

Standard Operating Procedure for the delivery of Sustained Low Efficiency Dialysis (SLED)/Prolonged intermittent HD (PIHD)

(Version 1)

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1.Introduction

Prolonged Intermitted HD (PIHD) or Sustained Low Efficiency Dialysis (SLED) is a renal replacement modality that can be used in critically ill patients with acute kidney injury (AKI) or hospitalised ESRD patients with intercurrent illness such as sepsis and myocardial ischaemia with or without haemodynamic instability.

PIHD/SLED reduces the hemodynamic perturbations of short intermittent haemodialysis, while obviating the resource demands of CRRT with the advantage of being performed with standard dialysis machines and equipment. It is essentially standard haemodialysis performed at lower blood pump speed and dialysate flow rates. Studies have shown this to be non-inferior to CRRT (CVVH/CVVHDF) in relatively stable patients requiring RRT (Renal Replacement Therapy). PIHD/SLED performed in evening/overnight will free the day for investigations and physiotherapy, facilitating rehabilitation. Although SLED/PIHD can be used as an alternative to CVVH/CVVHDF in critically ill patients in ITU, relative

haemodynamic stability is required to achieve adequate therapy.

2. Purpose

Provide guidance for safe and standardised delivery of SLED/PIHD for patients requiring RRT in Epsom & St. Helier University Hospitals NHS Trust

3. Scope

All medical, nursing and technical staff at the Epsom and St Helier University Hospitals NHS trust involved in the prescribing and delivery of SLED/PIHD

4. Clinical Practice Guidelines for SLED/PIHD

Indication:

AKI or ESRF who require RRT at risk of cardiovascular instability

Caution in patients:

Under 50kg in body weight

With a pre-dialysis urea of ≥ 40 mmol/L, risk of dialysis disequilibrium (if possible use a low flux dialyser)

Where:

Intensive care unit

High dependency unit

Renal unit (Renal Acute Care Unit)

Who can perform SLED/PIHD

Acute dialysis nurses

ICU nurses with appropriate training for RRT

Virology Screening

Hepatitis B, C and Human Immunodeficiency Virus (HIV) status **MUST** be checked pre-commencement of SLED and the dialysis machine temporarily isolated as per local infection control guidelines.

Pre-Dialysis Bloods

FBC

Urea and Electrolytes

Random Glucose

Bone Profile

Liver Profile

Coagulation Screen

Prescription

The dialysis prescription will be provided by the responsible clinician. It will include anticoagulation therapy, dialyser size, dialysate flow rate, pump speed, ultrafiltration rate and will be recorded in the notes and on the clinical management system.

Dialysis Access

SLED/PIHD can be performed using:

- Temporary double-lumen central venous catheter (Vascath)
- Permanent double-lumen central venous catheter (Permcath)
- An AV fistula or graft needed as with standard dialysis.

Dialyser

Please ensure that the dialyser can support low pump speeds. Most standard dialysers in the UK are suitable.

The dialyser size will depend on the clinical context

- Low flux dialysers with small surface area should be considered in patients with AKI and who have not had any form of RRT (i.e. no CVVH/CVVHD or CVVHDF) and present with very high urea levels (for example >40). This is to reduce the risk of dialysis disequilibrium.
- In the majority of patients a high flux dialyser will be appropriate. Start at the smallest size (e.g. Fresenius FX60 and increase dependent on clearance). When used in patients previously on CVVH/CVVHDF, it is appropriate to start with a high flux dialyser, eg: Fresenius Fx 60 dialysers and increase the filter size as needed depending on clearances achieved.

Dialysis machine

Most of the standard dialysis machines used in the UK are suitable to deliver SLED/PIHD as long as the supports low pump speeds of 150-200ml/min.

- Run the machine on HD mode and not HDF mode if using low flux dialysers.
- If using high flux dialysers, HDF mode can be used but it is recommended that SLED is delivered in HD mode.

Dialysis Session Duration

In most patients, prescribe an initial duration of 8h

This can be altered as appropriate with SLED/PIHD treatment times range from 6 to 10 hours depending on clinical need.

Blood Pump Speed (Qb)

We recommend SLED/PIHD should be delivered using **150-200mls/min** constant Qb. Initial prescription should start at 150mls and increases can be considered if tolerated

Dialysate flow: 300-350ml/min

Ultrafiltration (UF)

The maximum ultrafiltration rate is 300 ml/hour.

On first SLED/PIHD start UF at 50-100 ml/hour and titrate up dependent on patient stability.

BVM/BCM technology can be used to aid fluid removal assessment.

Dialysis fluid:

- Standard acid concentrates available can be used with choice depending upon pre dialysis sodium and potassium levels.
- Usual dialysis fluid electrolyte concentrations are: Na- 138 mmol/L, K- 1 to 3 mmol/L, Ca-1.25 to 1.5mmol/L, Bicarbonate 32 mmol/L, Acetate 3mmol/L, Glucose 1g/L
- Particular attention should be made to potassium prescription in those with recent MI or Cardiovascular instability.
- If using acid concentrate in cans (tanks), it can be replenished as required during treatment (standard 6L acid concentrate can/tank should be adequate for 8-10h SLED but both the tank and bicarbonate bag (BiBag) can be replaced during therapy if required without interrupting dialysis.

Adequacy

With 8h of SLED/PIHD , expected Kt/V 1.0-1.5 (URR around 65%), usually equivalent of 24 h treatment with 25ml/kg/h dose of CVVH.

However, clearance of middle and large molecular weight proteins including cytokines may be lower than CVVHDF when SLED is delivered with low flux dialysers.

The prescription can be modified to improve adequacy through increasing time, dialyser size or blood flow if possible.

Anticoagulation

Use unfractionated heparin 10,000units/10mls (1,000units/ml)
Dosing depends on bleeding risk

Standard Heparin Regime

1.0ml initial bolus

1.0ml continuous infusion.

CHECK APTTR at 4 hours

Dose can be titrated up or down depending on aPTTR (Target 1.5-2)

Reduced Rate Heparin Regime

Use unfractionated heparin 10,000units/10mls (1,000units/ml)

1.0ml initial bolus

0.5ml continuous infusion.

CHECK APTTR at 4 hours

Dose can be titrated up or down depending on aPTTR (Target 1.5-2)

Heparin Free

NO heparin given, saline flushing.

5. References

Golper, T. (2016) Up To Date. Sustained low efficiency or extended daily dialysis

Kitchlu et al. (2015) BMC Nephrology. Outcomes of sustained low efficiency dialysis versus continuous renal replacement therapy in critically ill adults with acute kidney injury: a cohort study. 16 (127) DOI: 10.1186/s12882-015-0123-4

Schwenger, V et al. (2012) Critical Care. Sustained low efficiency dialysis using a single-pass batch system in acute kidney injury - a randomized interventional trial: The REnal Replacement Therapy Study in Intensive Care Unit. 16 pp 451-459.

Wee Teo, B et al. Continuous Renal Replacement Therapies. in: Daugirdas JT et al. (2015) Handbook of Dialysis 5th ed. Lippincott Williams & Wilkins.

Zhang, L et al. (2015) American Journal of Kidney Disease. Extended Daily Dialysis Versus Continuous Renal Replacement Therapy for Acute Kidney Injury: A Meta-analysis. 66(2) pp322-330.

Heather E Fieghen et al (2010). BMC nephrol. The haemodynamic tolerability and feasibility of sustained low efficiency dialysis in the management of critically ill patients with acute kidney injury. 11:32