Publication Brief

Confidence limits of arteriovenous fistula flow rate measured by the “on-line” thermodilution technique.

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BACKGROUND

A method is presented for estimating the confidence limits or accuracy of the arteriovenous fistula flow rate measured at hemodialysis by the “on-line” thermodilution technique using a Fresenius 4008B dialysis machine outfitted with a blood thermodilution monitor (BTM).

OBJECTIVE

To describe a method to estimate the confidence levels of access flow rates as measured by an “on-line” thermodilution technique and to apply this to clinical decision making when assessing AV fistula and grafts.

STUDY

- 56 patients with 56 fistulas were in the study group.
- 189 pairs of measurements were analyzed.
- The study used a derivation of an expression to estimate what variance a set of repeated measures of flow would yield, using values pertaining to a single measure of flow.
- Confidence levels of a single measure could be estimated by applying laws of variance to the formula used to calculate flow, to account for its variables’ values and measurement errors.

RESULTS

- The variance estimated from a single measure was compared with that actually observed upon immediately taking a second measurement.
- Differences in 189 pairs of measurements were not significantly different from zero (P=0.56).
- Applying the results demonstrated that measured flow values of 430-570 mL/min typically had associated 95% confidence levels that included 500 mL/min;
- Therefore, true flow could not be said to be either side of 500 mL/min.
- The same was the case for 500-700 mL/min with regard to 600 mL/min. Confidence levels widened considerably with the magnitude of flow rate, limiting the accurate measurement of higher flows and the detection of decreases in flow.

CONCLUSIONS

- A method to estimate confidence levels of flow rate measured by the thermodilution technique is presented and validated.
- Application of the method demonstrated accurate measurements of low flow, but limitations at higher flows and in detecting falls in flow.
- Appreciation of the magnitude of these confidence levels is critical to informed clinical decision making when using flow rate in an access surveillance program.

REFERENCE