



ROHINI

COLLEGE OF ENGINEERING AND TECHNOLOGY

Approved by AICTE and affiliated to Anna University Chennai (An ISO Certified Institution)

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CBM352 Human Assist Devices

UNIT-III ARTIFICIAL KIDNEY

3.3 Wearable Artificial Kidney

The development of a wearable artificial kidney was an area of ongoing research and innovation. A wearable artificial kidney is envisioned as a portable and continuous renal replacement therapy (RRT) device that would offer greater mobility and flexibility for individuals with kidney failure.

Here are some key points related to the concept of a wearable artificial kidney:

The WAK™ is a miniaturized dialysis machine that a patient can wear 24 hours a day, seven days a week

The WAK™ has been designed for continuous use to allow for a far more effective method to remove excess fluids, salt, and toxins from the patient's body.

There are a number of benefits associated with the use of the WAK™ and daily dialysis. These include:

- i. Daily dialysis normalizes the blood pressure of dialysis patients, which greatly reduces or even eliminates the need for blood pressure medications
- ii. Conventional dialysis treatments do not remove enough salt from the body - but daily dialysis does. The accumulation of excess salt in ESRD patients is a common cause of high blood pressure
- iii. Retaining excess water within the body is a major issue in patients with kidney failure, as they produce little to no urine. This retained fluid accumulates in the lungs causing severe breathing problems. The removal of this fluid through conventional dialysis is uncomfortable and increases the risk of stroke and

heart disease. Daily dialysis, as with the WAK™, should alleviate these problems.

- iv. ESRD patients dialyzed with conventional dialysis are often malnourished, which increases the chance of infection and other complications. Daily dialysis has been shown to eliminate malnutrition in ESRD patients. In human and animal studies, the WAK™ has shown the same biochemical effects as daily dialysis, meaning that it is likely to help eliminate malnutrition.
- v. The WAK™ should be a tremendous boon to patients who live in rural areas. The use of this device should help reduce the hardship and cost it would take to travel distances in order to reach dialysis units.

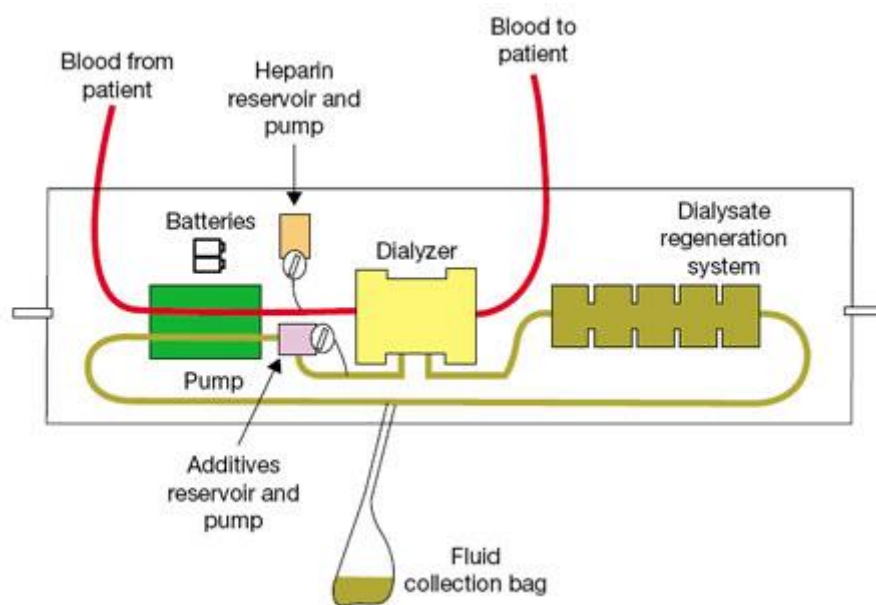
Working of WAK:

1. **Continuous Renal Replacement Therapy (CRRT):** Traditional hemodialysis machines are typically used for intermittent hemodialysis sessions in a clinic or hospital setting. In contrast, a wearable artificial kidney aims to provide continuous renal replacement therapy, allowing patients to undergo dialysis more frequently and for longer durations.
2. **Portable Design:** The goal of a wearable artificial kidney is to create a device that is compact, lightweight, and portable, enabling patients to move around and perform their daily activities while receiving continuous renal support.
3. **Miniaturized Components:** To make the device wearable, researchers focus on miniaturizing the components involved in dialysis, such as the filtration system and fluid management system.
4. **Battery-Powered:** Wearable artificial kidneys are expected to be powered by rechargeable batteries, allowing patients to wear the device without being tethered to a power source.
5. **Improved Quality of Life:** The development of wearable artificial kidneys is driven by the desire to improve the quality of life for individuals with end-stage renal disease. By offering more frequent and continuous renal support, it is hoped that patients will experience better outcomes and have more flexibility in their daily lives.

It's important to note that the development and regulatory approval of medical devices, including wearable artificial kidneys, are dynamic processes. Progress may have

occurred since my last update in January 2022. Researchers, engineers, and medical professionals continue to work on advancing technology in this field.

For the most current information on wearable artificial kidneys and related technologies, it is recommended to consult recent scientific literature, medical news, and official sources from healthcare organizations and regulatory bodies. Additionally, patients interested in such technologies should discuss their options with their healthcare providers to stay informed about potential developments and their implications for treatment.



The WAK is designed to be worn and used by patients for up to 24 hours per day and, thus, represents a wearable form of extended-hours hemodialysis in which patients receive substantially longer treatments than available with conventional thrice-weekly hemodialysis. Extended-hours therapies have been shown to lead to improved control of electrolyte homeostasis, including reductions in serum phosphorus. Extended-hours therapies also allow for slower and more physiological rates of volume removal via ultrafiltration, which may reduce the frequency of intradialytic hypotensive events and intradialytic myocardial stunning.
