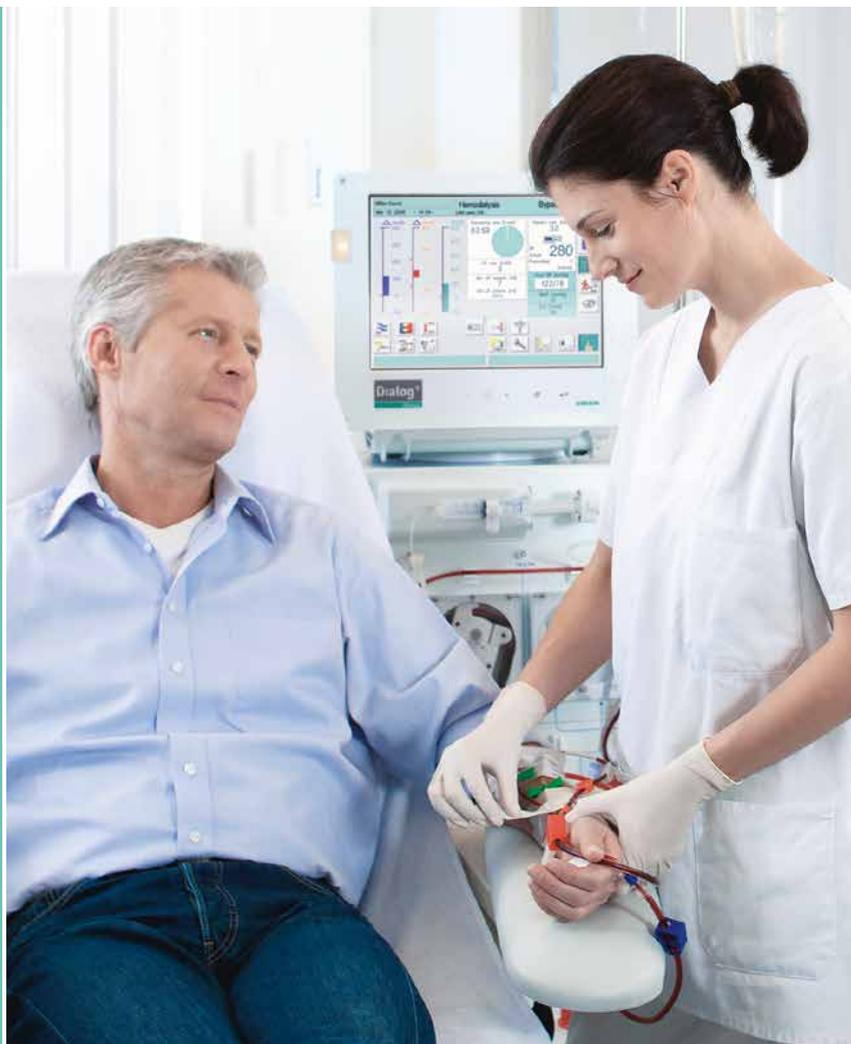


Adimea®

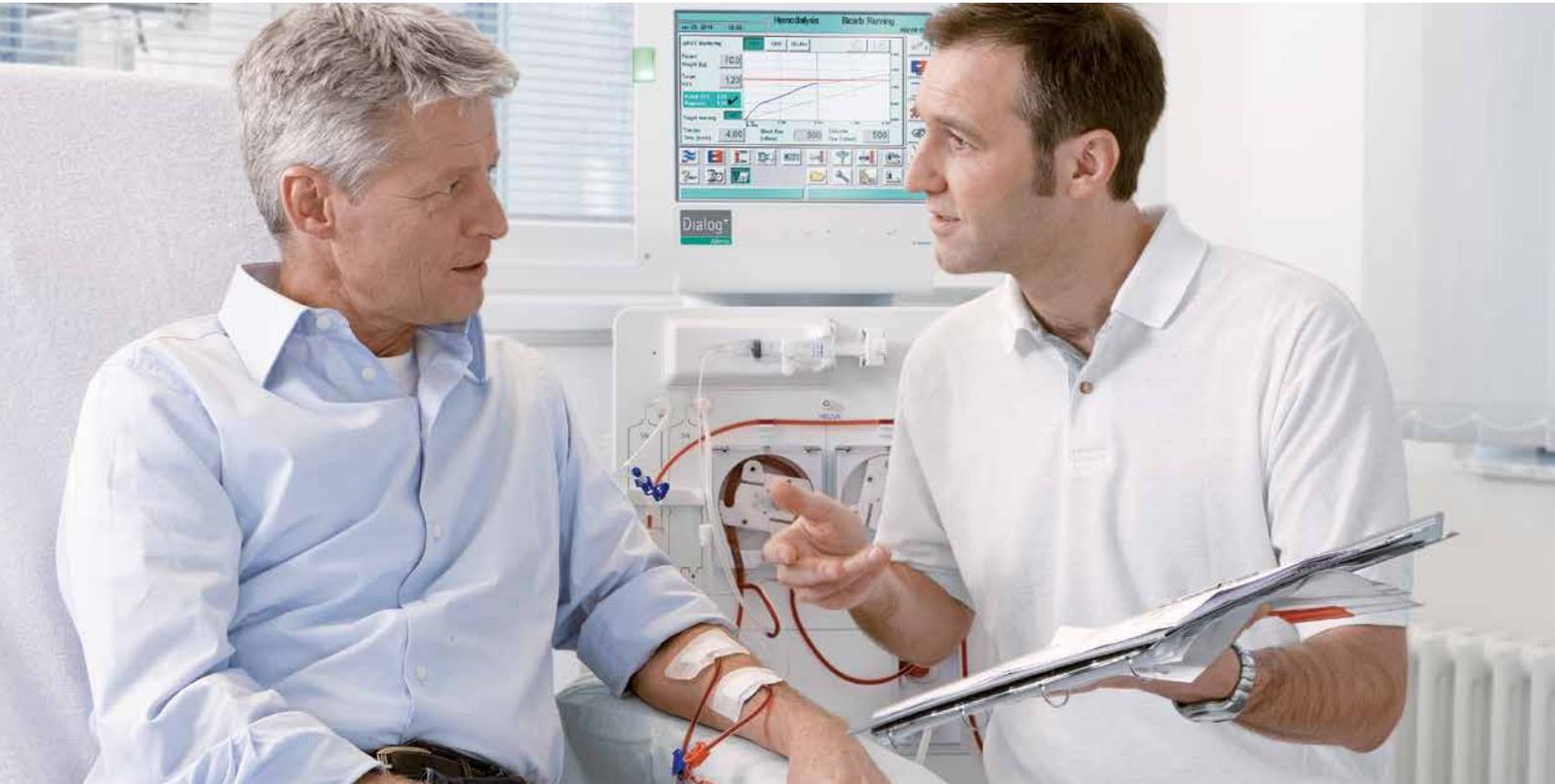
Precise real-time measurement of dialysis dose



Hemodialysis

B | BRAUN
SHARING EXPERTISE

Real-time monitoring of the dialysis dose for optimising the treatment quality



Continuous research and development:

Medical innovations over the past few decades and continuous further development today ensure extremely efficient and high-performance dialysis treatment, which allows patients to lead extensively normal lives despite restrictions. At the same time, the remit is always to fulfil the new requirements of health care policy, as demands on the quality standards of dialysis are constantly growing.

B. Braun has set itself the aim of fulfilling these growing requirements with continual research and development of efficiency, quality and ergonomics for all its products and services and to optimise these for the benefit of patients in a future-oriented manner.

Focus on the patient:

One of B. Braun's aims is to provide doctors and nursing staff with the best-possible support for giving patients the optimum dialysis dose. The basis for this is continual precise measurement and display of the dialysis effectiveness during treatment. B. Braun has developed the Adimea® real-time monitoring process.

Adimea® measures dialysis efficiency by determining the reduction in molar concentration of urinary excreted substances in the spent dialysate. Hence, Adimea® provides an accurate measurement process for reliable and continuous control of the dialysis dose (Kt/V) throughout the entire treatment.

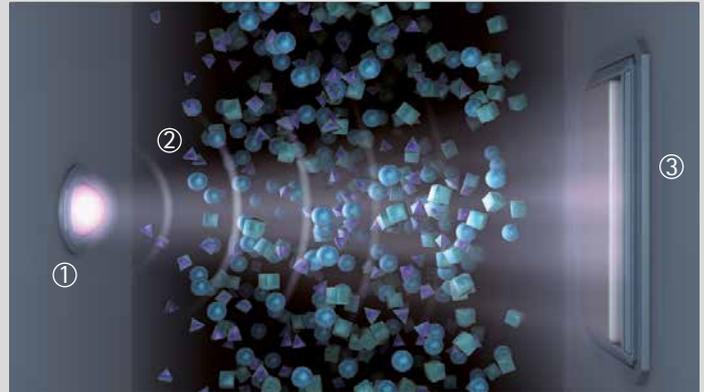
Treatment parameters can be adjusted by doctors and nursing staff for the benefit of patients even during treatment. This allows the equipment to optimally support the execution of the treatment objectives.

Advanced dialysis technology

The innovative Adimea® system utilizes the principles of spectroscopy for determining the reduction in the molar concentration of urinary excreted substances in the dialysate drain. A light source ① transmits ultraviolet (UV) light ② through the dialysate. The particles contained in the dialysate, which were removed from the plasma during dialysis, absorb the light. This absorption is measured by a sensor ③.

The pioneering technology enables measurement **in the spent dialysate**. Because it continuously analyzes change in the molar concentration, Adimea® is directly connected to the patient. On the basis of this characteristic, Adimea® is a highly reliable and accurate instrument for an online determination of the current Kt/V value during treatment.

Adimea® is not only convincing in terms of its technology, but also with regards to its simple and clear operation: The application merely requires the entry of one patient-specific parameter – the patient's weight before dialysis. This means there is no time-consuming determination and entry of the urea distribution volume (V).



Various treatment indices – from the simple urea reduction rate through spKt/V, or alternatively, eKt/V are available for continuous real-time control.

During therapy, the system – at the request of the user – generates a warning message in the event that the planned target value is not reached. This enables the user to carry out target-oriented adjustments to the treatment parameters – at any time during the ongoing dialysis.

Precise, innovative real-time measurement method

Precise, innovative determination of the reduction of urinary excreted substances in the spent dialysate using UV technology

Real-time monitoring during the entire treatment period via continual effectiveness measurement

Kt/V visible in EVERY treatment – not only monthly or quarterly

Easy and flexible operation

No determination of V – merely requires the pre-dialysis weight

Configurable and clear display of URR, spKt/V, eKt/V as well as result prognosis

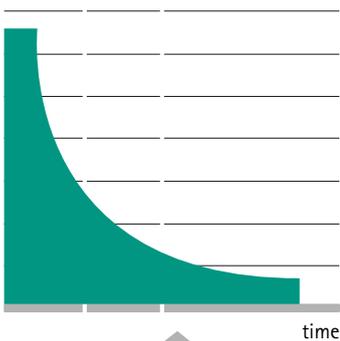
Changes to treatment parameters possible at any time

Progressive UV measurement

It has been proven¹, that the UV absorption measurements can be used to determine the dialysis dose as there is a very close linear correlation between the measured UV absorption signal and the urea in the dialysate. For this reason, the measurement values recorded by Adimea® can be used as replacement parameters for the urea.

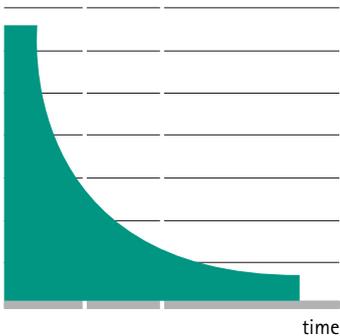
The progress of the measured substance reduction provides a true overview of the administered dialysis dose. Depending on the effectiveness of the dialysis, the concentration of urinary excreted substances, and hence also the UV light absorption, reduces over the course of the treatment. The continual measurements result in a patient-specific curve which almost precisely corresponds to the reduction in urea.

UV absorption in the dialysate



correlates

Urea concentration in the plasma



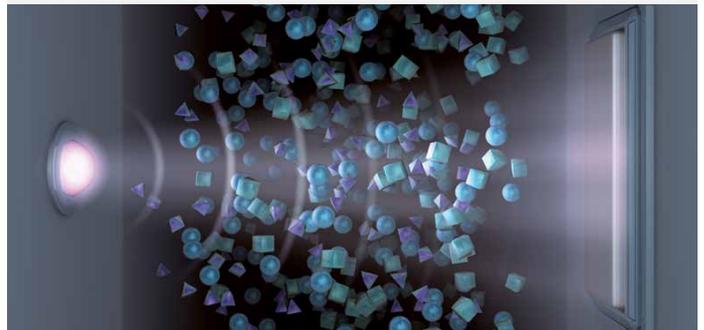
Adimea® processes this acquired information to determine, and clearly display, the Kt/V during treatment. (see treatment progress graphs)

¹ Uhlin F, Fridolin I, Magnusson M, Lindberg LG. Dialysis dose (Kt/V) and clearance variation-sensitivity using measurement of ultraviolet-absorbance (on-line), blood urea, dialysate urea and ionic dialysance. Nephrol Dial Transplant. (2006) 21: 2225-2231.

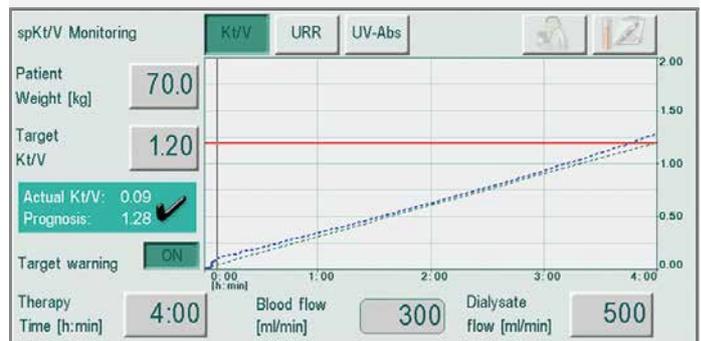
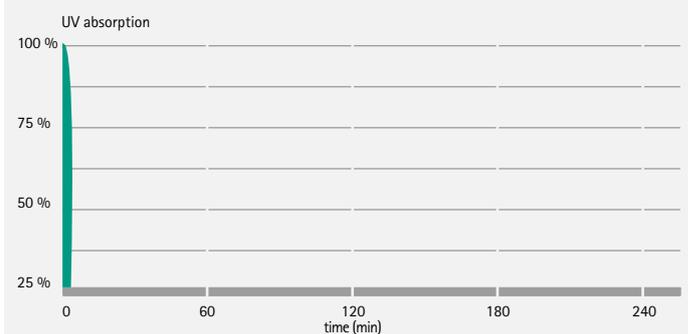
Beginning of treatment

High molar concentration in the dialysate ...

The urinary excreted substances in the dialysate absorb a majority of UV light on their way from the diode to the sensor.



... entails high UV absorption



The absorption signal provides information on the dialysis effectiveness

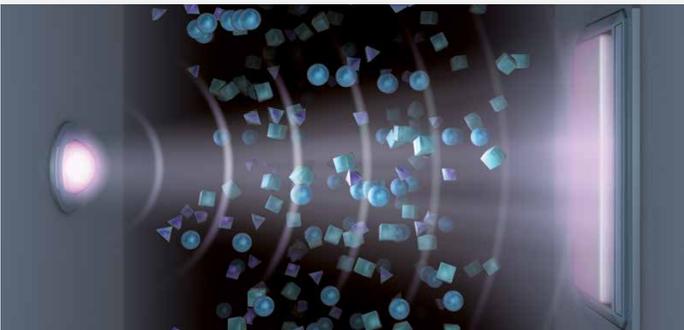
The user can see all parameters from the outset

- Selected treatment index (spKt/V example)
- Kt/V and URR
- Actual values achieved
- Expected final Kt/V value (prognosis)
- Overview of and access to: Treatment time / blood flow / dialysate flow.

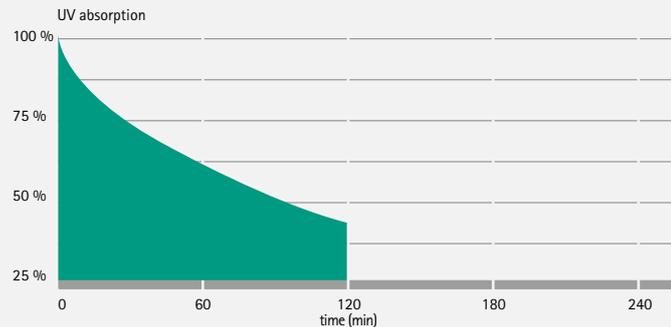
Middle of the treatment

The molar concentration decreases ...

After 120 minutes of dialysis, the volume of urinary excreted substances is considerably reduced.



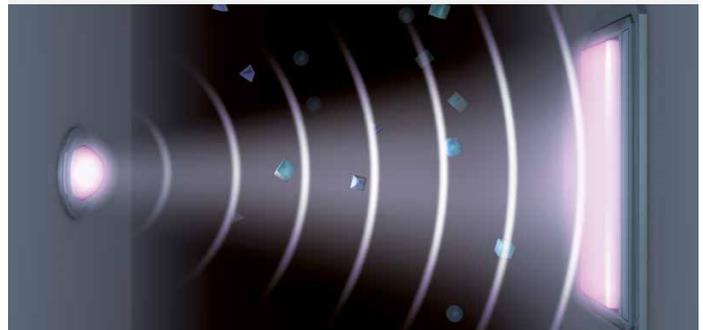
... and less UV light is absorbed



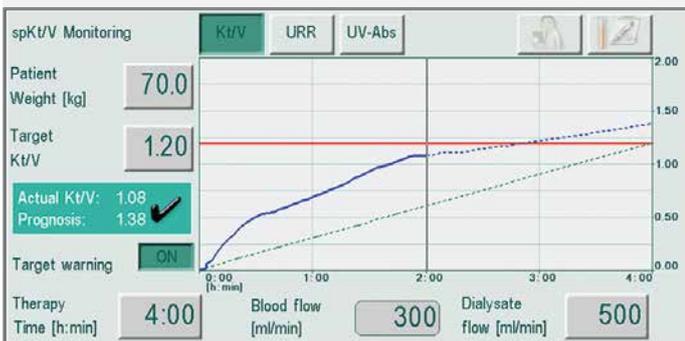
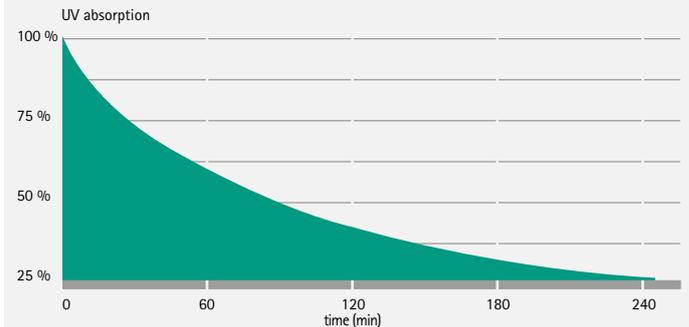
End of the treatment

The few remaining molecules ...

The low number of molecules still remaining in the dialysate drain barely absorb the UV light.



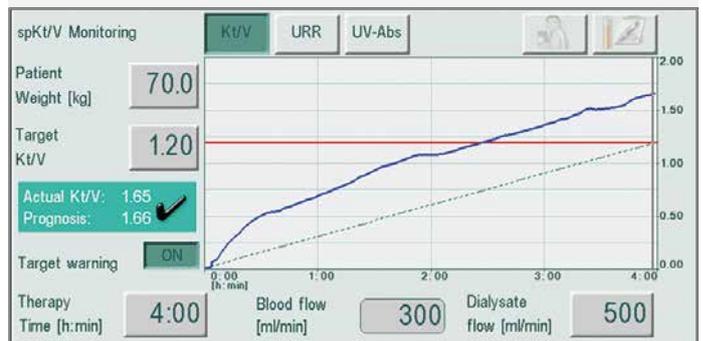
... hardly absorb any UV light any longer



Dialysis progress becomes apparent quickly and easily

The graphic display of the treatment progress enables optimum user support at all times.

Trends in the treatment progress can be identified in good time by displaying the real time value curve (blue) / the target value curve (red) and an optical orientation line (dashed green). A target value warning, that can be optionally activated, additionally supports the user.



Easy to understand display about the actual dialysis efficiency

At the end of the treatment, the user instantly sees whether the intended treatment objectives have been achieved. The relevant treatment data are available to be saved on the Patient Therapy Card and in Nexadia.

Innovative technology – precise results

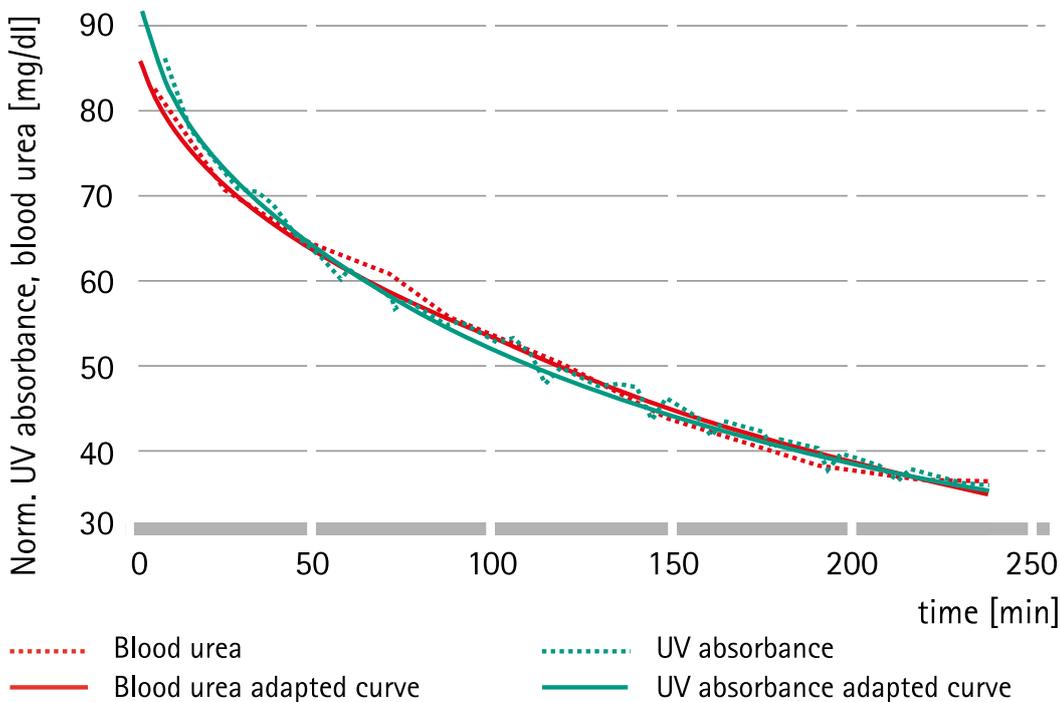


Fig. 1: This sample display for the UV absorption signal's treatment progress and the serum urea values at 20-minute measurement intervals reveals the excellent correlation.

Clinical trials^{2,3} reveal a very close correlation between the laboratory-determined blood-spKt/V and the Adimea®-spKt/V as well for hemodialysis (HD), hemodiafiltration (HDF) and Single Needle Cross Over (SNCO) treatment modes.

The sample display for the UV absorption signal's treatment progress (HD therapy) and the serum urea values at 20-minute measurement intervals reveals the excellent correlation (see Fig 1).

During a total of 234 treatments (HD n=64 / HDF n=87 / SNCO n=83), blood was serially taken for urea testing to acquire a determination of the spKt/V from the blood as accurate as possible. The spKt/V value determined by Adimea® was recorded at the same time.

The comparison of the data reveals for all treatment modes an excellent correlation between the blood-spKt/V and the Adimea®-spKt/V. Also the comparison of mean values support these results. This accounts for the high degree of accuracy for the method.

² Castellarnau A, Werner M, Günthner R, Jakob M: Real-time Kt/V determination by ultraviolet absorbance in spent dialysate: Technique validation. *Kidney Int.* 2010 Nov;78(9):920-5

³ Jakob M, Rawer P, Fach B, Wintergalen M, Koch M, Zinn S, Roth G, Hengst S: Clinical application of real-time Kt/V determination by ultraviolet absorbance (Adimea®) in Single Needle Cross Over (SNCO) dialysis and Hemodiafiltration modes (HDF Online) ERA-EDTA 2010.

Data hemodialysis (HD)

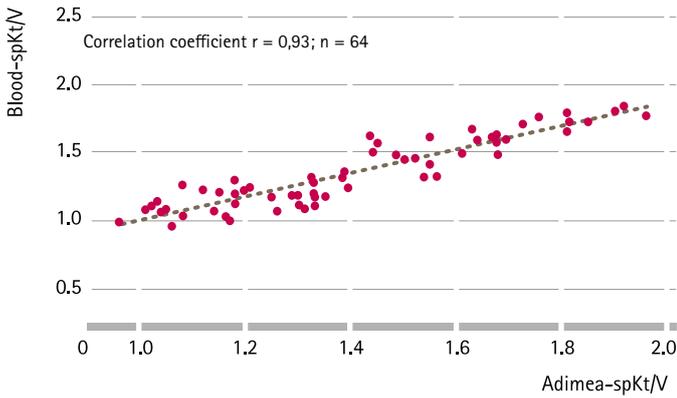


Fig. 2: Scatter plot correlation between blood-spKt/V vs. Adimea®-spKt/V.

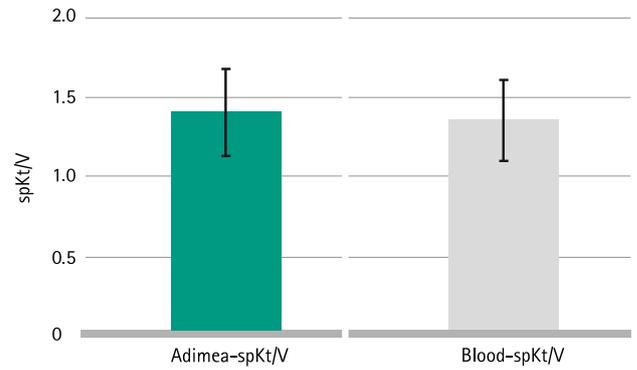


Fig. 3: Comparison of mean values Adimea®-spKt/V vs. blood-spKt/V.

Data hemodiafiltration (HDF)

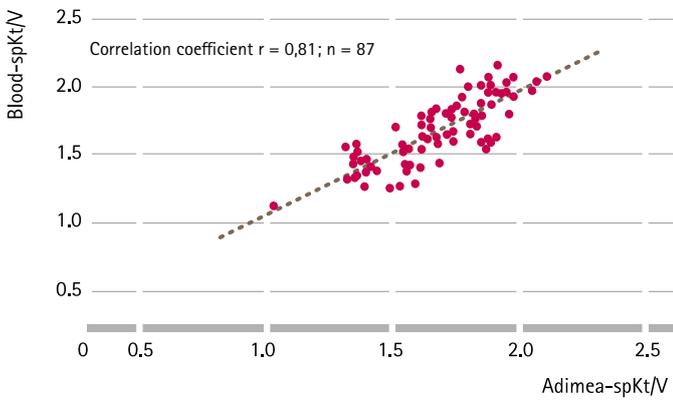


Fig. 4: Scatter plot correlation between blood-spKt/V vs. Adimea®-spKt/V.

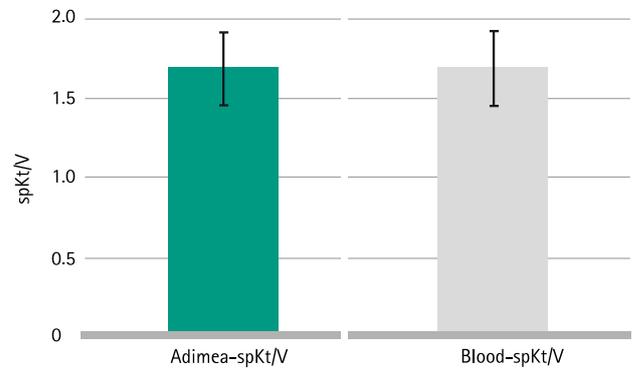


Fig. 5: Comparison of mean values Adimea®-spKt/V vs. blood-spKt/V.

Data Single Needle Cross Over (SNCO)

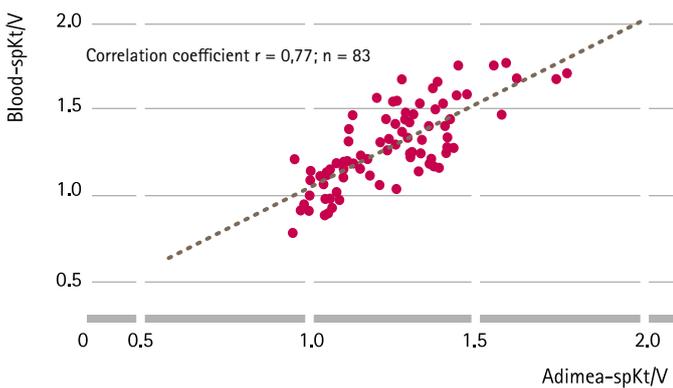


Fig. 6: Scatter plot correlation between blood-spKt/V vs. Adimea®-spKt/V.

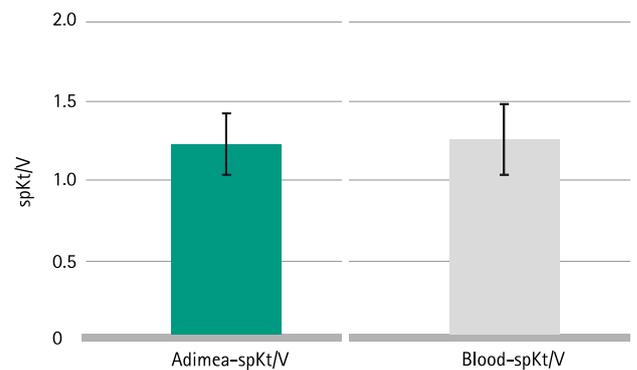
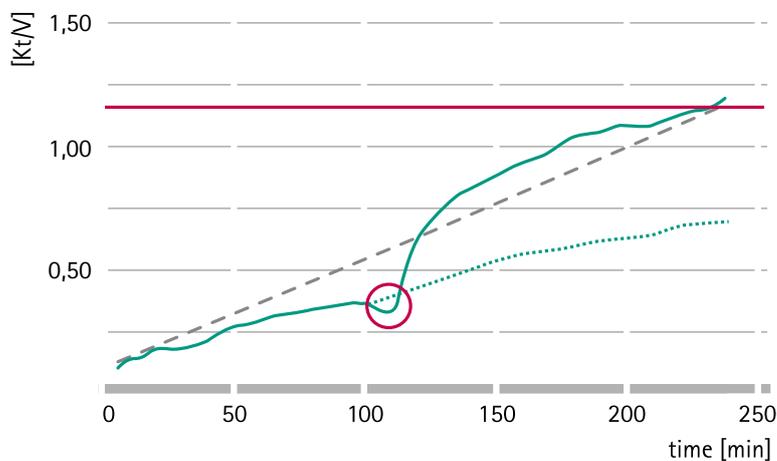


Fig. 7: Comparison of mean values Adimea®-spKt/V vs. blood-spKt/V.

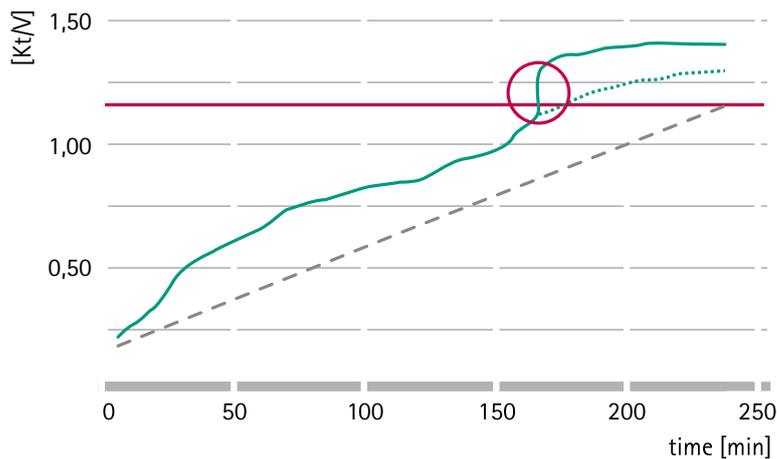
Insight into the patient-specific dialysis treatment

As a first, continuous Kt/V measurement with the help of Adimea® makes it possible to illustrate the impact of patient-specific factors on dialysis treatment. Specific curve traces and final Kt/V results permit an interpretation of the particular situation and in so doing help to support the clinical assessment of the patient. For example, final Kt/V

values below target over an extended period can be an indication of an existing problem within the vascular access. An improvement in the Kt/V curve after reducing the rate of blood flow during treatment is indicative of an existing recirculation – in this case, additional diagnostic measures should be taken.



-  Blood flow reduction
-  Prognosis without flow reduction
-  Curve after changing flow



Abrupt rises in Kt/V curve traces can be indicative of sudden recirculation or sudden clotting – the sensor interprets the supposedly (suddenly) 'pure' dialyzate as a temporarily positive Kt/V curve and displays it accordingly until the next recalculation in the curve.

Advantages for the user:

- Early indication of existing recirculation through permanently low final Kt/V values
- Recirculation check by observing the curve response to reduced blood flow
- Detection of sudden recirculation or clotting via the typical curve trace

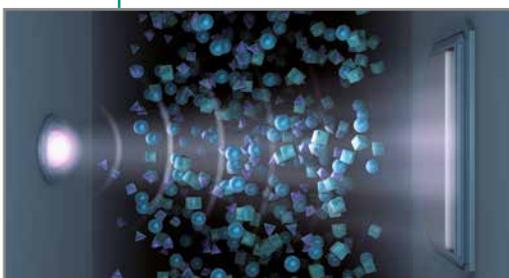
Flexible and efficient device integration

Dialog+

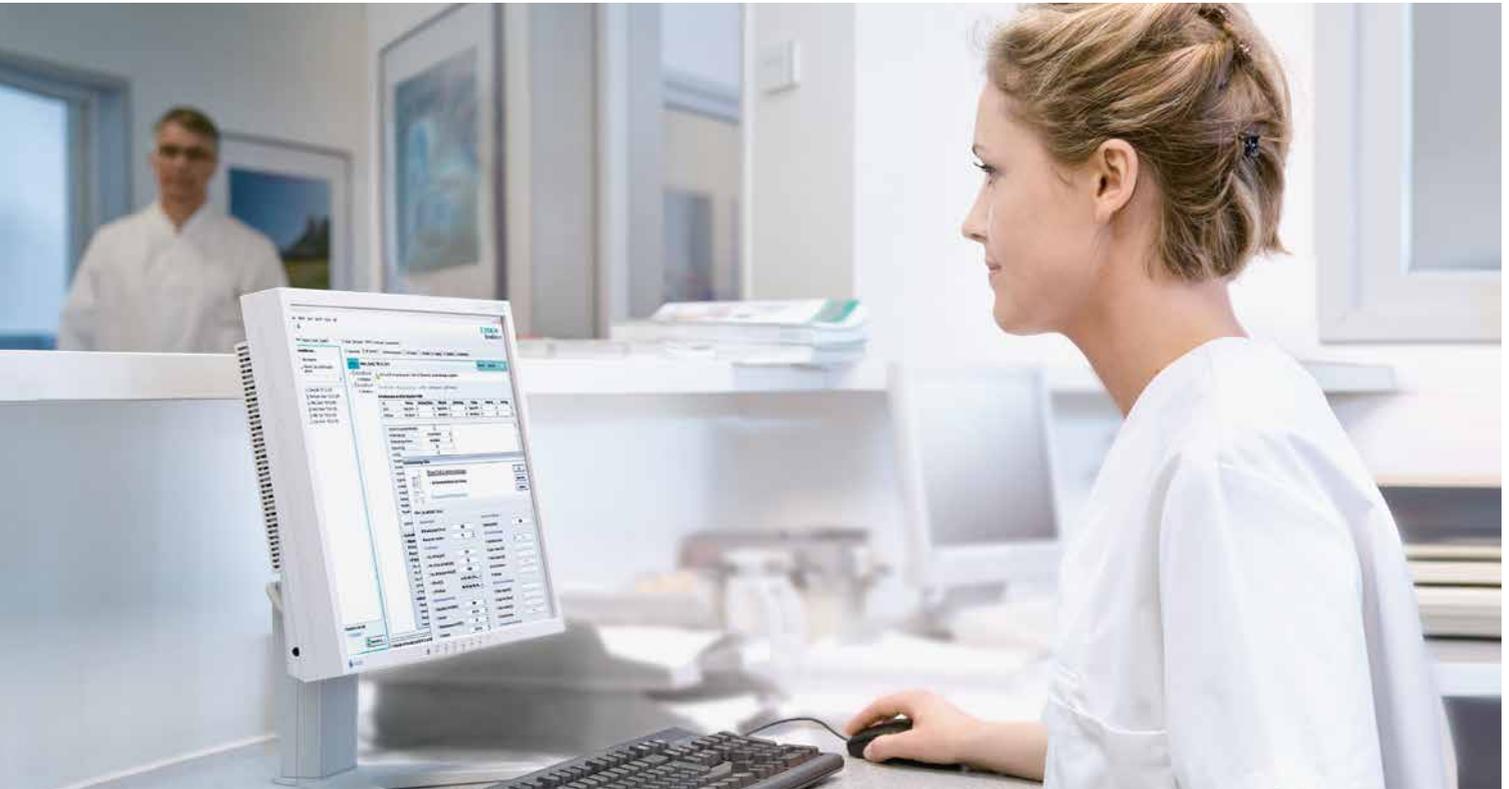
The evolution in demand-oriented configuration

With its three basic device configurations, Dialog+ sets standards in extracorporeal blood treatment. The inclusive and efficient treatment system enables users to have the greatest number of possible configurations when setting up their specific dialyzer. The Adimea® option can be installed in Dialog+ devices already in use without any major service input. The customer incurs no additional follow-up costs, as no consumables are needed.

The Adimea®
treatment option:



Synergies provided by the integrated system



Nexadia:

Our innovative and intelligent Nexadia data management system helps to simplify dialysis processes considerably and facilitates preparation of the documentation required for quality management. Nexadia provides efficient support in your everyday practice routine.

Systematic treatment quality, for that little extra quality of life

At B. Braun, we always define our performance aims ourselves: not only to fulfil the quality standards, but to exceed them. This also includes optimising the treatment efficiency of our products and services both for patients and for administering users.

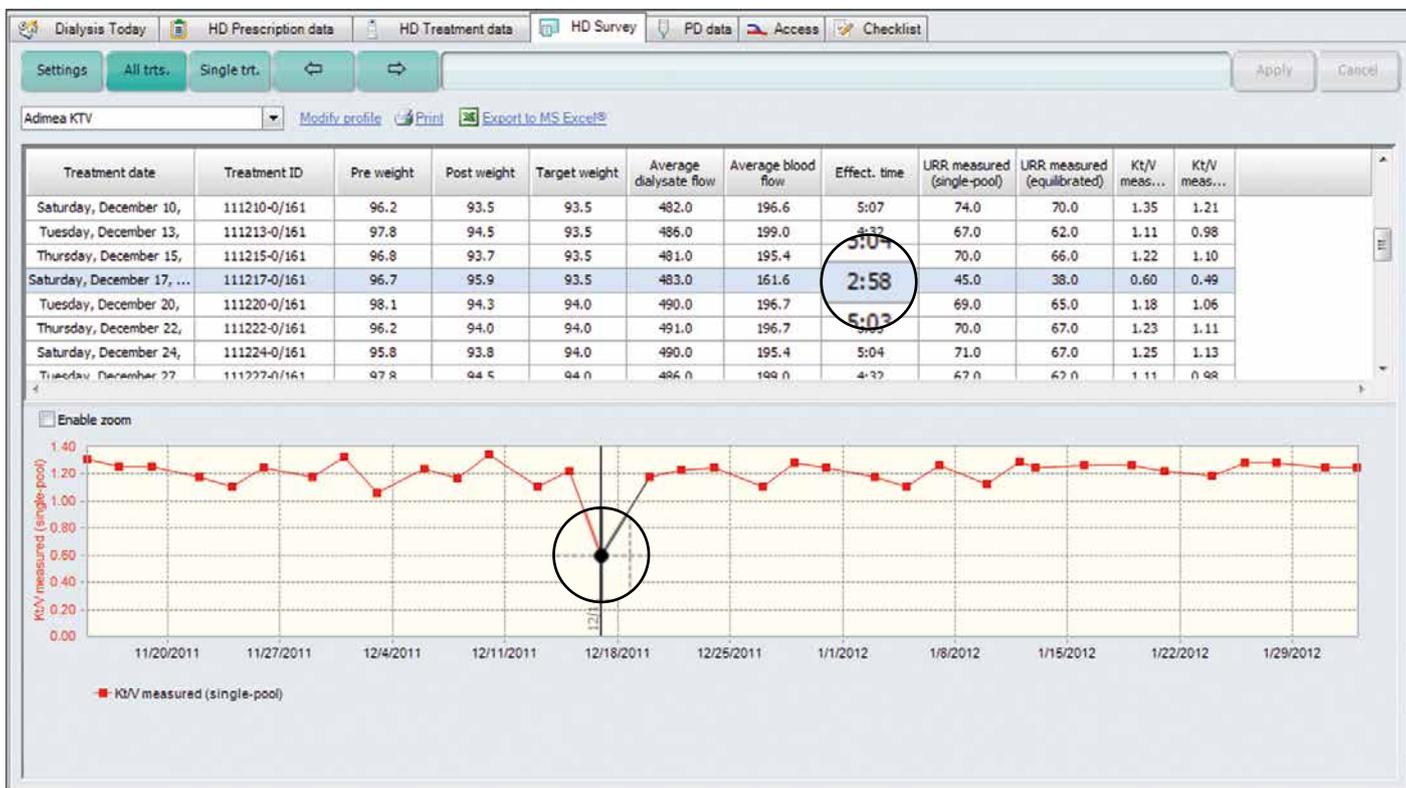
State-of-the-art as the benchmark in our continual challenge to benefit patients.

Quality, efficiency and ergonomics are the cornerstones of our systematic approach. With this, we have taken on the economic challenges facing the health system and constantly focus on the quality and efficiency of our efforts – with the objective of sustainably optimising the quality of life for patients requiring dialysis.

Dialog+, Adimea® and the data management system Nexadia: perfect harmony

Perfect results require perfect team work: with our treatment system, Dialog+, we offer – on conjunction with Adimea® and the Nexadia data management system – the perfect treatment environment for patients requiring dialysis.

The combination of innovative, intelligent hardware and software solution guarantees an outstanding treatment standard, the optimisation of the treatment parameters during ongoing treatment as well as proof of treatment success.



For example, the Nexadia data management system provides automatic pre-setting of the dialysis machine by means of a patient-specific chip card. Nexadia transfers the parameters required by Adimea®, such as patient weight and desired Kt/V, directly to the dialysis machine at the beginning of the treatment.

On the basis of this autonomous presetting, Adimea® can automatically start the Kt/V monitoring. In addition to storing lots of patient and treatment data, Nexadia also records the Kt/V value determined by Adimea® following the conclusion of the treatment for further utilisation.

In our Nexadia Expert database system, all Adimea® data are displayed graphically, too, for focused analysis. Long-term curves are quickly visible and allow for focused evaluation of the specific course of treatment. Negative trends and specific flaws in treatment are easily identified and indicate any required diagnostic measures or changes in the prescribed treatment early on.

You can also get detailed information from the separate brochure *The Nexadia System* or on the website www.nexadia-bbraun.com.

