



Assessing fluid shifts non-invasively in children – validation and reproducibility of a bioelectrical impedance assay (Bodystat[®])

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Background



The measurement of bioelectrical impedance is simple and non-invasive and offers a potential solution to the difficulties in measuring fluid shifts in critically ill patients. It may also be useful in predicting mortality in sick adults¹. Its use in children has been limited. We have measured its reproducibility in children in the short and medium term

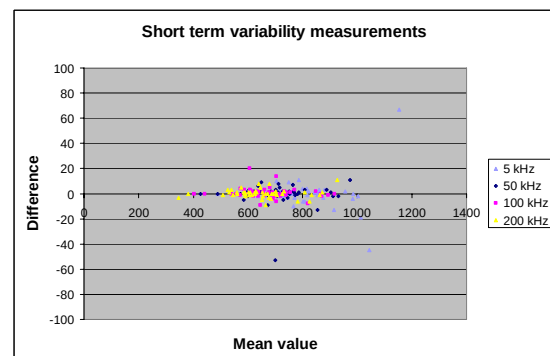
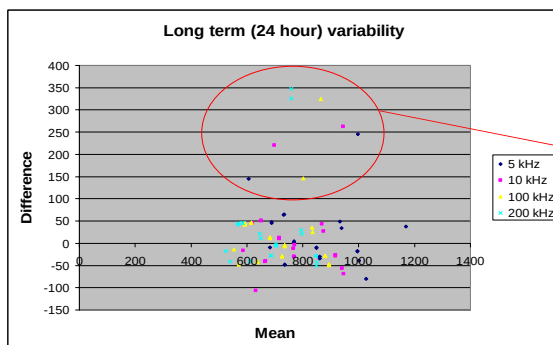
¹Nescolarde et al; Physiol Measur:2004 p1271

Methods

Ethical approval was obtained. Children aged 0-16 were recruited from the wards. Those with significant skin problems or oedema were excluded. Children were studied lying flat with their arms and legs extended and apart. Two electrodes were applied to a hand and the ipsilateral foot and impedance was measured at 5, 50, 100 and 200 kHz (Bodystat[®] Quadscan 4000). Studies were performed twice within 5 minutes and further studies were repeated up to 24 hours later.

Results

49 paired short-term studies were made. In all but one patient (2 studies) the coefficient of variability (CV) was 1% or less at all frequencies. Over 24 hours CV increased to 6%. One patient showed much greater fluctuations. The type of electrode used made no significant difference to the results (CV = 0.1%)



All of these data points were collected from the same patient who very restless and moved constantly through the study. In order to calm him his mother held his hand at times. We feel this may explain the increased variability of his results. If these results were removed from the analysis then it can be seen that there is very little variability between readings.

Discussion

It is known that paediatric intensive care (PICU) patients have problems with fluid shift and oedema, which can be difficult to quantify. Adult data appears to show a link between fluid shifts and patient outcome, and this can easily be measured using the Bodystat[®] machine. We have found that repeatable results can be obtained in nearly all children, with potential problems only arising in those who are unable to lie still.

Conclusion

The Bodystat[®] machine was simple to use and most results were very repeatable. A small percentage of patients seem to show variable results and it is unknown whether this is due to technical or physiological causes. We feel that this technique has the potential to improve patient care and should be explored further.