions regarding threshold values for specific subgroups of patients (for example, septic shock patients).

For similar reasons, the accuracy of lactate measurement in peripheral venous or capillary blood samples must be carefully considered. This is a simple and attractive approach that allows the measurement of serum lactate in the great majority of patients attended in the prehospital environment. The relationship between the lactate concentration in such samples and those drawn from an arterial or central venous catheter, however, has not been established. Anecdotal

experience suggests that lactate concentrations are often greater in peripheral blood samples but not by a constant or predictable margin. Any difference is likely to be of greater importance in more severely shocked patients.

The authors are to be congratulated for completing this first phase of a promising line of investigation. Future research should further clarify the clinical significance of lactate concentrations in patients with haemodynamic shock. Interventional trials may then confirm the efficacy of serum lactate measurements to aid the identification of these patients and to guide their subsequent treatment.

Competing interests

The author declares that they have no competing interests.

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