RENAL CARE

D.MED NEPHROFLOW™

RECIRCULATION AND ACCESS FLOW MEASUREMENT

NIPRO MEDICAL EUROPE

How can D.med NephroFlow help your patient?

The latest technological developments in dialysis are improving the comfort and quality of life of dialysis patients. Therapies such as convective techniques, biofeedback, and sodium management are commonly used.

However, all these advances are useless if the very basis of the treatment is shaky and unsafe, namely the vascular access.

Whether we are talking about an arteriovenous fistula, a graft, or a central venous catheter, the durability of the vascular access and its proper functioning guarantees the patient a dialysis treatment that is adequate and of high quality.

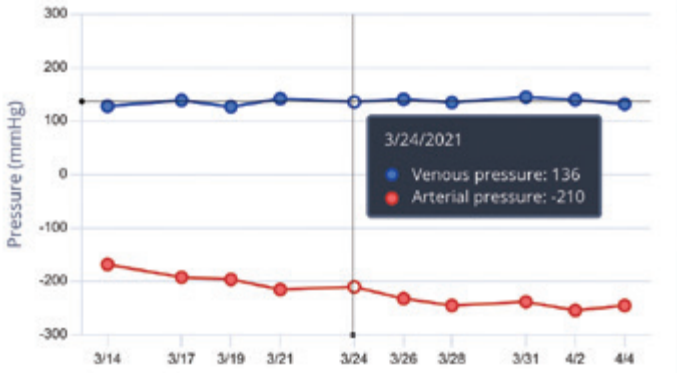
For dialysis patients, vascular access is simply considered THE lifeline. Special attention is therefore paid during dialysis to parameters such as arterial and venous pressures, blood flow, or adequacy of needle diameter with the blood flow, etc. But sometimes, even with the most sophisticated machines, some changes can go unnoticed.

Let's review a clinical example

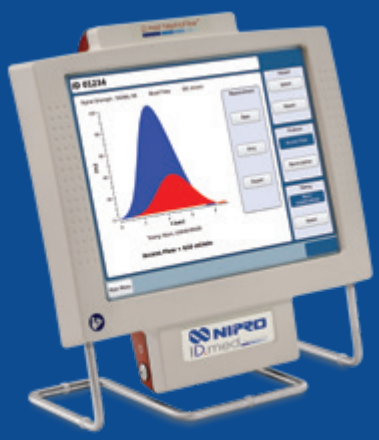
In a center, parameters of dialysis patients such as venous and arterial pressures were collected methodically as it is in all dialysis centers. In one patient, even though the machine was not sending out an alarm, a long-term assessment of arterial and venous pressures showed a change in the curves. This predicts a development of complications.

This patient had a decrease in arterial pressures without creating alarms. Without a long-term chart, a complication can develop under the radar and will be only noticed when it is too late.

However, this patient's nurse took the initiative to schedule an assessment of his vascular access. An assessment of the access flow and the recirculation was done. A low access flow of 610 mL/min was measured.



Cardiovascular mortality counts for almost 45% of all-cause mortality among dialysis patients.[1] KDOQI guidelines recommend vascular access intervention **when the access flow is below 600 mL/min for a graft and <400-500 mL/min for a fistula**. Low access flow has been reported with underdialysis and poor cardiac status[2] in the short-term and is also related to all-cause mortality in the long-term.[3]



The investigation demonstrated that the fistula was stenosed and a dilation was needed.

D.med NephroFlow™ improves dialysis management, helping the early detection of vascular access complications. Following KDOQI advice, the use of surveillance methods increases the detection of stenosis.[4]

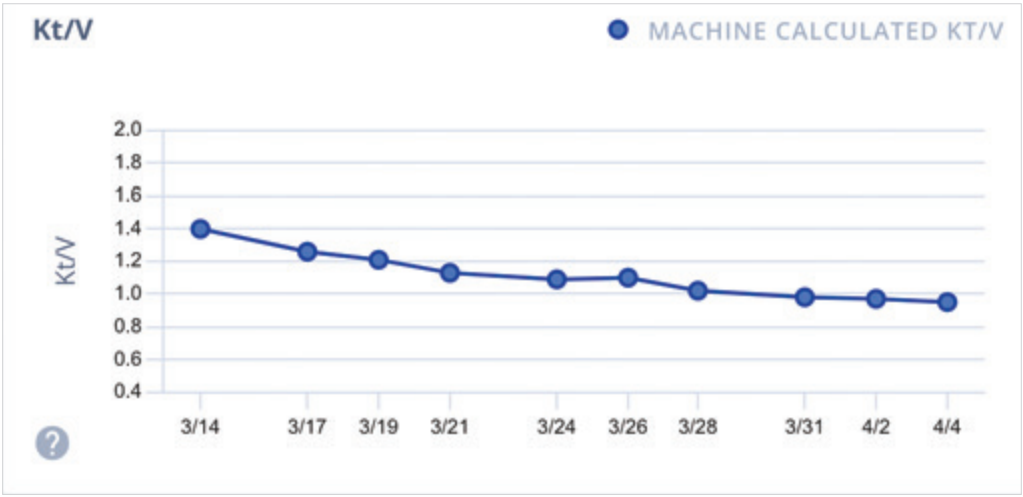
Decrease in dialysis efficiency

Delivering the right dose of dialysis is a priority for treatment and confirms the removal of uremic toxins. Although toxin reduction is increasingly focusing on the removal of medium molecules, it is still primarily urea removal that is measured either via blood sampling or online conductivity measurement.
Most dialysis machines on the market measure clearance or dialysance and display the resulting Kt or Kt/V during the session.

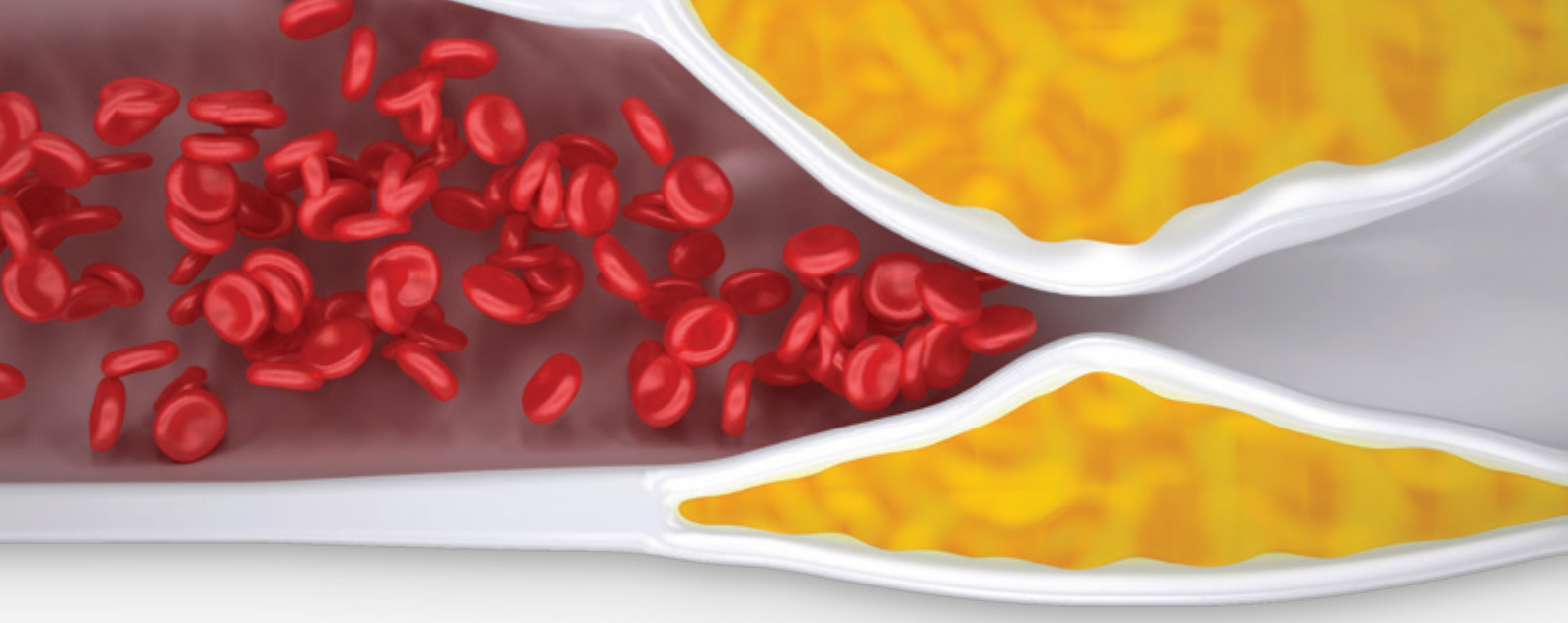
It is commonly accepted that the accuracy of Kt/V measurements via dialysis machines is high, making the displayed Kt or Kt/V a reliable measure of the quality of the dialysis session.[5] A single value doesn't give a good representation of the dialysis adequacy. This is why it is highly recommended to follow the trend of Kt or Kt/V measurements on a dialysis machine.

Let's have a look at a clinical case

Over a period of one month or a dozen dialysis sessions, the evolution of the Kt/V measured on the dialysis monitor decreased dangerously for the patient.



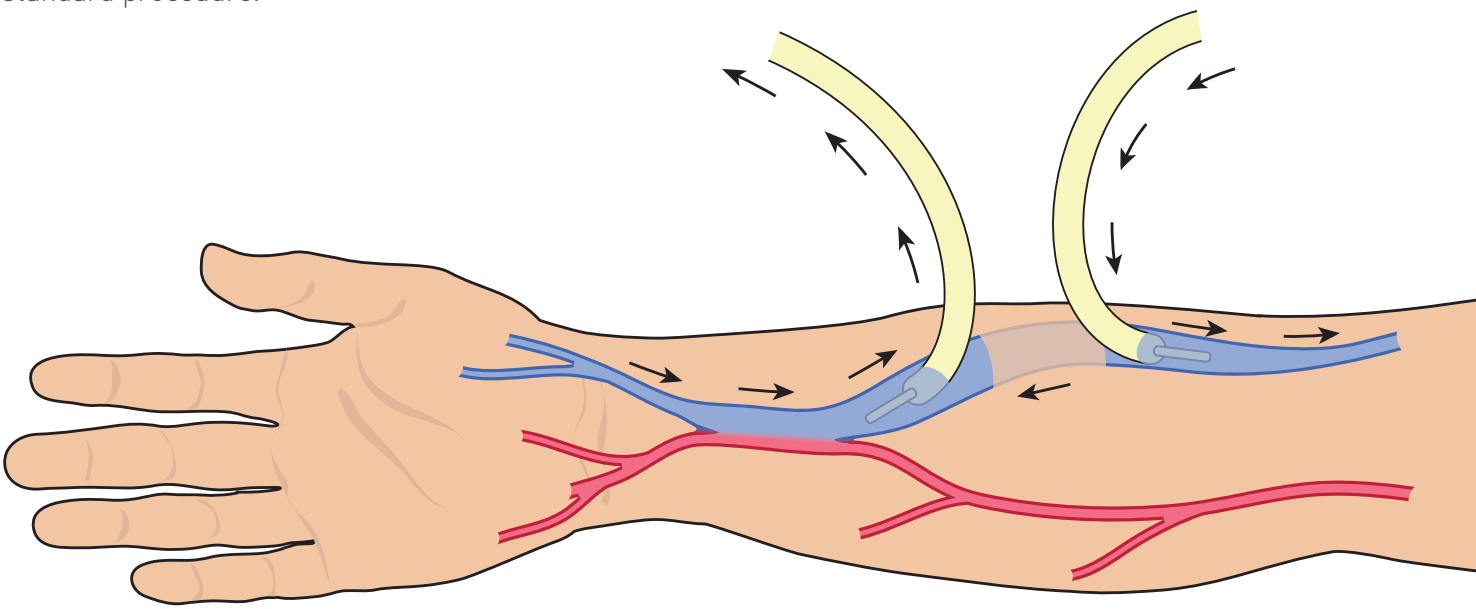
An evaluation of the vascular access was planned, and a measurement of the recirculation and the access flow were evaluated. During the next session, an evaluation of the recirculation was performed with D.med NephroFlow which showed a recirculation of 34%.



This measurement confirmed the nurse's doubts. The presence of arteriovenous fistula recirculation negatively impacts the adequacy of dialysis resulting in a possible reduction in the quality of life and ultimately the survival of dialysis patients.[6]

Access recirculation can occur with the presence of venous stenosis or thrombosis, improper needle position, and inadequate arterial blood flow.

After further investigation, it turned out that a thrombosis had formed after the venous puncture point. Once the problem was solved, the patient's pressures returned to normal and Kt/V went back to the original levels. Monthly recirculation and venous access measurements were implemented for all dialysis patients as a standard procedure.



Reduction of quality dose could be a good predictor of recirculation in vascular access. A close surveillance of recirculation prevents reduction in the quality of life, and ultimately increases survival.

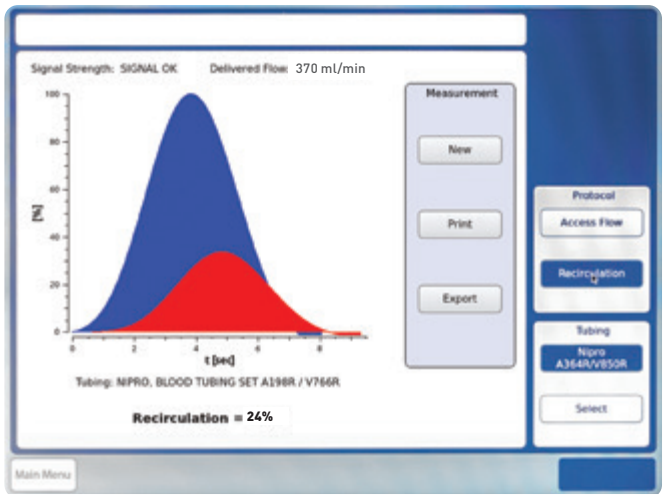
How to optimize the use of a catheter?

In some countries, the use of central venous catheters is very common and can represent up to 50% of the dialysis population.[7]

For these patients, and their nurses, one of the many challenges is to obtain high blood flows that will allow a large volume of blood to be treated. However, high blood flow with a catheter does not always mean optimal efficiency. Indeed, due to the proximity of the catheter lumens, some venous blood could be drawn into the arterial line, resulting in blood recirculation.

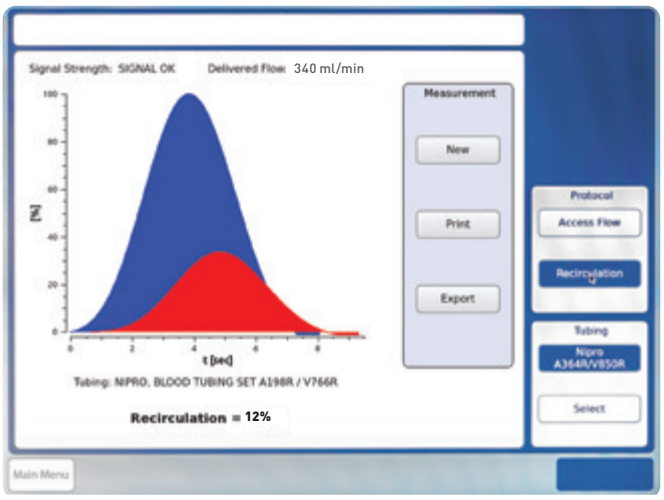
Let's see how the D.med NephroFlow can help optimize blood flow without causing high recirculation.

A high blood flow rate of around 350 mL/min or more is considered.



By measuring the recirculation at 370 mL/min, the measurement displays 24% recirculation, meaning an effective blood flow of 281 mL/min.

The evaluation was done again with another blood flow - this time with a blood flow of 340mL/min. The recirculation measured was 12%, meaning an effective blood flow of 300 mL/min.



D.med NephroFlow™ is an easy tool to evaluate the patency of a central venous catheter and helps to identify recirculation assuring the highest efficiency during dialysis.

D.med Nephroflow features:

Large touch screen

The high-sensitivity screen optimizes usability during treatment. Intuitive interfaces guide the user through step-by-step instructions and advice for taking measurements.

Quick measurement mode

The Quick mode allows the user to take measurements without entering patient data. D.med NephroFlow is ready to measure within seconds.

Built-in fast start

It takes only a few seconds to begin taking measurements once the device is switched on. No loss of time. Immediate effectiveness.

6-MONTH trend viewer

Graphical documentation of previous measurements, up to 6 months, allows for the supervision of the vascular access of the patient and encourages proactive intervention with minimal effort.

Print & save via USB

In Normal mode, all data is immediately stored in the patient record. A simple USB connection allows you to export and/or print data without requiring an external PC.

1. Al-Ghonaim M, Manns BJ, Hirsch DJ, et al. Relation between access blood flow and mortality in chronic hemodialysis patients. Clin J Am Soc Nephrol 2008; 3:387–91.
2. Lowrie EG, Laird NM, Parker TF, et al. Effect of the hemodialysis prescription of patient morbidity: report from the National Cooperative Dialysis Study. N Engl J Med 1981; 305:1176–81.
3. Wu C-K, Wu C-L, Lin C-H, et al. Association of vascular access flow with short term and long-term mortality in chronic haemodialysis patients: a retrospective cohort study. BMJ Open 2017;7: e017035. doi:10.1136/ bmjopen-2017-017035
4. National Kidney Foundation KDOQI clinical practice guidelines for vascular access.
5. Ionic dialysance and quality control in hemodialysis: 2001. Laboratoire de biophysique et Service de néphrologie, Groupe hospitalier Pitié-Salpétrière, Paris.
6. Abbasali Zeraati et al. A Review Article: Access Recirculation Among End Stage Renal Disease Patients Undergoing Maintenance Hemodialysis.
7. Hussein et al. Prevalence and correlates of central venous catheter use among haemodialysis patients in the Irish health system. BMC Nephrology, 2018-19:76

Technical specifications

Dimensions (HxWxD); weight	approx. 400 x 380 x 220 mm; approx. 5.5 kg
IP code	IPX0 (Non-protected against water and other liquids)
Power consumption	66 W

Power supply:

Type	Friwo FW 7488M/12
Input Voltage	100V - 240V/ 50-60 Hz / 1,7 A – 0,85 A
Output Voltage	12V DC / 5,5A
Electric Rating	Protection Class II
Dimensions (HxWxD)	50 x 149 x 79 mm
IP code	IP40 (Protected against solid foreign objects of 1,0 mm Ø and greater. Non-protected against water)

Battery (optional)

Type	RRC 2020
Voltage	11.25 V
Capacity	8.85 Ah
Max. charge current	6.2 A
Max. charge voltage	13.05 V
Max. discharge current	10.0 A
Dimensions (LxWxH)	149 x 89 x 20 mm
Weight	490 g

Ultrasonic Dilution Sensor (UDS)

Dimensions (HxWxL); weight	approx. 20 mm x 20 mm x 32 mm approx. 120 g
IP code	IPX4 (protected against ingress of dust/particles and water)

Accuracy, Range and Resolution

Blood Flow	Accuracy: ±6% of reading ±Offset of 10 mL/min Measurement Range: up to ± 2.0 l/min Resolution: 1 mL/min
Access Flow	Accuracy: ±15% of reading or ± 100 mL/min (the greater error of both is relevant) Measurement Range: up to 4.0 l/min Resolution: 10 mL/min
Recirculation	Accuracy: If recirculation is > 3%: ±3% (e.g. a recirculation of 15% can be between 12% - 18%) Measurement Range: 0- 100 % Resolution: 1%

Ultrasound

Acoustic output data	Frequency 2.25 MHz, pr < 1 MPa, Ispta < 20 mW/cm², Iob < 100 mW/cm²

Nipro Renal Care is part of Nipro Corporation Japan, a leading global healthcare company established in 1954. With over 35.000 employees worldwide, Nipro serves the Medical Device, Pharmaceutical, and Pharmaceutical Packaging industries.

Nipro Renal Care is a global market leader with over 6 decades providing renal solutions for dialysis and dialysis-related treatment. We specialize in developing dialysis machines, water treatment systems, and a comprehensive portfolio of disposable medical equipment.

In order to address the needs of patients, healthcare professionals, and procurement managers alike, Nipro Renal Care is driven by innovation and patient safety to offer the highest quality products that optimize time, effort, and costs.

BECAUSE EVERY LIFE DESERVES AFFORDABLE CARE

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Please contact your local representative for more information.

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