

Sustained Low Efficiency Dialysis (SLED): An Alternative to other Kidney Replacement Therapy in PICU

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Background

Critically ill children that require admission to pediatric intensive care units (PICU) are at an increased risk of developing acute kidney injury (AKI). In fact, one third of PICU admission end up developing AKI [1]. It was determined that AKI can increase mortality by more than four-fold [2]. This outcome has guided research to target the importance of finding the most effective ways to control AKI and decrease the chances of it happening in critically ill pediatric patients. For that, kidney replacement therapy (KRT) in PICUs was found to be effective in decreasing the incidence of AKI. In this manuscript, various modalities of KRT will be presented with a focus on Sustained Low Efficacy Dialysis, or SLED.

Methodology

This is a systematic review of the literature. The information was gathered using Pubmed and Google Scholar as search engines. The focus of the research was on pediatric patients in the setting of intensive care units. The search strategy was designed using combination of controlled vocabulary (sustained low efficiency dialysis or SLED, PICU, AKI in children). The study focuses on the different types of KRTs in the setting of PICUs. The different method of KRT therapies that were searched include: hemodialysis (intermittent hemodialysis), continuous renal replacement therapy (CRRT), peritoneal dialysis and SLED.

Defining and Prescribing SLED in PICU

Sustained low efficiency dialysis, also known as SLED, has been growing as a new type of Kidney Replacement Therapy. SLED’s mechanism is very similar to intermittent hemodialysis (IHD), but it is given over a longer period. Typically, IHD run for 3-4 hours, however SLED can run for 8 to 12 hours with gradual removal of substrate and filtration[8].

The goal of KRT in PICU is to lower the dialysate flow and increase the time of ultrafiltration. Hyperkalemia, azotemia, edema, and oliguria are all indications for SLED. Prescribing SLED in a PICU should take into consideration the children who are vasoconstrictive, have hypoalbuminemia, and low intravascular fluid while at the same time being in an overload fluid state. Thus, the choice of blood flow largely depends on child weight (Table 1).[10]

Table 1

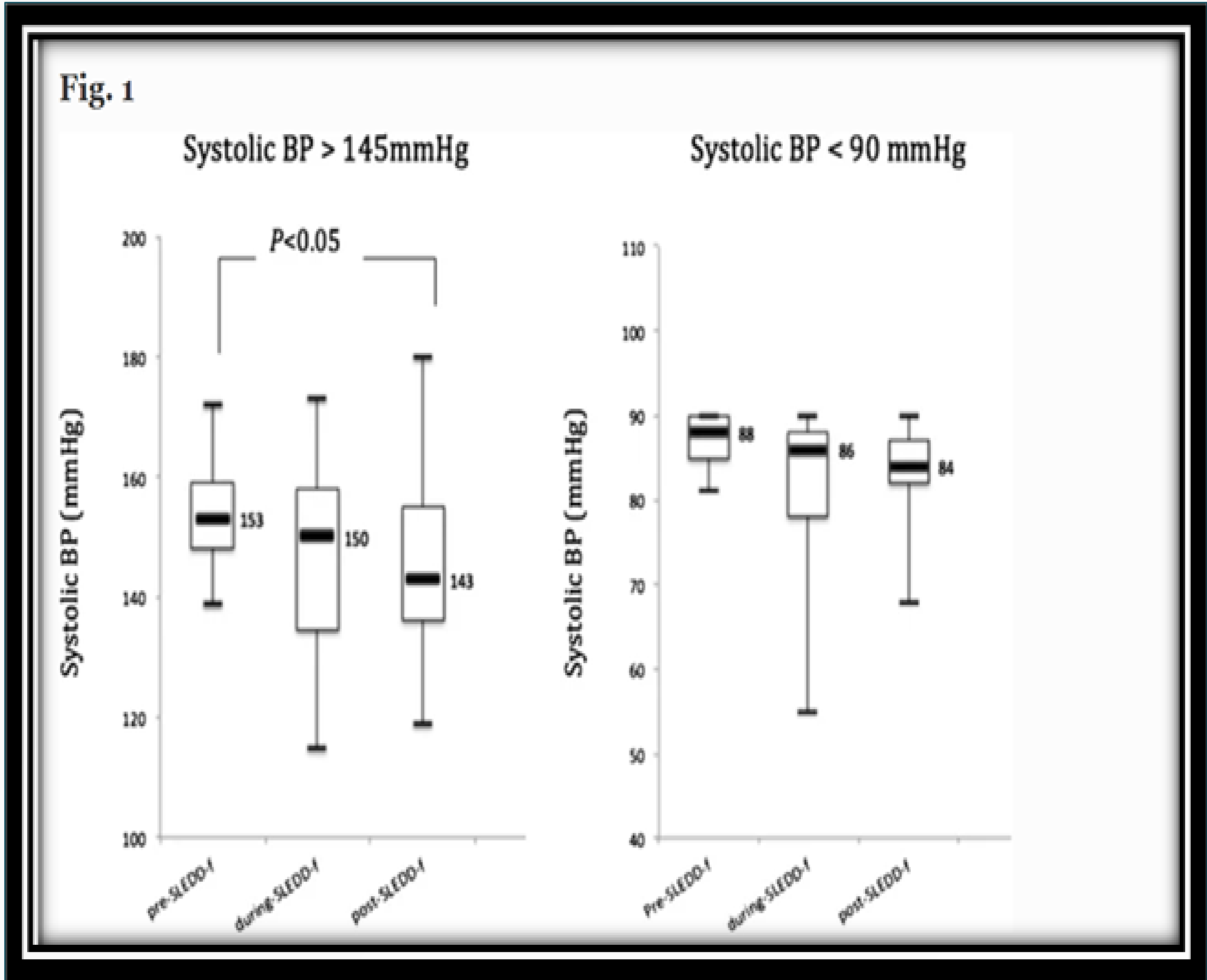
Weight in Kg	Blood flow
5-20 kg	30-75 ml/min
20-40 kg	75-125 ml/min
>40 kg	≥150 ml/min

Results

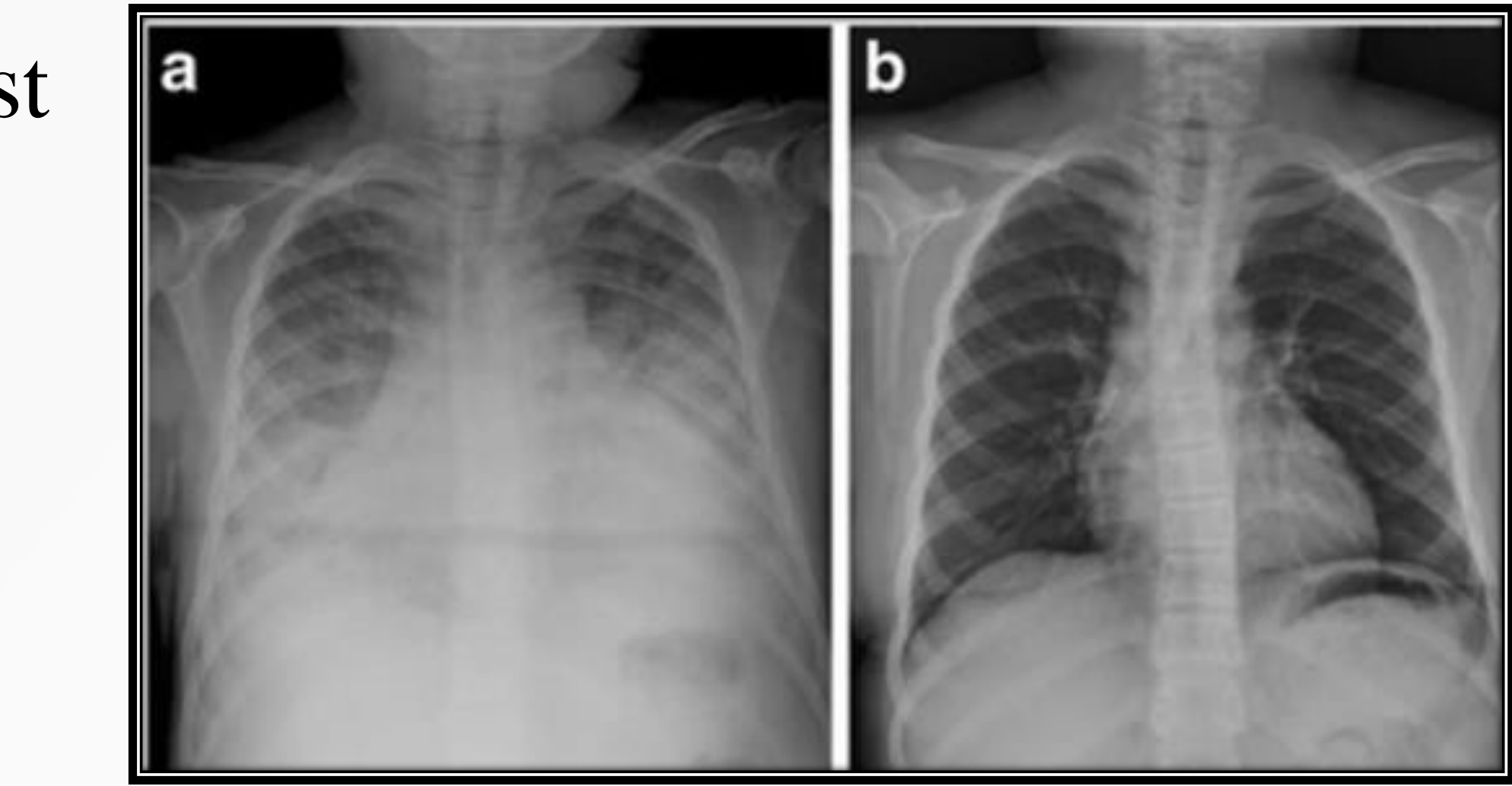
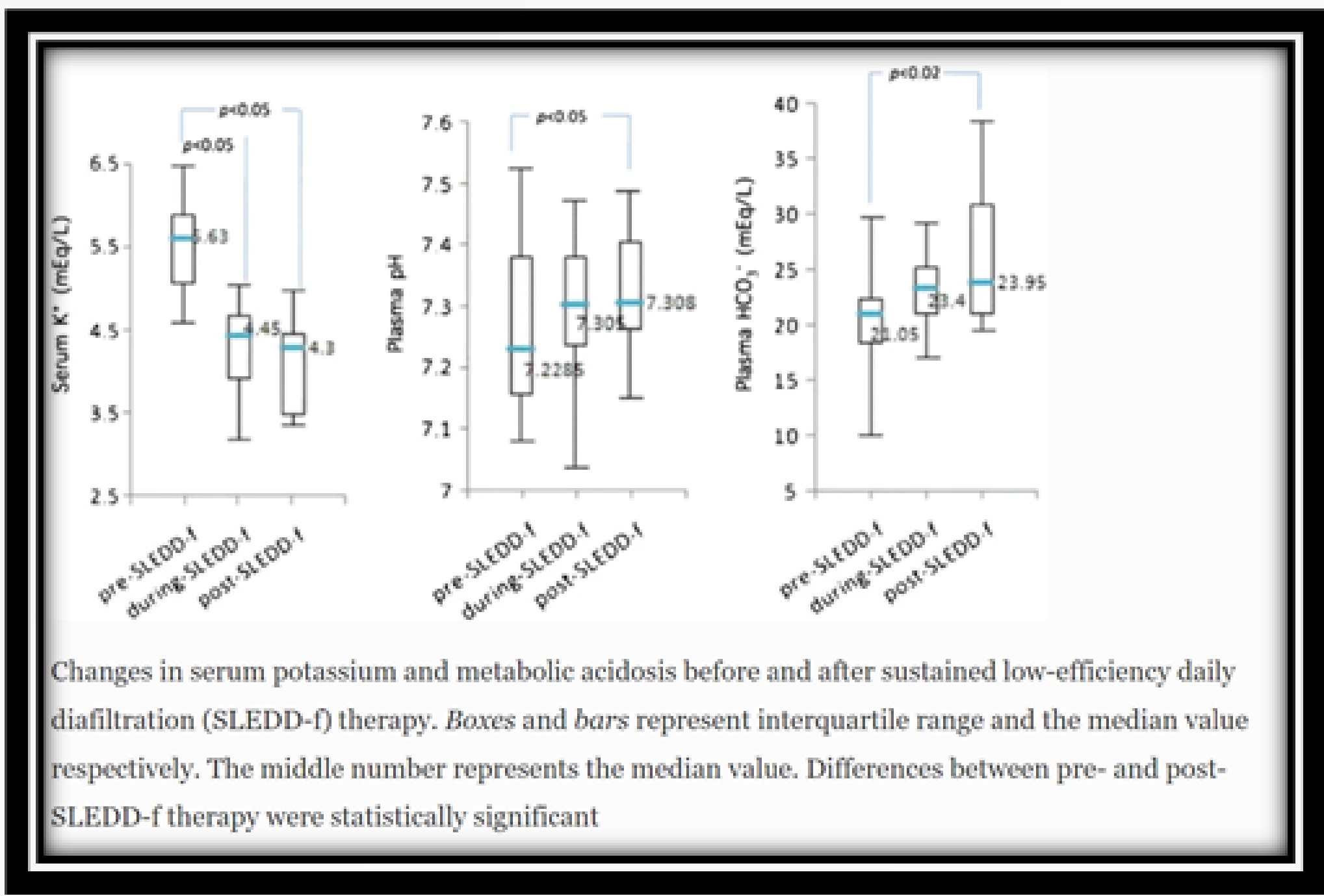
- Following SLED therapy, Blood pressure readings improved in children (Figure 1, Table 2).[12] [13]

Table 2

Parameters	Pre-SLEDD-f	Post-SLEDD-f	P value
Mean BP	86.3 ± 14	83.5 ±14.7	0.06



- Hyperkalemia and metabolic acidosis were corrected following SLED therapy (Figure 2, Table 3) [12] [13].



- Another significant change post SLED therapy was pulmonary edema and cardiomegaly.
- (Fig 3: a)before SLED; b)after SLED) [12]

Discussion

SLED was able to correct many parameters in the setting of AKI in PICU patients.[12][13]

- Metabolic acidosis and hyperkalemia were improved in pediatric patients needing kidney replacement therapy in the setting of intensive care unit.
 - This is demonstrated by the increase in bicarbonate levels along with a significant decrease in blood potassium levels.
- Systolic blood pressure and mean blood pressure readings improved after the use of SLED; this indicates that SLED can push PICU patients back towards homeostasis.
- SLED was found to have an important and crucial role in decreasing edema and reducing the amount of fluid pressing against the heart and lung in critically ill pediatric patients.
- SLED helped many PICU patients to regain normal kidney function and a successfully recover from AKI.
- These results indicate that SLED could be an important KRT alternative to use in PICU.

Conclusion

SLED can provide a good alternative, especially for children, since low blood flow is important to be maintained in this age group in the PICU. SLED was able to maintain hemodynamic stability, present important flexibility and provide high biochemical clearance. SLED corrected metabolic acidosis, hyperkalemia and blood pressure readings in critically ill children.

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