



Adimea:

Innovation meets clinical demand

Tel Aviv, 13 July 2010

B | BRAUN
SHARING EXPERTISE



Adimea

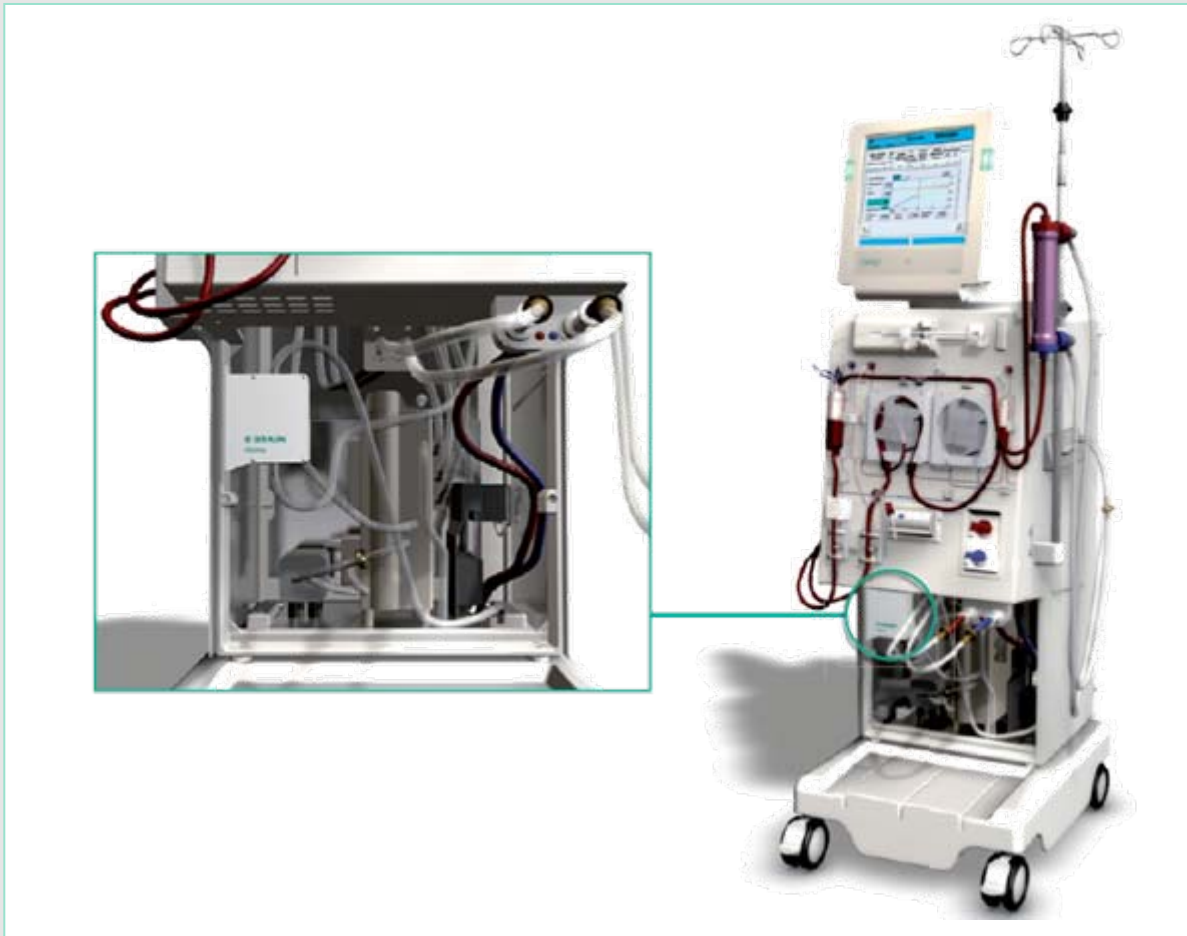
Accurate dialysis measurement.

Creating dimensions in monitoring dialysis dose

Adimea



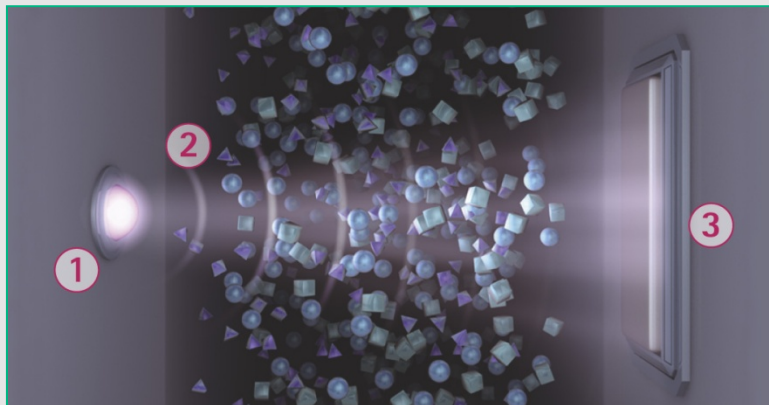
Adimea



Adimea

▶ The Adimea measurement principle

Utilisation of the principles of spectroscopy for determining the reduction of urinary excreted substances in the dialysate drain



- ▶ A light source ① transmits ultraviolet light through the dialysate flowing to the drain.
- ▶ The particles contained in the dialysate absorb the light depending on the concentration ②.
- ▶ This absorption is detected by a sensor ③.

➔ This provides the system with information about the curve of molar reduction in the urea.

Adimea

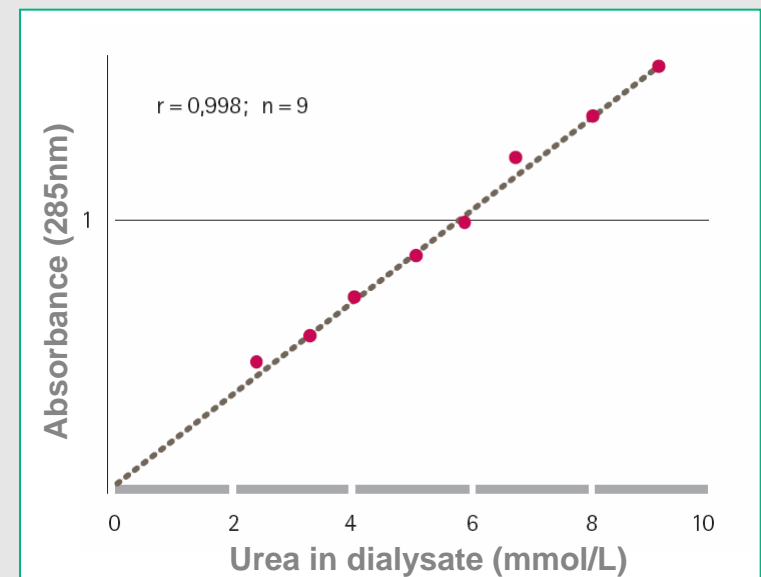
Approved by Several Publications:

- ▶ **Fridolin et al: On-line monitoring of solutes in dialysate using absorption of ultraviolet radiation: Technique description.**

The international Journal of Artificial Organs / Vol. 25 / no. 8, 2002 / pp. 748-761. Nephrol Dial Transplant (2003) 21: 2225-2231

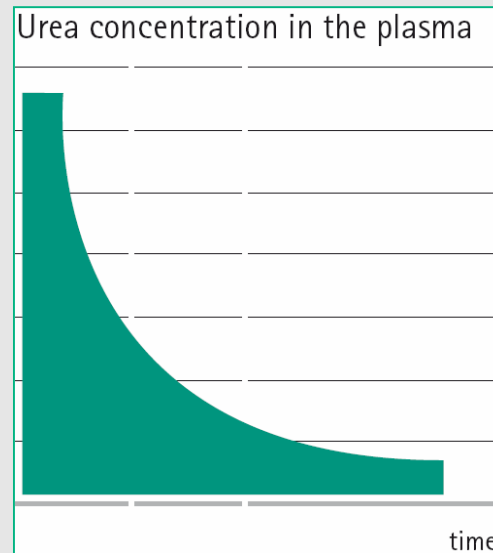
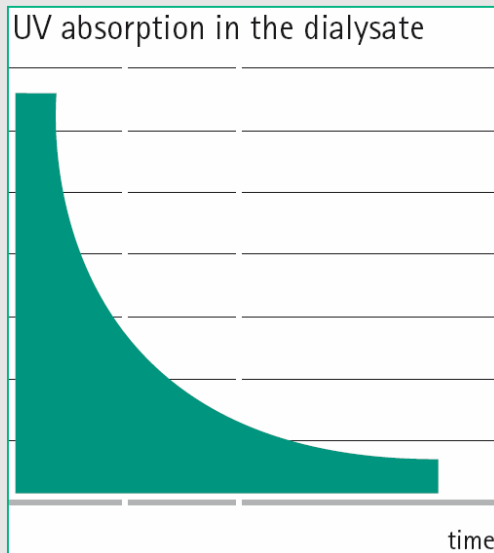
- ▶ **Uhlin et al: Estimation of Delivered Dialysis Dose by On-Line Monitoring of the Ultraviolet Absorbance in the spent Dialysate.**

American Journal of Kidney Diseases, Vol 41, No 5 (May), 2003: pp 1026-1036



Adimea

The measured curve for light absorption is almost identical to the curve for urea concentration:



◀ ▶
correlates
± 2%

$$A_t = A_0 \cdot e^{-\left(\frac{K}{V}\right) \cdot t}$$

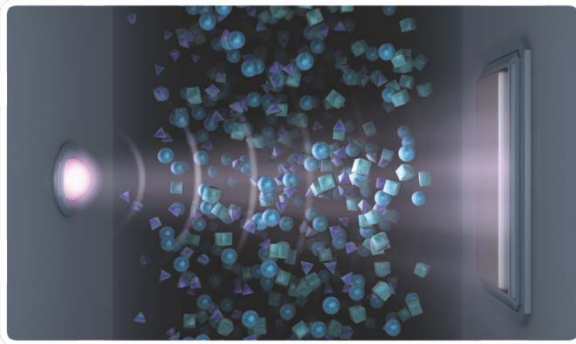
$$C_{Bt} = C_{B0} \cdot e^{-\left(\frac{K}{V}\right) \cdot t}$$

Kt/V can be determined directly on the basis of the curve.

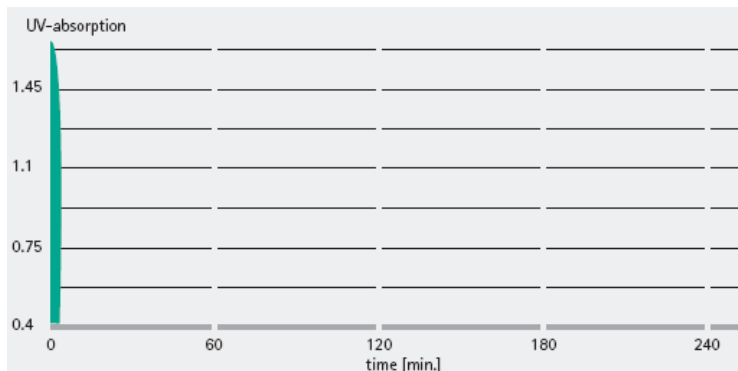
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Treatment start*

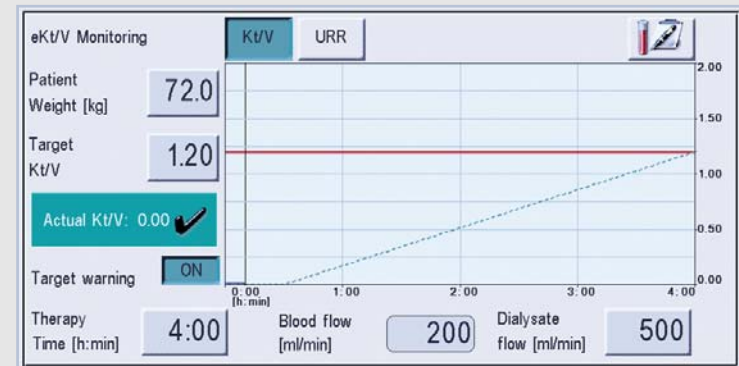
High molar concentration in the dialysate ...



... entails high UV absorption



Absorbed UV waves provide information about the quality of the dialysis

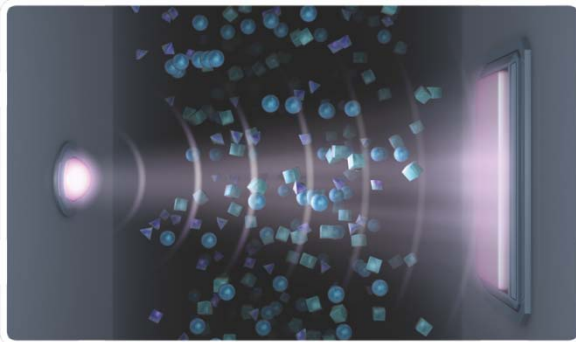


* (sample treatment curve)

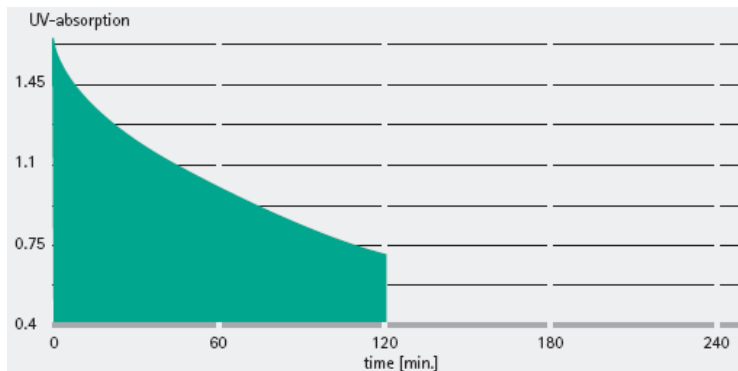
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In the middle of the treatment*

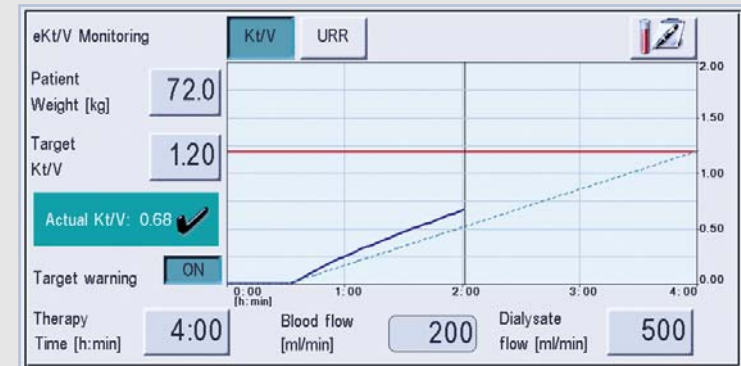
As molar concentration decreases ...



... the absorption of UV waves is also reduced



The progress of the dialysis progress can be seen quickly and easily

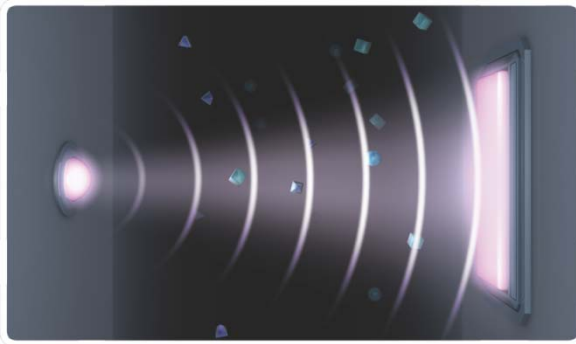


* (sample treatment curve)

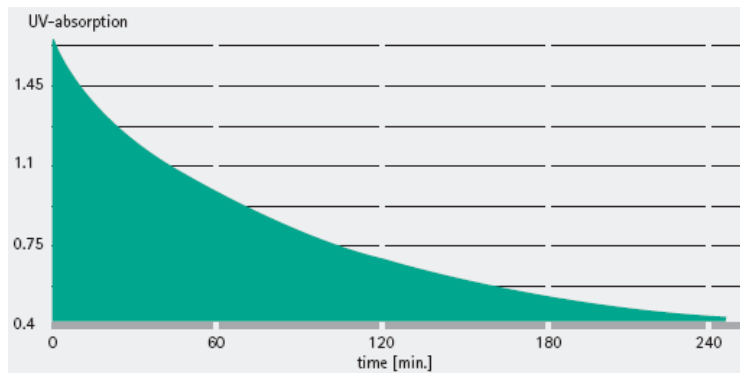
Adimea

Treatment end*

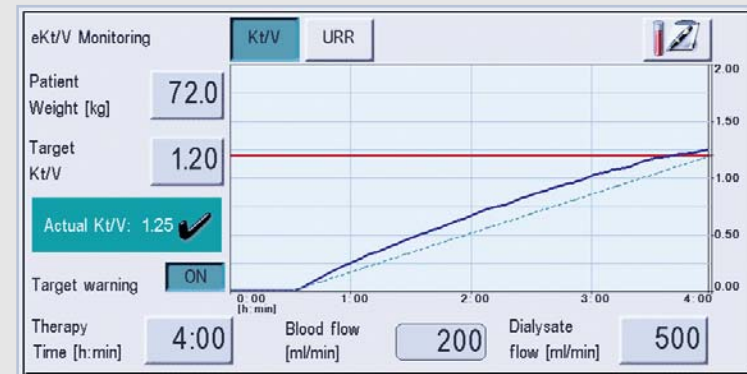
The few remaining molecules ...



... hardly absorb any UV light



Easy to understand display of actual dialysis efficiency



* (sample treatment curve)

Adimea

Clinical Data

Decisive question in daily routine:

- ▶ **How valid are the Adimea measuring results?**
- ▼
- ▶ **How close correlates the blood-Kt/V with Adimea-Kt/V?**

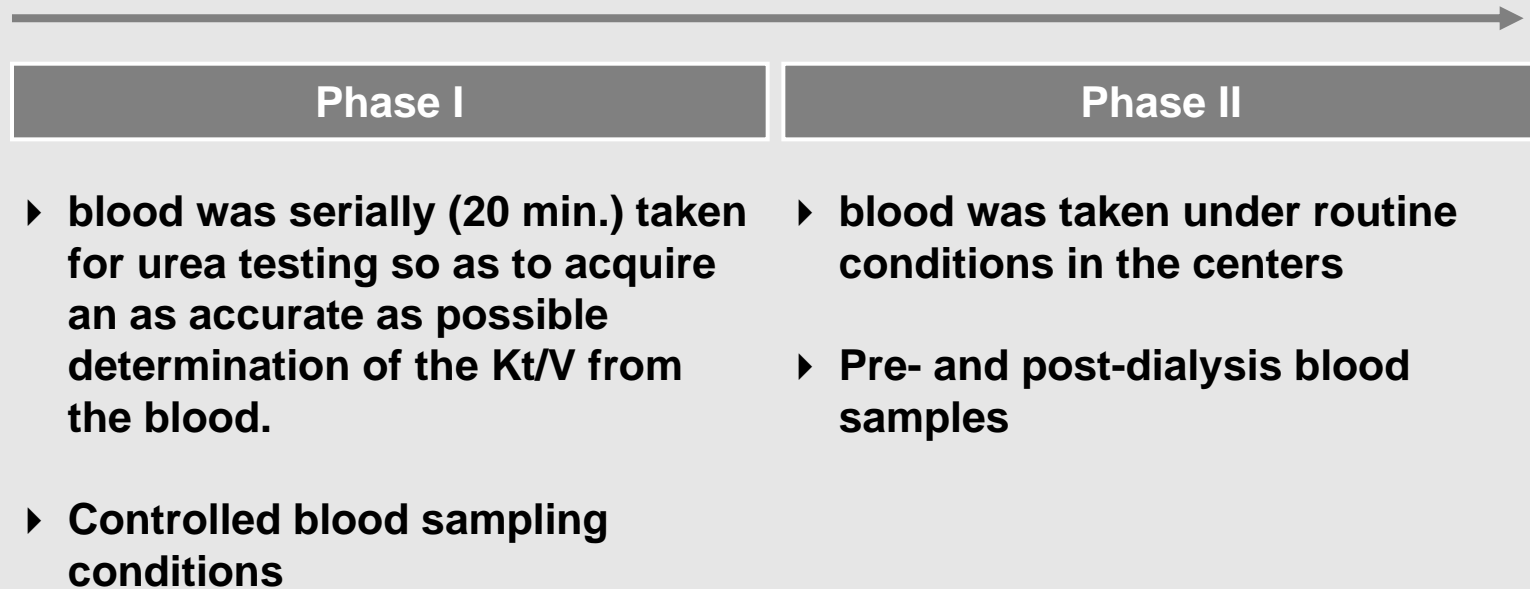


Adimea

Clinical Data

B. Braun Study

- ▶ **Comparison between blood-Kt/V (blood samples) und Adimea Kt/V**



Adimea

Clinical Data

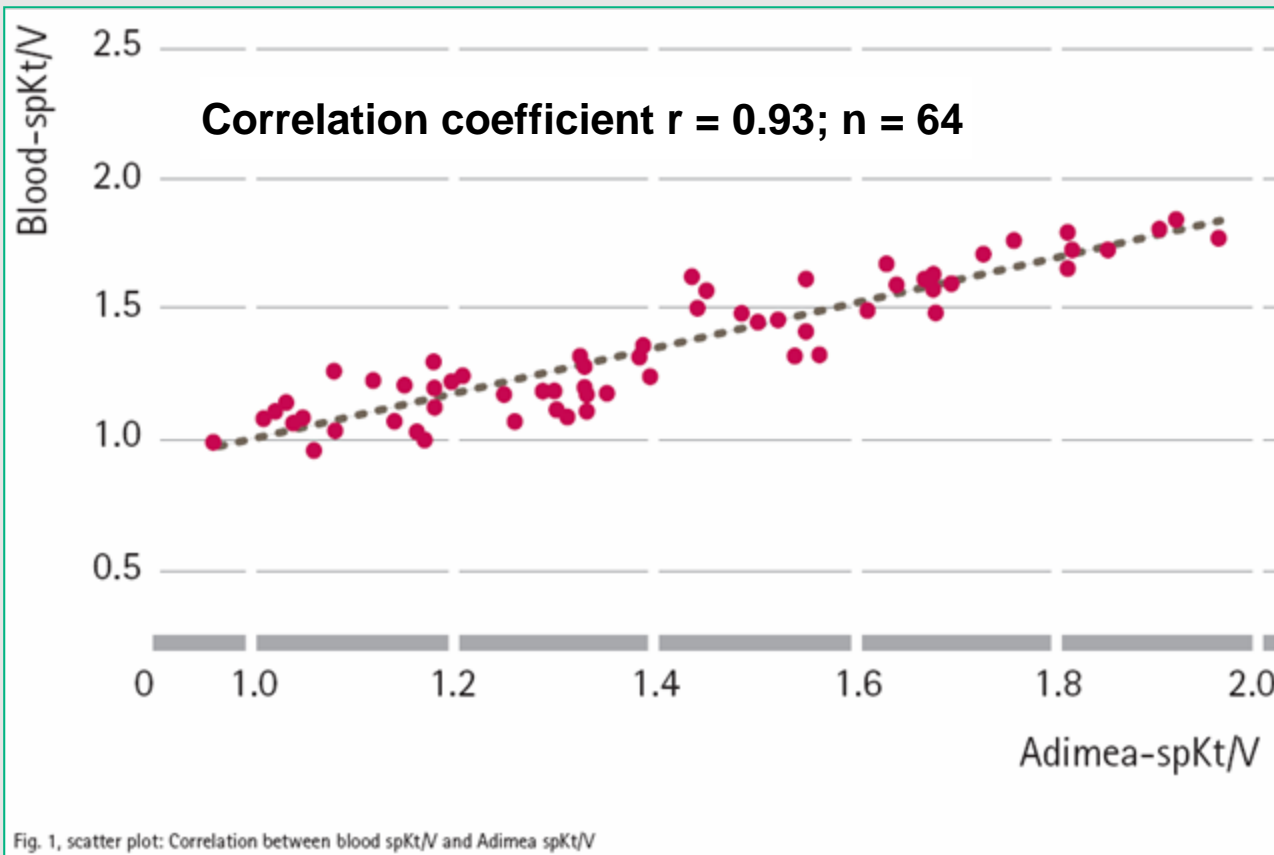


Fig. 1, scatter plot: Correlation between blood spKt/V and Adimea spKt/V

Serial measurements of blood urea - every 20 min throughout the entire treatment

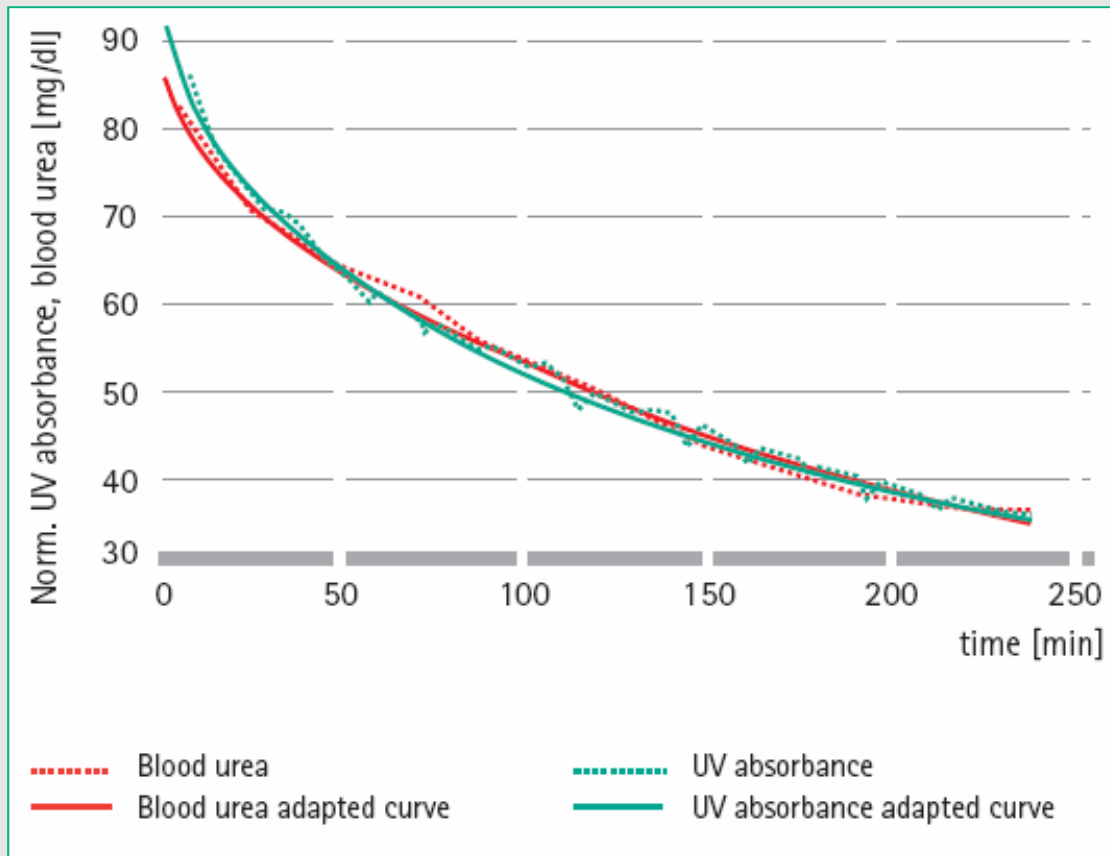
Non systematic error:

► **Only 7 %**

²Werner, Günthner et al., [B. Braun Avitum AG, Melsungen], 2009.

Adimea

Clinical Data



Sample treatment

UV absorption signal's vs. serum urea values (at 20-minute measurements).

Reveals the excellent correlation:

Non systematic error for this example only 5 %

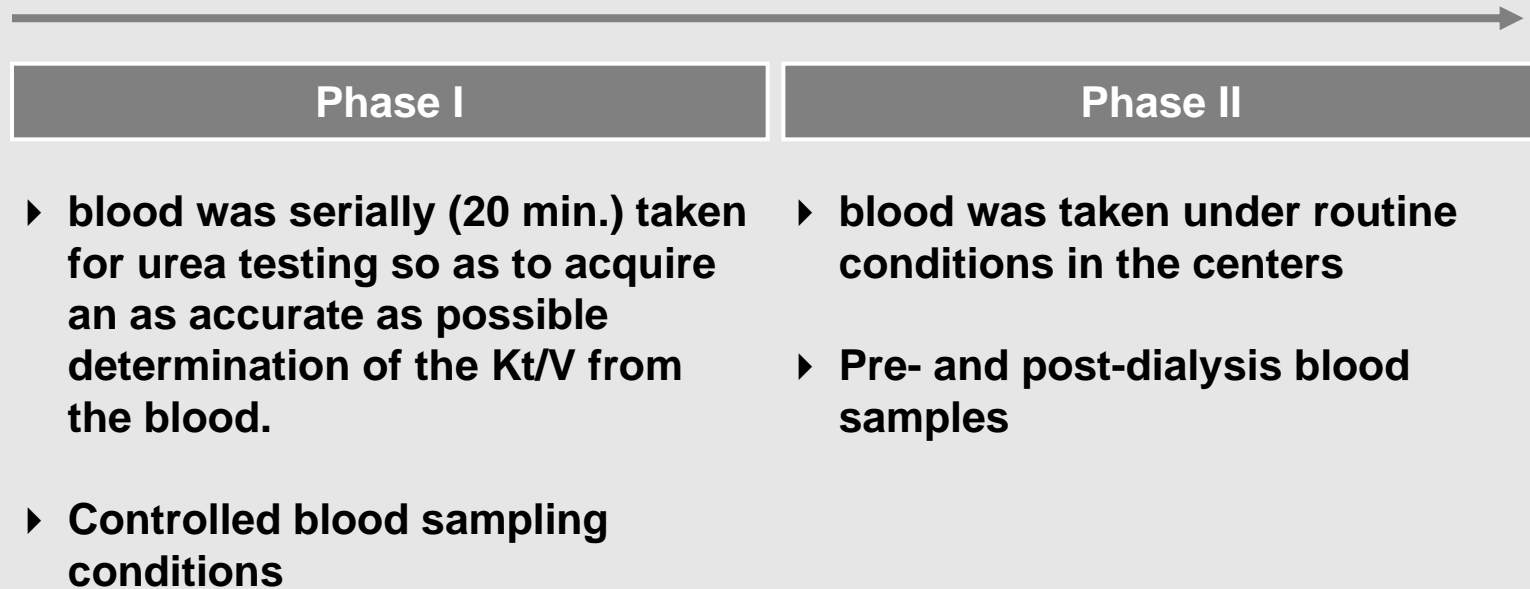
²Werner, Günthner et al., [B. Braun Avitum AG, Melsungen], 2009.

Adimea

Clinical Data

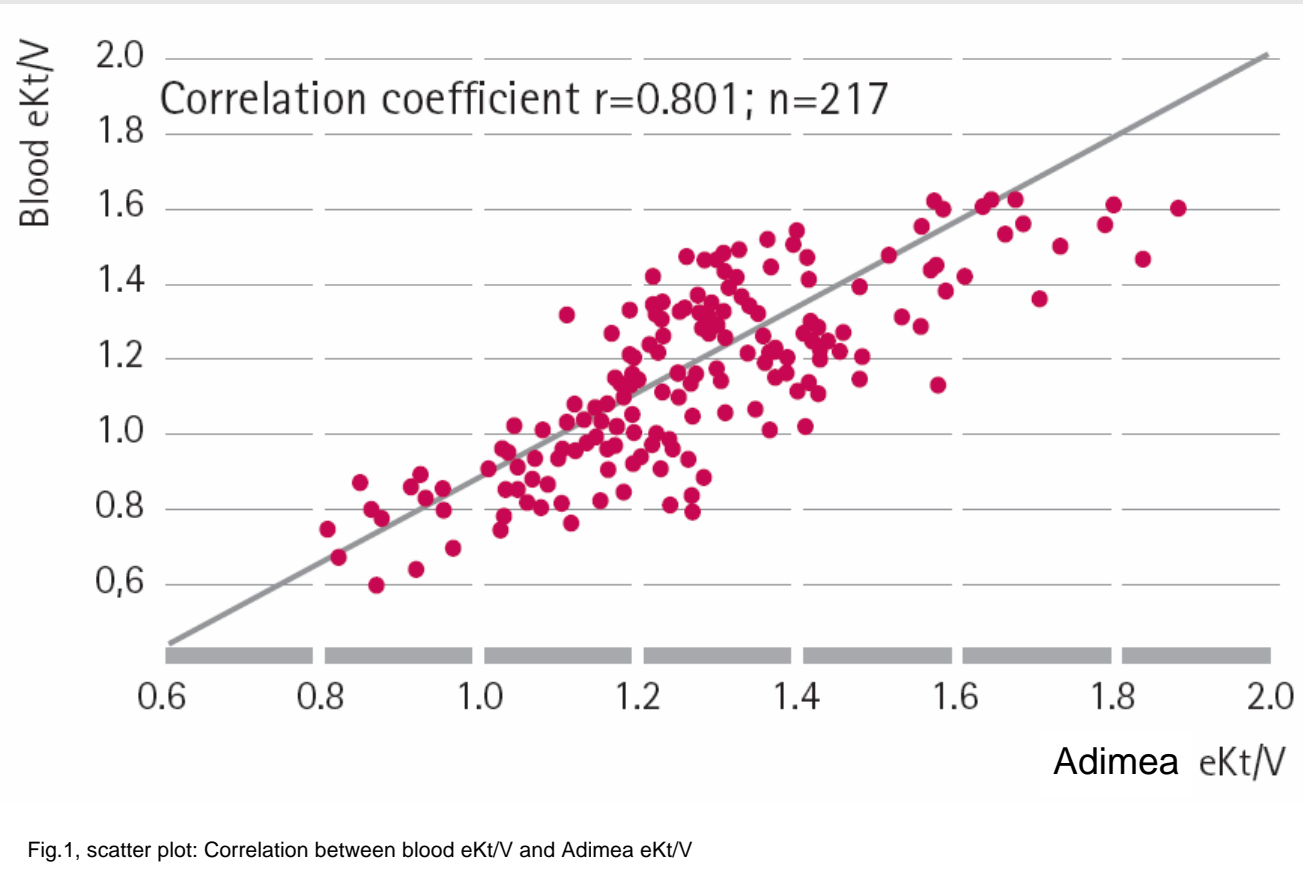
B. Braun Study

- ▶ **Comparison between blood-Kt/V (blood samples) und Adimea Kt/V**



Adimea

Clinical Data



Blood sampling in daily routine (pre- and postdialysis).

EDTA / Abstract

²Werner, Günthner et al., [B. Braun Avitum AG, Melsungen], 2009.

Adimea

Clinical Data

Variables in Kt/V determination [Daugirdas]

If the sampling of pre-dialytic blood is delayed, urea concentrations are at incorrectly low levels!

In the case of delayed post-dialytic blood sampling, urea concentrations are measured during the post-dialysis rebound, which means that the actual urea concentration is overestimated!

Factors to be avoided are thinning of blood samples through heparin or sodium chloride solutions, as well as aspiration of the clotting blood.

Please mind the influence of incorrect blood samples



The result:

**Incorrect
Kt/V.**

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Clinical Data

Kt/V determination process [Daugirdas]

Observations of dialysis practice and studies have shown:

Recommendations are not followed for a variety of reasons.

However, the timing and method of blood sampling have a significant impact on the result!

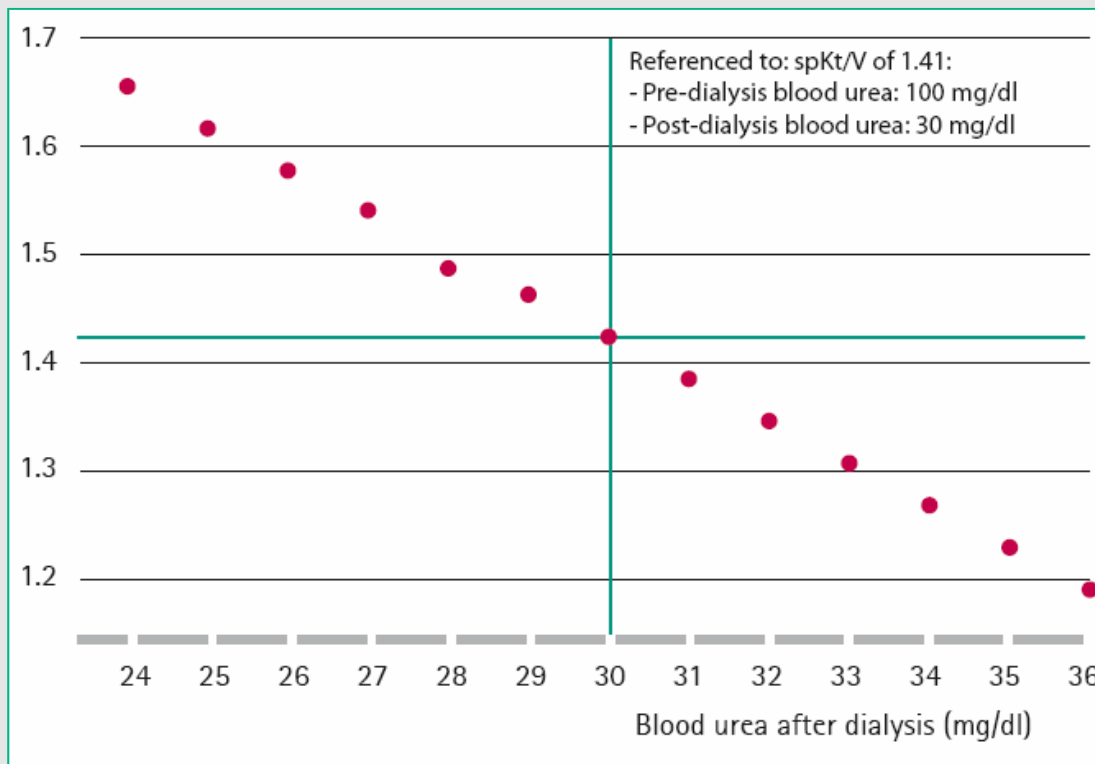
Variation in blood sample collection for determination of haemodialysis adequacy. Council on Renal Nutrition National Research Question Collaborative Study Group.

JA Beto, VK Bansal, TS Ing, JT Daugirdas.1998.

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Clinical Data

Influence of the post-dialysis blood (urea) sample on the spKt/V value [Daugirdas]



- ▶ Already little variations in the urea concentrations have an significant impact on the Kt/V!

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Clinical Data

Comparison between Adimea Kt/V and blood-Kt/V

- ▶ **The study shows: Adimea is not effected by the influences of blood sampling.**
- ▶ **A difference in correlation is often linked to mistakes while blood sampling and hence to incorrect urea values.**
- ▶ **A precise Adimea-Kt/V can not correlate with an incorrect blood Kt/V.**

Adimea

Selection in main menuue



Dec 08, 2008 - 14:18 -

Preparation Blood leak calibration

mmHg -400 -300 -200 -100 0 -100

mmHg -400 -200 0 -200 -400

Heparin rate [ml/h] 0.0

Blood flow [ml/min] 0

Start BP [mmHg] 122/78

MAP [mmHg] 87

P.R. [1/min] 98

Na⁺ ?HELP HOURS Ket/VV MAX/MIN [Syringe] [Syringe] [Syringe] [Syringe] [Syringe] [Syringe] [Syringe] [Syringe]

Adimea

Different calculation modes

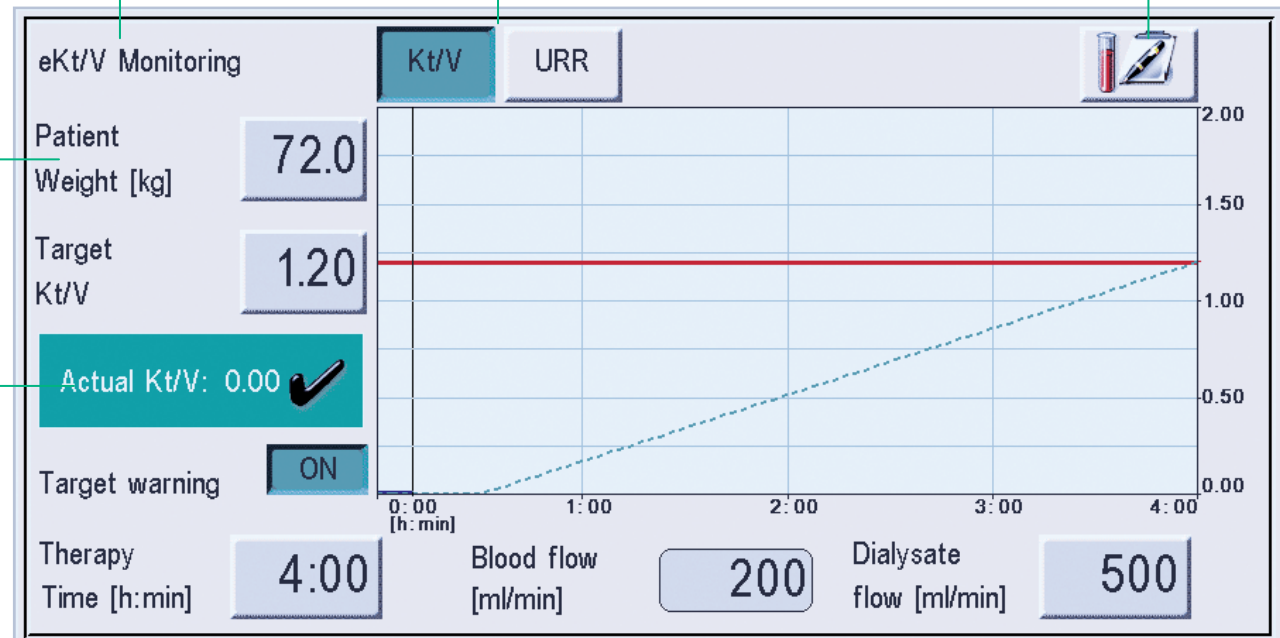
Easy switching between Kt/V and URR

Kt/V-Table

Single input parameter

Current actual value

Unlimited access to relevant treatment parameters

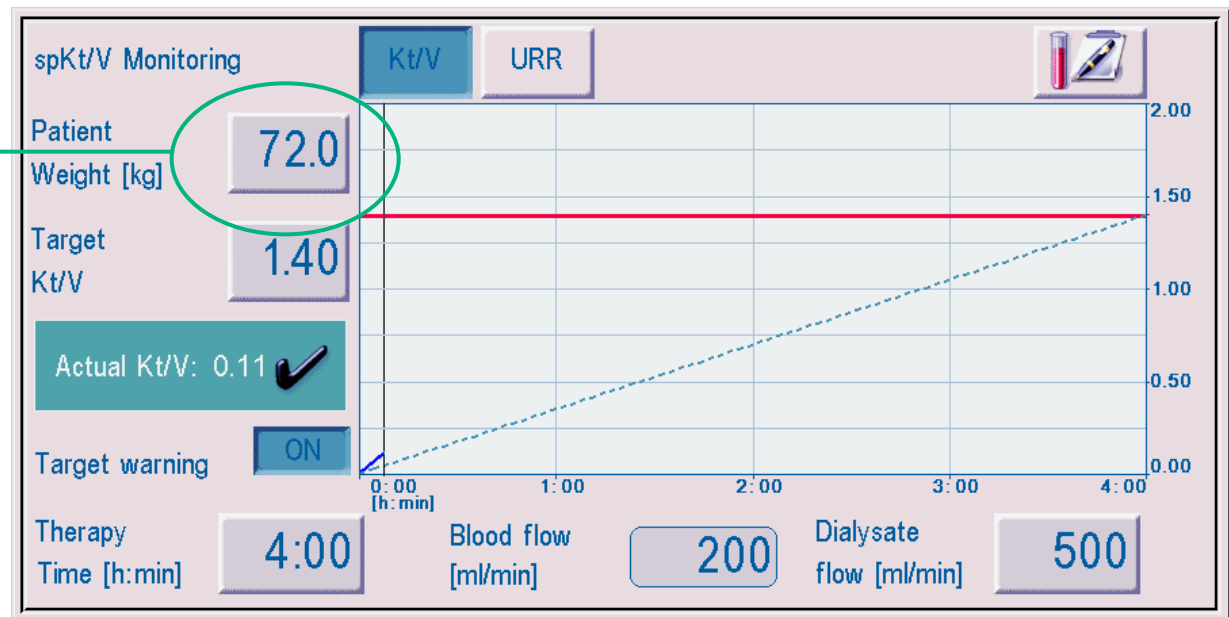


Adimea

Starting the Measurement

Adimea starts automatically as soon as patient weight [prior to dialysis] is entered.

(Later setting possible)



Adimea

Starting the Measurement

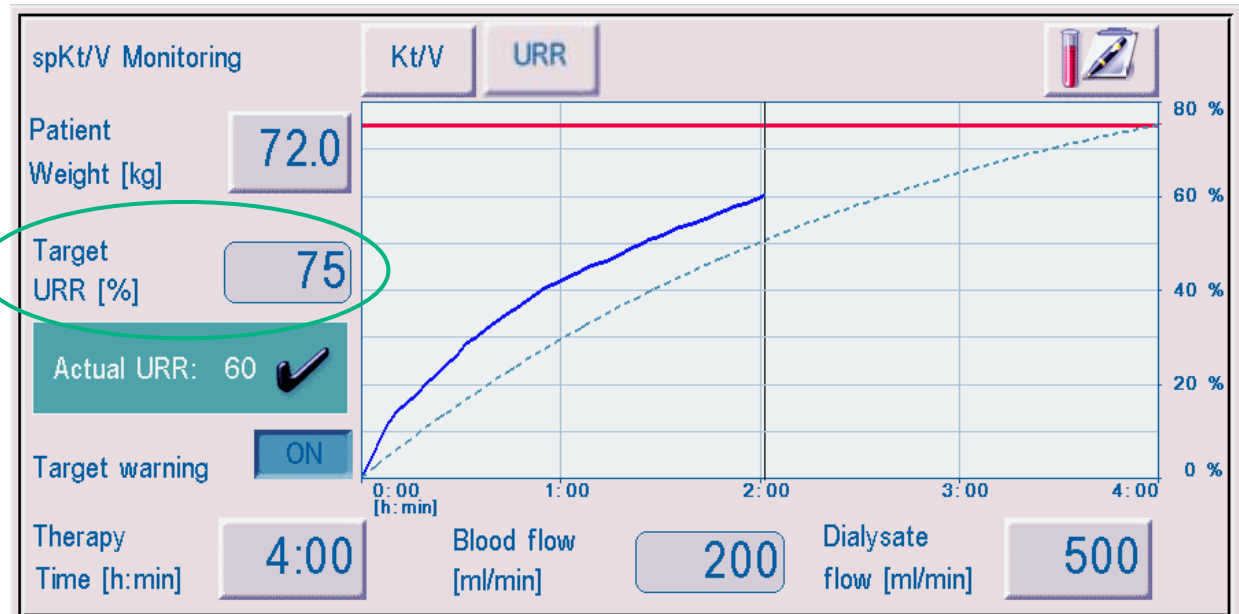
Setting parameter
via calculator

The screenshot displays the Adimea dialysis machine's control panel. At the top, the date and time are shown as 'Dec 08, 2008 - 15:53 -'. The main interface is divided into two sections: 'Preparation' and 'Acknowledge data!'. The 'Preparation' section includes fields for 'Patient Weight [kg]' (set to 72.0), 'Target Kt/V' (set to 1.20), 'Actual Kt/V' (displayed as --- with a checkmark), 'Target warning' (set to ON), and 'Therapy Time [h:min]' (set to 4:00). A calculator overlay is positioned over the 'Patient Weight' field, showing the value '72' and a range of '[0.0 ... 200.0]'. The calculator has a numeric keypad (0-9), a 'C' (clear) button, a '+/-' (sign) button, and a decimal point. Below the keypad are 'CANCEL' and 'O.K.' buttons. To the right of the calculator is a vertical scale from 0.00 to 2.00 with a red horizontal line at 1.00. Below the scale is a '500' value. The 'Acknowledge data!' section contains several icons: a syringe, a crossed-out 'X', a dialysis machine, a person, an eye, and a hand. At the bottom of the screen, a yellow bar contains the text 'Ack. data before connecting patient'.

Adimea

Display of Urea Reduction Ratio (URR)

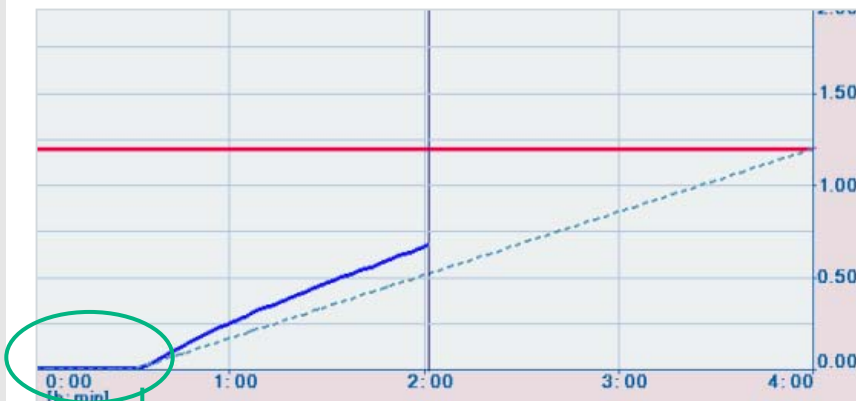
Target value depends on Kt/V



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Display eKt/V and spKt/V

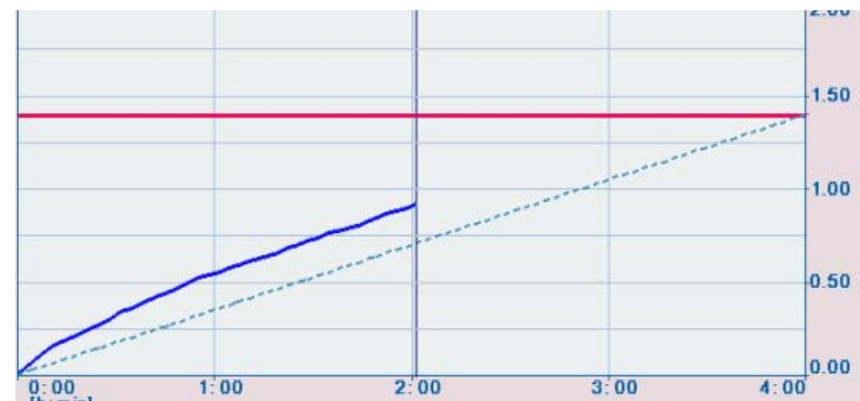
Calculation mode eKt/V



- ▶ **Display of current value starts always 36 min. after therapy start**

Rebound effect is considered in eKt/V formula.

Calculation mode spKt/V

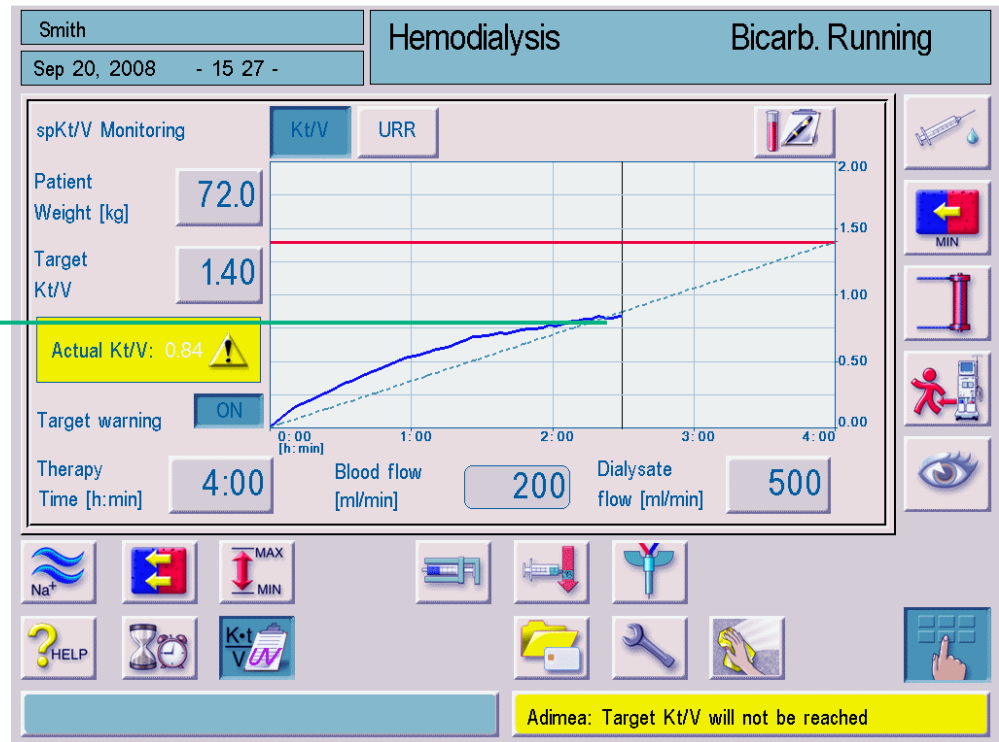


- ▶ **Display of current value starts from the beginning.**

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Target Warning I

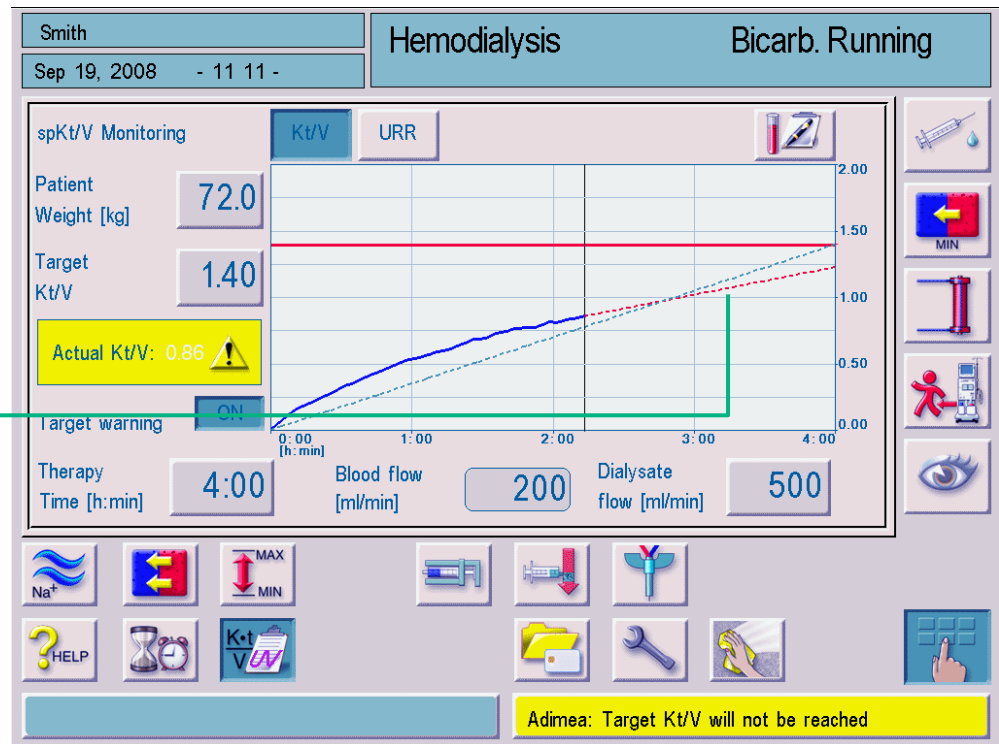
- ▶ Actual Kt/V below desired curve



Adimea

Target Warning II



- ▶ **Negative forecast**
The forecast is shown as a curve



Adimea

Kt/V-Table

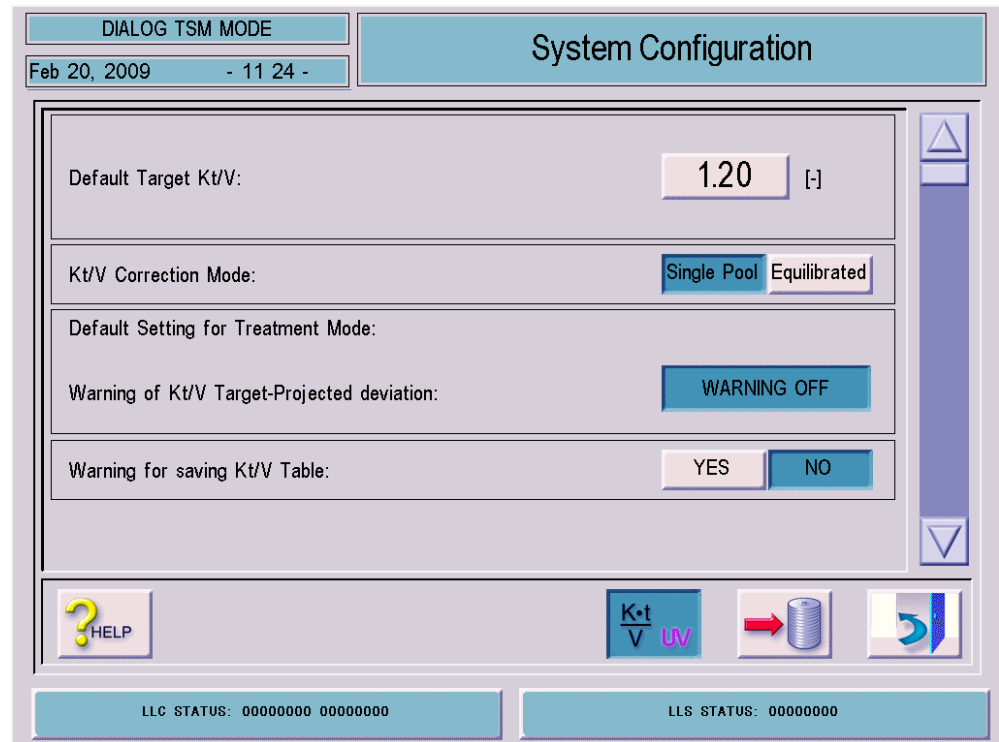
- ▶ **Precondition:**
Dialog+ is equipped with Card Reader.

Smith		Preparation		Acknowledge data!				
Sep 17, 2008 - 13 00 -								
Therapy date and time [dd.mm.yyyy h:min]	Target Kt/V [-]	Patient weight [kg]	Actual therapy time [h:min]	Average blood flow [ml/min]	Average dialysate flow [ml/min]	Act.URR [%]	Act.Kt/V [-]	spKt/V
17.09.2008 09:01	1.40	72.0	04:04	200	500	77	1.45	
 								
						Ack. data before connecting patient		

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Dialog+ TSM Settings

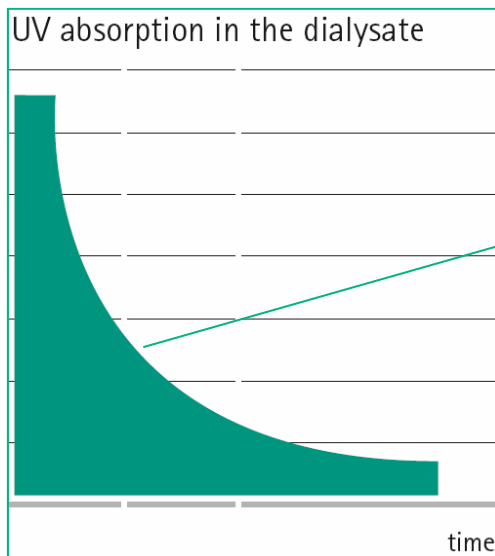
► **4 default settings**



Adimea

FAQs from the first field experience:

- I. Why is the determination of „V“ with Adimea not applicable?



- ▶ The V is included in the slope of the curve!

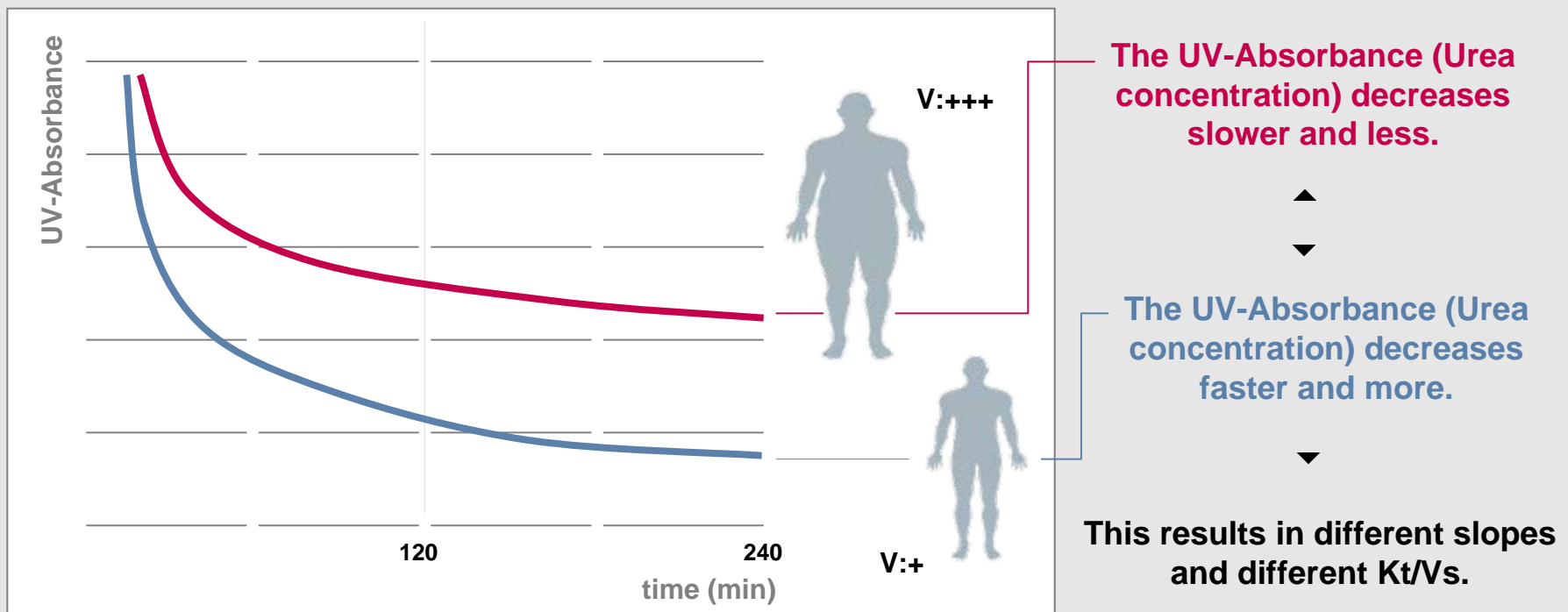
The slope is mathematically represented by the ratio (K/V) – recorded and determined by Adimea.

$$A_t = A_0 \cdot e^{-\left(\frac{K}{V}\right) \cdot t}$$

Adimea

An example should demonstrate the effect of different patients to the slope of the curve:

- ▶ Dialysis under same conditions (time / flow / filter ...)



Adimea

FAQs from the first field experience:



II. Why is the pre-dialysis weight needed?

- ▶ To provide the actual Kt/V on the Dialog⁺ screen in real-time!

Pre-dialysis weight

- Ultrafiltration volume

Weight after dialysis [W]

single-pool-Kt/V [spKt/V]

$$= \ln (R - 0,008 \cdot T) + (4-3,5 \cdot R) \cdot \frac{UF}{W}$$

Adimea

FAQs from the first field experience:



III. Can dialyzer clotting influence the measuring results?

- ▶ Yes – dialyzer clotting can maybe influence the results! To evaluate the results we recommend the use of the PBE.



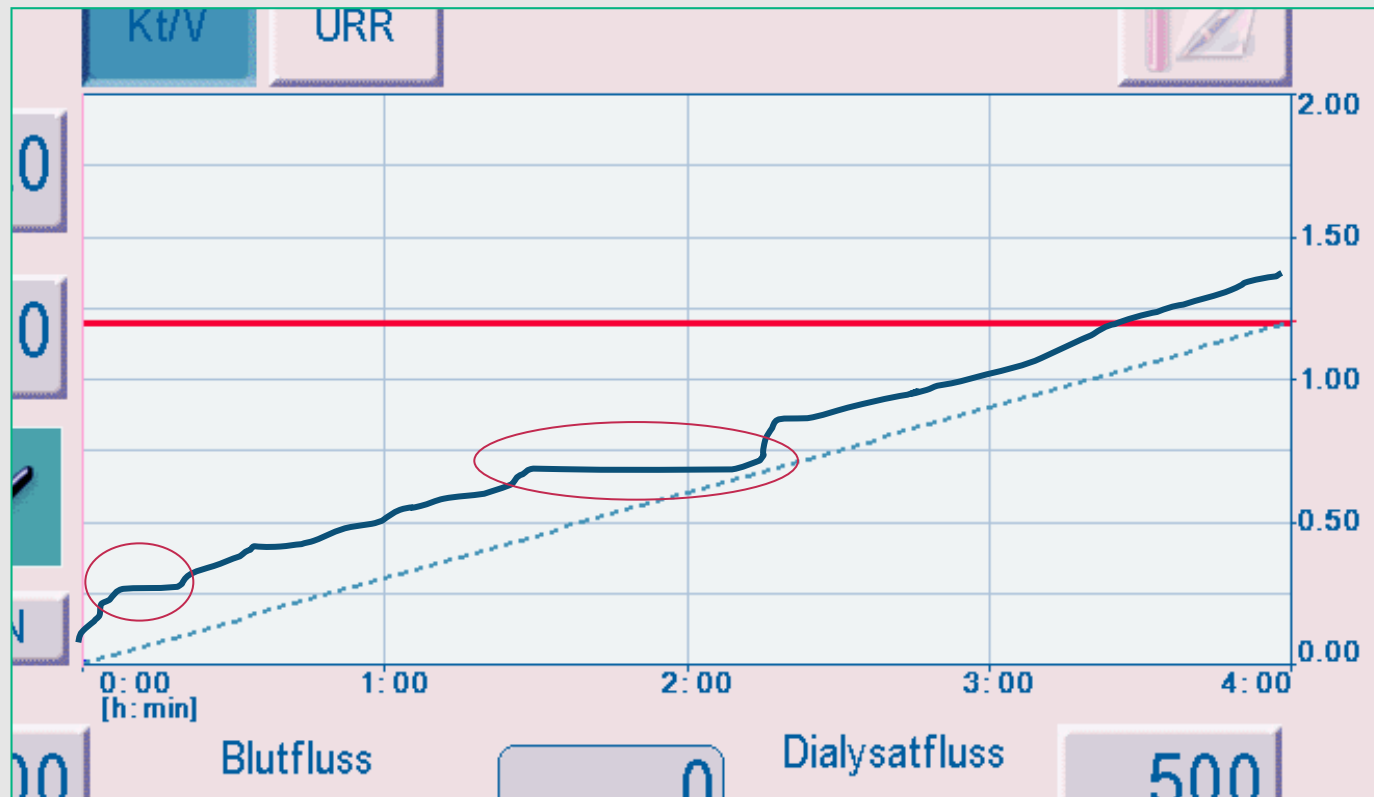
IV. Are there any consequential costs of using Adimea?

- ▶ No.

Monitoring Dialysis Dose

Adimea

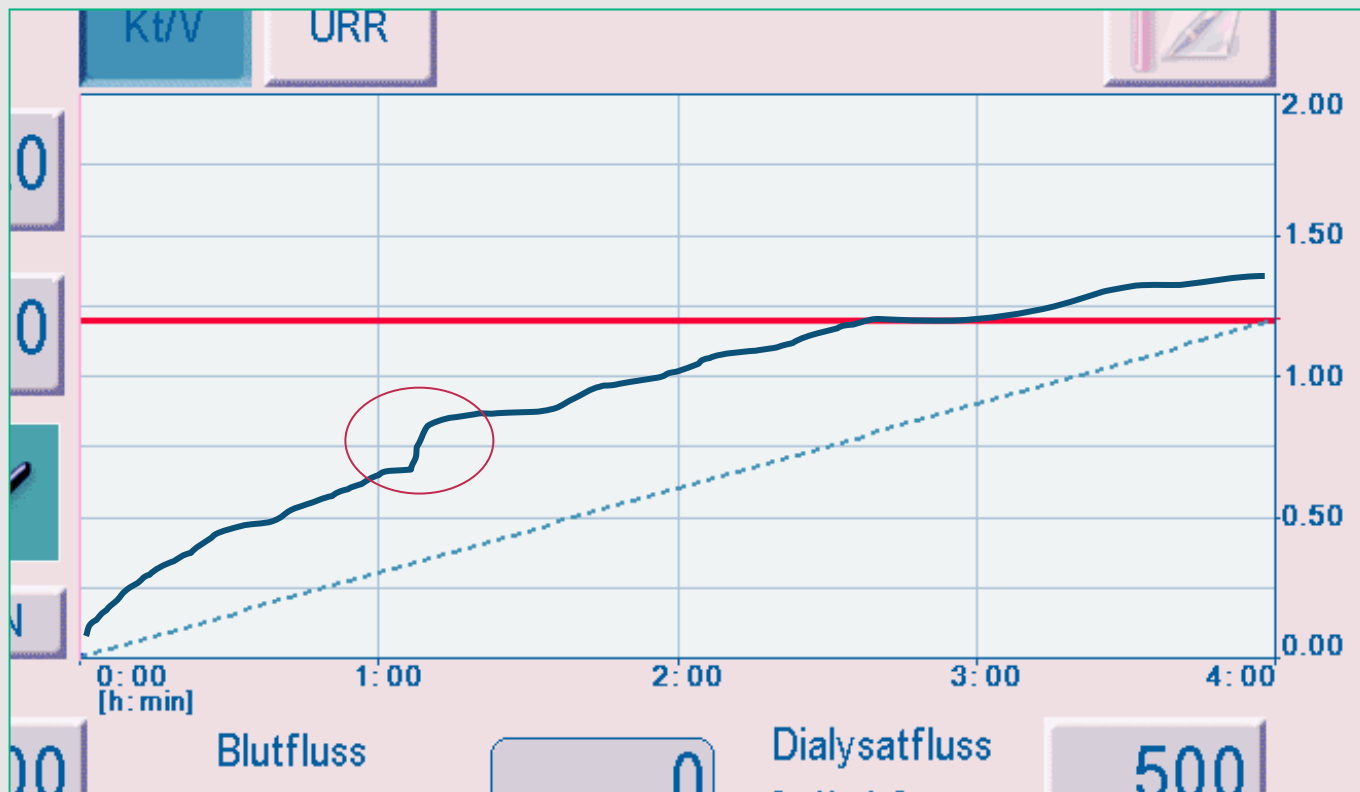
Our product in practical application ▶ Sequential Therapy Phases (sample curve)



Monitoring Dialysis Dose

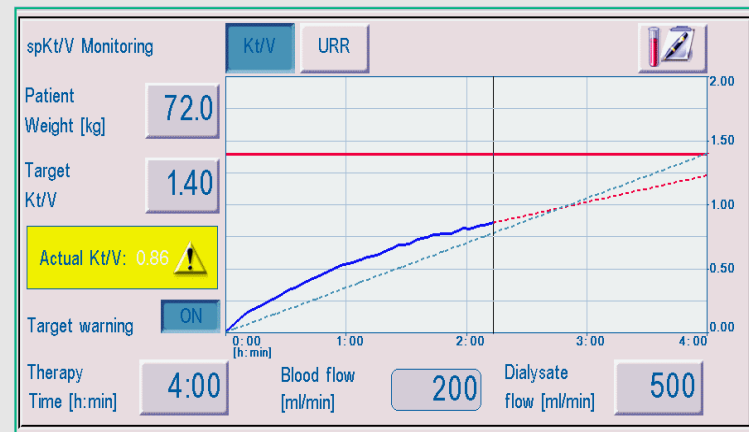
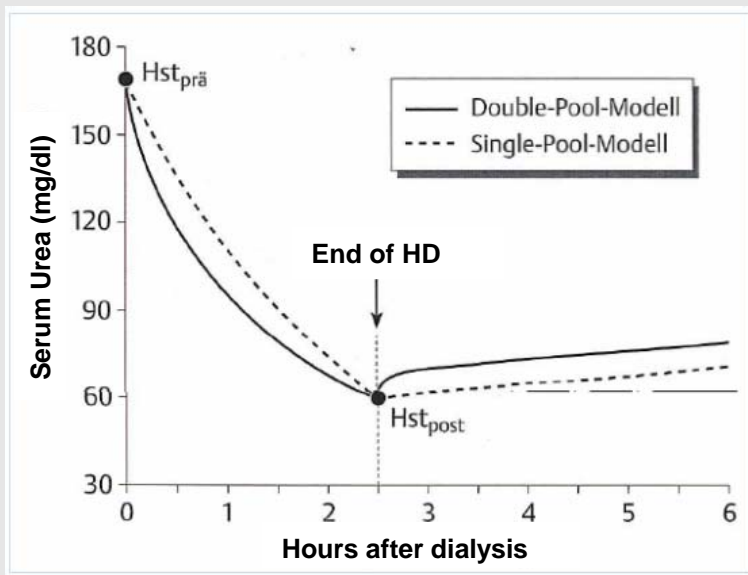
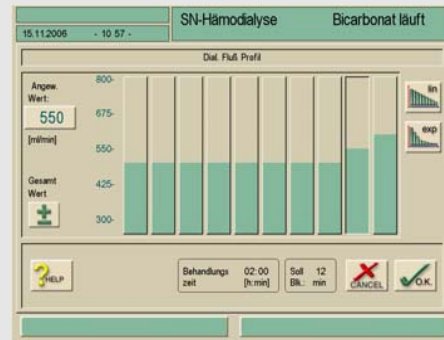
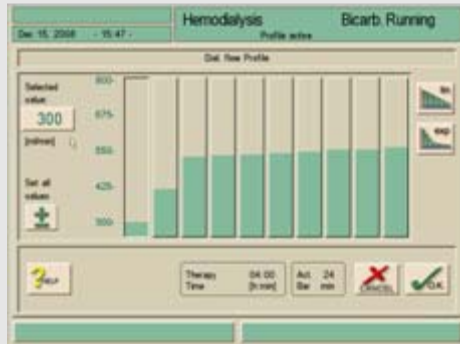
Adimea

Our product in practical application ▶ Recirculation (sample curve)

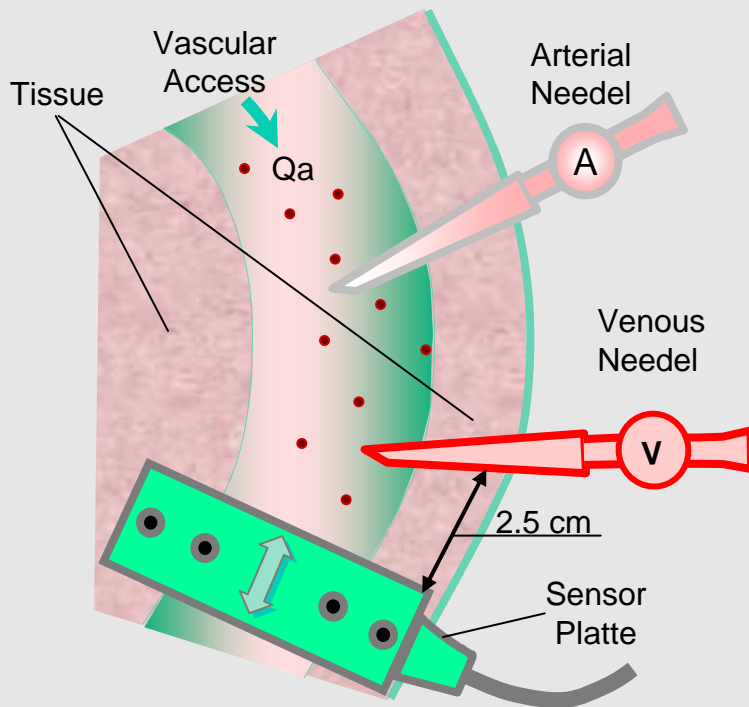


Dialysate flow = Diffusion... Kt/V

dialysate flow increase at the end of therapy rises the efficiency of the treatment.

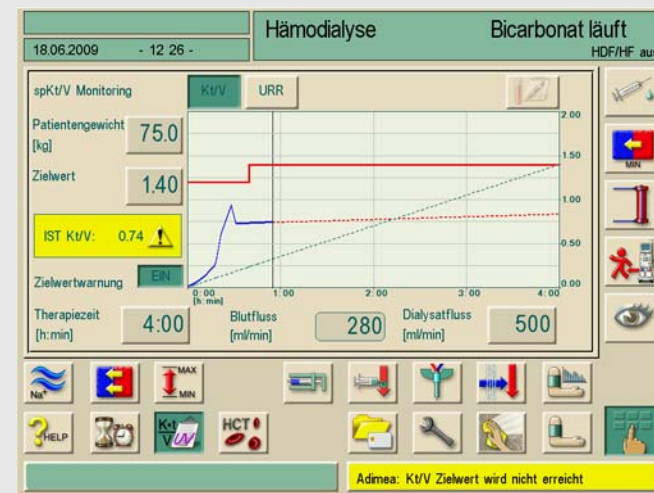


Dialysate flow relationship to blood flow & recirculation



shunt flow	blood flow	dialysate flow
500ml/min.	250ml/min.	500ml/min.
600ml/min.	300ml/min.	600ml/min.

Recirculation risk
if the blood flow is too high!



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Creating dimensions in monitoring dialysis dose

