

به نام خداوند جان و خرد

Volume management in hemodialysis patient

Presented by: Hamed Mohamadian Shoeili

حامد محمدیان شوئیلی

MD.Nephrologist

Body Composition

Total body water (TBW):

About 60 % of lean BW in men and 50 % in women

Distributed among 3 major compartments:

- Intracellular (60% -essential for normal cellular function)
- Extracellular (About 40%)
 - Interstitium(4/5)
 - Vascular space (1/5)(for adequate tissue perfusion)

Volume Overload

Volume overload in ESRD patients has been a clinical challenge that is associated with morbid conditions such as lower extremity edema, anasarca, ascites, pulmonary congestion/edema, hypertension and worsening heart failure.

In the absence of clinical features of volume overload, hypertension requiring more and more medications may itself be the indicator of volume overload. And increasing anti-hypertensives, in the setting of volume overload, may fail in controlling blood pressure.

volume overload has significant associations with mortality outcome and clinical consequences.

What can we do to combat the effects of volume overload?

The first step is to control “what goes in”

Diuretics

Ultrafiltration

Ultrafiltration

how much fluid can we safely pull off with HD?

UFR of >10 mL/hr/kg were associated with higher all-cause mortality risk

Heart ischemia

Brain ischemia

Kidney ischemia

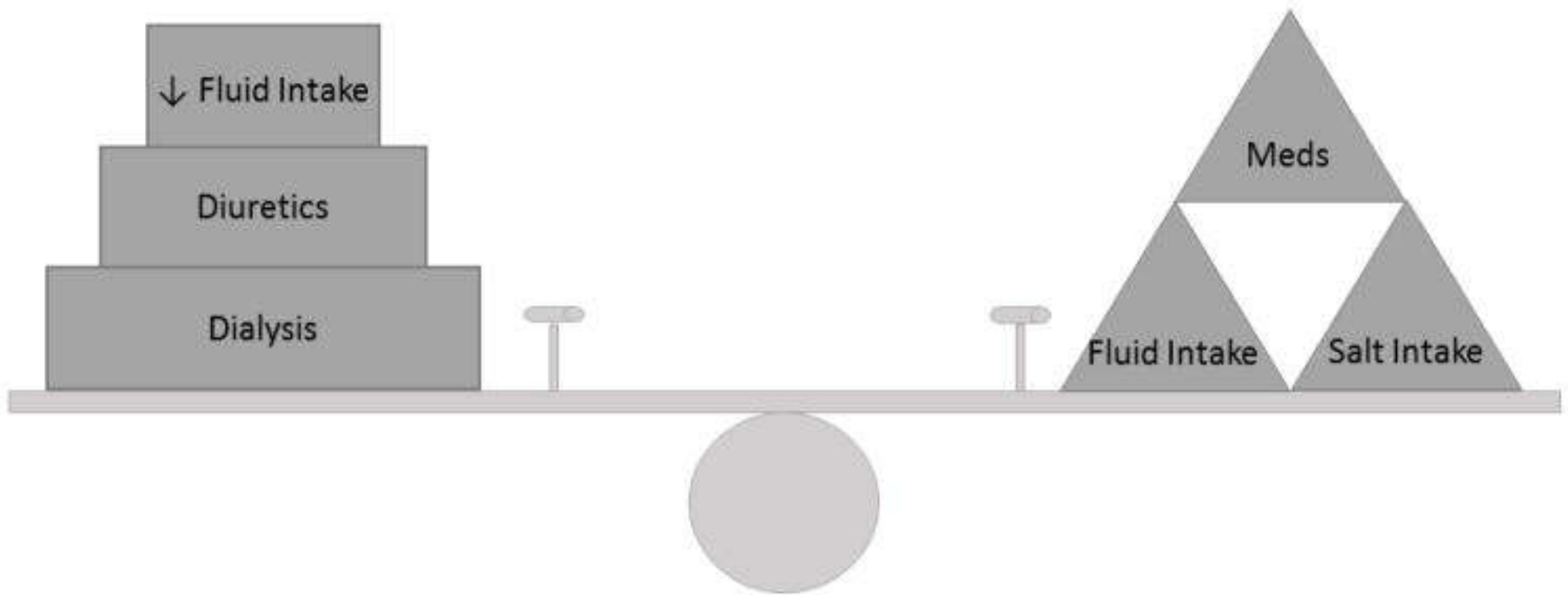
If higher UFRs are associated with worse outcomes and HD patients still require the same amount of fluid removed with each HD treatment, what is the solution to this conundrum?

Increase HD treatment run times and/or frequency

Short daily and nocturnal hemodialysis

Incremental HD

Volume Balance and Intradialytic Ultrafiltration Rate in the Hemodialysis Patient



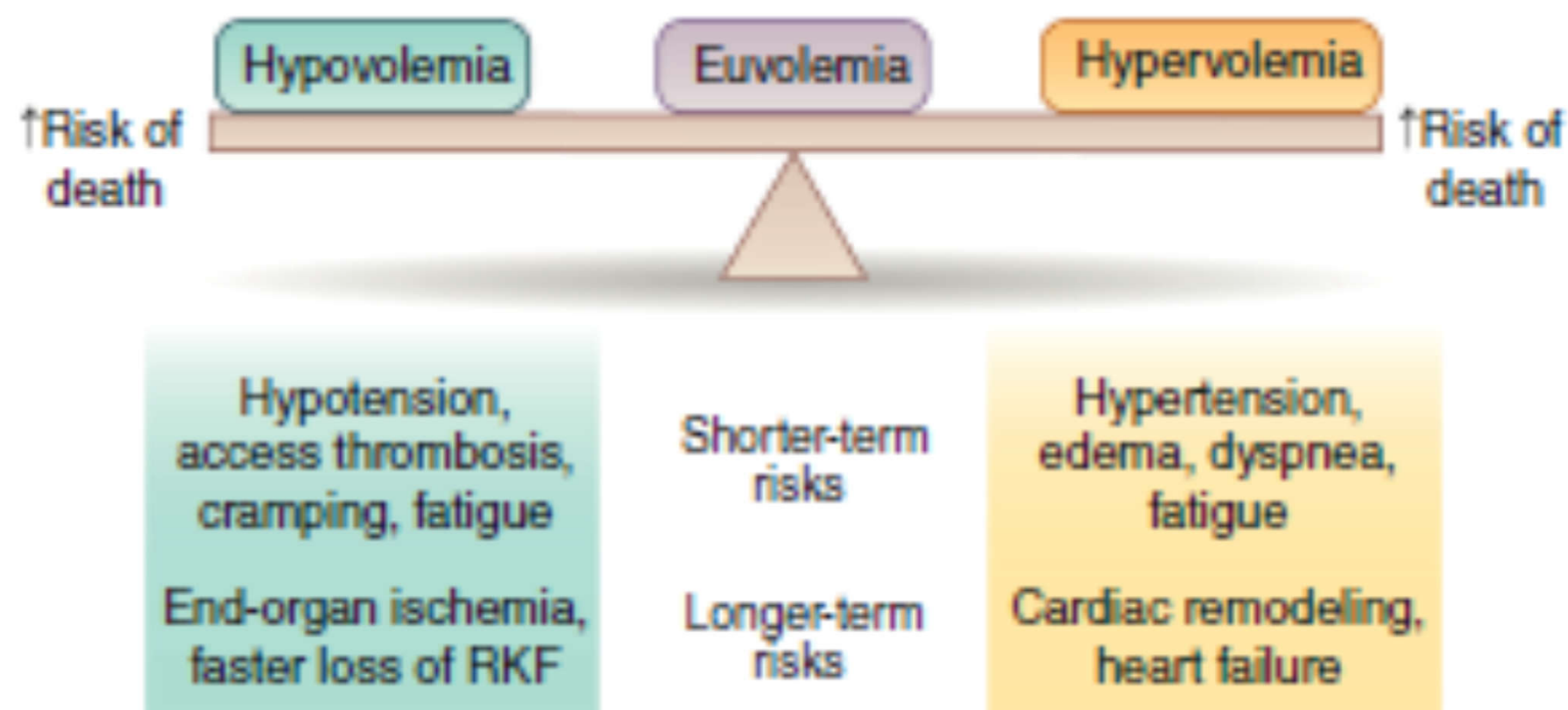


Figure 1 | Tension in balancing volume status within a narrow therapeutic window. RKF, residual kidney function.

Delivery of optimal volume management involves three key components:

1. Accurate estimation of volume status,
2. Correction of extracellular fluid overload
3. Prevention of intradialytic instability.

Fluid Status Exam

- A. trial-and-error
- B. Bioelectric Impedance Analysis
- C. Lung Water Ultrasound
- D. Inferior Vena Cava Ultrasound

Ultrafiltration Profiling

a recently completed clinical trial has shown that ultrafiltration profiling, the technique by which the rate of ultrafiltration is varied over the course of dialysis in an attempt to better match patients' physiology, which previously had been thought to ameliorate hypotension and promote hemodynamic stability, was ineffective in this regard.

Guidelines for ultrafiltration orders

Even patients who are quite edematous and in pulmonary edema rarely need removal of more than **4 L** of fluid during the initial session

If the patient does not have pedal edema or anasarca, pulmonary congestion, it is unusual to need to remove greater than **2–3 L** over the dialysis session

The fluid removal plan during dialysis should take into

The initial dialysis: the length of the dialysis session should be limited to 2 hours. However, if a large amount of fluid must be removed, it is impractical and dangerous to remove such an amount over a 2-hour period

In general, it is best to remove fluid at a constant rate throughout the dialysis treatment

Impact of dialysis frequency on ultrafiltration needs

Use of a frequent (4-7 times per week) dialysis schedule reduces the amount of fluid that needs to be removed with each dialysis,

SLED (sustained low-efficiency dialysis)

C-HF (slow continuous hemofiltration)

C-HD (slow continuous hemodialysis)

C-HDF (slow continuous hemodiafiltration)

FLUID REMOVAL ORDERS

Concept of “dry weight” or optimum post dialysis weight

If the dry weight is set **too high**, the patient will remain in a **fluid-overloaded** state at the end of the dialysis session

If the dry weight is set **too low**, the patient may suffer frequent **hypotensive** episodes during the latter part of the dialysis session

Frequent resetting of the optimum post dialysis weight:

The optimum post dialysis weight should therefore be reevaluated at least **every 2 weeks**

potential adjuvant therapies

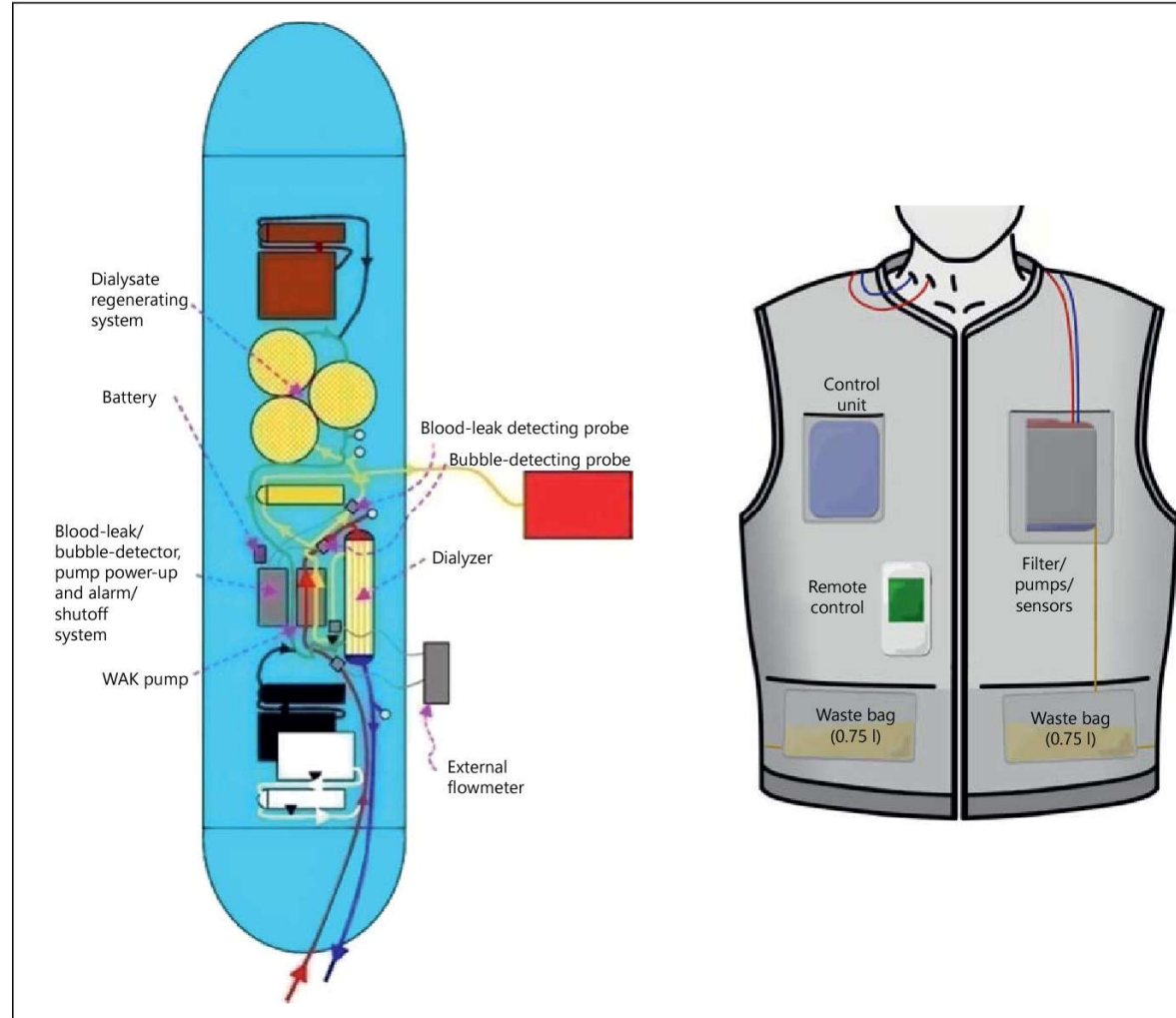
drugs that block the uptake of sodium from the gut (NHE3 inhibitors)

wearable ultrafiltration devices (WUF)

WUF

an ultrafiltration device adapted to be worn on a portion of the body of a patient includes:

- A blood inlet tube leading from a first blood vessel,
- a blood pump,
- an anticoagulant reservoir
- a blood filter
- a fluid bag for storing the excess fluid and a blood outlet tube leading to a second blood vessel



با سپاس از توجه شما