

European Best Practice Guidelines on Haemodialysis

Part 2

Generated by the
EBPG Expert Group on Haemodialysis



Supported by an unrestricted
educational grant from
Fresenius Medical Care

Evidence levels:

I: Meta-analysis

II: Randomized controlled trials

III: Observational and case-control

IV: Case series

Opinion

This brochure is an adapted summary of the

European Best Practice Guidelines on Haemodialysis (Part 2)

The complete version is available in
Nephrology Dialysis Transplantation,
Vol. 22, Supplement 2, May 2007,
published by Oxford University Press
on behalf of the ERA-EDTA

This summary was prepared by Fresenius Medical Care.

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EBPG guideline on Dialysis Strategies

Guideline 1. Time and frequency

Guideline 1.1

Dialysis should be delivered at least 3 times per week and the total duration should be at least 12 h per week, unless supported by significant renal function. See also guideline 4.1. (Evidence level III)

Guideline 1.2

An increase in treatment time and/or frequency should be considered in patients with haemodynamic or cardiovascular instability. (Evidence level II)

Guideline 1.3

Dialysis treatment time and/or frequency should be increased in patients who remain hypertensive despite maximum possible fluid removal. (Evidence level III)

Guideline 1.4

An increase of treatment time and/or frequency should be considered in patients with impaired phosphate control. (Evidence level III)

Guideline 1.5

An increase of dialysis time and/or frequency should be considered in malnourished patients. (Opinion)

Guideline 2. Flux and convection

Guideline 2.1

The use of synthetic high-flux membranes should be considered to delay long-term complications of haemodialysis therapy. Specific indications include:

- (i) To reduce dialysis-related amyloidosis (III)
- (ii) To improve control of hyperphosphataemia (II)
- (iii) To reduce the increased cardiovascular risk (II)
- (iv) To improve control of anaemia (III)

Guideline 2.2

In order to exploit the high permeability of high-flux membranes, on-line haemodiafiltration or haemofiltration should be considered.

The exchange volumes should be as high as possible, in consideration of safety. (Evidence level II)

Guideline 3. Dialysis dose methodology

Guideline 3.1

Delivered dialysis dose should be measured at least monthly. (Opinion)

Guideline 3.2

Dialysis dose should be measured using a validated method comparable with the reference method. The reference method is formal urea kinetic modelling using pre- and post-dialysis blood samples and taking ultrafiltration, urea generation and the post-dialysis rebound into account. (Opinion)

Guideline 3.3

Renal function may be taken into account in the dose measurement provided it is measured frequently enough to avoid overestimation as GFR falls, typically every 2 months. (Opinion)

Guideline 3.4

For three times weekly dialysis, dose should be quoted as eKt/V . For schedules other than three times weekly, dose should take frequency into account and be quoted as weekly standard Kt/V (stdKt/V), solute removal index (SRI) or equivalent renal clearance (EKR). (Opinion)

Guideline 4. Minimum adequate dialysis

Guideline 4.1

In anuric patients, treated by three times per week dialysis, the prescribed target eKt/V should be at least 1.2. Higher doses, up to 1.4 should be considered in females and those patients with high comorbidity. (Evidence level III)

Guideline 4.2

For patients with renal function or those with dialysis schedules other than three times per week, weekly dialysis dose should be at least equivalent to a SRI of 2. (Evidence level IV)

EBPG guideline on Haemodynamic Instability

Guideline 1. Prevention of intra-dialytic hypotension (IDH)

Guideline 1. 1 Evaluation of the patient

Guideline 1.1.1

Hydration state should be regularly assessed by clinical examination. (Opinion)

Guideline 1.1.2

Objective methods to assess fluid state should be considered in a patient with frequent IDH when clinical examination is inconclusive. (Evidence level III)

Guideline 1.2

Blood pressure and heart frequency rate should be measured frequently during dialysis in order to anticipate IDH. (Opinion)

Guideline 1.3

Cardiac evaluation should be performed in patients with frequent episodes of IDH. (Opinion)

Guideline 2. Lifestyle interventions

Guideline 2.1

In order to control inter-dialytic weight gain and reduce the risk of IDH, dietary salt intake should be assessed and not exceed 6 g/day unless contra-indicated. (Evidence level III)

Guideline 2.2

Food intake during or just before dialysis should be avoided in patients with frequent episodes of IDH (Evidence level II). In malnourished patients, the haemodynamic effects of food intake during dialysis should be balanced against the nutritional needs of the patient. (Opinion)

Guideline 3. Factors related to the dialysis treatment

Guideline 3.1 Optimizing ultrafiltration: Ultrafiltration profiling and blood volume controlled ultrafiltration

Guideline 3.1.1

Pulsed ultrafiltration profiles should not be used for the prevention of IDH. (Evidence level III)

Guideline 3.1.2a

Individualized, automatic blood volume control should be considered as a second-line option in patients with refractory IDH. (Evidence level II)

Guideline 3.1.2b

Manual adjustment of ultrafiltration according to a fixed protocol based on changes in blood volume should not be performed. (Evidence level II)

Guideline 3.2 Dialysate composition

Guideline 3.2.1 Dialysate sodium

Guideline 3.2.1

Although sodium profiling with supraphysiological dialysate sodium concentrations and high sodium dialysate (≥ 144 mmol/l) are effective in reducing IDH, they should not be used routinely because of an enhanced risk of thirst, hypertension and increased inter-dialytic weight gain. (Evidence level II)

Guideline 3.2.2 Dialysate buffer

Bicarbonate dialysis should be used to prevent IDH. (Evidence level III)

Guideline 3.2.3 Dialysate calcium

The use of a dialysate calcium concentration of 1.50 mmol/l should be considered in patients with frequent episodes of IDH, unless contra-indications are present. (Evidence level II)

Guideline 3.2.4 Other dialysate components

Guideline 3.2.4a

In patients with frequent episodes of IDH, low (0.25 mmol/l) magnesium dialysate should be avoided, especially in combination with low-calcium dialysate. (Evidence level II)

Guideline 3.2.4b

Glucose-free dialysate concentrations should be avoided in diabetics. (Opinion)

Guideline 3.3 Dialysis membranes and contamination of dialysate

No particular dialysis membranes should be preferred to prevent IDH. (Level II)

Guideline 3.4 Dialysate and body temperature

Guideline 3.4.1

Cool dialysate temperature dialysis (35-36°C) or isothermic treatments by blood temperature controlled feedback should be prescribed in patients with frequent episodes of IDH. (Evidence level I)

Guideline 3.4.2

With cool temperature dialysis, dialysate temperature should be gradually reduced in steps of 0.5°C from 36.5 °C until symptoms are controlled. (Opinion)

Guideline 3.4.3

Dialysate temperatures < 35°C should not be used. (Opinion)

Guideline 3.5 Convective techniques and isolated ultrafiltration**Guideline 3.5.1**

Haemo(dia)filtration techniques should not be considered as first-line option for the prevention of IDH, but as a possible alternative to cool dialysis. (Evidence level II)

Guideline 3.5.2

Sequential isolated ultrafiltration followed by isovolaemic dialysis should not be used as a regular strategy for the prevention of IDH. (Evidence level II)

Guideline 3.6 Dialysis duration and frequency

A prolongation in dialysis time or an increase in dialysis frequency should be considered in patients with frequent episodes of IDH. (Evidence Levels II-III)

Guideline 3.7 Switch to peritoneal dialysis

A treatment change to peritoneal dialysis should be considered in patients who remain refractory to interventions for the prevention of IDH. (Opinion)

Guideline 4. Avoidance of antihypertensive drugs and prescription of vasoactive medication before dialysis

Guideline 4.1

In patients with frequent episodes of IDH, antihypertensive agents should be given with caution prior to dialysis depending on pharmacodynamics, but should not be routinely withheld on the day of haemodialysis treatment. (Evidence level III)

Guideline 4.2

Midodrine should be considered if other treatment options have failed. (Evidence level I)

Guideline 4.3

L-carnitine supplementation should be considered for the prevention of IDH if other treatment options have failed. (Evidence level III)

Guideline 5. Stratified approach to prevent IDH

First-line approach

- Dietary counselling (sodium restriction).
- Refraining from food intake during dialysis.
- Clinical reassessment of dry weight.
- Use of bicarbonate as dialysis buffer.
- Use of a dialysate temperature of 36.5°C.
- Check dosing and timing of antihypertensive agents.

Second-line approach

- Try objective methods to assess dry weight.
- Perform cardiac evaluation.
- Gradual reduction of dialysate temperature from 36.5°C downward (lowest 35°C) or isothermic treatment (possible alternative: convective treatments).
- Consider individualized blood volume controlled feedback.
- Prolong dialysis time and/or increase dialysis frequency.
- Prescribe a dialysate calcium concentration of 1.50 mmol/l.

Third-line approach (only if other treatment options have failed)

- Consider midodrine.
- Consider L-carnitine supplementation.
- Consider peritoneal dialysis.

Guideline 6. Treatment of IDH

Guideline 6.1 Trendelenburg position

The Trendelenburg position should be considered in the treatment of IDH. However, efficacy may be limited. (Opinion)

Guideline 6.2 Stopping ultrafiltration

Ultrafiltration should be stopped during an episode of IDH. (Evidence level III)

Guideline 6.3 Infusion fluids

Guideline 6.3.1

Isotonic saline should be infused in patients unresponsive to stopping ultrafiltration and Trendelenburg's position during an episode of IDH. (Evidence level II)

Guideline 6.3.2

Infusion of colloid solutions should be considered in patients who remain unresponsive to saline infusion. (Evidence level III)

Guideline 6.4 Protocol-based treatment

The development of a centre-specific protocol, with stepwise interventions for the treatment of IHD should be considered. (Evidence level III)

EBPG guideline on Nutrition

Guideline 1. Prevalence of malnutrition and outcome

Nutritional status should be assessed at the start of haemodialysis. (Opinion)

Protein-energy malnutrition should be avoided in maintenance haemodialysis because of poor patient outcome. (Evidence level III)

In absence of malnutrition, nutritional status should be monitored every 6 months in patients < 50 years of age. (Opinion)

In patients > 50 years of age, and patients undergoing maintenance dialysis for more than 5 years, nutritional status should be monitored every 3 months. (Opinion)

Guideline 2. Diagnosis and monitoring of malnutrition

Guideline 2.1 Diagnosis of malnutrition

Malnutrition should be diagnosed by a number of assessment tools including (Opinion):

- (A) Dietary assessment
- (B) Body mass index
- (C) Subjective global assessment (SGA)
- (D) Anthropometry
- (E) Normalized protein nitrogen appearance
- (F) Serum albumin and serum prealbumin
- (G) Serum cholesterol
- (H) Technical investigations (bioimpedancemetry, dual X-ray absorptiometry, near-infrared reactance)

(A) Dietary assessment

Every haemodialysis patient should have access to a qualified dietitian. (Opinion)

All haemodialysis patients should receive a care plan and individualized dietary information in writing. Both the care plan and dietary information should be reviewed frequently depending on individual medical conditions and personal circumstances. (Opinion)

All haemodialysis patients should be reassessed and counselled within 1 month after haemodialysis has started. (Opinion)

Malnourished haemodialysis patients should be reassessed and counselled more frequently. (Opinion)

(B) Body mass index (BMI)

Haemodialysis patients should maintain a BMI > 23.0. (Evidence level III)

(C) Subjective global assessment (SGA)

SGA should be used to identify severe malnutrition in haemodialysis patients. (Evidence level III)

(D) Anthropometry

Anthropometry in maintenance haemodialysis patients should be assessed immediately after dialysis. (Opinion)

Anthropometry:

Mid Arm Circumference (MAC), Mid-Arm Muscle Circumference (MAMC) and four site Skin Fold Thickness (SFT) should be performed by the same individual on the non-fistula arm. (Opinion)

(E) Normalized protein nitrogen appearance (nPNA)

Normalized PNA should be measured in clinically stable haemodialysis patients and be above 1.0 g/kg ideal BW/day. (Evidence level III) (see Guideline 3)

(F) Serum albumin and serum prealbumin

Serum albumin should be above 40 g/l by bromocresol green method. (Evidence level III)

For other albumin assessment methods the target values should be adapted to the above. (Opinion)

Serum prealbumin should be above 0.3 g/l. (Evidence level III)

(G) Serum cholesterol

Serum total cholesterol should be measured and be above the minimal laboratory threshold value. (Evidence level III)

Guideline 2.2 Monitoring and follow-up of nutritional status

Nutritional status should be followed by using the following assessment tools (Opinion):

- (A) Dietary interviews
- (B) Body weight
- (C) nPNA, serum albumin and serum cholesterol

The use of other technical investigations should be restricted to research purposes. (Opinion)

(A) Dietary interviews

Stable and well-nourished haemodialysis patients should be interviewed by a qualified dietitian every 6 - 12 months or every 3 months if they are over 50 years of age or on haemodialysis for more than 5 years. (Evidence level III)

Malnourished haemodialysis patients should undergo at least a 24-hr dietary recall more frequently until improved. (Opinion)

(B) Body weight

Post dialysis body weight should be averaged over the month and percentage change in the average weight of the previous month, should be calculated. (Opinion)

Percent interdialytic weight gain (IDWG) should be based on “dry weight” (post dialysis). (Evidence level III)

(C) nPNA, serum albumin and serum cholesterol

nPNA, serum albumin and serum cholesterol should be measured at presentation, 1 month after beginning of haemodialysis and 3 monthly thereafter in clinically stable patients. (Opinion)

In clinically unstable patients with a number of comorbidities, persistent inflammation, during periods of intensive dietary counselling and during therapeutic intervention the frequency of measurements should be increased to monthly intervals. (Opinion)

Guideline 3 Recommendations for protein and energy intake

Guideline 3.1 Recommended protein intake

The dietary protein intake in clinically stable chronic haemodialysis patients should be at least 1.1 g protein/kg ideal body weight/day. (Evidence level III)

The achieved nPNA in a clinically stable chronic haemodialysis patient should be at least 1.0 g/ideal body weight/day. (Evidence level III)

Guideline 3.2 Recommended energy intake

The recommended energy intake in a clinically stable chronic haemodialysis patient should be 30 - 40 kcal/kg ideal body weight/day, adjusted to age, gender and to the best estimate of physical activity level. (Evidence level III)

Regular physical activity should be encouraged, and energy intake should be increased proportionally to the level of physical activity. (Opinion)

Guideline 4. Recommendations for vitamins, minerals and trace elements administration in maintenance haemodialysis patients

Guideline 4.1 Vitamins

Guideline 4.1.1 Water soluble vitamins

Thiamine (Vitamin B1)

A daily supplement of 1.1 - 1.2 mg thiamin hydrochloride is recommended.

Riboflavin (Vitamin B2)

A daily supplement of 1.1 - 1.3 mg is recommended.

Pyridoxine (Vitamin B6)

A daily supplement of 10 mg as pyridoxine hydrochloride is recommended.

Ascorbic Acid (Vitamin C)

A daily supplement of 75 - 90 mg is recommended.

Folic Acid (Folate, Vitamin B9)

A daily supplement of 1 mg folic acid is recommended.

Cobalamin (Vitamin B12)

A daily supplement of 2.4 µg vitamin B12 is recommended.

Niacin (Vitamin B3, Nicotinamide, Nicotinic acid, Vitamin PP)

A daily supplement of 14 - 16 mg niacin is recommended.

Biotin (Vitamin B8)

A daily supplement of 30 µg biotin is recommended.

Pantothenic acid (Vitamin B5)

A daily supplement of 5 mg pantothenic acid is recommended.

Guideline 4.1.2 Fat-soluble vitamins

Retinol (Vitamin A)

A daily intake of 700 - 900 µg is recommended.

Vitamin A supplements are not recommended.

Alpha-Tocopherol (Vitamin E)

A daily supplement of 400 - 800 IU is recommended in secondary prevention of cardiovascular events and for preventing recurrent muscle cramps.

Vitamin K

A daily intake of 90 – 120 µg is recommended.

There is no need for vitamin K supplementation, except in patients receiving long term antibiotic treatment or those with altered coagulant activity; a daily amount of 10 mg vitamin K may be temporarily administered.

Guideline 4.2 Minerals

Phosphate (phosphorus)

A daily intake of 800 - 1000 mg phosphate is recommended.

Dietary education improves phosphate control.

Dietary phosphate control should not compromise protein intake.

Calcium

The total intake of elemental calcium should not exceed 2000 mg/day including calcium obtained from calcium-based phosphate binders.

Sodium and fluid

A daily intake of no more than 80 - 100 mmol (2000 - 2300 mg) sodium or 5 - 6 g (75 mg/kg BW) per day of sodium chloride is recommended.

Interdialytic weight gain (IDWG) should not exceed 4 - 4.5 % of dry body weight.

Potassium

In patients with a pre-dialysis serum potassium greater than 6 mmol/l, a daily intake of potassium of 50 - 70 mmol (1950 - 2730 mg) or 1 mmol/kg IBW is recommended.

Guideline 4.3 Trace elements

Iron (Fe)

A daily intake of 8 mg Fe for men and 15 mg for women is recommended.

Supplementary Fe should be given to all haemodialysis patients treated with an erythropoiesis-stimulating agent (ESA), to maintain adequate serum transferrin and serum ferritin levels, aimed to achieve a target haemoglobin (Hb) concentration > 110 g/l or a haematocrit > 33%, except for those receiving the iron intravenously.

Zinc (Zn)

A daily nutritional intake of 8 - 12 mg of elemental zinc (Zn) for women and 10 - 15 mg for men is recommended.

Routine zinc supplementation is not recommended.

A zinc supplementation of 50 mg elemental Zn per day for 3 - 6 months should be considered in haemodialysis patients with a chronic inadequate protein/energy intake and symptoms evoking zinc deficiency (impaired taste or smell, skin fragility, impotence, peripheral neuropathy).

Selenium (Se)

A daily intake of 55 µg of selenium is recommended.

Routine selenium supplementation is not recommended.

A selenium supplementation for 3 - 6 months should be considered in haemodialysis patients with symptoms evoking selenium deficiency (cardiomyopathy, skeletal myopathy, thyroid dysfunction, haemolysis, dermatosis).

Guideline 5. Treatment of malnutrition

Guideline 5.1 Dietary intervention

Malnourished haemodialysis patients should receive nutritional counselling. (Evidence level III)

In hospitalized patients counselling should be started within 3 days of referral. A daily follow-up should be performed when patients are at high nutritional risk and weekly when at low risk. (Opinion)

Guideline 5.2 Oral supplements and enteral feeding

Nutritional supplements should be prescribed if nutritional counselling does not achieve an increase in nutrient intake to a level that covers minimum recommendation (see Guideline 3). (Evidence level III)

Products specifically formulated for dialysis patients should be prescribed in preference to standard supplements for non-renal patients. (Evidence level III)

Enteral tube (nasogastric or percutaneous entero-gastrostomy (PEG)) feeding using disease specific formulas for dialysis patients should be prescribed if attempts to increase dietary intake with oral supplements fail and nutritional status does not improve. (Evidence level IV)

Guideline 5.3 Intradialytic parenteral nutrition

When intensive dietary support, oral supplements and enteral nutrition have failed, a course of parenteral nutrition is recommended. (Evidence level IV)

Intradialytic parenteral nutrition (IDPN) is recommended in malnourished patients only if spontaneous nutrient intake is > 20 kcal/kg IBW and 0.8 g protein/kg IBW/ day. Otherwise, total parenteral nutrition infused over the entire day is indicated. (Opinion)

Guideline 5.4 Anabolic agents

In case of severe malnutrition resistant to optimal nutritional intervention, a course of androgens should be considered in maintenance haemodialysis patients for 3 - 6 months. (Evidence level II)

Androgens should be administered weekly or bimonthly. (Evidence level II)

Patients should be monitored at regular intervals for side effects (hirsutism, voice change, priapism, alteration in plasma lipids, liver tests and prostatic markers). (Evidence level II)

Patients with a known prostate cancer should not receive androgens. (Evidence level II)

Guideline 5.5 Other interventions: daily dialysis

A 6 - 12 months trial of daily dialysis (either short daily or long nocturnal) should be considered as a rescue therapy in unstable patients undergoing difficult haemodialysis sessions with symptoms of malnutrition or malnourished patients with poor appetite after a negative nutritional work-out. (Opinion)

Guideline 6. Metabolic acidosis

Mid-week predialysis serum bicarbonate levels should be maintained at 20 - 22 mmol/l. (Evidence level III)

In patients with venous predialysis bicarbonate persistently < 20 mmol/l, oral supplementation with sodium bicarbonate and/or increasing dialysate concentration to 40 mmol/l should be used to correct metabolic acidosis. (Evidence level III)

EBPG guideline on Vascular Access

Guideline 1. Patient referral

Guideline 1.1

An early plan for venous preservation should be a substantial part of pre-dialysis care and education in any chronic kidney disease (CKD) patient regardless the choice of treatment modality. (Evidence level IV)

Guideline 1.2

Every chronic renal failure patient, who has opted for haemodialysis, should start dialysis with a functioning vascular access. (Evidence level III)

Guideline 1.3

Potential chronic haemodialysis patients should be ideally referred to the nephrologist and/or surgeon for preparing vascular access when they reach the stage 4 of their CKD (glomerular filtration rate $< 30\text{ml}/\text{min}/1.73\text{m}^2$) or earlier in case of rapidly progressive nephropathy or specific clinical conditions such as diabetes or severe peripheral vascular disease. (Evidence level III)

Guideline 2. Pre-operative evaluation

Guideline 2.1

Clinical evaluation and non-invasive ultrasonography of upper extremity arteries and veins should be performed before vascular access creation. (Evidence level II)

Guideline 2.2

Central vein imaging is indicated in patients with a history of previous central vein catheters. (Evidence level IV)

Guideline 3. Strategies for access creation

Guideline 3.1

The access should provide sufficient blood flow to perform adequate haemodialysis. (Evidence level II)

Guideline 3.2

Autogenous arteriovenous fistulae should be preferred over AV grafts and AV grafts should be preferred over catheters. (Evidence level III)

Guideline 3.3

The upper extremity arteriovenous fistula should be the preferred access and should be placed as distal as possible. (Evidence level III)

Guideline 3.4

Fistula maturation should be monitored to allow pre-emptive intervention if needed. (Evidence level III)

Guideline 4. Role of nurses and staff in access management

Guideline 4.1

Nurses and medical staff should be involved in vein preservation and monitoring of the vascular access. Every patient with chronic kidney disease should have a declared plan for preserving the vascular access and potential access sites. (Evidence level IV)

Guideline 4.2

Any staff involved in handling vascular access or cannulating veins in renal patients should be adequately trained and be in a continuous training scheme for access management. (Evidence level IV)

Guideline 4.3

An autogenous fistula should be cannulated when adequate maturation has occurred. (Evidence level III)

Guideline 4.4

The rope ladder technique should be used for cannulation of grafts. (Evidence level III)

Guideline 5. Surveillance of vascular access

Guideline 5.1

Prior to any cannulation, autogenous arteriovenous fistulae and grafts should be assessed by physical examination. (Evidence level IV)

Guideline 5.2

Objective monitoring of access function should be performed at a regular base by measuring access flow. (Evidence level II)

Guideline 6. Diagnosis of stenoses in AV fistulae and AV grafts

Guideline 6.1

If a haemodynamically significant stenosis is suspected by physical examination and/or flow measurement, imaging should be performed as soon as possible. (Evidence level III)

Guideline 6.2

Pre-emptive intervention should be performed percutaneously or surgically without further delay and imaging should be performed immediately before the intervention. (Evidence level II)

Guideline 6.3

If the complete arterial inflow and venous outflow vessels need to be visualized, magnetic resonance angiography (MRA) should be performed. (Evidence level III)

Guideline 7. Treatment of stenosis and thrombosis in AV fistulae and AV grafts

Guideline 7.1

For venous outflow stenosis percutaneous transluminal angioplasty (PTA) is the first treatment option. (Evidence level III)

Guideline 7.2

Thrombosed autogenous and graft fistulae should be treated either by interventional radiology or surgery. Individual centres should review their results and select the modality that produces the best results for that centre. (Evidence level III)

Guideline 8. Diagnosis and treatment of central venous obstruction

Guideline 8.1

If symptomatic central venous obstruction is suspected, angiography of the access and complete venous outflow tract should be performed. (Evidence level III)

Guideline 8.2

Treatment should be performed by percutaneous intervention. (Evidence level III)

Guideline 9. Diagnosis and treatment of access-induced ischaemia

Guideline 9.1

Access-induced ischaemia should be detected by clinical investigation and the cause should be identified by both non-invasive imaging methods and angiography. (Evidence level III)

Guideline 9.2

Enhancement of arterial inflow, access flow reduction and/or distal revascularization procedures are the therapeutic options. When the above methods fail, access ligation should be considered. (Evidence level II)

Guideline 10. Central venous access

Guideline 10.1

Central venous catheters should be inserted as a last resort in patients without a permanent access and the need for acute haemodialysis. (Evidence level III)

Guideline 10.2

The percutaneous route should be used for both acute and chronic catheter insertion. Insertion should be guided by ultrasound. A plain X-Ray (chest or abdomen) should be performed before use to locate catheter and detect any complication. (Evidence level II)

Guideline 10.3

The right internal jugular vein is the preferred location for insertion. (Evidence level II)

Guideline 10.4

Non-tunnelled catheters should only be used in emergency situations and should be exchanged as soon as possible for tunnelled catheters. (Evidence level III)

Guideline 11. Management of central venous access complications

Guideline 11.1

Catheter dysfunction should be corrected by local fibrinolysis designed to restore flow patency. Repetitive catheter dysfunction requires local fibrinolysis with additional catheter imaging, microbiological assessment and systemic coagulation evaluation. (Evidence level III)

Guideline 12. Management of the infected vascular access

Guideline 12.1

Infection of autogenous AV fistulae without fever or bacteraemia should be treated by appropriate antibiotics for at least 2 weeks. (Evidence level III)

Guideline 12.2

Infection of autogenous AV fistulae with fever and/or bacteraemia should be treated by appropriate antibiotics given intravenously for 2 weeks. Excision of the fistula is required in case of infected thrombi and/or septic emboli. (Evidence level IV)

Guideline 12.3

Infected graft AVFs should be treated by appropriate antibiotics given intravenously for 2 weeks and continued orally for 4 weeks. Depending on the presence of bacteraemia and/or infected thrombi segmental explantation of the graft with bypass needs to be considered. (Evidence level III)

Guideline 12.4

Anastomotic infection is an indication for total graft explantation. (Evidence level II)

Guideline 12.5

Catheter removal must be considered when catheter infection is suspected. Immediate removal should be performed in non-tunnelled catheters when infection is diagnosed. (Evidence level III)

Guideline 12.6

In tunnelled catheters with a short febrile and/or bacteraemic reaction, a delayed removal may be considered. (Evidence level III)

In septicaemia, immediate removal should be performed in tunnelled catheters as well.

Appendix

Composition of the work group for the second part of European Best Practice Guidelines on Haemodialysis

Global chair

R Vanholder (Gent, Belgium)

Intradialytic Haemodynamic Instability:

Chair: Kooman J (Maastricht, the Netherlands)

Members: Basci A (Izmir, Turkey)

Pizzarelli F (Florence, Italy)

Malnutrition and Acidosis

Chair: Fouque D (Lyon, France)

Members: ter Wee PM (Amsterdam, the Netherlands)

Vennegoor MAA (London, United Kingdom)

Wanner C (Würzburg, Germany)

Vascular Access

Chair: Tordoir JHM (Maastricht, the Netherlands)

Members: Canaud B (Montpellier, France)

Haage P (Wuppertal, Germany)

Konner K (Cologne, Germany)

Dialysis Strategies

Chair: Tattersall J (Leeds, United Kingdom)

Members: Martin-Malo A (Cordoba, Spain)

Pedrini LA (Seriata, Italy)



Cardioprotective Haemodialysis

**There's more to dialysis
than dialysis**

Fresenius Medical Care is aware of the significance of the excessive cardiovascular risk in dialysis patients. That's why our dialysis therapy systems are specifically designed to minimize additional, treatment-related risk factors. What can we achieve? Improved blood pressure and anaemia control with less medication, fewer hypotensive episodes during treatment, reduced inflammatory stimuli and response, and reduced oxidative stress.



Fresenius Medical Care

