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Dialysis System

SW 8.09.13

Training module 4 – Functions in Practice

Ref: Operator's Manual SW 8.09.13
Chapter 7 – Isolated UF
Chapter 11 – Hemoscan Monitoring System
Chapter 12 – Diascan Monitoring System

Functions in Practice

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- Isolated UF
- Hemoscan
- Diascan

Important:
Please note that the SW change to 8.09.13 of this presentation does not change the training of the Artis Dialysis System for users.

Important Notice:
This presentation does not relieve any user of the Artis Dialysis System from his or her duty to carefully read the full text of the Operator's Manual before using the system.

Isolated UF

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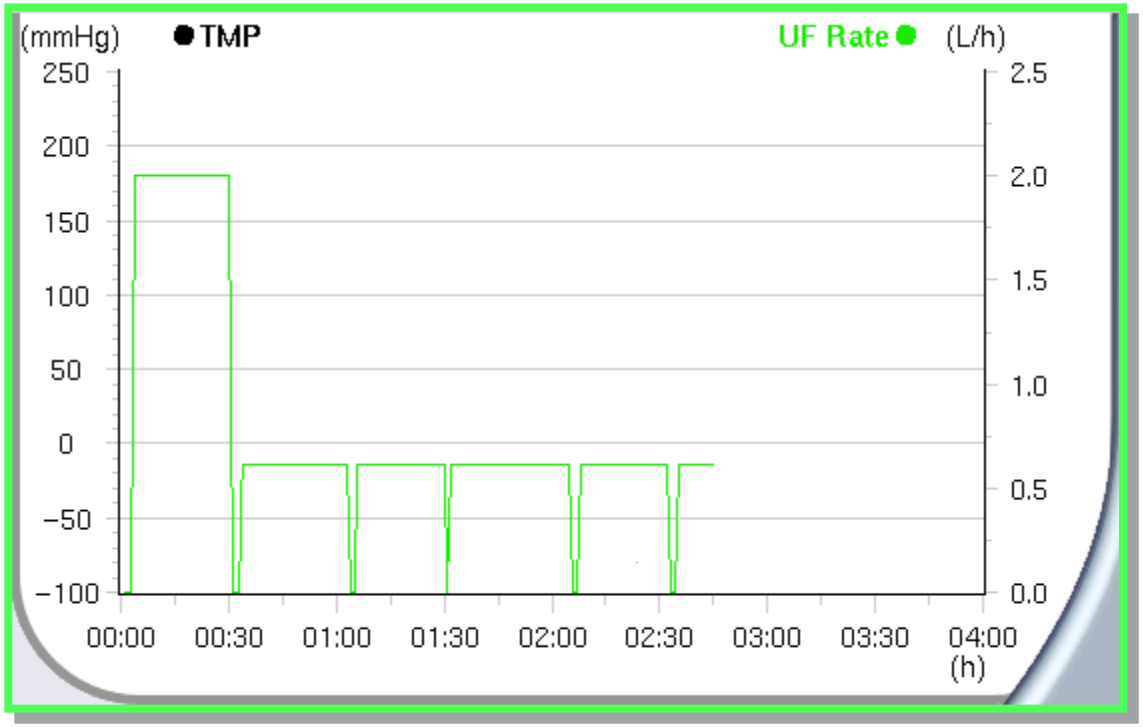

Fluid screen

Isolated UF

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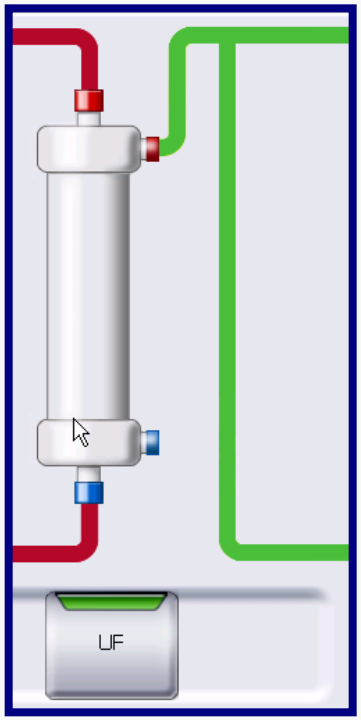


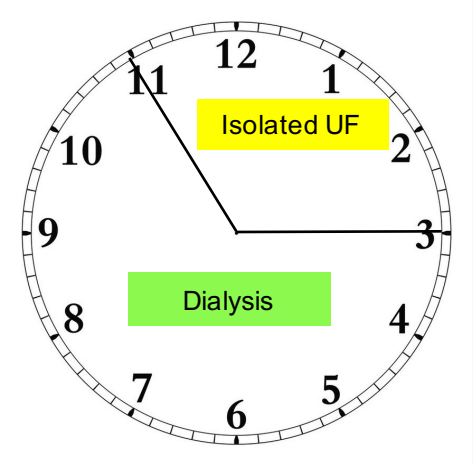
Treatment Overview screen

Separate procedure

- Before diffusion starts
- Max 120 min
- Max UFR 3L/h

No diffusion, therefore

- Limited solute removal
- No electrolyte or base balance correction



Isolated UF Activation

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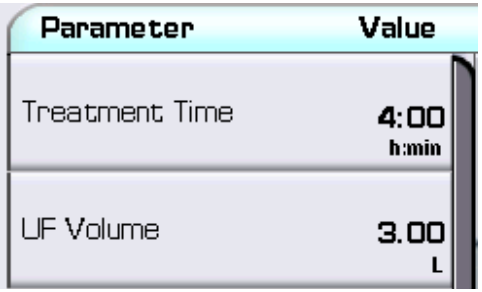
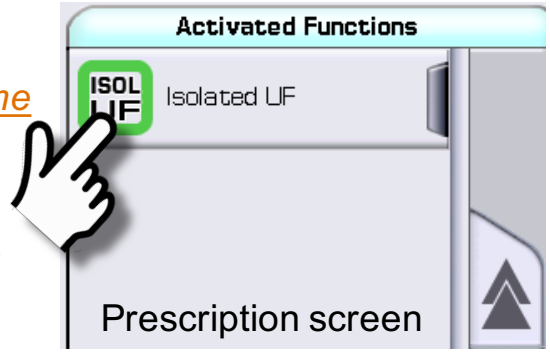


Prescription screen

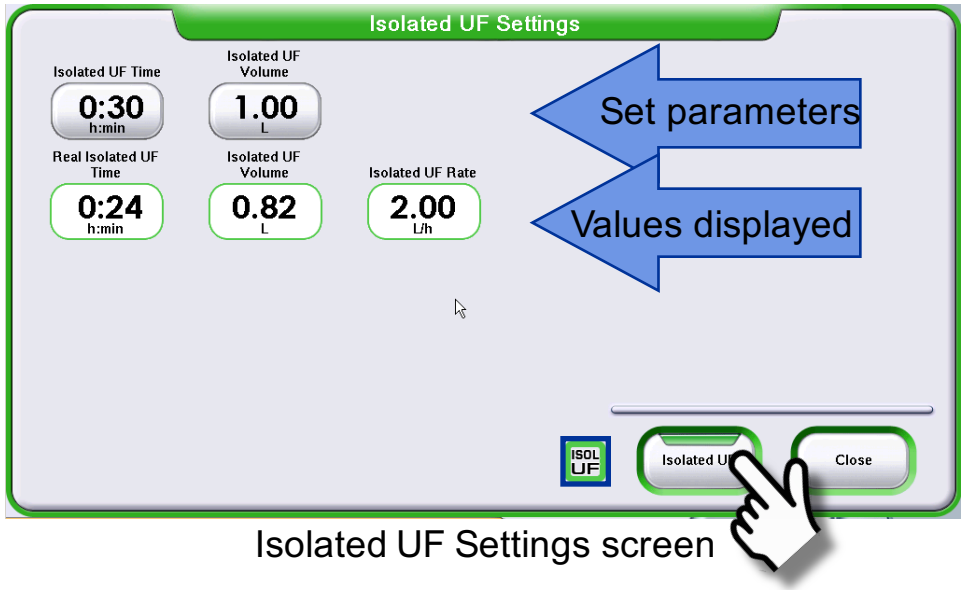
Set mandatory parameters:

- Treatment Time - *Include Isol. UF time*
- UF Volume - *Include Isol. UF volume*

Select Isolated UF function → →



Prescription screen



Isolated UF Settings screen

Set Isolated UF parameters:

- Isolated UF Time
- Isolated UF Volume
- Activate

Values displayed:

- Real (actual) Isolated UF Time
- Isolated UF Volume (actual)
- Isolated UF Rate

Isolated UF must be activated before "Start Treatment" button is pressed

Isolated UF Completed Information Signal

Indicates:

- Set Isolated UF Time is completed
- No UF takes place
- No diffusion takes place

Diffusion and UF starts as soon as the Information Signal is Confirmed

Isolated UF Completed

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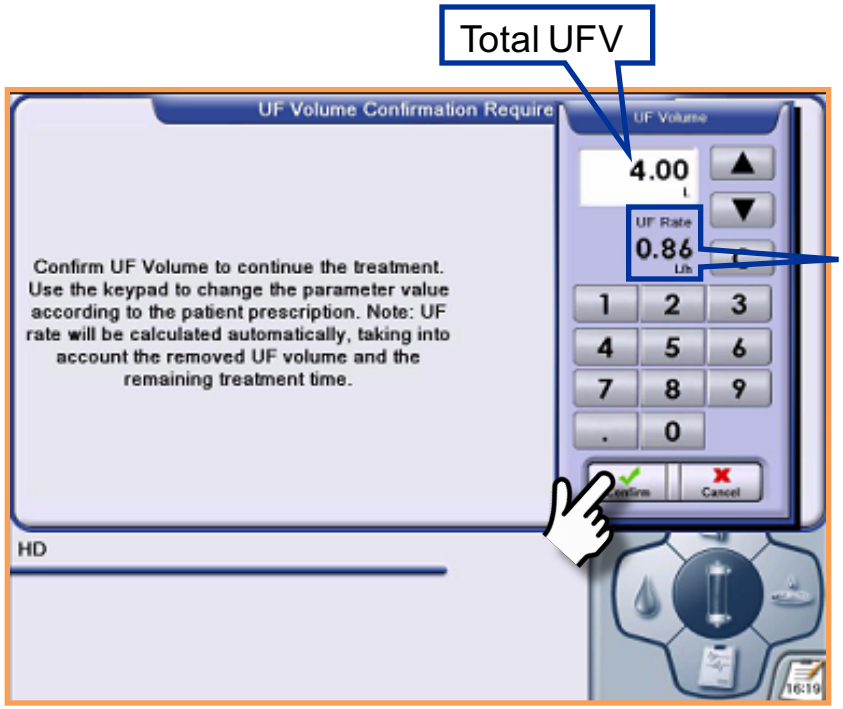

Confirmation Required

UF Volume Confirmation is Required

- The UF rate displayed on the key pad is calculated accordingly:

$$\text{Remaining UF Rate} = \frac{\text{Total UF Vol.} - \text{Acc. Isolated UF Vol.}}{\text{Remaining treatment time}}$$

- Check and adjust the UF Volume if needed
- Press CONFIRM (note: press CANCEL has no effect)
  - If the display shows "-.—", press CANCEL (note: press CONFIRM has no effect)
- Treatment time and/or UF Volume can be adjusted in the Fluid screen if needed

Once deactivated, Isolated UF cannot be activated again for the rest of the treatment

Nice to Know – Isolated UF

- The mandatory parameters must be confirmed before the Isolated UF parameters can be set
- The Isolated UF parameters should be included in the Treatment time and the UF Volume
- The Isolated UF time must be set before the Isolated UF Volume
- Isolated UF must be deactivated to get access to the Special Procedures button
- Until the “Isolated UF completed” information signal is Confirmed, no UF and no diffusion takes place.
- Isolated UF is not resumed after “Pause Treatment”, “Change Circuit” or Fast recovery procedures.

Hemoscan[1]

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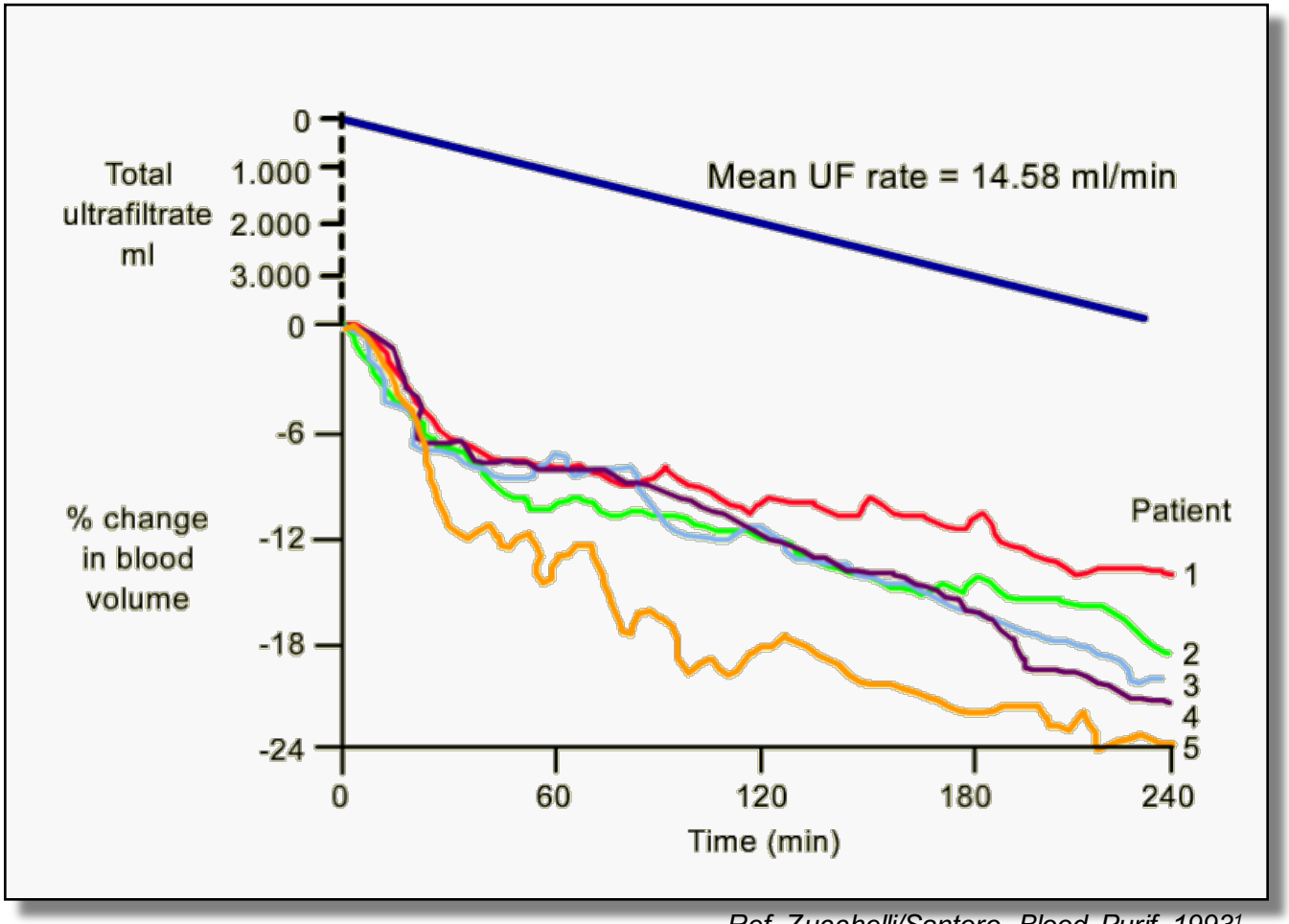

Ref. Zucchelli/Santoro, Blood Purif. 1993[1]

1: Zuchelli and Santoro, Dialysis induced hypotension: A fresh look at pathophysiology; *Blood Purification* 1993; 11:85-98

Hemoscan

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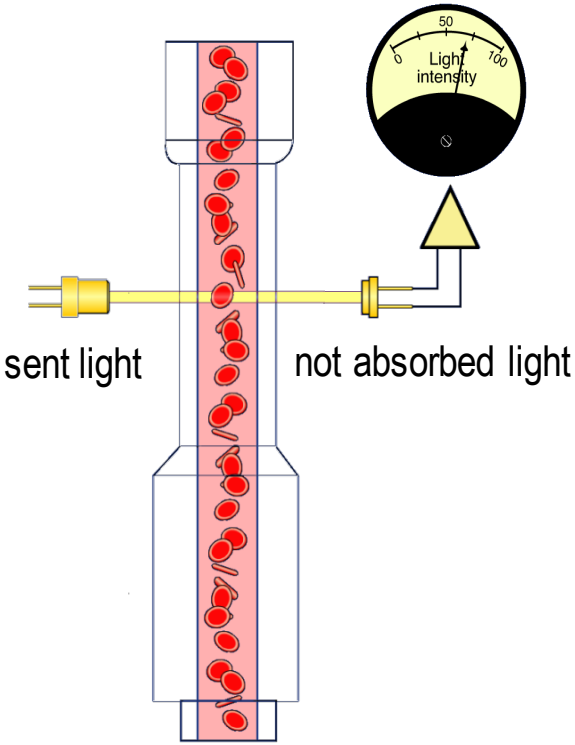
Non invasive blood volume monitoring:

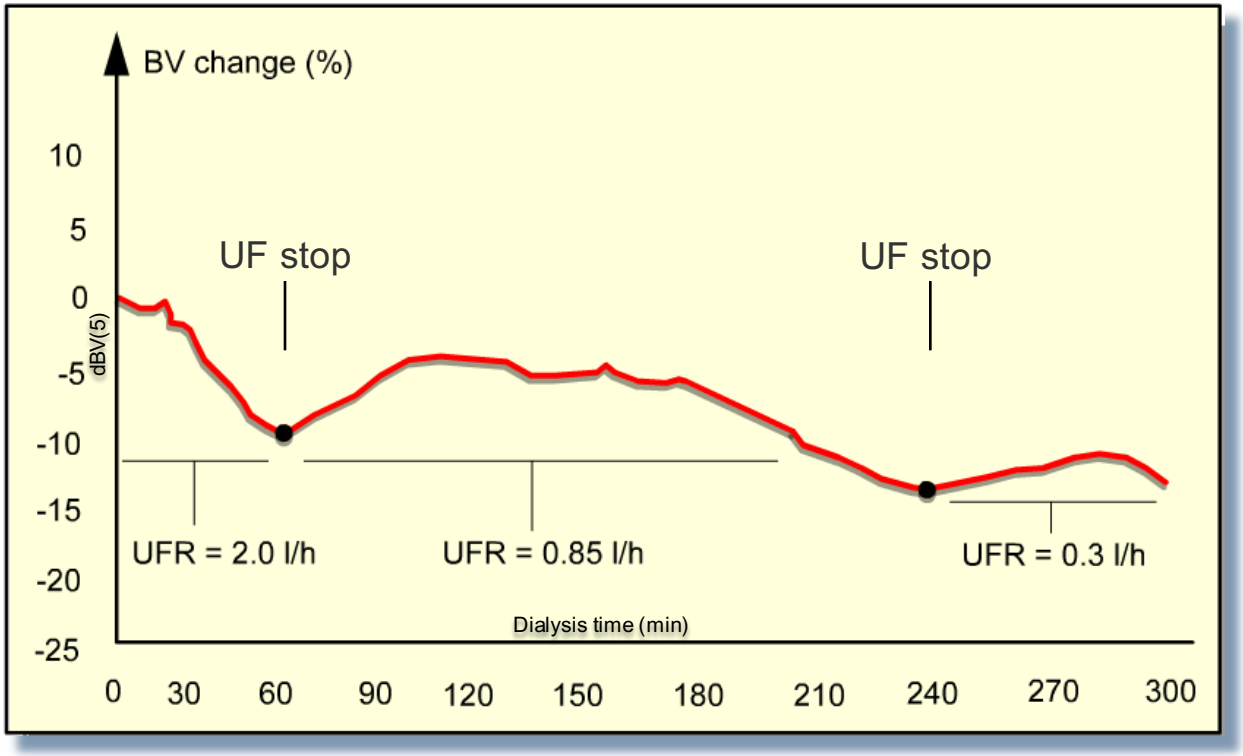
- An optical sensor working on the assumption the quantity of red blood cells remains constant during treatment (hemoconcentration occurs)[2]
- A decrease in plasma water correlates with a higher light absorption
- An increase in plasma water correlates with a less light absorption
- A blood volume change is displayed as percentage of an initial value monitored at treatment start



For measurements;
blood flow >180 ml/min and hemoglobin range 6-16g/dl

2; Dasselar, Judith, Effects of Relative Blood Volume-Controlled Hemodialysis on Blood Pressure and Volume Status in Hypertensive patients, *ASAIO* 2007; 1: 357-365

Blood Volume Response to UF



Ref: F.Lopot EDTNA-ERCA 1996 [3]

3: Lopot, F., Clinical use of Continuous blood volume monitoring; *EDTNA-ERCA* 1996; XXII: 4

Hemoscan in practice

- Self-test is performed on machine start up
- Autocalibration is performed when ArtiSet is loaded
- Hemoscan must be activated before Start Treatment

Hemoscan can be activated by preset

Hemoscan during treatment

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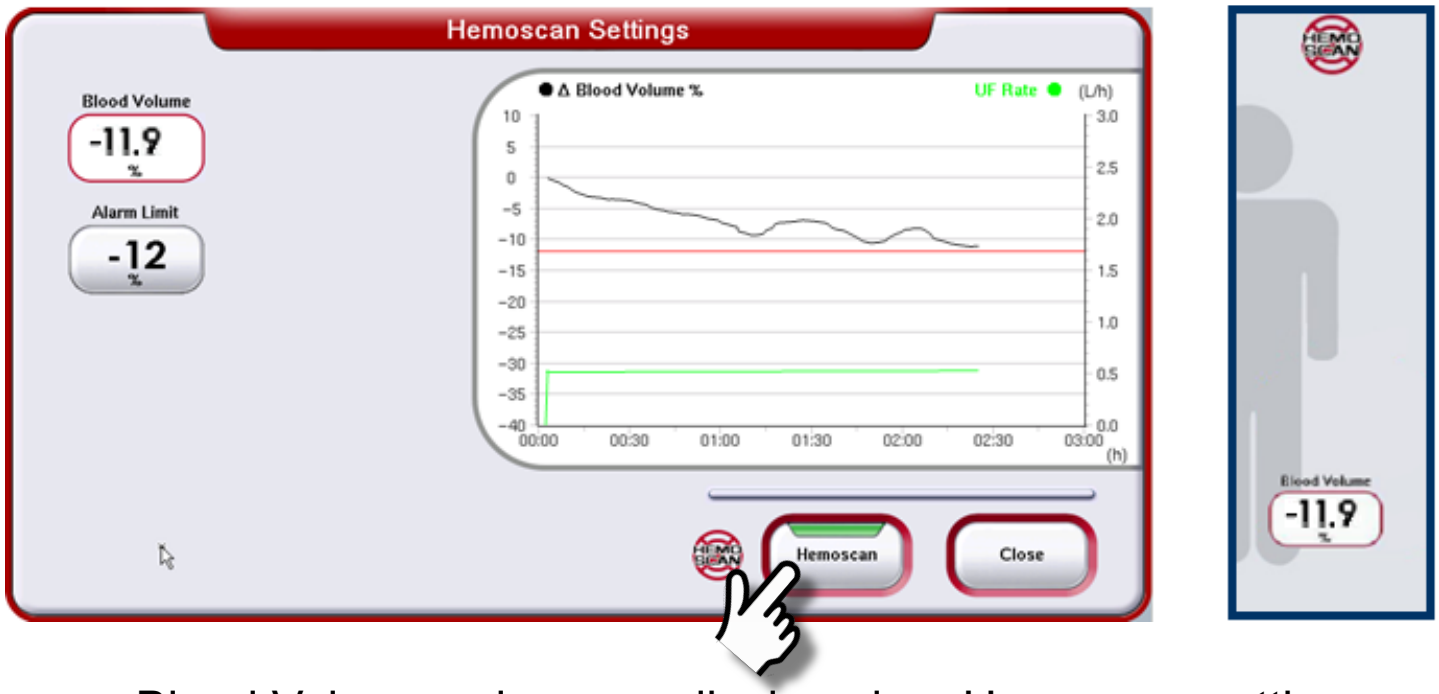

- Blood Volume values are displayed on Hemoscan settings screen and Overview screen
- Blood Volume Alarm Limit can be set
- Blood Volume changes and UF rate are plotted in the trend graph

Nice to Know - Hemoscan

- To pass the Hemoscan self-test at machine startup, Artiset must be loaded with the Hemoscan cuvette properly inserted in the arterial sensor bar slot.
- If Hemoscan self-test fails, the setup procedure continues but Hemoscan function is not activated (alarm).
- Whenever an Artiset is loaded, a Hemoscan auto calibration is performed. If the auto calibration fails an alarm is triggered – *deactivate the Hemoscan to solve the alarm.*
- When Hemoscan is activated, the Auto-Prime button becomes available when calibration of the Hemoscan sensor is performed.
- At treatment start a reference hemoglobin concentration value is calculated – the first BV value is displayed appr. 6-7 minutes after treatment start
- After a Fast Recovery procedure, Hemoscan is automatically deactivated

Diascan

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Automatic measure of clearance and Kt/V for quality-assured dialysis

Diffusive Clearance

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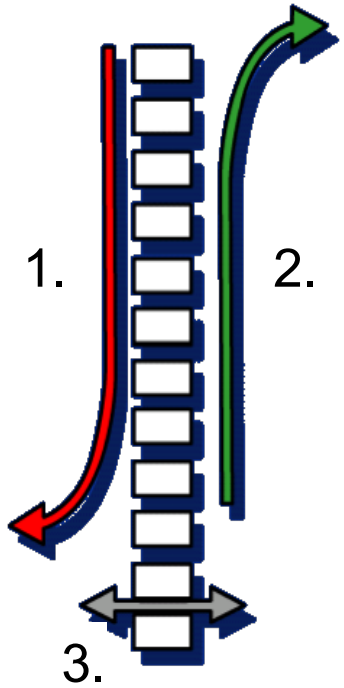
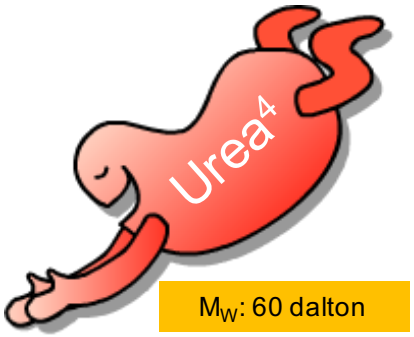
1. Blood flow rate, QB
2. Dialysis fluid flow rate, QD
3. Diffusive permeability of the membrane
4. Treatment Time





4.

4: Daugirdas John, T., Chronic Hemodialysis Prescription: A Urea Kinetic Approach; *Handbook of Dialysis* 4th Edition 2007: 9, p. 146

The Diascan Feature …

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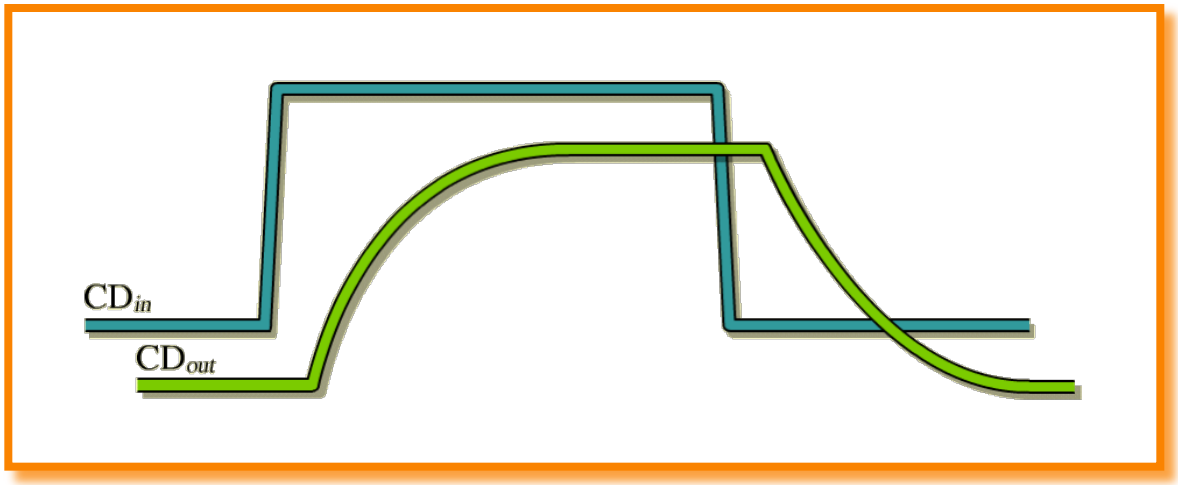
… is an integrated quality assurance tool providing real time values and forecasts on treatment efficiency



… is validated and proved to be an effective and accurate method for treatment quality assessment[5]

5: DiFillipo &al; Relationship between urea clearance and ionic dialysance; *Kidney Intl* 2005, Vol 68, pp2389-2395

Diascan - The Science Behind

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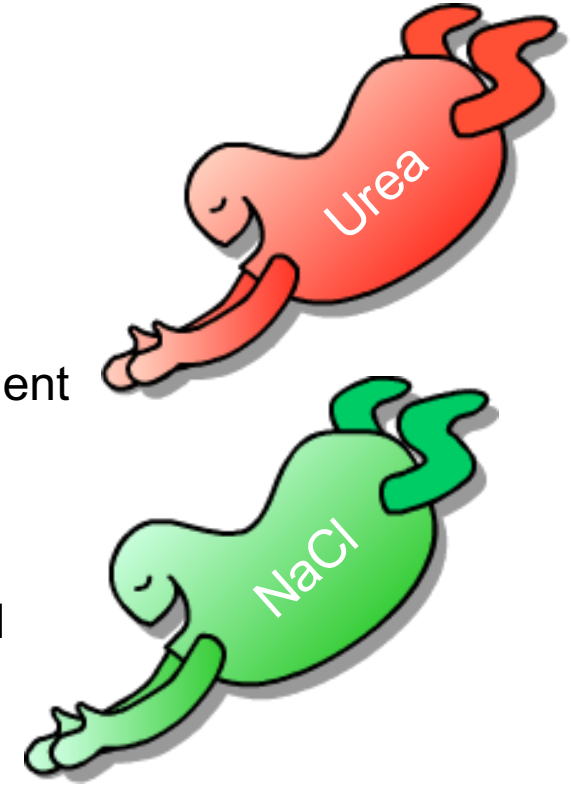
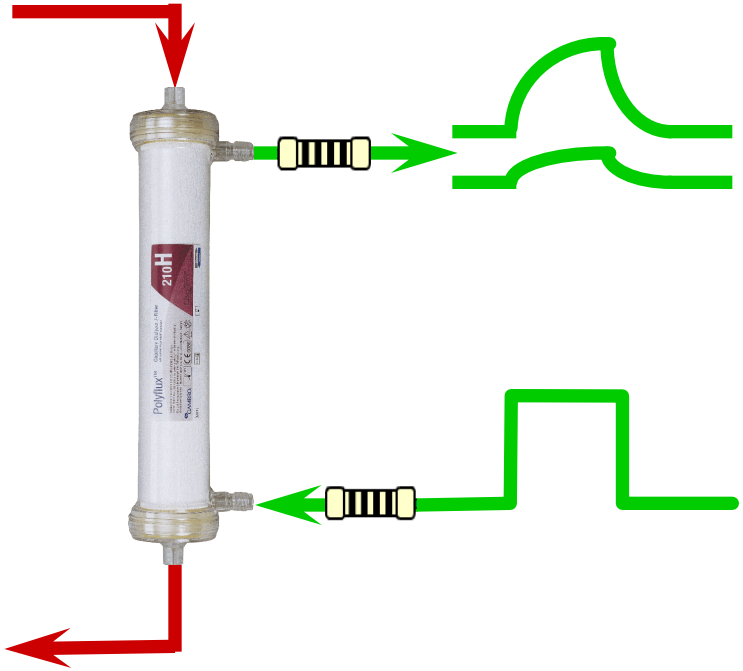
- The Urea molecule (M_W 60) is approximately the same size as the sodium chloride (M_W 58,5)
- Urea and sodium chloride are closely related in clearance characteristics
- Urea transfer can be derived from the measurement of sodium chloride transfer
- Sodium chloride is available in the dialysis fluid
- The sodium ion concentration is easily measured with a conductivity cell



Automatic On-line Clearance Checks



= low clearance
= high clearance

automatically generated
conductivity (NaCl) pulses

Clearance assessment for every treatment

Diascan in Practice

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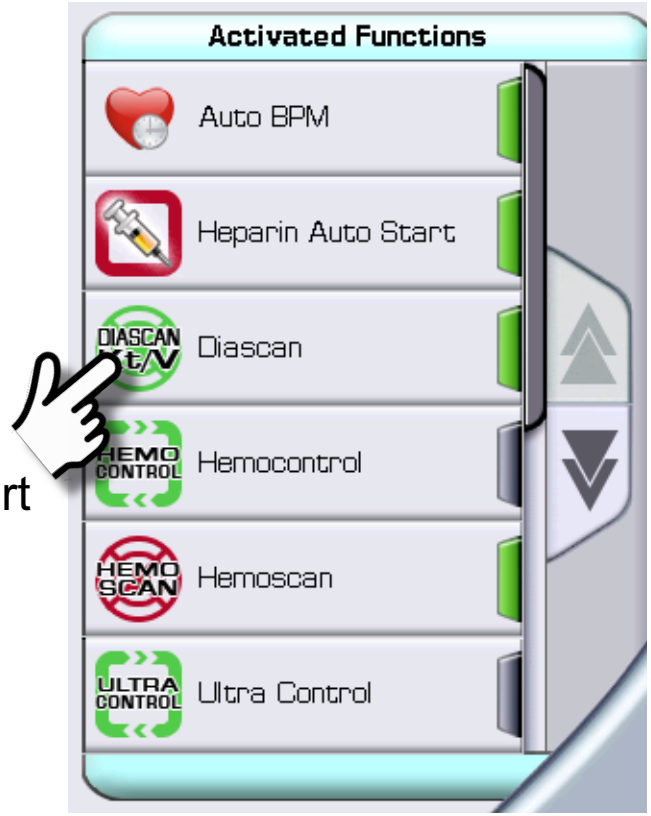
Availability:

- HD / HDF / SN
- HEMO^{CONTROL},
- AFBK (constant K)
- Hemoscan
- Isolated UF



Diascan must be activated before treatment start

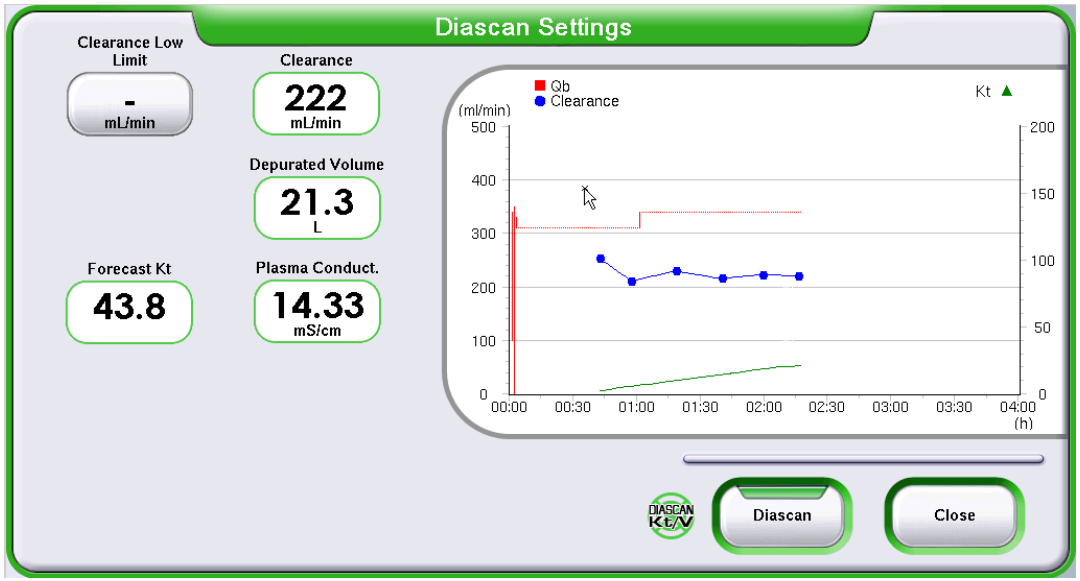
- May be activated by preset

Diascan measurement starts when Qb is $\geq$80 ml/min

- Measuring interval is 15 or 30 minutes

Once deactivated, Diascan cannot be activated again for the rest of the treatment

Diascan Settings Screen - Clearance



Rule of thumb: an adequate Clearance should be at least 55% of the Qb - a SmartScan note will alert the Operator if this level is not reached

Available set buttons:

- Clearance Low Limit (ml/min)

Values boxes:

- Clearance (actual)
- Depurated Volume (=Kt)
- Forecast Kt
- Plasma conductivity

Graph parameters:

- Blood flow (Qb)
- Clearance
- Kt (depurated volume)

Updates during treatment:

- Forecast Kt value by minute
- Clearance and Forecast Kt after each measurement

Dialysis dose by Diascan, Kt and Kt/V

Ionic clearance
- *measured by the machine*

$$\frac{K \cdot t}{V}$$

Effective treatment time
- *measured by the machine*

Distribution volume
- *required input*

Kt = the blood volume cleared (L)

Example:

200 ml/min for 240 min = 48000 ml = 48 L

Kt/V = the blood volume cleared divided by the patient's estimated plasma urea volume (V)

Example:

If V = 40 L then Kt/V = 48 : 40 = 1.20

Patient Distribution Volume: Watson formula[6]

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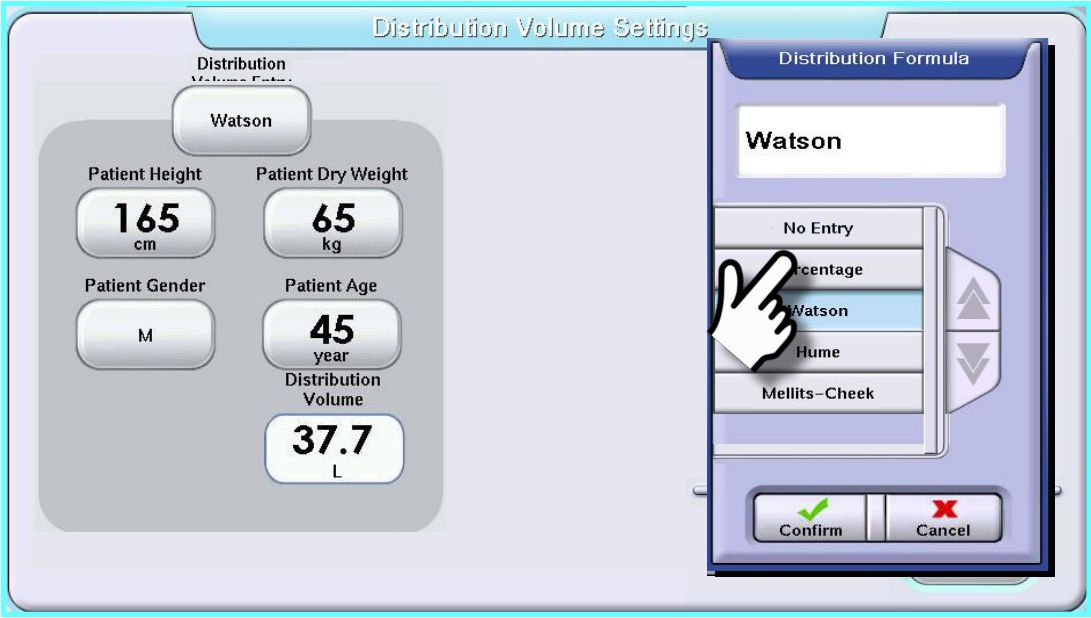
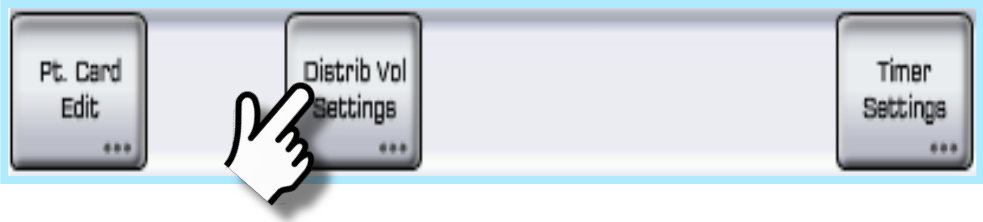




Currently it is not possible to set an already defined patient distribution volume

6: Daugridas John T., Chronic Hemodialysis Prescription: A Urea Kinetic Approach, *Handbook of Dialysis*, 4th edition 2007: 9, p. 151

Diascan Settings Screen - Kt/V

Available set buttons:

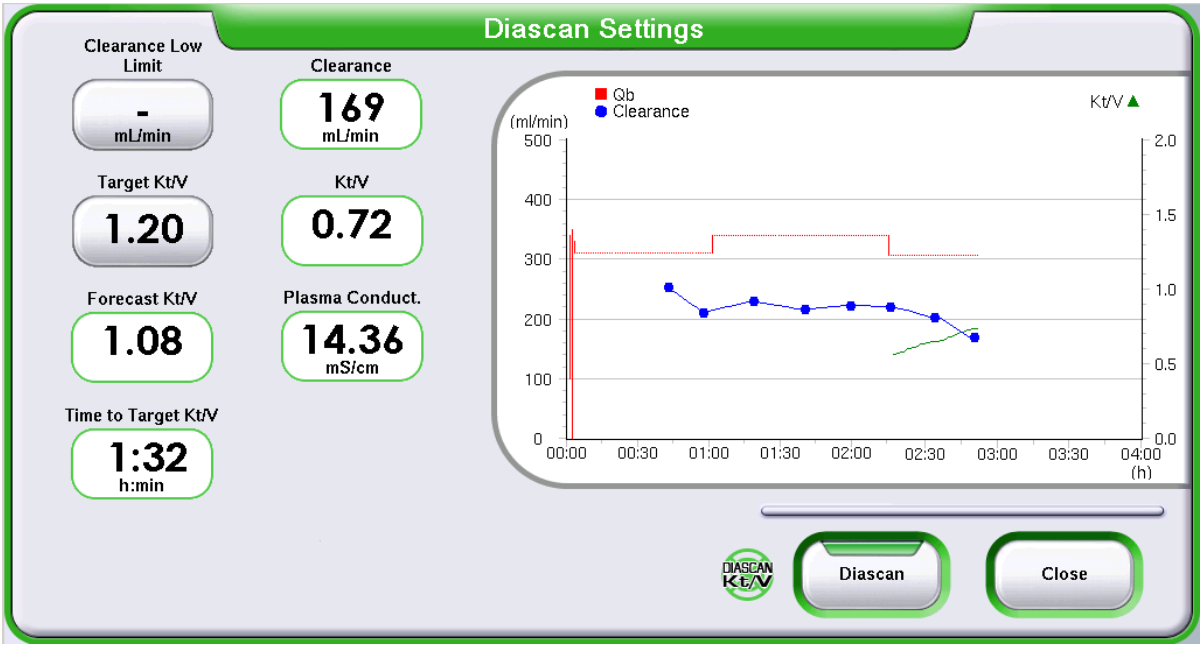
- Clearance low limit
- Target Kt/V

Value boxes:

- Clearance
- Kt/V (actual)
- Forecast Kt/V
- Time to target Kt/V
- Plasma conductivity

Graph parameters:

- Blood flow (QB)
- Clearance
- Kt/V



The Watson formula overestimates V in many patients, resulting in a lower Kt/V

Nice to know - Diascan

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- In case of an Autocalibration Failure alarm:
  switch Artis OFF → wait 5 sec → switch Artis ON, or deactivate Diascan
- During measurements, the inlet conductivity is automatically adjusted by 1.0 mS/cm (unit of measure for conductivity on Artis) for 2 minutes
- The Diascan measurement will be interrupted if parameters directly affecting the measurement are changed (i.e. QB, Qd, Na)
- If no Clearance Low Limit is set, a SmartScan notification will appear when clearance becomes less than 55% of the blood flow
- A SmartScan notification is triggered in case the Forecast Kt/V measurement value is below the Target Kt/V
- The Operator is alerted via an Information Signal if a Diascan measurement fails
- After a Fast Recovery procedure, Diascan is automatically deactivated

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Hands on Module 3

- *Set up HD double needle*
- *Treatment time 90 min,*
- *UF volume 2.5 L*
- *Heparin - linear*
- *Distribution volume*
- *Diascan*
- *Hemoscan*
- *Isolated UF – time 45 min, UF volume 1L*
- *Start treatment*
- *End treatment procedure*

References

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1: Zuchelli and Santoro, Dialysis-Induced Hypotension: A Fresh Look at pathophysiology *Blood Purification* 1993;11: 85-98

2: Dasselar, Judith, Effects of Relative Blood Volume-Controlled Hemodialysis on Blood Pressure and Volume Status in Hypertensive patients, *ASAIO* 2007; 1: 357-365

3: Lopot, F., Clinical use of Continuous blood volume monitoring: *EDTNA-ERCA* 1996; XXII: 4

4,6: Daugirdas John, T., Chronic Hemodialysis Prescription: A Urea Kinetic Approach: *Handbook of Dialysis* 4th Edition, 2007: 9, pp.146-151

5: DiFillipo & al; Relationship between urea clearance and ionic dialysance; *Kidney Intl*, Vol 68, 2005, pp.2389-2395

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For the safe and proper use of the devices referenced within, refer to the warnings, precautions and complete instructions for use or the appropriate manual available by contacting customer support.