

Acute Therapy Systems

multi**Filtrate**PRO

A perfect fit for every team



Ci-Ca®  multi**Intense**Care




**FRESENIUS
MEDICAL CARE**

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multi**Intense**Care by Fresenius Medical Care is a comprehensive concept that aims to achieve better outcomes for your ICU patients.

The therapy circle  symbolizes the complete therapy range, combining products, therapy assistance, training and education, and service support.

Fresenius Medical Care was the first to offer a complete **Ci-Ca® regional citrate anticoagulation** for application in CRRT, enabling citrate anticoagulation as suggested in the current KDIGO clinical practice guidelines for acute kidney injury.¹

Supporting your clinical practice

multiIntenseCare

Today, intensive care units (ICUs) are experiencing increased workloads and high working pressure. This has substantially changed the requirements for modern CRRT machines: besides safety of therapy application being essential, the safeguarding of a smooth treatment performance has become significantly more important. At the same time, efficient use of resources is crucial.

Fresenius Medical Care addresses these contemporary requirements with the multi**Filtrate**PRO:

Treatment safety benefits from long-standing experience

- Integrated safety concepts support reliable operation
- A multitude of sensors continuously monitors the treatment

Focus on truly continuous CRRT and haemodynamic stability

- Reduced treatment interruptions through citrate anticoagulation – the basis for truly continuous CRRT
- Longer filter patency with effective citrate anticoagulation means less consumption of filters and less workload for nurses

Comprehensively integrated Ci-Ca[®] anticoagulation

- All pumps integrated into the multi**Filtrate**PRO and linked by supportive software
- Proven reduction of bleeding complications compared to heparin anticoagulation¹⁻³

Ci-Ca[®]  multi**Intense**Care

multi**Filtrate**PRO

The Pillars

Products &
Disposables

Therapy
Assistance

Training &
Education

Service
Support

A perfect fit for every team

Most critically ill patients in ICUs are suffering from multiple organ failure. They depend on a reliable and undisturbed application of their complex treatment. The thoughtfully designed multiFiltratePRO supports hospital staff in intensive care units through a multitude of features. It helps to effectively apply CRRT to patients with acute kidney injury while keeping the workload limited.

CRRT with multiFiltratePRO

The multiFiltratePRO is a new-generation CRRT-device that builds on the substantial experience with the multiFiltrate and the successfully established Ci-Ca[®] regional anticoagulation. Patients benefit from less bleeding, long filter running times and lower blood product requirements.¹⁻⁴



The multiFiltratePRO offers all available Ci-Ca[®] therapy modes as well as all common standard CRRT options:

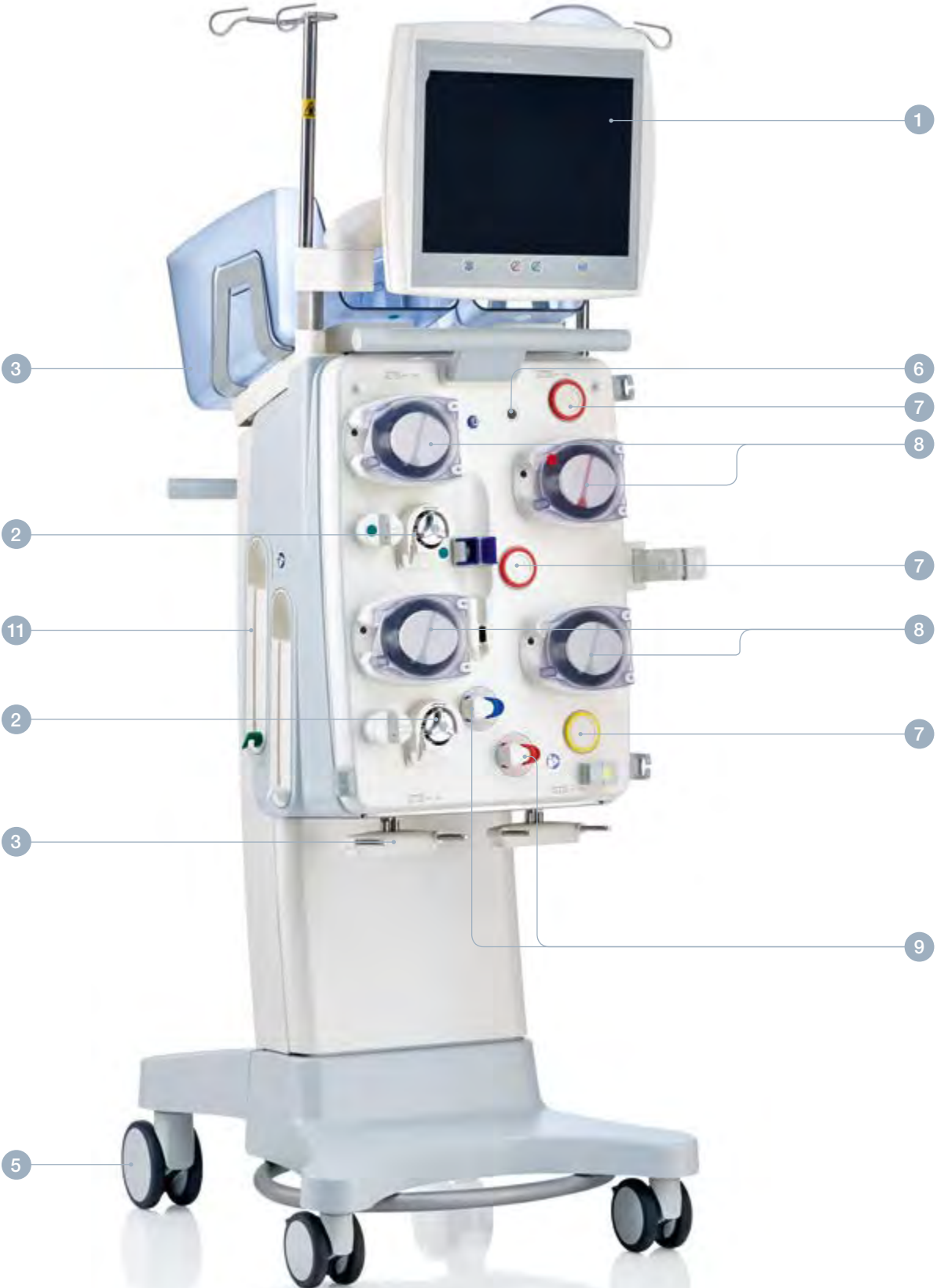
- Ci-Ca[®] CVVHD AV1000S
- Ci-Ca[®] CVVHD EMiC[®]2
- Ci-Ca[®] postCVVHDF

- CVVHD
- Post-CVVHDF
- Pre-CVVHDF
- Post-CVVH
- Pre-CVVH
- Pre-Post CVVH





Features overview





- 1 Large and adjustable touch screen with status recognition light on top, visible from a distance
- 2 Dedicated citrate and calcium pumps for optimal citrate anticoagulation management
- 3 High-capacity scales for a robust and accurate balancing system; clear separation of fresh (at the top) and used fluids (at the bottom), easing hygienic operation
- 4 Heparin pump for all therapies
- 5 Four rotatable wheels with 2-stage locking system allow turning on the spot
- 6 Optical cassette detection
- 7 Air-free pressure measurement units
- 8 Blood and fluid pumps with automated insertion and ejection of all pump segments
- 9 Clamps for return as well as access bloodlines ensure emergency separation of patient and machine in case of system failures
- 10 Ergonomic handles at front and back for easier handling
- 11 Two highly effective integrated fluid heaters

Ergonomic design

The field of intensive care is characterized by substantial challenges. A large number of patients require careful observation and an immediate response in critical situations. Therefore it is important that the delivery of CRRT respects these constraints on available user attention. CRRT treatment with the multiFiltratePRO offers simple handling and little need for user interaction.



Large and adjustable monitor:

Enhanced readability from various angles

The easy-to-read touch screen monitor allows recognition of key information even from a distance. Rotation around the horizontal and vertical axes enables adjustment for different-sized users and to different relative positions of the device and user.



Versatile chassis:

Excellent mobility and stability

The compact design makes it easy to move the machine. The 4-wheel chassis with 2-stage locking system allows efficient transport along corridors as well as easy turning on the spot within the narrow space at the bedside. The compact design and the ergonomically formed front and back handles make it easy to move the machine and help avoid collisions.



Easy application of CRRT

Device-supported set-up process:

Easy and time-saving

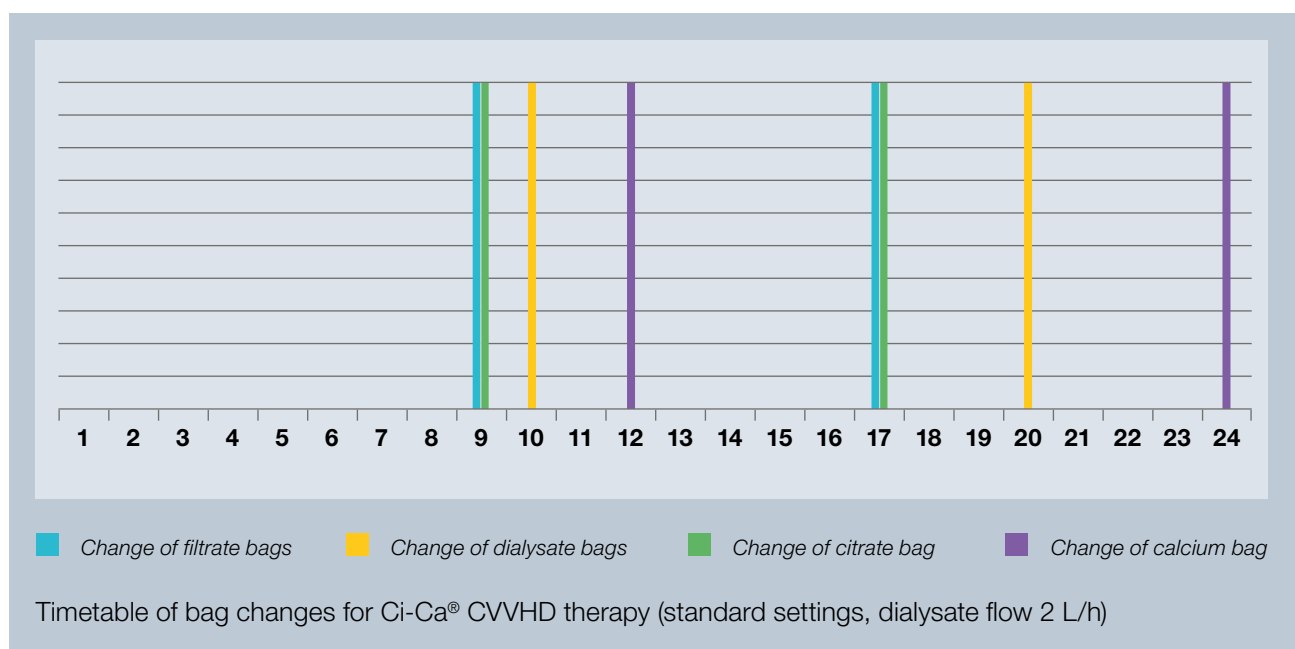
Fitting the pump positioners automatically triggers the insertion of the pump segment. The corresponding pressure domes open and guide the correct installation of the tubing. Multiple automated tests accompany the set-up process, keeping the user on the right track. As a result, the number of handling steps is reduced.



Large-scale capacity:

Long intervals between bag changes

The scales for fresh CRRT fluid and for filtrate can hold up to 20 L fluid each, resulting in long time intervals between bag changes. For these scales, one bag change is typically sufficient per 8h nursing shift.



Card system:

Safe access to special functions

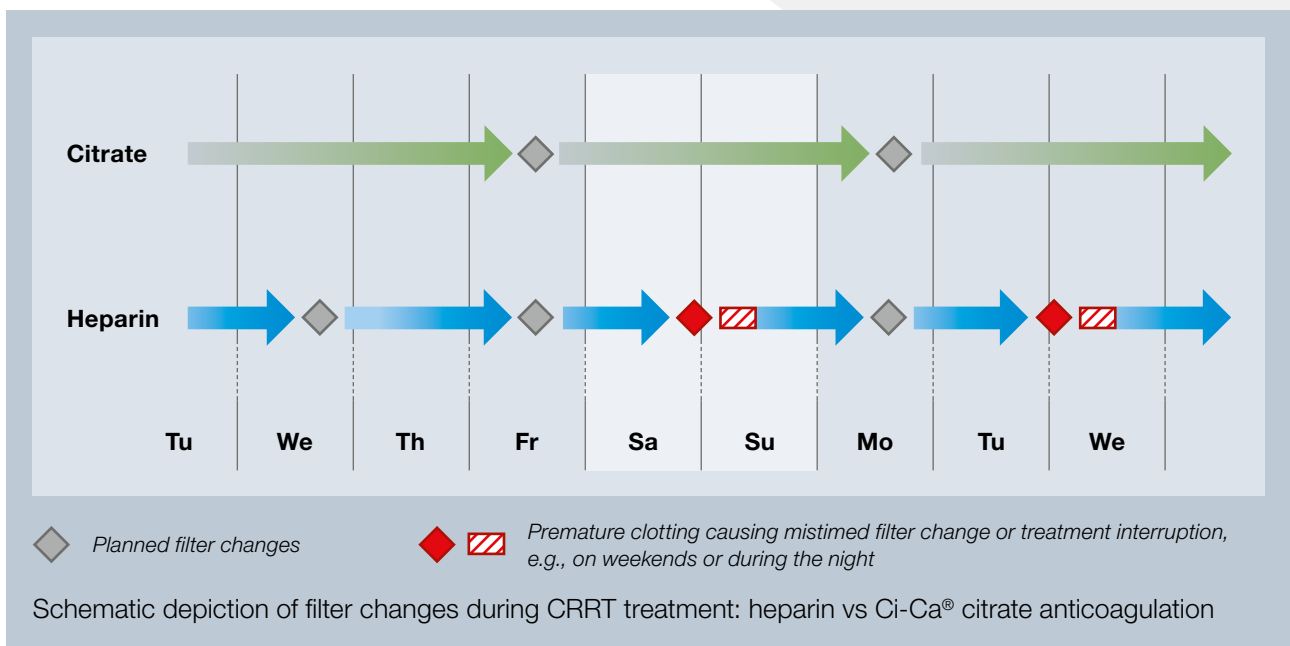
Functions that are not required for routine treatment are accessible via user and service cards, e.g. to simulate treatment in training sessions, to change certain set-up parameters or to allow quick check-ups by technicians.



Ci-Ca® anticoagulation:

Change of treatment kits become projectable

With Ci-Ca® CVVHD the released filter lifetime of 72 hours is reached in most cases, making filter changes a projectable activity.^{3, 5, 6} In many cases, this makes weekends without a change of the treatment kit possible.



Advanced graphic user interface

The multiFiltratePRO includes a graphic user interface that monitors and displays all relevant set-up and treatment data. The integrated alarm system helps to quickly determine the urgency as well as the root cause of alarms.

Graphic-assisted handling descriptions:

Comprehensible at a glance

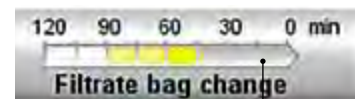
Self-explanatory illustrations and step-by-step instructions intuitively support the set-up, making it fast and easy. This helps to avoid mistakes in the stressful ICU environment.



Information on next user action:

Optimal integration into the workflow enabled

The time until the next expected user action is displayed in the status bar. In addition, a list of further upcoming user interactions can be retrieved on the screen. Both help to optimize work processes in the ICU.



Pressure / alarm history	Next operator action	
Greater	30min	Filtrate bag change
	30min	Dialysate bag change
	1h	Ca bag change
	1h	Citrate bag change
	1h	Substitute bag change



Assist mode for reduced blood flow:

Undisturbed patient care

The "Care Button" switches the multiFiltratePRO into care-mode, by decreasing the blood flow, stopping the balancing system and extending the pressure limits. This will prevent unnecessary alarms when moving the patient or manipulating the catheter.



Integrated safety features

Air-free pressure monitoring:

Diminished risk of coagulation

Air-free pressure sensors reduce the risk of coagulation during treatment. Time-consuming changes of treatment kits can be avoided. In addition, the extracorporeal blood volume is reduced as an arterial expansion chamber is not required.

Integrated fluid heaters:

Keeping the patient continuously warm

Thermal energy balance is important during CRRT. Separate and fully integrated heaters for the substitute and dialysate keep the patient warm even at high flows. Unlike other technical approaches like certain blood warmers, no increase of extracorporeal blood volume is required.

Hygienic design:

Separation of fresh and used fluids

Design with separation of fresh fluids at the top and used fluids at the bottom of the device eases hygienic operation and thus adherence to relevant hygienic standards.

Electrical safety fulfils the highest standards:

Reliable use with central venous catheters

Potential direct contact between central venous catheters and the heart raises concerns about electrical safety. Patient contact to electrical mains after failure of other ICU equipment like electric beds or heating blankets also needs to be considered. Leakage currents via patient and multi**Filtrate**PRO to the ground are limited to the strict requirements of safety class CF*. The multi**Filtrate**PRO is approved for parallel use of defibrillators as might be required in the ICU.

**Except countries using electrical supply with a line voltage of 220 V/230 V/240 V provided at 60 Hz and 240 V provided at 50 Hz: BF*

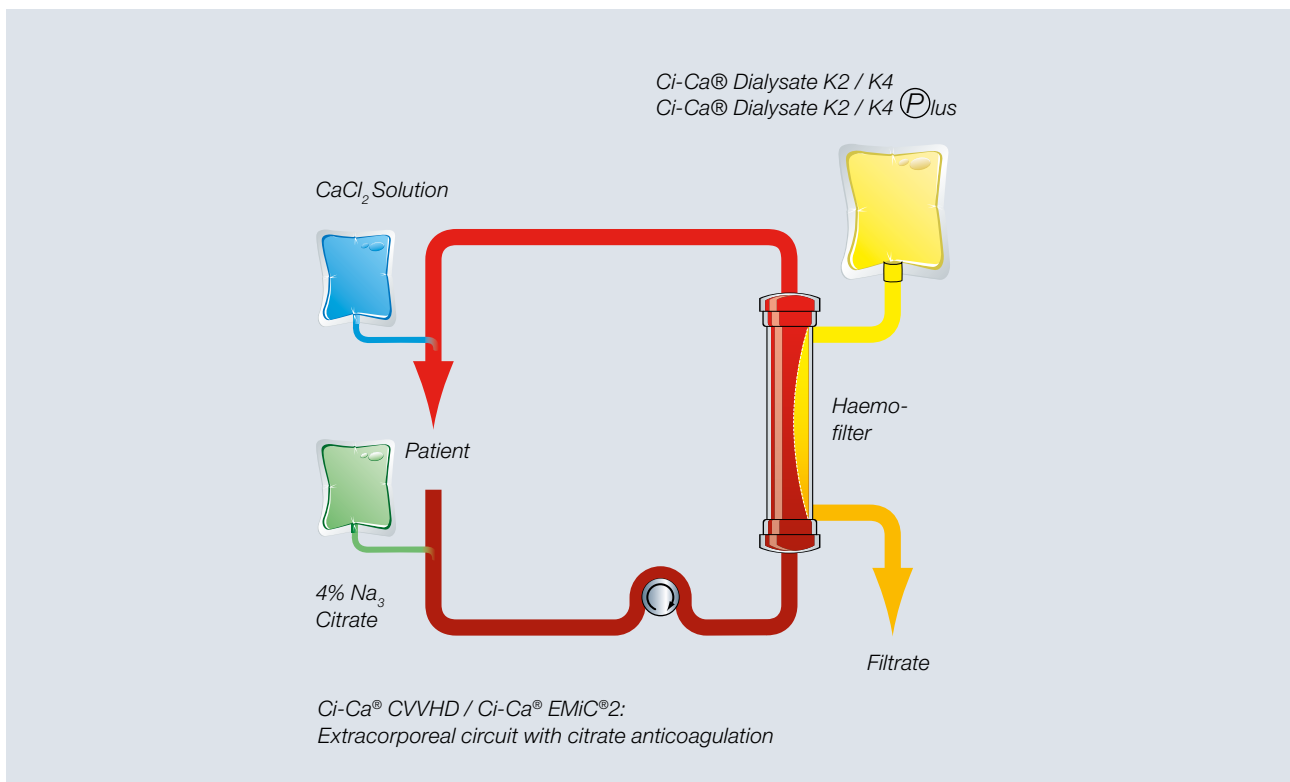
Comprehensively integrated Ci-Ca® citrate anticoagulation

The reliable application of citrate anticoagulation is supported through an integrated device, as is provided with multiFiltratePRO. In recent years, health care personnel have experienced the advantages of Ci-Ca® anticoagulation. They have benefited from the well-concerted fluids, the long-term proven protocol and the Ci-Ca® module as an integrated part of the CRRT-device.^{3, 5-9}

Intelligent software support with Ci-Ca® therapy: Reducing the complexity of citrate anticoagulation

Intelligent coupling of all active pumps through a single user interface:

- Infused volumes of citrate and calcium solutions are automatically balanced with the filtrate pump
- If the blood flow is changed, the device automatically adjusts the citrate pump
- If the filtrate flow is changed, the calcium pump is adjusted accordingly
- The citrate infusion continues for a reliable, limited period of time throughout bag changes (dialysate, substitute, filtrate). This helps to avoid an early coagulation of the system.



Ci-Ca® protocol included in the software:

Key information directly available

For routine adjustments of Ci-Ca® therapy, information from the Ci-Ca® protocol can easily be retrieved on the screen. Also, when setting certain values outside the standard range, the multiFiltratePRO makes the user aware of potentially risky clinical situations.

Ci-Ca® avoids significant predilution:

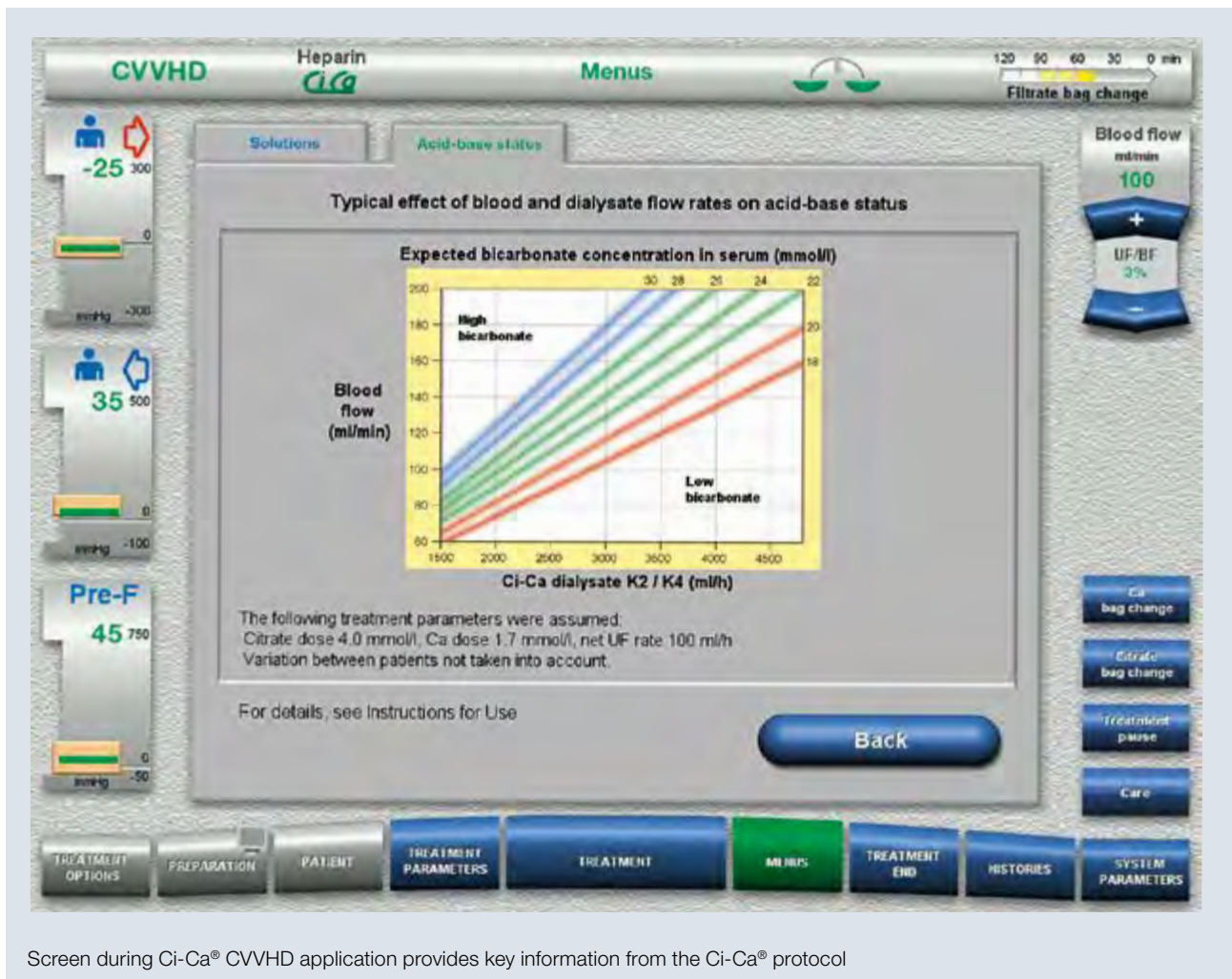
Efficient use of CRRT fluid

With predilution, 30% more replacement fluid can be required relative to other CRRT modes.¹⁰

Dedicated hardware components for citrate anticoagulation:

Clear allocation of functionality

Dedicated pumps for citrate and calcium keep the syringe pump available for heparin application if needed during Ci-Ca® therapy. Separate level detectors and drip counters enable timely detection of empty bags, preventing air being transported downstream and enabling a smooth continuation of the treatment.



Screen during Ci-Ca® CVVHD application provides key information from the Ci-Ca® protocol

High-quality disposables

The device set-up is particularly easy and user-friendly due to preconfigured treatment cassettes, designed for use with self-inserting pumps.



Complete cassettes:

Easy set-up without additional tubing

All tubing relevant for the selected therapy is built up on the cassette as applicable:

- Access and return blood lines
- Citrate and calcium lines integrated and fixed to the access and return bloodlines respectively
- Dialysate, substitute and filtrate lines

The clearly structured and well laid-out extracorporeal blood circuit enables a quick set-up of all components.

Improved tubing:

Reduced extracorporeal blood volume

- 115 mL for the Ci-Ca® cassette
- 116 mL for the heparin cassette
- Uniform colour-coding to prevent set-up failure

Treatment kits at your disposal:

All you need in one box

The high quality of our products is an important prerequisite for the reliability of each treatment. Every component of the kit is designed for convenient operation and usability in order to reduce stress and workload.

Each treatment kit contains the tubing you need for the respective treatment – and nothing more. This helps to protect the environment and to save you costs.

Product	Art. No.	Surface volume/description
multiFiltratePRO – Kit HDF 1000	F00000461	1.8 m ² Ultraflux® AV1000S with preassembled multiFiltratePRO HDF Cassette, 246 mL total blood volume
multiFiltratePRO – Kit Ci-Ca® HD EMiC®2	F00000462	1.8 m ² Ultraflux® EMiC®2 with preassembled multiFiltratePRO Ci-Ca® HD Cassette, 245 mL total blood volume
multiFiltratePRO – Kit Ci-Ca® HD 1000	F00000463	1.8 m ² Ultraflux® AV1000S with preassembled multiFiltratePRO Ci-Ca® HD Cassette, 245 mL total blood volume
multiFiltratePRO – Kit Ci-Ca® HDF 1000	F00005329	1.8 m ² Ultraflux® AV1000S with preassembled multiFiltratePRO Ci-Ca® HDF Cassette, 245 mL total blood volume

Well-concerted CRRT solutions

To maintain the patient's electrolyte levels in the desired physiological range, it is necessary to use fluids with the right compositions. As one option, haemofiltration solutions suitable for heparin anticoagulated CRRT are available.

Specific fluids for Ci-Ca® anticoagulation

Especially in case of Ci-Ca® anticoagulation, it is essential to use CRRT fluids which are well-concerted with each other in order to avoid side effects. With multiple Ci-Ca® Dialysate compositions and a 4% citrate solution, we offer suitable solutions for your prescriptions when using citrate anticoagulation.



Colour-coded connectors:

Ci-Ca® dialysate clearly distinguished

The correct application of Ci-Ca® Dialysate is guided by yellow connectors, both on the fluid bag as well as on the respective dialysate lines. In case of Ci-Ca® postCVVHDF, this also helps to prevent mixing up dialysis and substitution solutions.



Please contact your Fresenius Medical Care representative in case you want to receive details about our CRRT fluids.

References

1. KDIGO Clinical Practice Guideline for Acute Kidney Injury. *Kidney Int Suppl* 2012. 2:1-138
2. Morgera S et al., Metabolic complications during regional citrate anticoagulation in continuous venovenous hemodialysis: single-center experience. *Nephron Clin Pract* 2004. 97:c131-6
3. Morgera S et al., A safe citrate anticoagulation protocol with variable treatment efficacy and excellent control of the acid-base status. *Crit Care Med* 2009. 37:2018-24
4. Monchi M et al., Citrate vs. heparin for anticoagulation in continuous venovenous hemofiltration: a prospective randomized study. *Intensive Care Med* 2004. 30:260-5
5. Link A et al., Total-to-ionized calcium ratio predicts mortality in continuous renal replacement therapy with citrate anticoagulation in critically ill patients. *Crit Care* 2012. 16:R97
6. Kalb R et al., Regional citrate anticoagulation for high volume continuous venovenous hemodialysis in surgical patients with high bleeding risk. *Ther Apher Dial* 2013. 17:202-12
7. Schultheiss C et al., Continuous venovenous hemodialysis with regional citrate anticoagulation in patients with liver failure: a prospective observational study. *Crit Care* 2012. 16:R162
8. Raimundo M et al., Maintaining normal levels of ionized calcium during citrate-based renal replacement therapy is associated with stable parathyroid hormone levels. *Nephron Clin Pract* 2013. 124:124-31
9. Khadzhynov D et al., Incidence and outcome of metabolic disturbances consistent with citrate accumulation in critically ill patients undergoing continuous venovenous hemodialysis with regional citrate anticoagulation. *J Crit Care* 2014. 29:265-71
10. Huang Z et al., Operational characteristics of continuous renal replacement modalities used for critically ill patients with acute kidney injury. *Int J Artif Organs* 2008. 31:525-34



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