

Dialysis adequacy in children

Date written: May 2004

Final submission: January 2005

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GUIDELINES

No recommendations possible based on Level I or II evidence

SUGGESTIONS FOR CLINICAL CARE

(Suggestions are based on Level III and IV sources)

- **In the absence of adequate data relating dialysis dose to outcomes in children, delivered doses of dialysis for children for both peritoneal and haemodialysis should at least equal doses recommended for adult patients.**

Background

No data exist in children to show that reduced dialysis dose correlates with increased morbidity and mortality.

It is generally recommended that delivered doses of dialysis in children should be the same as or above those recommended for adults, pending more data.

The objectives of this guideline are to review the available evidence for the relationship between dialysis adequacy and growth in children with end-stage kidney disease (ESKD).

Search strategy

Databases searched: Medline (1996 to November Week 2 2003) and Embase (1980 to November 2003). MeSH terms for kidney disease were combined with MeSH terms and text words for dialysis adequacy. The Cochrane Renal Group Specialised Register of randomised controlled trials was also searched for relevant trials not indexed in Medline.

Date of searches: 1 December 2003.

What is the evidence?

No randomised controlled trials (RCTs) examining dialysis adequacy in relation to nutrition, growth, morbidity and mortality in children with ESKD were identified. There are some data which suggest that increasing dialysis dose may result in small improvements in growth rates in children. However, further studies are required to determine the relative contributions of nutrition, dialysis dose and residual renal function to growth.

Studies from the Mid-European Pediatric Peritoneal Dialysis Study Group (Schaeffer et al 1999) indicate a small positive effect of higher dialysis creatinine clearances and a small negative effect of high transporter state on increase in height standard deviation score (SDS).

There was a trend for positive change in height SDS with increasing creatinine clearance in 21 children on peritoneal dialysis (PD) (Hölttä et al 2000). Catch-up growth occurred in 62% of 21 children on PD with Kt/V of 3.2 and total creatinine clearances of 69 L/1.73 m²/week. Mean height SDS changed over 9 months from -1.8 (1.0) to -1.0 (1.1) in children aged < 5 years and from 0.8 (1.3) to 0.6 (1.0) in older children. Energy and protein intake were unchanged.

Another study found no relationship between height SDS and dialysis adequacy in children on PD (Chadha et al 2001) but found that 7 of 12 children with residual renal function showed catch-up growth compared with only 2 of 12 children without residual renal function.

Children on haemodialysis who were dialysed to achieve a Kt/V of 2.0 and urea reduction ratio of 85% and who received 91% and 156% of recommended daily intake (RDI) for energy and protein respectively, showed an improvement in height SDS of +0.31 SD/year (Tom et al 1999).

Albumin levels correlate negatively with Kt/V in PD but not in haemodialysis patients (Brem et al 2000).

What do the other guidelines say?

Kidney Disease Outcomes Quality Initiative:

Minimum Delivered Dose of Hemodialysis (Adults—Evidence, Children—Opinion).

The dialysis care team should deliver a Kt/V of at least 1.2 (single-pool, variable volume) for both adult and pediatric hemodialysis patients. For those using the U, the delivered dose should be equivalent to a Kt/V of 1.2 (ie, an average URR of 65%). URR can vary substantially as a function of fluid removal, however.

Prescribed Dose of Hemodialysis (Opinion). To prevent the delivered dose of hemodialysis from falling below the recommended minimum dose, the prescribed dose of hemodialysis should be Kt/V 1.3. In terms of URR, a Kt/V of 1.3 corresponds to an average URR of 70%, but the URR corresponding to a Kt/V of 1.3 can vary substantially as a function of ultrafiltration.

Weekly Dose of CAPD (Adults—Evidence, Children—Opinion). For CAPD, the delivered PD dose should be a total Kt/V_{urea} of at least 2.0 per week and a total creatinine clearance (C_{Cr}) of at least 60 L/wk/1.73 m² for high and high-average transporters, and 50 L/wk/1.73 m² in low and low-average transporters. Clinical judgment suggests that the target doses of PD for children should meet or exceed the adult standards. However, there are currently no definitive outcome data in pediatric patients to suggest that any measure of dialysis adequacy is predictive of well-being, morbidity, or mortality. There also are minimal data regarding the real protein needs of children, especially young children, on dialysis. It is the opinion of the Work Group that the nutritional requirements per kilogram of body weight are higher in children than in adults. Therefore, PD doses in children, and especially small infants who have very high protein requirements, may have to be higher than PD doses in adults.

British Renal Association: No recommendations for children.

Canadian Society of Nephrology: No recommendations for children.

European Best Practice Guidelines: No recommendations for children.

Implementation and audit

No recommendation.

Suggestions for future research

An international multicentre RCT could be carried out in children on haemodialysis or on PD, comparing the effect of different dialysis doses (doses recommended for adults compared with higher doses) on growth and total body nitrogen. In each study, children would be maintained on the same energy and protein intake and residual renal function would have to be measured to assess its contribution to outcomes.

References

Brem AS, Lambert C, Hill C et al. Outcome data on pediatric dialysis patients from the end-stage renal disease clinical indicators project. *Am J Kidney Dis* 2000; 36: 310–17.

Chadha V, Blowey DL, Warady BA. Is growth a valid outcome measure of dialysis clearance in children undergoing peritoneal dialysis? *Perit Dial Int* 2001; 21: S179–S184.

Hölttä T, Ronnholm K, Jalanko H et al. Clinical outcome of pediatric patients on peritoneal dialysis under adequacy control. *Pediatr Nephrol* 2000; 14: 889-97.

Schaefer F, Klaus G, Mehls O. Peritoneal transport properties and dialysis dose affect growth and nutritional status in children on chronic peritoneal dialysis. The Mid-European Pediatric Peritoneal Dialysis Study Group. *J Am Soc Nephrol* 1999; 10: 1786–92.

Tom A, McCauley L, Bell L et al. Growth during maintenance hemodialysis: impact of enhanced nutrition and clearance. *J Pediatr* 1999; 134: 464–71.