Elimination of Redundant Peritoneal Dialysis Fluid Heaters

Site: Warszawski Uniwersytet Medyczny (WUM), Warsaw, Poland.

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Life Cycle Assessment Support

Life Cycle Assessments were conducted by Dr James Larkin, Postdoctoral Researcher and Sustainability Officer at Trinity College Dublin.

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Why did you start?

Problem Description

In the dialysis unit, four fluid heaters have been continuously operating as a result of the room organization, which divided the treatment space into two separate sections. While this arrangement ensured convenient access, it also led to the unnecessary use of four devices at the same time. A review of clinical requirements confirmed that one heater is fully sufficient to warm fluids whenever needed, even in emergency admissions. The other three heaters can remain available as a backup device, but its continuous use is unnecessary.

Specific Aims

Following the SMART Goals framework, the project aimed to:

Specific - Switch off three of the four fluid heaters in the dialysis unit and consolidate all fluid warming to a single device.

Measurable - Estimate a reduction in electricity use of approximately 197 kWh per year, monitored by tracking consumption during the first three months after implementation.

Achievable - Implement the change without major workflow disruption, since one heater is sufficient to cover all operational needs.

Relevant - Improve operational efficiency, reduce energy costs, and lower the environmental footprint of the department.

Time-bound - Complete the switch-off within one month and evaluate feasibility and initial savings after a 3-month observation period

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What did you do?

Context

The optimization was implemented in the dialysis department of a university hospital. The unit occasionally provides care for approximately 20 peritoneal dialysis patients, primarily in emergency situations such as peritonitis, while their chronic treatment is conducted at home.

Intervention

A number of activities were undertaken as part of this intervention.

To guide implementation, a structured action plan was developed, outlining the key steps followed during the project:

Step 1: Preparation and Baseline Measurement

Install a plug-in energy meter to measure the daily electricity consumption of the heater prior to disconnection.

Collect baseline data on average energy use over several days.

Obtain leadership approval and inform staff about the planned optimization.

Step 2: Implementation of Heater Consolidation

Switch off the other heaters and maintain it only as an emergency backup.

Ensure staff are trained and confident that one heater is sufficient for operational needs.

Document the workflow change and provide clear guidance on heater usage protocols.

Step 3: Monitoring and Evaluation

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Monitor energy consumption data for three months following the intervention. Compare post-intervention data with baseline measurements to estimate savings. Gather staff feedback to ensure the change does not cause disorganization or safety concerns. Review results with department leadership to decide on permanent adoption.

Measures

Patient outcomes:

No direct clinical outcomes expected; monitored indirectly through staff reporting of any workflow or safety concerns related to fluid heating.

Environmental sustainability:

The energy consumption of one representative heater was measured with a plug-in energy meter to estimate the overall impact.

Economic sustainability:

Cost savings calculated from reduced electricity consumption over the 3-month observation period and projected annually.

Social Sustainability:

Social impact was assessed using the KitNewCare modelling framework, including estimates of forced labour medium-risk hours. Staff feedback on workflow efficiency and safety collected through short conversations.

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What did you find?

Results

Patient outcomes:

No safety risks were observed following implementation. Fluid warming remained available when required, and no adverse events or disruptions to patient care were reported during the observation period.

Environmental sustainability:

Removal of three heaters from routine use corresponded to an annual energy saving of 197.10 kWh. This was associated with an estimated annual reduction of 136.20 kg CO_2e, equivalent to 6.81 kg CO_2e per patient per year (based on 20 peritoneal dialysis patients).

Using Poland-specific conversion factors, this also corresponded to an estimated saving of 42.13 m^3 world equivalent water deprivation, or 2.11 m^3 per patient per year.

Economic sustainability:

The reduction in electricity consumption resulted in lower energy-related costs. Estimated cost savings were 56.87 PLN per year (€13.27).

Social sustainability

There was an estimated reduction of 419.83 forced labour medium-risk hours per year, or 21 forced labour medium-risk hours per patient per year.

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The relatively high value reflects the inclusion of upstream infrastructure and supply chain contributions within the electricity model, including energy generation and distribution systems.

The intervention was implemented without disruption to routine clinical workflows. Staff reported that the use of a single heater was sufficient for operational needs and did not introduce delays or safety concerns. The availability of backup heaters supported confidence in the change and ensured flexibility in case of increased demand.

What does it mean?

Summary

This project demonstrates that small operational changes can deliver measurable sustainability benefits without affecting patient safety or workflow. Consolidating fluid warming to a single device reduced energy consumption while maintaining clinical flexibility through the availability of backup heaters.

Key contributors to the project's success included clear communication with staff, straightforward technical feasibility, and a shared understanding that unnecessary energy use could be reduced without affecting patient care.

The intervention is now embedded into routine practice, with the backup heater maintained for exceptional cases and periodic reviews planned to ensure continued effectiveness.

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