

**Baxter**



**HEMO  
CONTROL**

ENGLISH | FRANÇAIS

Making possible personal.



# Mrs. Harvey

37 years old

Too much fluid removed; asymptomatic



[VIEW PATIENT CASES](#) →

[START THE SIMULATION](#) →

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Because every patient is different.  
Because every session is different.



# Mrs. Harvey

Mrs. Harvey is a 37-year-old mom who has been on hemodialysis for the past 2 years. She is used to four- to five-hour sessions, 3 times per week. Although her blood pressure remains steady at 140/80 mmHg throughout treatment, her blood volume decreases by approximately 20% during sessions. Generally, she does not feel well after treatment, an indication that perhaps too much fluid is removed. This outcome directly impacts her lifestyle as it impedes her daily activities.

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Because every patient is different.  
Because every session is different.



# Mrs. Smith

60 years old

Not enough fluid removed; symptomatic



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Because every patient is different.  
Because every session is different.



# Mrs. Smith

Mrs. Smith is 60 years old. She used to be very active in her community. Two years ago, she went into renal failure post-cardiac surgery and was put on hemodialysis. Adhering to her renal diet and fluid restrictions is a challenge. During treatment, blood pressure fluctuations between 96/60 mmHg and 78/60 mmHg make her dizzy. It is uncertain what her blood pressure is between treatments. She also experiences severe cramping, making it difficult to remove fluid and reach the target. She is apprehensive prior to each dialysis session, as she normally does not

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Because every session is different.



# Mr. Jones

78 years old

Drop in BP, symptomatic



VIEW PATIENT CASES →

START THE SIMULATION →

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Because every patient is different.  
Because every session is different.



# Mr. Jones

Mr. Jones is 78 years old. He is hypertensive and overweight (120 kg). He was diagnosed with diabetic nephropathy in his early 60s, which ultimately led to hemodialysis. His average blood pressure at the onset of treatment is 198/107 mmHg. His blood pressure sometimes drops to 110/70 mmHg after treatment. He has a well-documented history of IDH, feels unwell throughout the treatment, and requires close monitoring from the nurse. His maximum fluid removal rarely exceeds 2 litres, which leaves him with 1 to 1.5 kg over his dry weight target. He is always tired, which is impacting his overall health and quality of life, while taking its toll on both him

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Because every patient is different.  
Because every session is different.



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IDH – A dialysis challenge



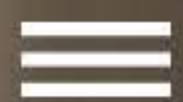


## IDH – A dialysis challenge

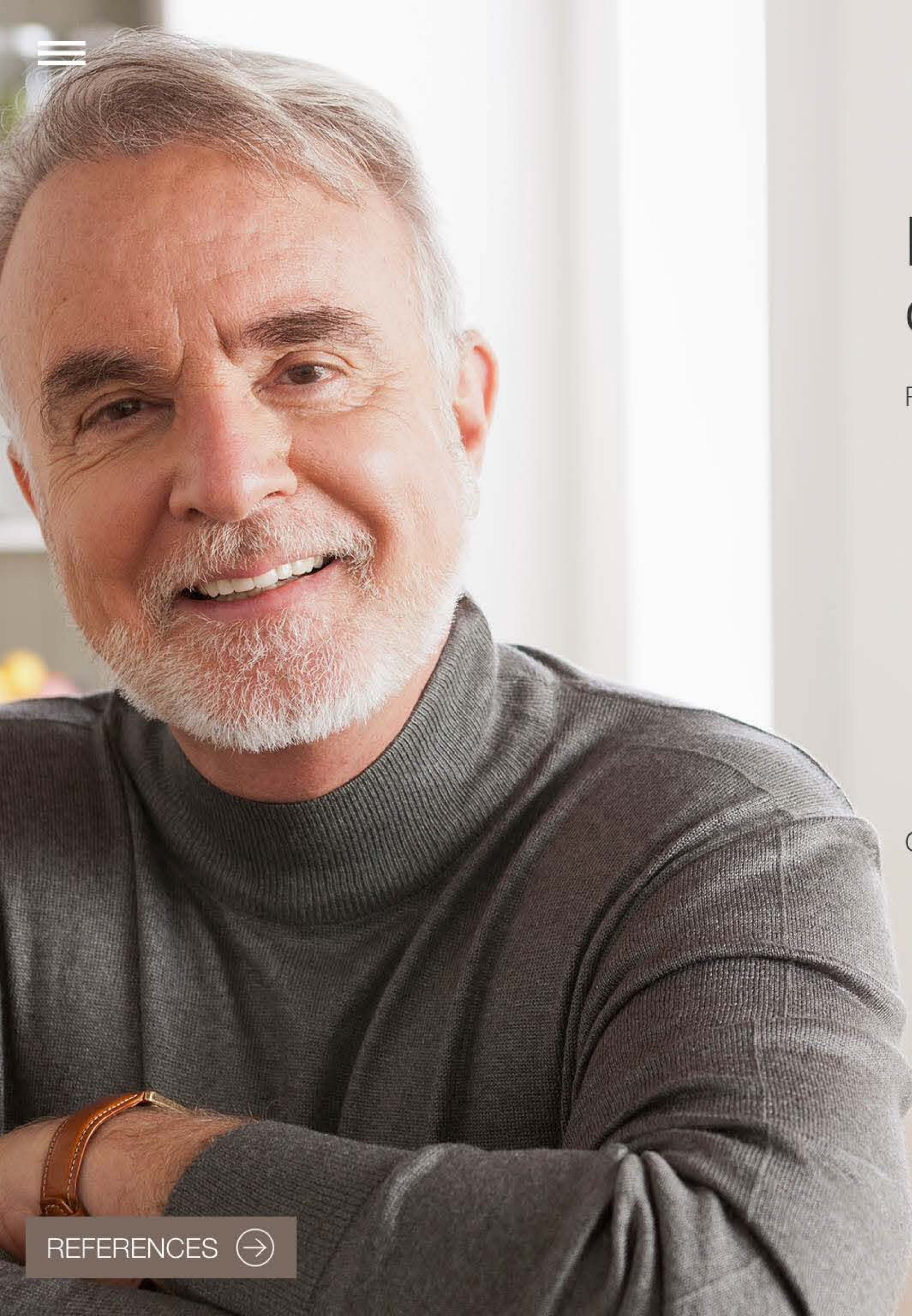
- IDH is estimated to occur in 25% to 50% of all hemodialysis treatments<sup>1,2</sup>
- IDH symptoms are generally transient but can cause permanent damage:<sup>3,4</sup>
  - Myocardial infarction
  - Cerebrovascular accident
  - Intestinal infarction
  - Occlusion of the arteriovenous fistula
- Factors for the development of IDH:
  - Volume related (large weight gain, high UFR, low dry weight target, low dialysis)
  - Inadequate vasoconstriction (high dialysis solution temperature (> 36 degrees Celcius), autonomic neuropathy, antihypertensive drugs, eating during treatment, anemia)
  - Cardiac factors (diastolic dysfunction, arrhythmias, ischemia)
  - Other uncommon causes (pericardial tamponade, myocardial infarction, hemorrhage, septicemia, dialyzer reaction, hemolysis, air embolism)
- All of these factors may lead to chronic overhydration and also underdialysis

IDH: Intradialytic hypotension

UFR: Ultrafiltration rate



## Risk factors and etiology of IDH<sup>3</sup>




# Risk factors and etiology of IDH<sup>3</sup>

## Risk factors:

- Age
- Diabetes
- Left ventricular hypertrophy
- Diastolic dysfunction
- Prior myocardial infarction
- Symptomatic coronary heart disease
- High interdialytic weight gain

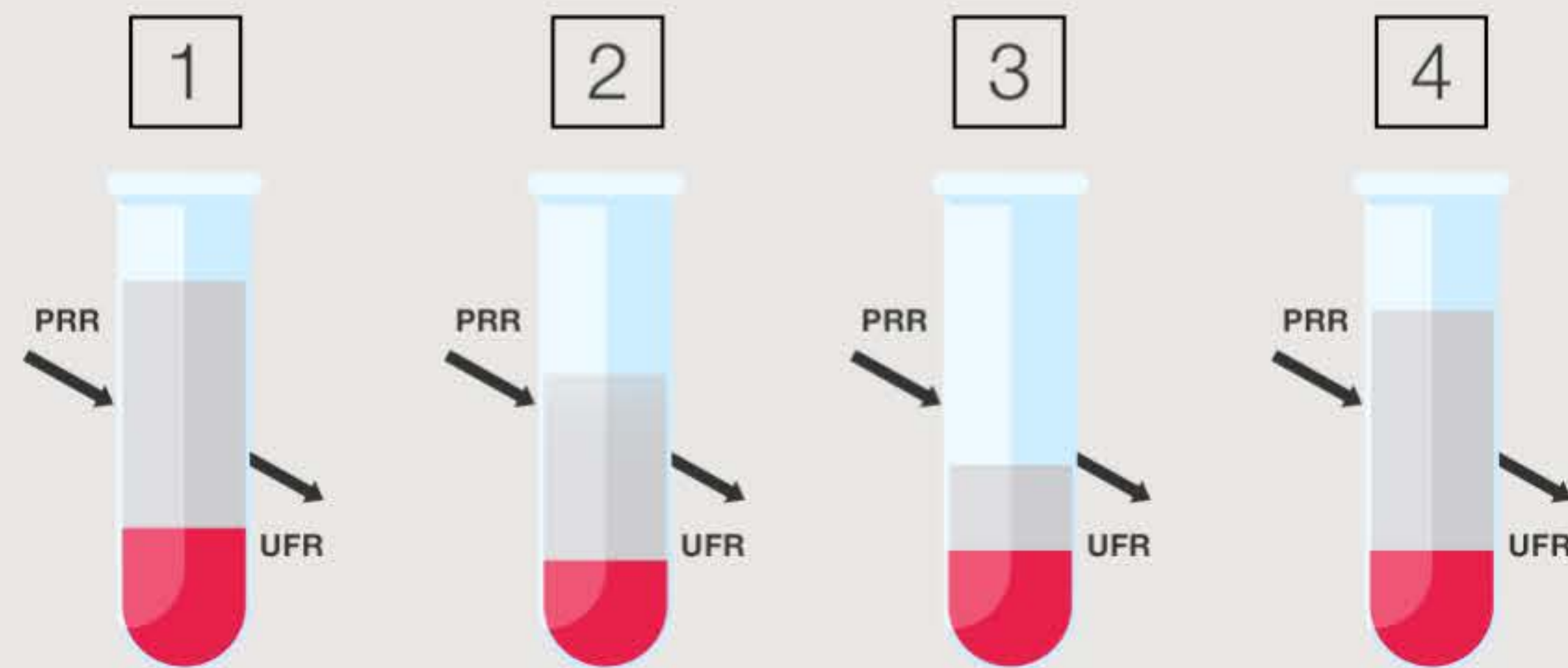
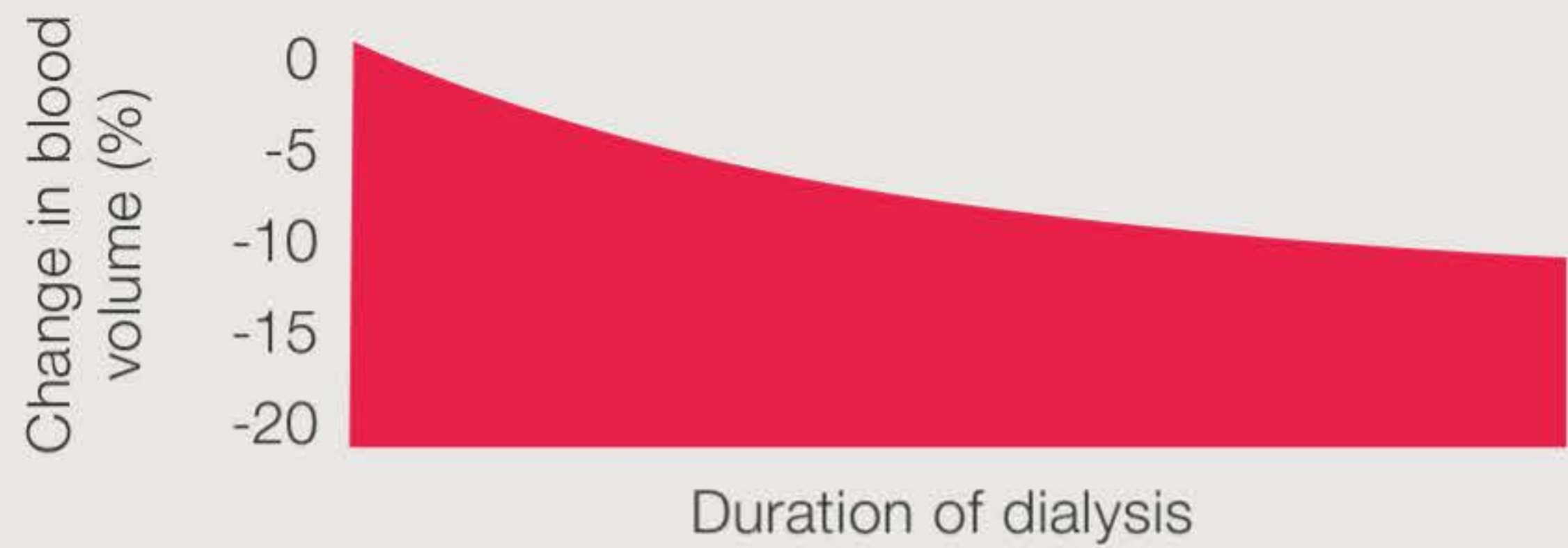
## Causes

- Volume depletion [VIEW DATA](#) 
- Cardiac disease
- Autonomic nervous system dysfunction

IDH: Intradialytic hypotension



# Volume depletion



■ = Red blood cell volume  
■ = Plasma

**Tube 1: Treatment start**

PRR is usually good in the first hour of treatment.

**Tube 2: UFR > PRR**

PRR is slowing down. This causes a gradual reduction in BV.

**Tube 3: Morbidity zone**

UFR is significantly > PRR.

**Tube 4: "Rebound" zone**

UFR < PRR. Fluid is shifting into the bloodstream faster than it is being removed.

UFR: Ultrafiltration rate  
 PRR: Plasma refill rate  
 BV: Blood volume



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HemoControl™ system

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# What is the HemoControl™ system?

- Fully integrated and automated profiling system
- Monitors the patient's blood volume and PRR to maintain the blood volume along a predetermined trajectory

PRR: Plasma refill rate





# What are the goals of the HemoControl™ biofeedback system?

Based on BV change, HemoControl™ adjusts UF and sodium levels

1. Preserve the cardiovascular stability

2. Help restore the target dry weight

3. Maintain the desired sodium balance

Blood volume



»»» Blood pressure stability

BV: Blood volume  
UF: Ultrafiltration

# What are the goals of the HemoControl™ biofeedback system?

Based on BV change, HemoControl™ adjusts UF and sodium levels

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3. Maintain the desired sodium balance



BV: Blood volume  
UF: Ultrafiltration





# What are the goals of the HemoControl™ biofeedback system?

Based on BV change, HemoControl™ adjusts UF and sodium levels

1. Preserve the cardiovascular stability

2. Help restore the target dry weight

3. Maintain the desired sodium balance

Dialysate sodium level



Prevention of sodium overload

BV: Blood volume  
UF: Ultrafiltration



# What are the HemoControl™ characteristics?



- The HemoControl™ system is a built-in function of the Artis™ dialysis system
- Setting the HemoControl™ parameters may be simplified with the use of the Patient Card for the Artis™ dialysis system
- Easy to integrate in clinical practice
- Easy to interpret notifications with use of Smart Scan

\*HemoControl™ is not available for on-line HDF treatments

For the safe and proper use of the Artis™ Dialysis System, refer to the operator's manual.



# HEMO CONTROL

HemoControl™ system explained:  
Hemoscan; Diascan™



Hemoscan

Diascan™

## Hemoscan system

- Non-invasive RBV monitoring during dialysis [VIEW DATA](#)
- RBV change monitored by an optical sensor and displayed as a percent change on screen

HemoControl™ can be used for:

- Patients in whom the removal of fluid is difficult due to symptoms such as IDH and cramping
- Patients in whom overhydration is suspected but the removal of extra fluid is difficult due to IDH and/or symptoms such as cramping
- As an aid in the evaluation of the target dry weight, in addition to physical examination and chest X-ray, cardiac ultrasonography or measurement of the inferior *vena cava*

Situations where you should **NOT** use HemoControl™:

- Hemoscan is not accurate in the following circumstances:
  - Administration of blood transfusions during the dialysis session
  - Dialysis with an effective blood flow rate below 180 ml/min
  - Infusion of therapeutic solutions during dialysis through the red port of the arterial line



## Hemoscan

## Diascan™

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Situations where you should **NOT** use HemoControl™:

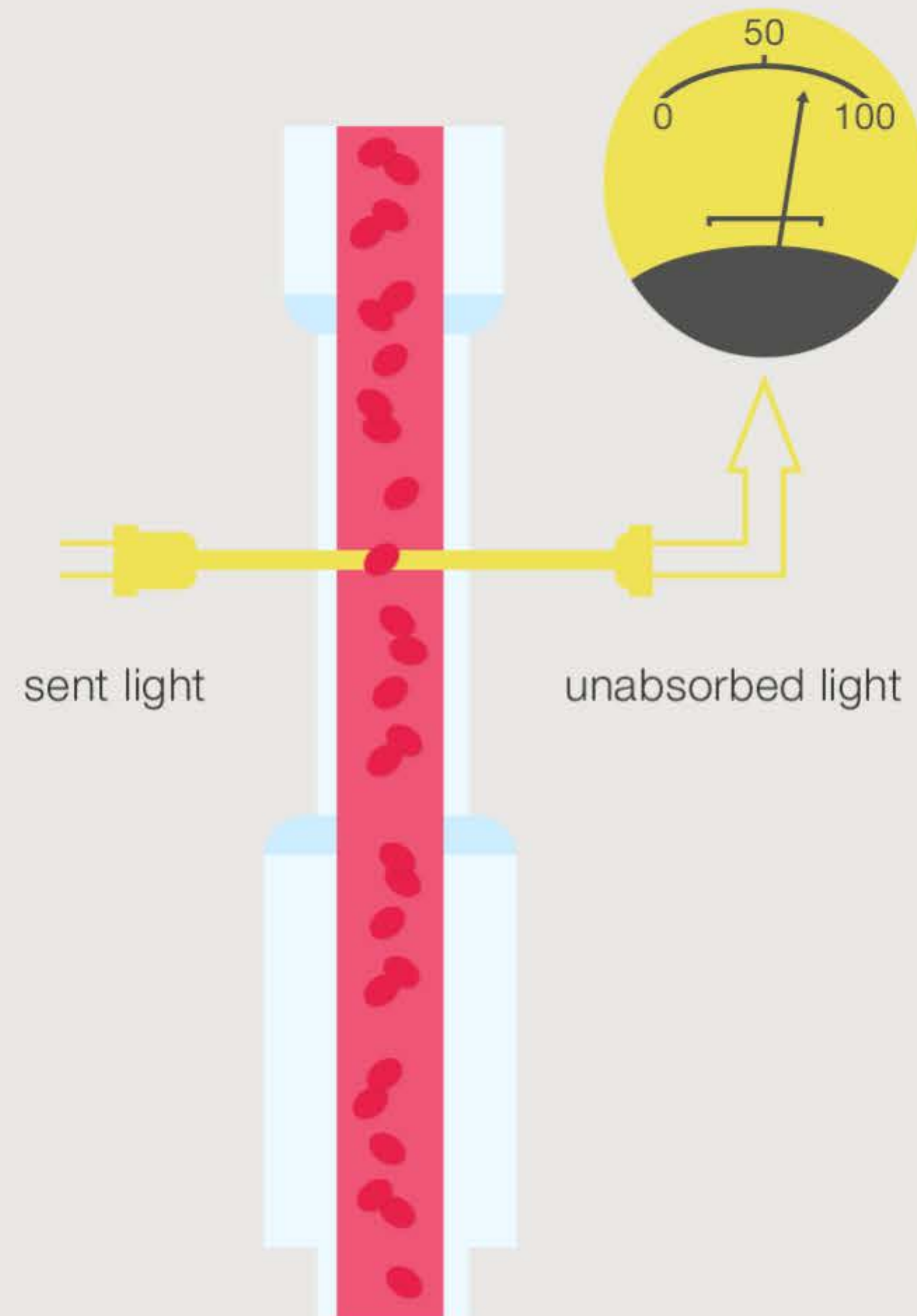
- Hemoscan is not accurate in the following circumstances:
  - Administration of blood transfusions during the dialysis session
  - Dialysis with an effective blood flow rate below 180 ml/min
  - Infusion of therapeutic solutions during dialysis through the red port of the arterial line
- It has been stated that the simultaneous administration of parenteral nutrition, especially if it contains a large amount of fat, is a possible contraindication, but until now this has not been investigated thoroughly enough to permit a final judgment

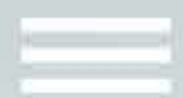
RBV: Relative blood volume

IDH: Intradialytic hypotension



# Non-invasive RBV monitoring during dialysis





Hemoscan

Diascan™

## Diascan™ system

- Sodium modeling system
- Ensures control of sodium transfer preventing the risk of sodium overload



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Who should use HemoControl™?

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Nurse's challenges

Proven clinical benefits

## Nurses: IDH clinical implications

- Prolonged treatment or additional/unplanned patient care caused by IDH disturbs the operational flow of the clinic
- RBV decreases are often unpredictable as they vary significantly from patient to patient but also between different HD sessions in the same patient<sup>5</sup>
- IDH increases nurse interventions (e.g. prompt reclining of chair, manual reduction of UFR and/or blood flow, and infusion of saline)<sup>2</sup>
- Frequent interruption of sessions and repetitive administration of IV fluids may result in chronic over hydration<sup>6</sup>

IDH: Intradialytic hypotension

RBV: Relative blood volume

HD: Hemodialysis

UFR: Ultrafiltration rate

IV: Intravenous



Nurse's challenges

Proven clinical benefits

## Nurses: Proven clinical evidence for most patients

- Demonstrated a significant reduction in number of sessions requiring nurse interventions (secondary endpoint)<sup>2</sup>

[VIEW DATA](#) 

- Beneficial to patients:
  - Where prescription adjustments have been ineffective at controlling IDH
  - Where IDH occurs after a certain decrease in the RBV
  - With a degree of overhydration, difficult to resolve due to IDH
- Assists in determining optimal dry weight to reach treatment goal

IV iron therapy can be administered. RBV changes should be ignored upon administration. RBV will regulate when line is clamped. HemoControl™ should be deactivated when giving blood transfusions or intradialytic parenteral nutrition.

HD: Hemodialysis

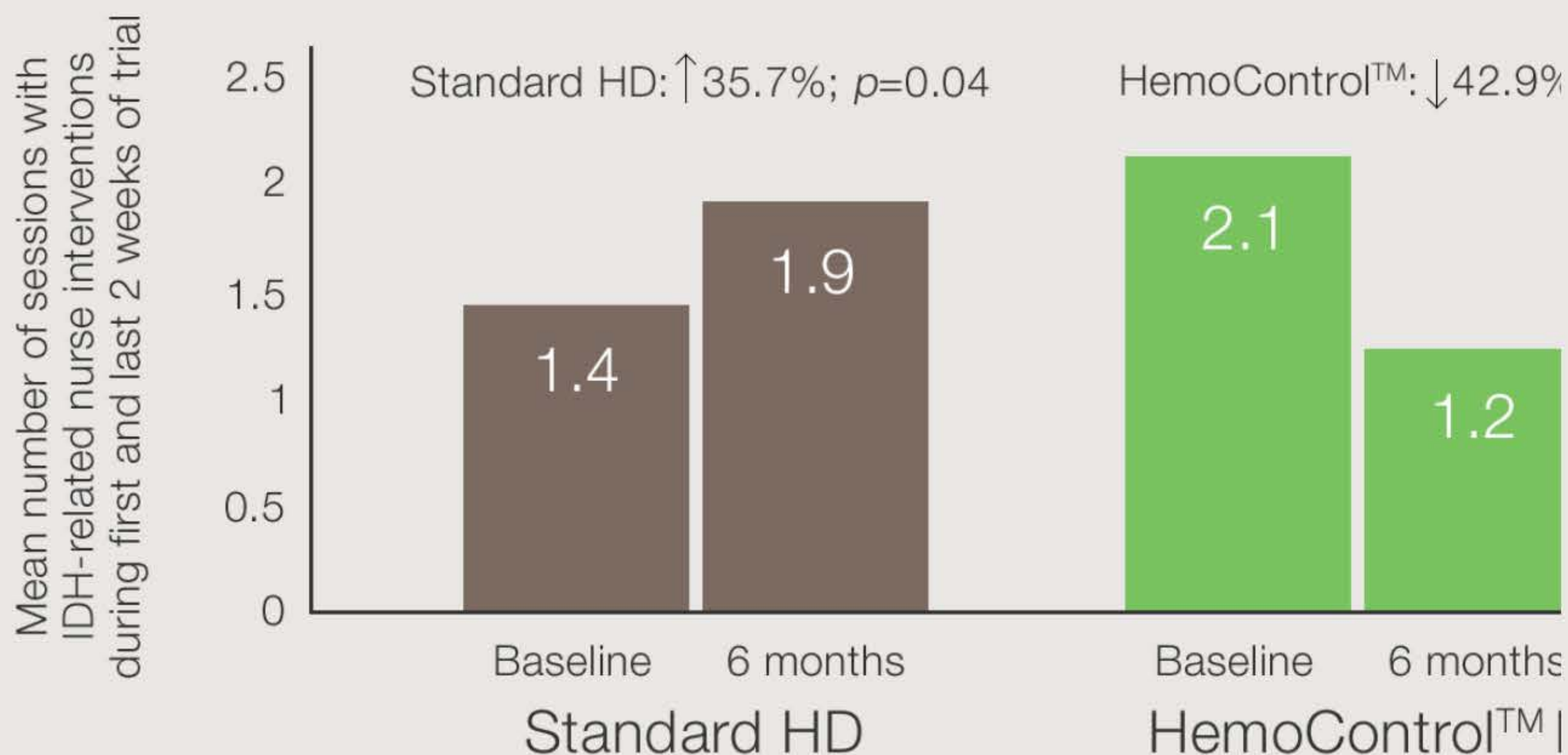
IDH: Intradialytic hypotension

RBV: Relative blood volume

REFERENCES 



Demonstrated a significant reduction in number of sessions requiring nurse interventions (secondary endpoint)<sup>2</sup>



Adapted from Déz

Mean number of dialysis sessions per patient for which intradialytic hypotension-related nursing interventions were required during the first 2 weeks and the last 2 weeks of the trial in both the HemoControl™ and standard HD groups. The percentages represent the proportions of sessions per patient for which nursing interventions were required over the total number of dialysis sessions



Doctor's challenges

Proven clinical benefits

## IDH

- Organ hypoperfusion can cause:<sup>7</sup>
  - Cardiac complications (infarction, arrhythmias)
  - Neurologic complications (stroke, seizures)
  - Gastrointestinal complications (mesenteric ischemia)
- Long-term effects of IDH may accelerate the decline in residual renal function<sup>7</sup>
- IDH may result in repetitive, asymptomatic cardiac ischemia resulting in irreversible damage to the heart<sup>7</sup>
- Repeated IDH limits fluid removal during the dialysis session leading to chronic fluid overload, inadequate solute clearance and subsequently increased morbidity and mortality<sup>8,9</sup>

## Hypertension

- Hypertension is estimated to occur in 50% to 90% of patients undergoing long-term maintenance HD<sup>2</sup>

IDH: Intradialytic hypotension  
HD: Hemodialysis



Doctor's challenges

Proven clinical benefits

## Doctors: Proven clinical benefits for most patients

- ~ 20% reduction of median IDH with HemoControl™ vs. standard HD treatments in patients over the 25% threshold of hypotension episodes<sup>10</sup>

[VIEW DATA](#) 

- Potential for improved cardiac function with less dialysis-induced myocardial stunning<sup>11</sup>

[VIEW DATA](#) 

- 39% reduction in the number of IDH episodes reducing stress and preserving the CV system, both in the short and long term<sup>13</sup>
- Provides significant improvements in intradialytic CV stability<sup>10, 12</sup>
- Showed no evidence of clinically significant sodium loading<sup>10, 12, 13</sup>

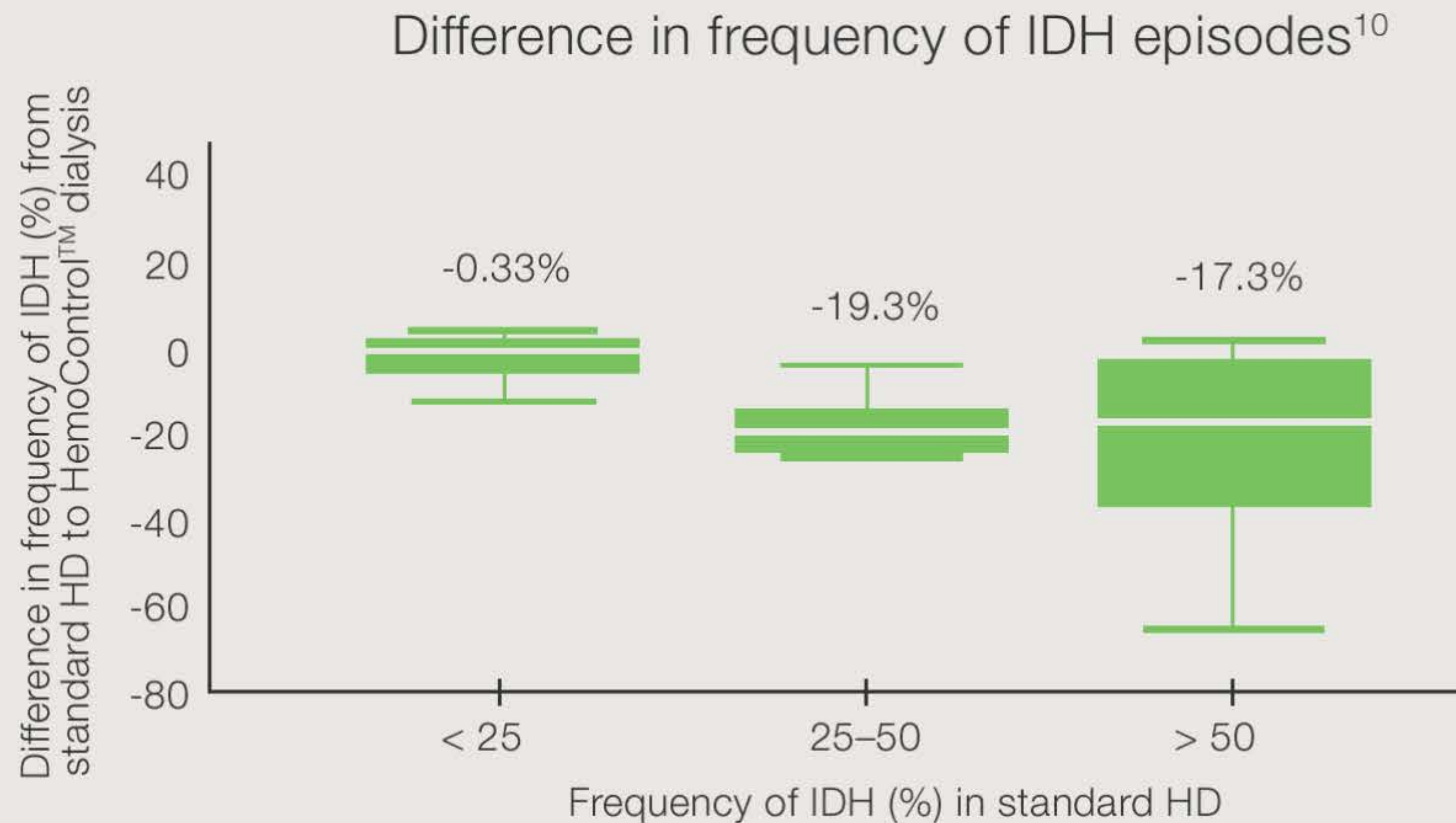
IDH: Intradialytic hypotension

HD: Hemodialysis

CV: Cardiovascular



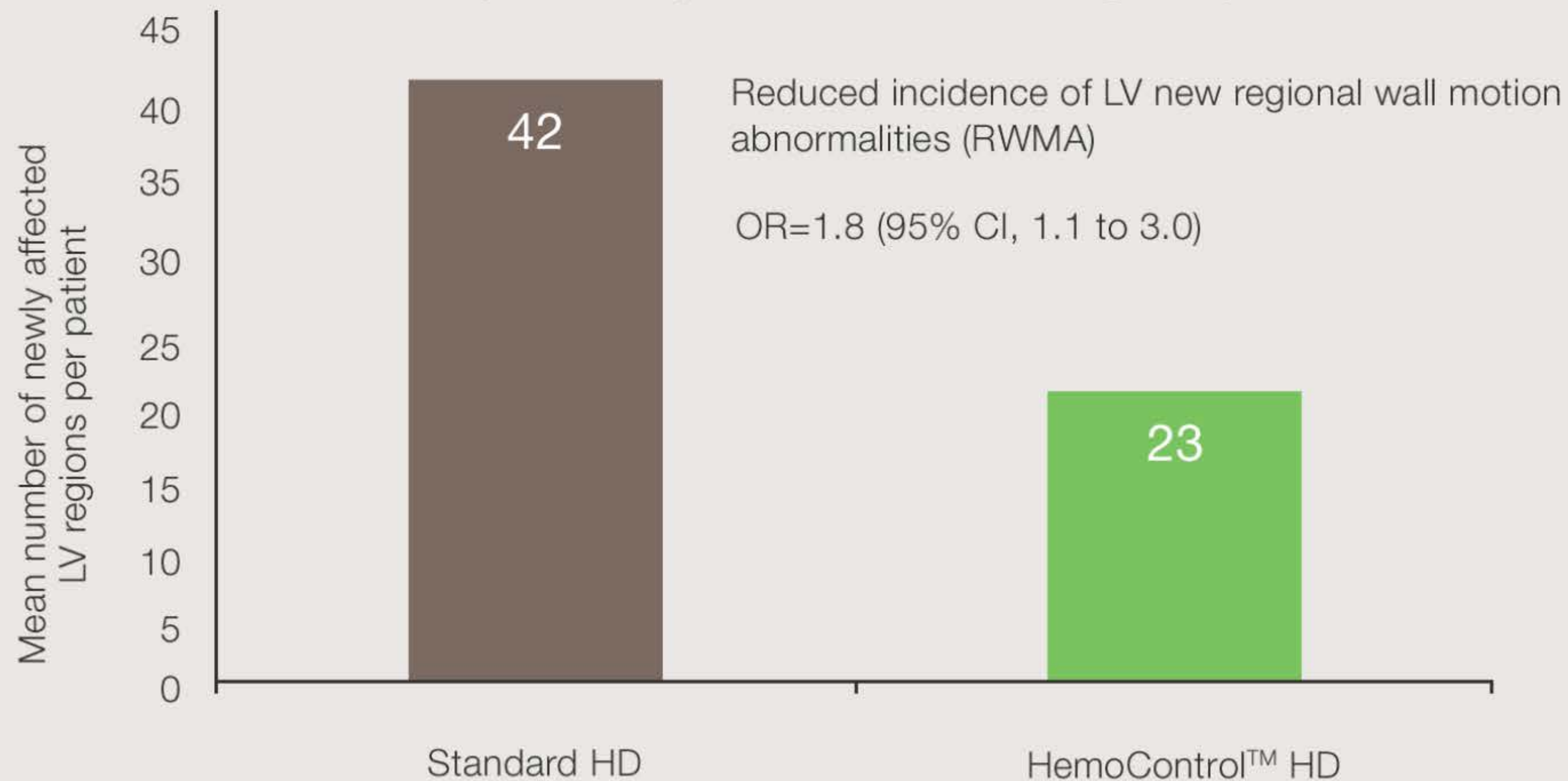
~ 20% reduction of median IDH with HemoControl™ vs. standard HD treatments in patients over the 25% threshold of hypotension episodes<sup>10</sup>



Adapted from Santoro et al.<sup>10</sup>

# Potential for improved cardiac function with less dialysis-induced myocardial stunning<sup>11</sup>

New LV regional wall motion abnormalities (RWMA) in patients prone to IDH during dialysis<sup>11</sup>



More regional wall motion abnormalities developed during HD compared with biofeedback dialysis, with a total of 42 regional wall motion abnormalities during HD compared with 23 regional wall motion abnormalities during biofeedback dialysis (OR, 1.8; 95% CI, 1.1 to 3.0)."

LV: Left ventricular

Adapted from Selby et al.<sup>11</sup>



Patient's challenges

Proven clinical benefits

## Impact on patients

- IDH leads to severe patient discomfort during HD treatment, as well as a longer recovery after treatment<sup>14</sup>
- Patients fear symptoms of IDH (dizziness, weakness, dyspnea/chest pain, nausea/vomiting, cramps and fatigue)<sup>3</sup>

IDH: Intradialytic hypotension

HD: Hemodialysis





Patient's challenges

Proven clinical benefits

## Potential improvement of patient HD session tolerance

- Significant improvement in health-related quality of life vs. standard HD<sup>2</sup>
- Improves patient's tolerance and reduces fatigue<sup>2</sup>
- Patients tend to recover faster and experience an improved quality of life as measured in the KDQOL-SF questionnaire<sup>15</sup>

[VIEW DATA](#) 

HD: Hemodialysis

KDQOL-SF: Kidney Disease and Quality of Life – Short Form questionnaire

REFERENCES 



Patients tend to recover faster and experience an improved quality of life as measured in the KDQOL-SF questionnaire<sup>15</sup>

Patient's recovery with Standard HD vs. HemoControl™<sup>15</sup>



Adapted from Gil HW et al.<sup>15</sup>



## Summary - clinical benefits

- Reduced interruptions of clinical operations due to uninterrupted HD sessions and fewer treatment delays<sup>2</sup>
- Provides a more predictable/manageable treatment
- No extra cost

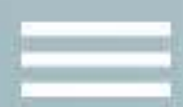
HD: Hemodialysis





**HEMO  
CONTROL**

How to introduce the HemoControl™ system  
in your dialysis unit



## How to introduce the HemoControl™ system in your dialysis unit

- Ensure that all relevant personnel are familiar with the function of the Artis™ dialysis system monitor during regular dialysis treatments
- Set up a specific working group before the actual start with HemoControl™ including a dialysis technician for adjusting the machine presets, a nephrologist and a dialysis nurse
- Prepare the introduction of the HemoControl™ system and educate all relevant personnel
- Experience has shown that the best results are achieved with frequent, small-scale training sessions
- Start with small group of patients (1 or 2 patients)
- Baxter representatives will accompany you on your journey!

For the safe and proper use of the Artis™ dialysis system, refer to the operator's manual.



**HEMO  
CONTROL**

## Setting of HemoControl™



# Prescription screen

Prior to activating the HemoControl™ function, start by setting and confirming the following parameters:

- Treatment time
- UF volume
- Distribution volume



For the safe and proper use of the Artis™ dialysis system, please refer to the warnings, notes and detailed instructions for use in the operator's manual.

UF: Ultrafiltration



# Prescription screen

Then open the HemoControl™ Settings sub-screen by:  
Selecting the “Hemocontrol™” option in the Activated Functions list

VIEW STEPS →

Parameter	Value
Treatment Time	4:00 h:min
UF Volume	0.00 L
Temperature	37.0 °C
Dialysis Fluid Flow	600 mL/min
Sodium	140 mmol/L
Bicarbonate	34 mmol/L

**Activated Functions**

- Auto BPM
- Heparin Auto Start
- Diascan
- Hemocontrol** (indicated by a green arrow)
- Hemoscan
- Ultra Control

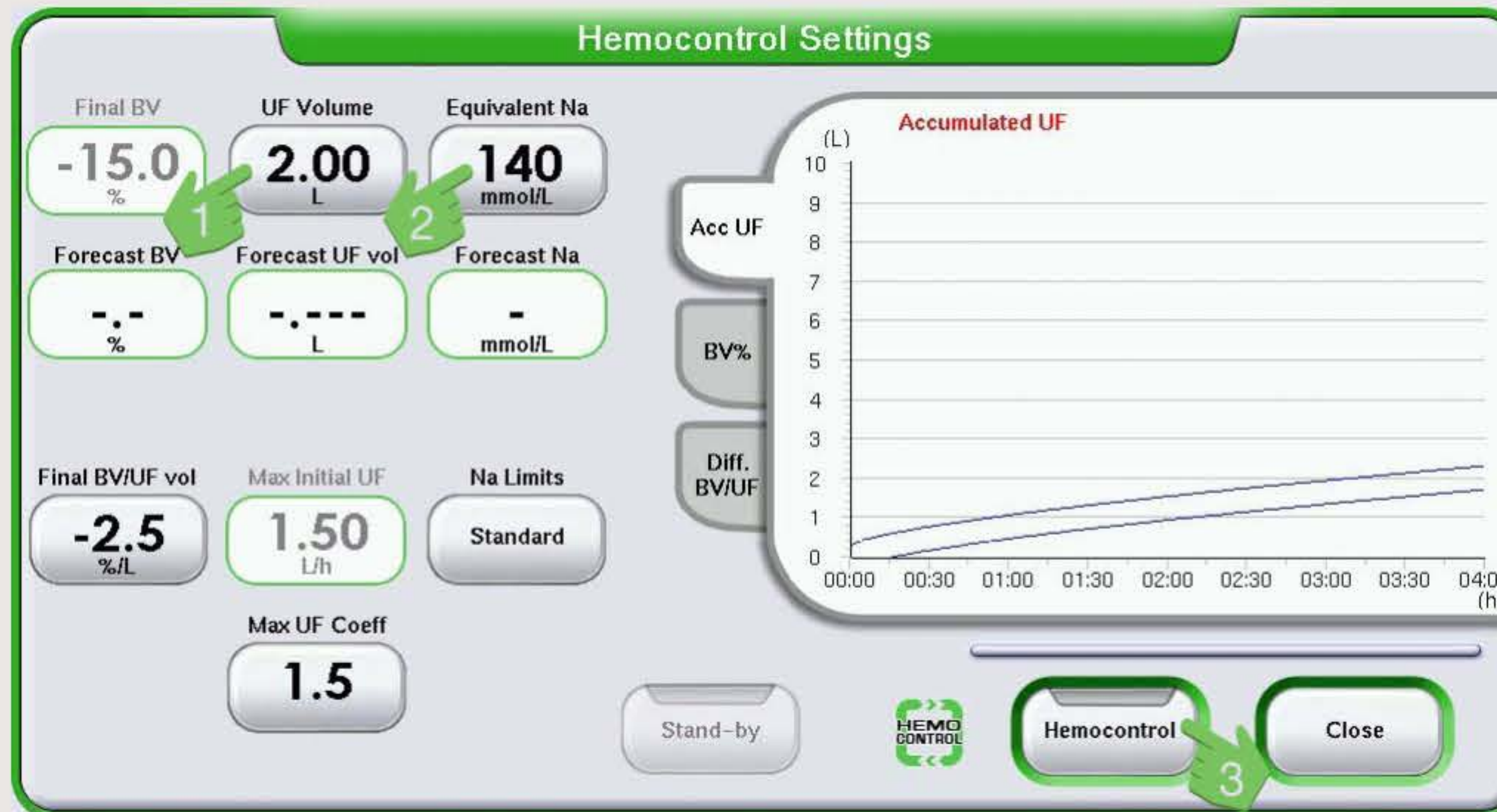
**Treatment**

Treatment Type: HCF Post  
Needle Mode: Double  
Control Mode: Volume Mode

Pt. Card Edit    Distrib Vd Settings    Timer Settings



# HemoControl™ Settings sub-screen



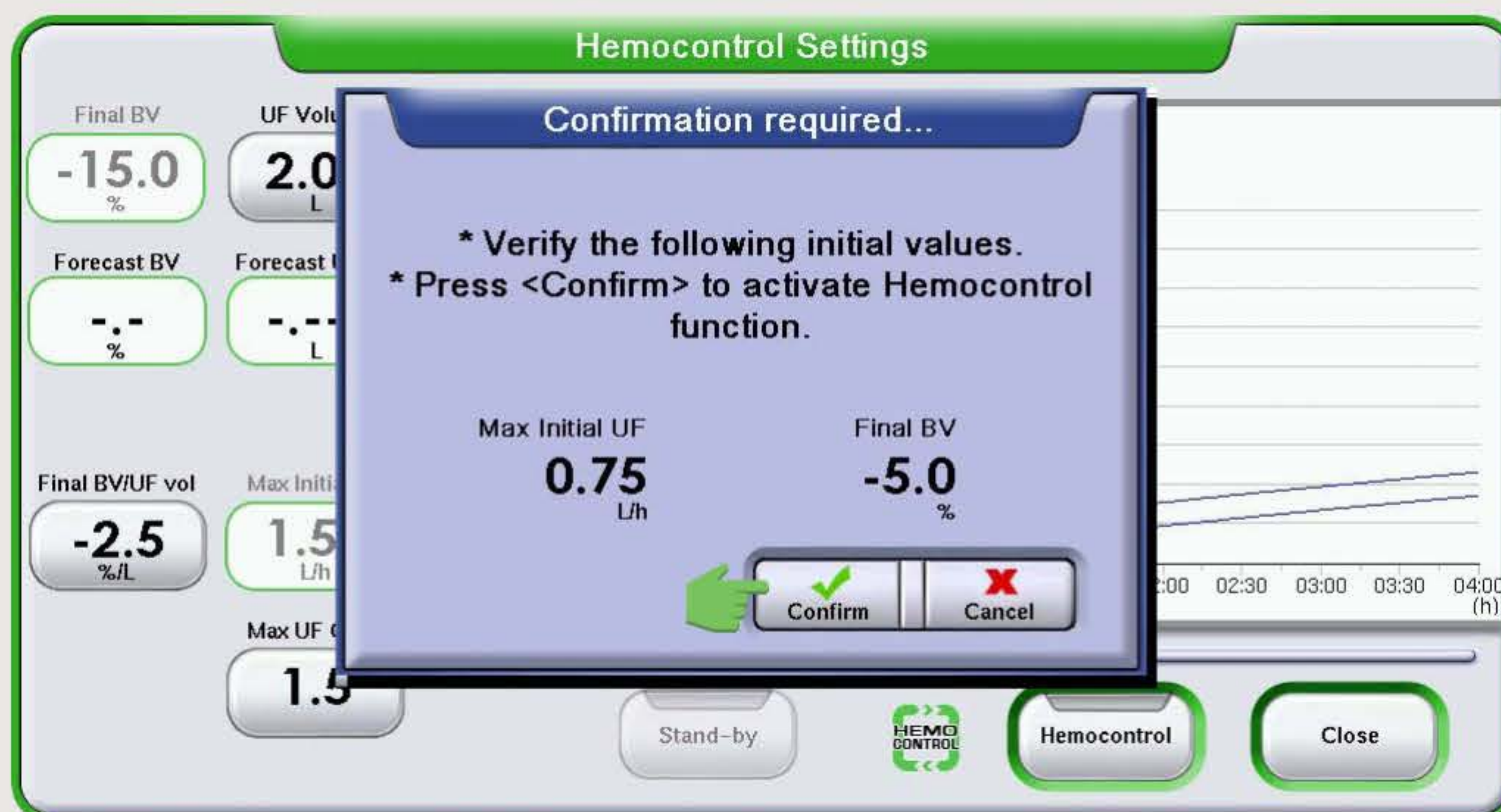
In the HemoControl™ Settings sub-screen the user must:

- 1 Ensure that the UF volume is correct
- 2 Ensure that the Equivalent Na is correct (that is, the sodium value that would be set for a standard dialysis)
- 3 Activate the HemoControl™ function by pressing the Hemocontrol button on the screen; a new window will pop up asking to confirm the settings

NEXT STEP



# HemoControl™ Confirm window



The calculated “Max Initial UF” and “Final BV” values are displayed on the Confirm window.

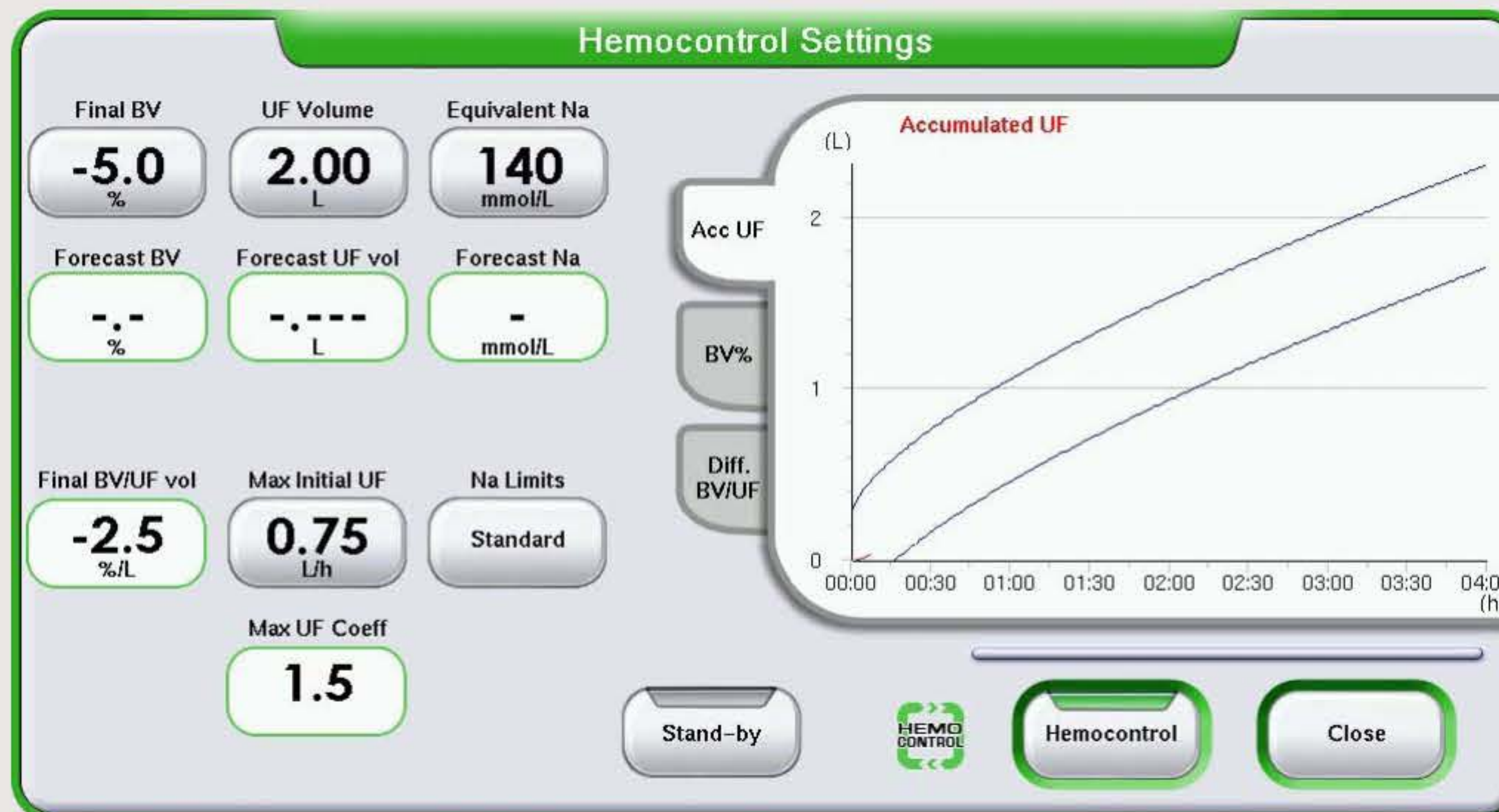
Click on the “Confirm” button to return to the HemoControl™ setting screen.

BV: Blood volume

← PREVIOUS STEP

NEXT STEP →

# HemoControl™ Settings sub-screen



As soon as the “Start Treatment” button is pressed and confirmed, the HemoControl™ function starts setting the “UF Rate” and the “Sodium” values.

- The “Stand-by” button becomes available
- The “Final BV” and “Max Initial UF” parameters are automatically calculated by the Artis™ dialysis system device
- The “Final BV/UF vol” and “Max UF Coeff” parameters become read-only
- The machine starts updating the “Acc UF” and “BV%” graphs
- The HemoControl™ button changes to green.

← PREVIOUS STEP

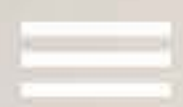
FINISH →



## Rules of thumb



- Avoid adjusting more than one parameter at a time.
- A value half-way between Forecast and Final values may be used as guidance for any adjustment.
- It takes about 30 minutes before the full effect of any adjustment is visible. Be patient and do not change any other parameter during this time.
- In general, no more than one adjustment should be necessary during the treatment.
- Final BV/UF volume value of -2.5 %/L could be used as a start value for most patients.



**HEMO  
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Summary



# Summary

## Improved cardiovascular stability

- Provides significant improvements in intradialytic cardiovascular stability<sup>10, 12</sup>

## Secured clinical targets

- Ensures reaching the prescribed dry weight with no risk of Na overload<sup>10, 12</sup>

## Better treatment tolerance

- More stable treatments and reduction of hypotensive episodes<sup>2</sup>



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