II.3 Haemodialysis dose and residual renal function (Kr)

Guideline II.3

A. In the case of significant residual renal function (Kr), the amount of therapy to be delivered with HD may be estimated with the aid of the equivalent renal urea clearance (EKR).
(*Evidence level: B*)

Commentary on Guideline II.3

In some cases, especially at the start of chronic HD therapy, significant residual kidney function is still present. Its favourable effect on outcome of HD, as well as methods of measurement and reporting, are more extensively discussed in Section I.

The contribution of residual renal clearance to the total urea removal has been computed by Gotch and Keen [190] in terms of equivalent urea Kt/V value provided by the native kidneys: (Kt/VKr) for thrice- and twice-weekly HD, and added to the dialytic Kt/V to yield the total fractional clearance (KTV):

$KTV = Kt/V + 5.9 \times Kt/VKr$ (thrice-weekly HD)
$KTV = Kt/V + 10.1 \times Kt/VKr$ (twice-weekly HD).

More recently, a kinetic estimate of a time-averaged KT, derived from the spUKM, has been proposed: the EKR [189]. EKR is computed as the ratio of the net urea generation (G, mg/min) to the time-averaged urea concentration (TAC, mg/ml). It defines the averaged urea clearance delivered, in ml/min, as the sum of dialytic plus residual renal clearance. EKR is independent of treatment type and schedule. On the basis of the relation found between EKR and Kt/V, the minimum 'adequate' EKR, normalized for urea volume, is ~15 ml/min, corresponding to an spKt/V of 1.4, and can be recalculated to a value of 13 ml/min for an eKt/V value of ~1.2.

According to the relation between EKR_c, Kt/V, and Kr_c ($EKR_c = 1 + 10\ Kt/V + Kr_c$ for a thrice-weekly schedule, $EKR_c = 1 + 6.2\ Kt/V + Kr_c$ for a twice-weekly schedule) the minimum dialytic dose in terms of eKt/V to be delivered in presence of Kr varying from 0 to 5 ml/min can be derived with the equations:

$eKt/V\ HD = (12 - Kr_c)/10$ (for a thrice weekly HD schedule)
$= (12 - Kr_c)/6.2$ (for a twice-weekly HD schedule)

where
Kr_c (normalized for urea volume) $= Kr \times 40/$Watson V.
Kr can be calculated according to the following formula proposed by Gotch [190]:
$Kr = U_{vol} \times U_{urea}/[t \times (0.25 \times B^1_{urea} + 0.75 \times B^2_{urea})]$ (for a thrice-weekly HD schedule)
$Kr = U_{vol} \times U_{urea}/[t \times (0.16 \times B^1_{urea} + 0.84 \times B^2_{urea})]$ (for a twice-weekly HD schedule)
where
U_{vol} = volume of urine collected between the first two dialysis session of the week,
U_{urea} = urea concentration in the urine,
t = urine collection time,
B^1_{urea} = blood urea concentration at beginning of collection time,
(= end of first dialysis session of the week),
B^2_{urea} = blood urea concentration at end of collection time,
(= before second dialysis session of the week).