In the name of Allah, Most Gracious, Most Merciful.

THE HEMODIALYSIS PRESCRIPTION

- Rx: Acute hemodialysis (not for initial treatment)
- Session length: Perform hemodialysis for 4 hours
- Blood flow rate: 350 mL/min Dialyzer
- Dialyzer membrane: *your choice*
- Dialyzer *KUF: your choice*
- Dialyzer efficiency: usually a dialyzer with a *K0A of 800–1200 is used*

Dialysis solution composition (variable)

- Base: bicarbonate 25 mM
- Sodium: 145 mM
- Potassium: 3.5 mM
- Calcium: 1.5 mM (3.0 mEq/L)
- Magnesium: 0.375 mM (0.75 mEq/L)
- Dextrose: 5.5 mM (100 mg/dL)
- Phosphate: none

- Dialysis solution flow rate: 500 mL/min
- Dialysis solution temperature: 35°C–36°C
- Fluid removal orders: Remove 2.2 L over 4 hours at a constant rate

Reduce the amount of dialysis for the initial one or two sessions

- Especially when the predialysis serum urea nitrogen (SUN) level is very high (e.g.,>125 mg/dL [44 mmol/L]), the dialysis session length and blood flow rate should both be reduced.
- A urea reduction ratio of <40% should be targeted. This usually means using a blood flow rate of only 200 mL/min (150 mL/min in small patients) for adults along with a 2-hour treatment time and a relatively low-efficiency hemofilter

A longer initial dialysis session or use of excessively high blood flow rates in the acute setting may result in the so-called ***disequilibrium syndrome***

Dialysis frequency and dose for subsequent treatments and dialysis adequacy

- One option is to dialyze sick patients with acute renal failure on a daily (six or seven times per week) basis.
- Each treatment is then approximately 3–4 hours in length.
- Data suggest that mortality is reduced in patients with acute renal failure dialyzed six times per week as opposed to those receiving dialysis every other day.
- If every-other-day dialysis is to be given, the treatment length should probably be set at 4–6 hours

Choosing the dialysis solution

In our example, we have chosen a bicarbonate level of 25 mM with a sodium level of 145 mM, a potassium level of 3.5 mM, a calcium level of 1.5 mM (3.0 mEq/L), a magnesium level of 0.375 mM (0.75 mEq/L), a dextrose level of 5.5 mM (100 mg/dL), and no phosphorus.

Dialysis solution bicarbonate concentration

In the sample prescription mentioned earlier, we have chosen to use a 25 mM bicarbonate level

- If the predialysis plasma bicarbonate level is 28 mM or higher, or if the patient has respiratory alkalosis, a custom dialysis solution containing an appropriately lower bicarbonate level (e.g., 20–28 mM, depending on the degree of alkalosis) should be used.

Dangers of excessive correction of metabolic acidosis

- Excessive correction of severe metabolic acidosis (starting plasma bicarbonate level <10 mmol/L) can have adverse consequences, including lowering of the ionized calcium level and a paradoxical acidification of the cerebrospinal fluid and an increase in the tissue production rate of lactic acid.
- Initial therapy should aim for only partial correction of the plasma bicarbonate level; a target postdialysis plasma bicarbonate value of 15–20 mmol/L is generally appropriate; and for such severely acidotic patients, a dialysis solution bicarbonate level of 20–25 mM is normally used.

Dialysis solution sodium level

The dialysis solution sodium level in the sample prescription is 145 mM.

Hyponatremia

- Hyponatremia is common in seriously ill patients requiring acute dialysis, primarily because such patients have often received large amounts of hyponatric intravenous solutions with their medications and parenteral nutrition.
- Hyponatremia is frequently seen accompanying severe hyperglycemia in diabetic dialysis patients.

- For every increase of 100 mg/dL (5.5 mmol/L) in the serum glucose concentration, there is a corresponding initial decrease of 1.6 mmol/L in the serum sodium concentration as a result of osmotic shift of water from the intracellular to the extracellular compartment.
- Because osmotic diuresis secondaryto the hyperglycemia does not occur, the excess plasma water is not excreted, and hyponatremia is maintained.
- Correction of hyperglycemia by insulin administration reverses the initial water shift and thereby corrects the hyponatremia

Hypernatremia

- Hypernatremia is less common than hyponatremia in a hemodialysis setting but does occur, usually in a context of dehydration, osmotic diuresis, and failure to give sufficient electrolyte-free water.
- The safest approach is to first dialyze a patient with a dialysis solution sodium level close to that of plasma and then correct the hypernatremia by slow administration of slightly hyponatric fluids.

Dialysis solution potassium level.

- The usual dialysis solution potassium concentration for acute dialysis ranges from 2.0 to 4.5 mM.
- An important number of patients requiring acute dialysis will have a plasma potassium value in the normal or even the subnormal range, especially in patients with nonoliguric acute renal failure and in oliguric patients if food intake is poor

- When the predialysis serum potassium level is <4.5 mmol/L, the dialysis solution potassium level can be ≥4.0 mM, with special caution needed in cardiac patients prone to arrhythmias.
- In patients with a predialysis plasma potassium level >5.5 mmol/L, a dialysis solution potassium level of 2.0 is usually appropriate in stable patients, but the dialysis solution potassium concentration should be raised to 2.5 to 3.5 in patients at risk for arrhythmia or in those receiving digitalis.
- If the potassium level is >7.0, some nephrologists will use a dialysis solution potassium level below 2.0 mM.
- However, the plasma potassium level must be monitored hourly, and there is considerable danger of precipitating arrhythmia if the plasma potassium concentration is lowered too rapidly

Dialysis solution calcium levels

- Our generally recommended level for acute dialysis is 1.5–1.75 mM (3.0–3.5 mEq/L).
- There is some evidence that dialysis solution calcium levels <1.5 mM (3.0 mEq/L) predispose to hypotension during dialysis.

dextrose (100–200 mg/dL; 5.5–11 mmol/L)

- Septic patients, diabetics, and patients receiving beta-blockers are at risk of developing severe hypoglycemia during dialysis.
- Addition of dextrose to the dialysis solution reduces the risk of hypoglycemia and may also result in a lower incidence of dialysis-related side effects.

Choosing the dialysis solution flow rates

For acute dialysis, the usual dialysis solution flow rate is 500 mL/min.

Dialysis solution temperature

This is usually 35°C–37°C. The lower range should be used in hypotension-prone patients

Ultrafiltration orders

Fluid removal needs can range from 0 to 5 kg per dialysis session.

a.Even patients who are quite edematous and in pulmonary edema rarely need removal of more than 4 L of fluid during the initial session. Remaining excess fluid is best removed during a second session the following day.

b.If the patient does not have pedal edema or anasarca, in the absence of pulmonary congestion, it is unusual to need to remove greater than 2–3 L over the dialysis session. In fact, the fluid removal requirement may be zero in patients with little or no jugular venous distention. Fluid removal rates of 10 mL/kg per hour are usually well tolerated in volume overloaded patients.

c.The fluid removal plan during dialysis should take into account the 0.2 L that the patient will receive at the end of dialysis in the form of saline to rinse the dialyzer and any other fluid ingested or administered during the hemodialysis session

Impact of dialysis frequency on ultrafiltration needs

- It is difficult in an acute setting to limit a patient's fluid gain to <2 L per day.
- Often 3 L per day is absorbed in patients receiving parenteral nutrition.
- Use of a frequent (4-7 times per week) dialysis schedule reduces the amount of fluid that needs to be removed with each dialysis, thereby lowering the risk of intradialytic hypotension and further ischemic damage to an already impaired set of kidneys.
- An alternative way to remove fluid relatively asymptomatically is to use *SLED*.


Thank you for
your attention