

KitNewCare Case Study: Switching to on-demand use of heating plates for peritoneal dialysis solution

Site: Hospital Universitario Fundación Jiménez Díaz, Madrid, Spain.

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Why did you start?

Problem Description

Peritoneal dialysis (PD) fluid bags are commonly warmed before use to improve patient comfort and reduce temperature-related discomfort during infusion. In the Dialysis Unit of the Jiménez Díaz Foundation, four dialysis fluid heaters were routinely left switched on continuously to ensure warmed fluid was available when required for patient training, technical complications such as peritonitis, and occasional inpatient admissions.

A review of practice suggested that the heaters remained in operation for long periods despite relatively infrequent use. This created an opportunity to review whether heating practices could be optimised to reduce unnecessary energy consumption while maintaining safe and effective patient care.

Specific Aims

The aim of this study was to reduce the environmental impact associated with peritoneal dialysis fluid heating by eliminating the continuous operation of multiple heaters and limiting their use to when required.

What did you do?

Context

A total of 29 patients were on peritoneal dialysis during the study period. Overseeing their care is a nephrologist and two nurses dedicated to peritoneal dialysis.

Intervention

Following optimisation, heater use was limited to periods when fluid heating was clinically required, with devices switched off when not in use. Staff were informed that from now on the heaters should only be switched on when needed, instead of all the time.

This adjustment allowed the department to maintain safe and flexible patient care while avoiding unnecessary continuous energy consumption.

Measures

Patient outcomes:

Availability of heated dialysis fluid when required was monitored.

Environmental sustainability:

Electricity consumption was directly measured using a plug-in energy meter (kWh meter) for the fluid heaters over a one-month period.

Economic sustainability:

Financial savings were calculated using kWh saved and hospital electricity tariffs.

Social sustainability:

Staff feedback was collected qualitatively to assess workflow impact and acceptability of the intervention.

What did you find?

Results

Patient outcomes:

The change in heater operation did not affect the availability, safety, or quality of dialysis treatment, and patient care procedures remained unchanged throughout implementation.

Environmental sustainability:

Based on electricity consumption measurements collected over a one-month period using a plug-in energy meter, the estimated annual environmental saving was 45.13 kg CO₂e, corresponding to approximately 1.56 kg CO₂e per patient per year (based on 29 patients).

The estimated annual water deprivation saving was 19.31 m³, equivalent to approximately 0.67 m³ per patient per year.

The observed savings were approximately 20% of what would be expected under full implementation of the intervention. This reflects real-world conditions, where heater use was not consistently reduced to the intended level. Based on modelling, heating plates left switched on for 24 hours per day are associated with an annual carbon footprint of

342.16 kg CO₂e, whereas consistent use of heaters for only eight hours per day would result in an estimated annual carbon saving of approximately 228.11 kg CO₂e.

Economic sustainability:

Based on electricity consumption measurements collected over the one month observation period, the estimated annual electricity saving was 161.76 kWh. Using an electricity cost of €0.035137 per kWh, this equates to an estimated annual cost saving of approximately €5.68, or around €1.42 per heater across the four units. These estimates reflect observed electricity use under real world implementation conditions rather than the theoretical savings achievable under full adherence to the intervention.

Using a representative EU average electricity price for non-household consumers (approximately €0.18 per kWh, Eurostat), the same reduction in energy use would correspond to an estimated annual saving of approximately €29.12, or around €7.28 per heater. This highlights the influence of local energy prices on financial outcomes and the potential for greater cost savings in other European settings. Electricity tariffs in healthcare settings may vary depending on procurement arrangements and consumption levels, with some large organisations benefiting from lower negotiated rates.

Social sustainability:

The intervention was implemented without disruption to routine clinical practice. Heater use could be adjusted to an on demand approach without affecting workflow, and no operational barriers were identified during implementation.

What does it mean?

Summary

Switching from continuous to on demand use of peritoneal dialysis heaters reduced unnecessary energy consumption without impacting patient care.

There is potential to apply similar approaches to other equipment within the organisation and other healthcare settings where continuous operation is not essential. Scaling this approach across departments and centres could contribute to cumulative reductions in energy use and associated emissions. In countries with a more carbon intensive energy grid the savings would be more substantial.

There is a possible impact on microplastic leaching from the bags into the PD fluid during prolonged warming, such effects have been seen in the warming of blood bags. This warrants investigation as it might be an even more important driver for minimising heating times. Microplastic leaching is an area of increasing focus within the nephrology and healthcare community.