

Moroccan Wearable Artificial Kidney: An Ecological Revolution in Hemodialysis

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Abstract

Faced with the challenges posed by the current environmental context, the search for sustainable solutions is attracting growing interest from researchers in various fields, including medicine and more specifically hemodialysis, because it's an energy- and water-intensive therapy and generates large quantities of waste due to its concept. It is therefore imperative to seek sustainable solutions to reduce the ecological impact of hemodialysis, in given its high carbon footprint, particularly that associated with electricity consumption. Hemodialysis is the most widely used treatment of choice for most patients with end-stage renal disease (ESRD) worldwide. However, it requires large quantities of water and energy, contributing to a significant ecological footprint. During a 4-hour hemodialysis session, a patient consumes around 500 liters of water (78 m³ per year), generates more than a kilogram of potentially hazardous waste, many of which are not recyclable, and in the same session, the hemodialysis machine consumes around 7 kWh of energy, while the water treatment unit consumes around 150 kW/d to ensure its operation. On the other hand, the prevalence of ESRD continues to rise, reaching 9.1% in 2017, an increase of 29.3% since 1990. This situation poses a threat to the natural resource of countries, particularly arid and semi-arid countries, and has a negative effect on the ecology by increasing the carbon footprint associated with hemodialysis unit activity. Nowadays, the green dialysis and ecodialysis approach is at the heart of research. It aims to optimize the water and electricity resources associated with hemodialysis and minimize waste production, through the Recycle, Reuse and Reduce triangle. The ultimate goal of this approach is to combine patient care with responsible management of natural resources. This is one of the purposes of the Moroccan Wearable Artificial Kidney (MorWAK) project. This paper is intended to present a sustainable alternative solution (MorWAK), for treating patients with ESRD. This is a portable hemodialysis device. It is designed to purify patients' blood without the requirement for water, consumes very few energy and generates very few waste products. This device's eco-friendly solution holds the potential to contribute to a sustainable future for public health and change how dialysis is performed.

Keywords

MorWAK, Hemodialysis, End-stage Renal Disease, Ecological Impact of Hemodialysis, Climate Change