



Comparison of standard and artificial neural network estimators of hemodialysis adequacy

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RESUMEN

The National Kidney Foundation and the European Renal Association recommend routine measurement of hemodialysis (HD) dose and have set standards for adequacy of treatment. We compare the results of five methods for HD dose estimation, classifying each result as adequate or inadequate on the basis of equilibrated (eq) Urea Reduction Ratio (URReq) $\geq 65\%$ or $Kt/V_{eq} \geq 1.2$, to assess the accuracy of each method as a diagnostic tool. Data from 113 patients from two different dialysis units were analyzed. Equilibrated postdialysis blood urea was measured 60 min after each hemodialysis session to calculate URReq and Kt/V_{eq} , considered as gold standard indexes (GSI). URR and Kt/V were estimated by using the Smye formula, an artificial neural network (ANN), modified URR, the second generation Kt/V Daugirdas formula, and standard indexes based on postdialysis urea, then compared to the GSI. For URR, best estimator was ANN (error rate: $ER\% = 12.70$), followed by modified URR ($ER\% = 17.46\%$), the Smye ($ER\% = 22.22$), and standard URR ($ER\% = 23.81$). For Kt/V , the Daugirdas equation and the ANN were similar ($ER\% = 9.52$ and 11.11). The single-pool Kt/V ($Kt/V_{sp} \geq 1.4$ (ERA recommended) produced an $ER\% = 7.94$ and a false positive rate (FPR%) equal to that shown by the ANN (FPR% = 3.17). According to the current threshold limits for HD dose adequacy, the ANN was a reliable and accurate tool for URR monitoring, better than the Smye and the modified URR methods. The use of the ANN urea estimation yields accurate results when used to calculate Kt/V . The Kt/V_{sp} with an adequacy threshold of 1.4 is a superior approach for HD adequacy monitoring, suggesting that the current adequacy limits should be reviewed for both URR and Kt/V .

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