Implementing the Switch from 1:34 to 1:44 Dialysis Acid Concentrate:

How-to Guide

Although this guide has been developed by experts in sustainability and sustainable kidney care, local teams should use their discretion in its implementation according to local context and requirements

Project: Sustainable Kidney Care – Implementing Best Practice

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1. Introduction

Transitioning from a 1:34 to a 1:44 acid concentrate dilution in haemodialysis (HD) can reduce environmental impact without compromising patient care. Recent studies highlight the benefits of this change, including reduced packaging waste and lower greenhouse gas emissions [1].

Benefits of Switching to 1:44 Acid Concentrate

- **Reduced Packaging Waste**: Higher concentration requires less volume, leading to less packaging waste [2]
- **Lower Transport Emissions**: Decreased volume translates to less weight for deliveries, reducing carbon footprint [2][3]
- **Improved Storage Efficiency**: Less storage space needed due to reduced volume.
- **Reduced Staff Manual Handling:** Each 1:44 canister is approximately 1 kilogram lighter.
- **Cost Neutral**: Lower packaging and transport costs over time [4]
- **Clinical Equivalence**: No difference in patient outcomes when properly implemented and no initial start-up costs.

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2. Step-by-Step Implementation Guide

Central acid delivery : The switch from 1:34 to 1:44 needs to be carefully planned with the renal technicians and suppliers, as any residual acid concentrate preparations still delivered by canister (these are usually the less commonly used ones) will need to be switched at the same time.

Central acid delivery reconstituted from dry powder: provided this is the main source of acid concentrates to the unit, we do not recommend that a conversion from 1:34 to 1:44 is made. Where 1:34 canister delivery still makes up a substantial (e.g. > 20%) proportion of the acid concentrate used, we suggest that the potential environmental and cost savings of a conversion are calculated to inform the decision to proceed.

Where acid concentrate is wholly delivered by canister, we strongly recommend that the conversion is made for a whole clinical area at a single point in time to minimise the patient safety risk.

We suggest a timeline for conversion as follows:

1. Ensure that your HD machine fleet in the target clinical area can be reconfigured to allow 1:44 dilution.
2. Estimate the time and staffing needed to undertake the re-configuration.

3. Take an inventory of weekly use of the full range of 1:34 acid concentrates to determine 1:44 concentrate requirements after the switch. This should include all preparations delivered by both canister and through central delivery.
4. Not every 1:34 concentrate has a direct 1:44 equivalent so check availability of 1:44 concentrates in the formulas required. If any concentrate changes are needed these need to be approved by the clinical team and communicated in advance to the technical team and the wider MultiDisciplinary Team (MDT). (Appendix 1)
5. Communicate your 1:44 requirements to your supplier(s) and agree a provisional date to switch and delivery dates for new stock. Where like-for-like conversion of acid concentrates cannot be undertaken, pause and discuss rationalisation of the suite of available acid concentrates, to include the clinical team.

Once the provisional date for the switch has been confirmed:

Ensure sufficient renal technical staff availability to convert the machine fleet for the target unit in one (non-dialysing) day – this will usually be a Sunday. If insufficient staff availability, this may require staggered conversions

3. Engage Stakeholders

- **Technical Staff**: Verify compatibility of dialysis machines with 1:44 concentrate. If feasible, get a sample of the new concentrates and run some workshop tests possibly with samples of dialysis fluid being analysed to verify the electrolyte composition. It is also advisable to also test that the HD machines with the new settings will no longer run up on 1:34 dilution concentrate. If successful, and in conjunction with the MDT, develop a plan for the changeover, one unit at a time starting with a smaller unit. Managing residual in tank – Appendix 2. Change over SOP Appendix 3.
- **Clinical Team**: Discuss the patient safety implications of the switch from 1:34 to 1:44. Failing to change the dialysis machine settings can result in patient acid base and electrolyte imbalances.
- **Procurement**: Inform suppliers of the intended switch for the availability of 1:44 acid concentrate and negotiate a changeover date to allow completion of machine re-configuration and staff engagement before delivery of new stock which will be determined by your local inventory.

4. Staff Training

- **Educate**: Advise staff the same process is required for 1:44 concentrate on handling and preparing as 1:34 concentrate.
- **Update Documentation**: Revise any relevant protocols or standard operating procedures to reflect the change.

5. Full Implementation

During the implementation project it is vital that all staff are aware of the need to physically separate the new and old concentrates. The plan must include the two dilutions being stored in different areas.

Conclusion

Switching to a 1:44 acid concentrate dilution is a practical step towards sustainable dialysis care. The transition promises environmental benefits and operational efficiencies, aligning with global efforts to reduce the carbon footprint of healthcare services [1-4]. In conjunction, your audit results of concentrate waste may also highlight the need to install concentrate acid delivery alongside 1:44.

References^

[1] Jiménez, M.D.A., Audije-Gil, J., Martínez, R., Martín Vaquero, N., Gómez, M., Portillo, J., Pereda, G., Gascueña, D.H., Duane, B., Sanjuan, M., Martín, J.L.F., Dapena, F., Ortiz, A., Arias, M. (2024) How to improve the environmental impact in haemodialysis: small actions, big changes. *Clinical Kidney Journal*. Dec 20;18(2):sfae407. doi: 10.1093/ckj/sfae407. PMID: 39927256; PMCID: PMC11806634. https://doi.org/10.1093/ckj/sfae407

[2] Murcutt, G., Hillson, R., Goodlad, C., & Davenport, A. (2024). Reducing the carbon footprint for a 30-bed haemodialysis unit by changing the delivery of acid concentrate supplied by individual 5 L containers to a central delivery system. *Journal of Nephrology*, 37, 1949–1955. https://link.springer.com/article/10.1007/s40620-024-02073-9

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[4] Choo, S.M.Y., Murcutt, G., Steinbach, I., Stoves, J. (2025). Sustainable health care in a renal centre - carbon saving is coupled with cost-efficiency | Journal of Nephrology *Journal of Nephrology*. https://doi.org/10.1007/s40620-025-02354-x

Appendix 1. Summary Acid replacements when amending prescriptions (for full version follow link: Full list acid formulations for 1 44 switch)

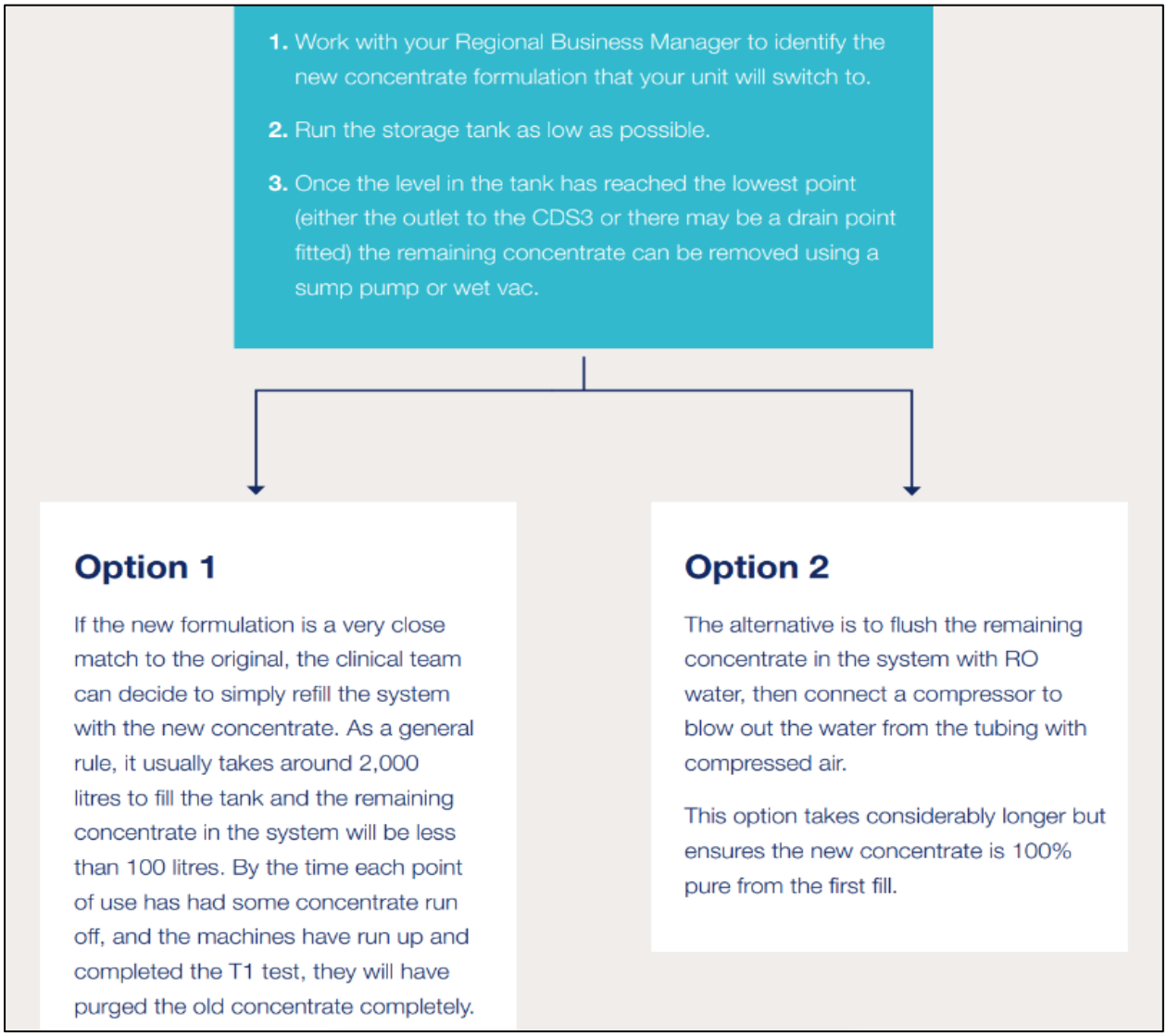
Original Acid 1:34	Ca (mmol)	K (mmol)	Replace with 1:44	Ca (mmol)	K (mmol)
A231	1.50	2	AC-F 213/4#	1.50	2
A232	1.50	1	AC-F 119/5	1.25*	1
A333	1.75	2	AC-F 213#	1.75	2
A335	1.25	2	AC-F 219/1	1.25	2
A453	1.25	3	AC-F 313/2	1.25	3
A336	1.00	2	A27	1.00	2
A253	1.50	3	A313/2	1.25*	3
A511	1.75	3	A26	1.75	4*

*No direct conversion available. Clinical team to monitor calcium or potassium levels.
#Please note that AC-F 213/4 and AC-F 213 have different calcium levels

Appendix 2. Managing the residual in a tank at the time of switch

Summary Table for Clinicians (Including 5% and 10% residuals)

Electrolyte Dialysate Examples	Pure 1:44	Blend 5% 1:34	Blend 10% 1:34	Absolute Difference (5%)	% Difference (5%)	Absolute Difference (10%)	% Difference (10%)
Sodium (mmol/L)	138	136.5	134.93	-1.5	-1.10%	-3.07	-2.22%
Potassium low (mmol/L)	1	0.99	0.978	-0.01	-1.10%	-0.022	-2.22%
Potassium high (mmol/L)	3	2.97	2.93	-0.03	-1.10%	-0.07	-2.22%



Full version available at: FLOW CHART CDS RATIONALISATION.pdf

Appendix 3. SOP for switchover