

Volume overload and heart failure

Volume overload is a key clinical complication of heart failure (HF) and the **primary driver of HF-related morbidity and hospitalisation**. Chronic HF is a progressive disease that is caused when the heart is unable to pump enough blood through the body. It is characterized by retention of sodium and water with resulting **fluid accumulation across the body** including in the arms, legs, lungs and abdomen. Patients with heart failure commonly experience shortness of breath, fatigue and difficulty exercising. The increase in fluid volume increases the burden on the weakened heart, further worsening the problem clinically.

Risk factors

- Coronary artery disease
- High blood pressure
- Previous heart attack
- Heart valve defect
- Heart muscle damage
- Diabetes
- Obesity
- Sleep apnea

Key Principle



1 Maintaining a constant concentration of sodium in the body (homeostasis) is vital for patient health – the brain and kidneys maintain this balance.



2 The body's response to heart failure causes sodium levels to increase.

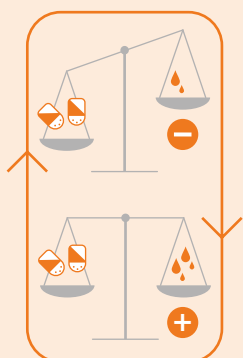


3 To restore the balance, the body retains water, leading to volume overload.

Limitations of Diuretic Therapy

The current standard of care is diuretic therapy; this primarily removes hypotonic urine (low amounts of sodium), resulting in increased sodium concentrations in the body.

To restore homeostasis, the body retains water (thirst response) or cuts back on urination, limiting the impact on volume overload.



- In addition to the limited benefit, there are well known problems with diuretics. They frequently cause patients to develop kidney failure and up to **40%** of HF patients on IV loop diuretics have a poor response, with **24%** of patients re-admitted to hospital within 30 days.
- There is a **high unmet need** for a safe and effective chronic treatment solution to treat volume overload due to heart failure when diuretics are no longer effective, especially one that can be used **in an out-patient chronic setting**.
- Extracorporeal ultrafiltration is an alternative approach but with limited use as it requires vascular access and is associated with significant hospital resources, limited clinical evidence and treatment-related adverse events.

Clinical and economic burden



The U.S. and European market for Sequana Medical's **alfapump**[®] DSR to treat volume overload in diuretic-resistant heart failure patients is forecast to exceed \$5 billion annually by 2026.

For more information, visit www.sequanamedical.com

Regulatory disclaimer: The **alfapump** DSR is still in development and not currently approved for clinical research in the U.S. or Canada. There is no link between **alfapump** DSR and ongoing investigations with the **alfapump** system in Europe.

References: heart.org; mayoclinic.org; cardio.com; Costanzo (2007); Kilgore (2017); Global Data Forecast 2026; Testani (2014 & 2016); Ross (2010); Costanzo (2017)