EVIDENCE-BASED MONITORING FOR THE DIAGNOSIS OF HYPOVOLAEMIA

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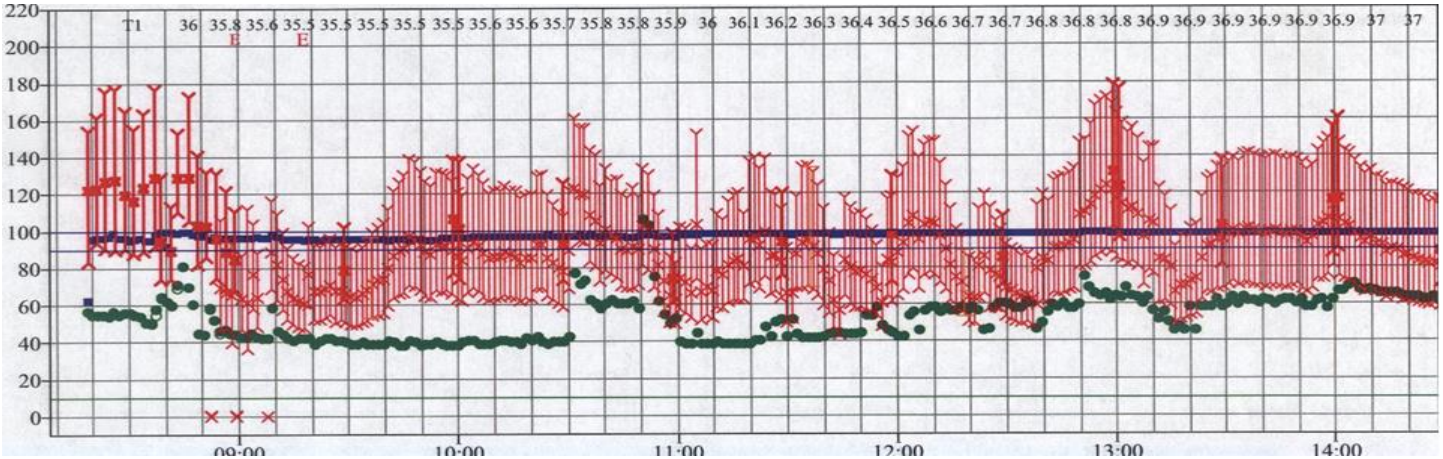


Introduction:

Present monitoring systems use threshold values for alarm generation and do not integrate the data streams that are produced from the monitored variables. False alarms are common and can result in alarms being ignored [1]. In addition, many medical errors are attributed to error or delay in diagnosis [2]. The purpose of this

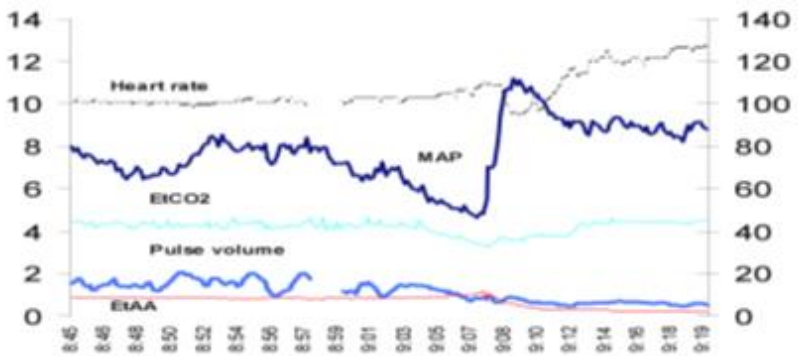
Results:

Ten patients' data were analysed; a total of 46 hours of anaesthesia time. There were 32 15-minute episodes where the anaesthetist assessed the patients as being hypovolaemic; the evidence-based software suggested hypovolaemia in 35 periods. Using the clinicians' assessment as the gold standard the sensitivity the software testing

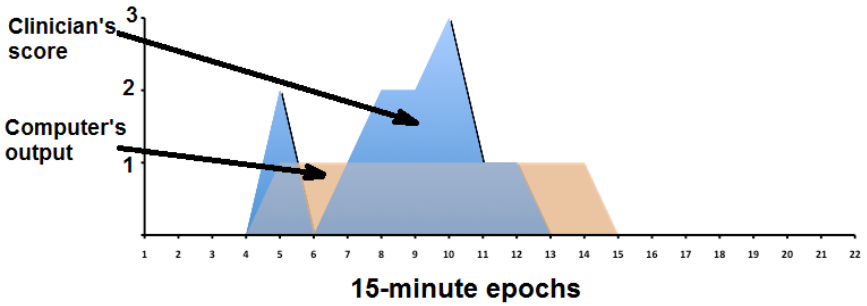
project was to produce a secondary monitoring system that would combine features (pieces of evidence) in the data streams to suggest adverse patient states.

Method:

A monitoring system evolved that allows some pathologies and the type of anesthetic to modify the alert generating system. Data were collected from GE AS5 monitors at 10s intervals and arterial pressure waveforms at 100Hz (to assess respiratory associated pulse pressure variability); the monitoring system processes the data in real-time. With local ethics committee approval and patient consent intra-operative data were collected simultaneously with the anaesthetists' assessment of the patient's volume status at 15-minute intervals using a scoring system; from 1 (possible) to 3 (definite). An off-line assessment of the monitor's output was compared with the clinical assessments (change in blood pressure, heart rate, use of vasoconstrictors and fluids) of the patients' volume status.



was 0.59 and the specificity 0.83. The agreement (the total of true positives and true negatives) was 72%; the number of false positives 13%. An example of the output is presented in the figure.



Conclusions

It is possible to create software that recognises the patterns of physiological change in real-time and alert the anaesthetist to the change. These changes are pieces of evidence that when combined are suggestive of a diagnosis; a falling blood blood pressure, rising heart rate together with a diminution in the pulse volume suggests an organised physiological response to hypovolemia. This pilot study indicates that this approach merits further testing with more objective measures – the anaesthetist is not a gold standard and it is possible that the monitoring software was correct in suggesting hypovolaemia when the anaesthetist did not recognise the early subtle changes of blood loss.

References

1. *Br J Anaesth. 2006;97(1):12-7.*
2. JAMA 1994. 272:1851–68.