FRESENIUS MEDICAL CARE

CRIT-LINE®
Where Therapy and Diagnostics Meet

Case Study

Fluid Assessment - Crit-Line® Monitor Application in AKI

Visualizing the Dynamic Nature of Intravascular Volume in the Absence of Ultrafiltration

The case presented is a real-world scenario and addresses how an individual facility chose to address those patient treatments on that day. It is included to assist health care professionals in forming their own conclusions and is not intended to replace the judgment or experience of the attending physician or other medical professionals. The treatment prescription is the responsibility of the attending physician.

Medical History:

85-year-old Caucasian female admitted to ICU status post CABG who developed AKI 48 hours post-op. She was intubated and placed on a ventilator with O2 setting at 60%. She uses an intra-aortic balloon pump with cardiac output of 1.9 and generalized edema throughout. Pulmonary artery saturation initially ranged from 40-58% (normal range 60-80%). Her IV intake was 60 ml/hr due to various cardiac support medications: Dopamine, Dobutamine, Epinephrine, Vasopressin, Insulin, and Amiodarone.

Due to the patient's instability, the medical team determined the best treatment modality to be sustained low-efficiency dialysis (SLED).

MD order and Treatment Plan:

MD Order: Dialyze 12 hours via femoral catheter using the Crit-Line monitor to help guide fluid removal of no more than -8% RBV over the full treatment time.

Treatment Plan was established to reduce relative blood volume (RBV) from -3% to no more than -8% via double lumen femoral vein catheter. UFR was set at a minimum of 200 ml/hr, and starting HCT was 21.7.

Within 30 minutes of treatment, her RBV decreased to -7% **(Marker #1)**. At this point the UF pump was stopped, and the MD changed the order to zero ultrafiltration for the remainder of the treatment.

Despite zero ultrafiltration, the RBV continued to decrease and a maximum HCT of 24 was achieved within 1.6 hours. This corresponded to an overall RBV change of -9.5% **(Marker #2)** from the beginning of the treatment.

When looking at the Crit-Line monitor, this continual decrease in RBV without ultrafiltration visually confirmed the physiological process of third spacing of fluid.

As the clinical team continued to monitor the RBV, from 1.6 hours through 8 hours of the treatment, third spacing remained constant.

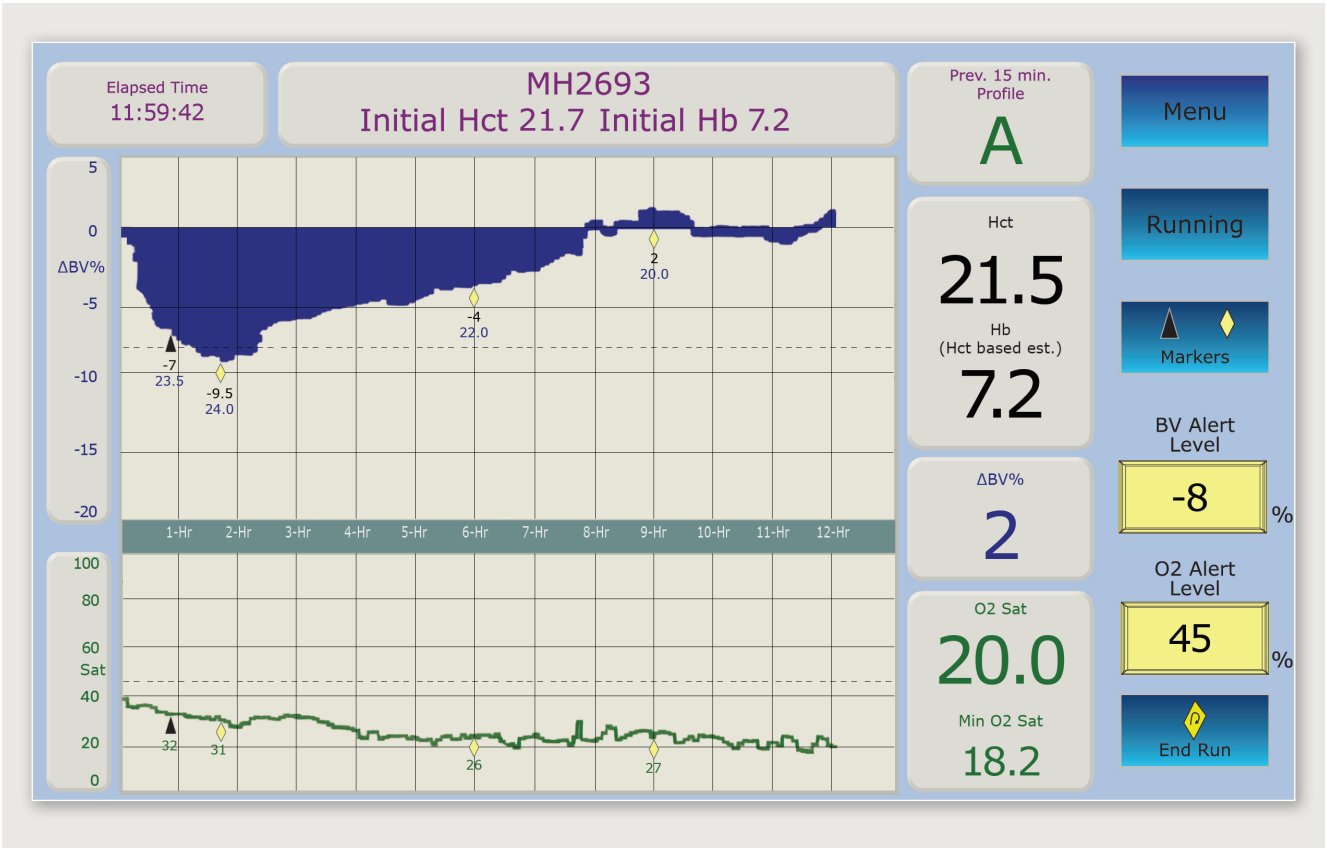
Interestingly, blood chemistry **(Marker #3)** drawn at the 6th hour indicate a modest correction to the patient's baseline levels.

After 9 hours of treatment, per the Crit-Line monitor, the RBV increased significantly from -9.5% to +2%, leaving the patient vascularly overloaded. Given the burden of vascular overload on the cardiac and circulatory system, hypothetically, ultrafiltration could have been re-initiated at this time. However, the medical team decided to continue the remainder of the treatment without any additional ultrafiltration. Her RBV continued to stay at a +2%, indicating vascular overload, over the next several hours, until the treatment was discontinued.

Venous oxygen saturation < 60% is associated with cardiac dysfunction.[1,2] Throughout the treatment, the patient's Crit-Line saturations ranged from 18.2% to-40%. It is important to note, the blood was sourced from the femoral vein demonstrating lower extremity venous saturation. None-the-less, the trend is clinically significant. Her oxygen saturation continually declined from onset of treatment to S_vO_2 < 20% range for the final seven hours of monitored treatment.

Given her overall medical decline and frailty, the family and medical team decided to withdraw the patient from all treatment. She was put on comfort care and deceased shortly thereafter.

This case study is significant because it demonstrates the dynamic nature of intravascular volume in the absence of ultrafiltration.



1. Bauer, P., et al., Significance of venous oximetry in the critically ill. Med Intensiva. 2008;32(3):134-42. (Department of Anaesthesiology and Critical Care Medicine. Friedrich-Schiller-University. Jena. Germany)
2. Cordtz, J., et al. Central venous oxygen saturation and thoracic admittance during dialysis: New approaches to hemodynamic monitoring, Hemodialysis

Use: Crit-Line Technology is designed to non-invasively measure hematocrit, oxygen saturation and percent change in blood volume. The technology employs a sensor clip which emits multiple wavelengths of light to trans-illuminate the blood in the Crit-Line blood chamber. The differences in light absorption between blood constituents allow for the identification and measurement of the hematocrit. The measurement of hematocrit, percent change in blood volume and oxygen saturation in real-time during hemodialysis is intended to provide a more effective treatment for both the dialysis patient and the clinician. Based on the data that the monitor provides, the clinician/nurse, under physician direction, can intervene (i.e., by increasing or decreasing the rate at which fluid is removed from the blood) to remove the maximum amount of fluid from the dialysis patient without the patient experiencing the common complications of dialysis which include nausea, cramping and vomiting. The technology is available as a stand-alone device (Crit-Line IV Monitor) or as an optional module on the 2008T hemodialysis machine (CLiC™ device).

Caution: Federal (US) law restricts these devices to sale by or on the order of a physician.

Note: Read the Instructions for Use for safe and proper use of these devices. For a complete description of hazards, contraindications, side effects and precautions, see full package labeling at www.fmcna.com.