The hemodynamic tolerability of sustained low-efficiency dialysis in the management of critically ill patients with acute kidney injury

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Abstract

***Objective*: This study aimed to compare the hemodynamic tolerability and efficacy of sustained low-efficiency dialysis (SLED) versus continuous veno-venous hemodialysis (CVVHD) in critically ill patients with acute kidney injury (AKI).**

***Design*: A prospective observational comparative study.**

***Setting*: The study was conducted in the Critical Care Departments of Cairo University Teaching Hospitals, Misr University for Science and Technology Hospitals, and Kobry El Kobba Military Hospital between March 2018 and April 2019.**

***Patients and participants*: A total of 60 hemodynamically unstable patients diagnosed with AKI were included. Patients were divided into two groups: 30 underwent SLED, and 30 received CVVHD.**

***Interventions*: Patients were managed using either SLED or CVVHD as part of their renal replacement therapy (RRT). Hemodynamic parameters, laboratory markers, dialysis efficiency, and patient outcomes were evaluated.**

***Measurements and results*: Baseline characteristics, including age, gender, cardiac status, and Acute Physiology and Chronic Health Evaluation (APACHE) II scores, were comparable between the groups. CVVHD demonstrated superior solute removal, with significantly higher urea reduction ratio (URR) (40% vs 29%, p=0.006), and creatinine reduction ratio (CRR) (38% vs 25%, p=0.001). SLED showed a greater improvement in serum bicarbonate levels (17% vs 4%, p<0.001). Fluid removal was significantly higher in CVVHD (3.3±0.34 l vs 2.2±0.52 l, p<0.001). No significant differences were observed in hemodynamic stability, arrhythmia occurrence, or vasopressor use. Patients in the SLED group had a significantly longer duration of mechanical ventilation (5.53±1.83 vs 3.25±1.25 days, p<0.001) and ICU stay (9.5±4.8 vs 6.4±1.46 days, p=0.001). Mortality rates were similar between groups (63.3% vs 63.3%, p=1).**

***Conclusions*: Both SLED and CVVHD were well-tolerated hemodialysis modalities for critically ill patients with AKI, demonstrating comparable hemodynamic stability and mortality rates. While CVVHD provided superior solute clearance and fluid removal, SLED was more effective in correcting metabolic acidosis and allowed for greater patient mobility. These findings suggest that SLED is a feasible and cost-effective alternative to CVVHD in hemodynamically unstable patients requiring RRT.**

Keywords: Acute kidney injury, renal replacement therapy, sustained low-efficiency dialysis, continuous veno-venous hemodialysis, hemodynamic stability, critical care.

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Introduction

Acute renal failure (ARF), now commonly referred to as acute kidney injury (AKI), is characterized by a sudden decline in renal function, leading to the accumulation of nitrogenous waste products such as urea and creatinine, along with electrolyte and fluid imbalances. The most practical clinical marker for detecting this dysfunction is serum creatinine, which serves as an estimate of the glomerular filtration rate (GFR). The incidence of AKI has risen significantly in intensive care units (ICUs), where it frequently occurs in critically ill patients with multiorgan failure, often complicated by sepsis and hemodynamic instability. (1)

The cornerstone of AKI management is supportive care, with renal replacement therapy (RRT) being essential in cases of severe renal dysfunction. Various RRT modalities exist, including intermittent hemodialysis (IHD), continuous renal replacement therapy (CRRT), and hybrid techniques such as sustained low-efficiency dialysis (SLED). (2) Despite advancements in these interventions, the mortality rate in critically ill patients with AKI remains alarmingly high, exceeding 50% in severe cases. Timely initiation of RRT is crucial to mitigating life-threatening complications such as uremia and electrolyte disturbances, yet the optimal timing, modality selection, and dosing strategy continue to be subjects of ongoing clinical debate. (3)

Several RRT modalities are available, each with distinct advantages and limitations. IHD, peritoneal dialysis, CRRT, and hybrid approaches such as SLED offer different levels of hemodynamic stability, solute clearance, and fluid management. (2)

CRRT encompasses a range of techniques, including hemofiltration, hemodialysis, and hemodiafiltration, which integrate convective and diffusive mechanisms for solute clearance. Convective therapies (hemofiltration) are particularly effective for removing middle and larger-molecular-weight solutes, whereas diffusive therapies (hemodialysis) primarily target small molecular toxins. (4)

On the other hand, SLED is a hybrid approach that utilizes a conventional hemodialysis machine but operates at a lower blood flow rate over an extended duration. This technique employs standard dialysis fluid, a low-flux membrane, and slow ultrafiltration rates, offering enhanced hemodynamic stability compared to traditional IHD while maintaining efficient solute clearance. (5)

This study aimed to evaluate and compare the efficacy and hemodynamic tolerability of SLED versus continuous veno-venous hemodialysis (CVVHD) in critically ill patients with AKI. Additionally, the study sought to assess the impact of both modalities on key clinical parameters, including hemodynamic stability, laboratory markers, fluid balance, and overall patient outcomes, with the ultimate goal of reducing mortality in hemodynamically unstable AKI patients.

Patients and methods

Study design and setting

This prospective observational comparative study was conducted on 60 hemodynamically unstable patients diagnosed with AKI in the Critical Care Departments of Cairo University Teaching Hospitals, Misr University for Science and Technology Hospitals, and Kobry El Kobba Military Hospital. The study took place between March 2018 and April 2019 and was approved by the Ethical Committee of the Faculty of Medicine, Cairo University (Code: CMDRF132701). Written informed consent was obtained from all participants or their legally authorized representatives before enrollment in the study.

Inclusion and exclusion criteria

The study included adult patients aged between 18 and 70 years who were diagnosed with AKI based on the Risk, Injury, Failure, Loss of kidney function, and End-stage kidney disease (RIFLE) criteria. Patients classified as being at risk had a creatinine increase of 1.5 times the baseline or a GFR reduction of at least 25%, with urine output dropping below 0.5 ml/kg/hour for six hours. Those classified as having an injury had a creatinine level that doubled or a GFR reduction of at least 50%, with urine output below 0.5 ml/kg/hour for 12 hours. Patients in the failure category exhibited a creatinine increase of three times the baseline, a GFR reduction of at least 75%, or a creatinine level exceeding 4 mg/dl, with urine output falling below 0.3 ml/kg/hour for 24 hours or anuria lasting 12 hours.

Exclusion criteria included patients with chronic kidney disease, those with end-stage renal failure requiring long-term dialysis, and individuals diagnosed with active malignancies. Patients with known infections such as human immunodeficiency virus (HIV), hepatitis B, or hepatitis C were also excluded. Those who were immunosuppressed following an organ transplant or had hepatorenal syndrome were not considered for the study. Pregnant women were also excluded due to potential risks associated with dialysis procedures.

Study groups and treatment modalities

Patients were categorized into two groups based on the mode of RRT administered. Group 1 included 30 hemodynamically unstable patients with AKI

who underwent SLED, while group 2 consisted of 30 similar patients who received CVVHD.
The study aimed to evaluate these patients regarding key parameters such as systolic and diastolic blood pressure, the need for vasopressor support, history of ischemic heart disease or ischemic cardiomyopathy, cardiac function, and presence of cardiomegaly. The fluid status of each patient before and after dialysis was recorded, along with kidney function tests pre- and post-procedure. Additionally, the frequency of hypotensive events during dialysis, the necessity for early termination of the procedure, and the occurrence of arrhythmias were documented. Acute Physiology and Chronic Health Evaluation (APACHE) II scoring was used to assess disease severity, and mortality rates in both groups were compared. (6)

Patient evaluation and data collection
All eligible patients underwent a thorough medical evaluation upon enrollment. A detailed medical history was obtained, including demographic data such as hospital code, name, age, and sex. The history of the present illness was documented, along with any previous medical conditions, past surgical interventions, and drug history, with particular attention to nephrotoxic medications.
A comprehensive physical examination was performed, assessing the patient's general appearance, vital signs, and systemic health. The cardiovascular, renal, and neurological systems were carefully evaluated to determine the severity of hemodynamic instability. In addition, local examinations were conducted to detect signs of fluid overload, metabolic imbalances, or any contributing factors to the patient's critical condition.
Laboratory assessments were performed for all patients, including renal function tests such as serum creatinine, blood urea nitrogen (BUN), and electrolyte levels (sodium, potassium, bicarbonate, and pH). Complete blood counts (CBC), coagulation profiles, and arterial blood gas (ABG) analysis were also conducted to evaluate acid-base balance. Inflammatory markers, such as C-reactive protein and procalcitonin, were assessed in patients with suspected sepsis.
All patients underwent pelvi-abdominal ultrasonography to exclude nephropathy, urinary obstruction, or any structural abnormalities in the kidneys. This imaging modality was essential for identifying underlying conditions that could impact renal function and patient management.

Severity assessment and scoring system
The Sequential Organ Failure Assessment (SOFA) scoring system was used to evaluate the severity of illness and predict mortality risk. (7) The SOFA score ranges from 0 to 24 and assesses dysfunction in six organ systems. Higher scores are associated with an increased risk of mortality. The scoring system was applied to all patients upon admission and reassessed every 48 hours throughout their hospital stay.
Mortality risk was estimated based on the SOFA score, with scores below six indicating a mortality risk of less than 10%, while scores exceeding 15 were associated with an expected mortality rate of over 80%. The scoring criteria included respiratory function (partial pressure of oxygen [PaO2]/fraction of inspired oxygen [FiO2] ratio), coagulation status (platelet count), liver function (bilirubin levels), cardiovascular function (mean arterial pressure and need for vasopressors), central nervous system status (Glasgow Coma Scale score), and renal function (serum creatinine and urine output).

Dialysis interventions
SLED was performed using a conventional hemodialysis machine with a low blood pump rate over an extended duration. The procedure utilized a standard hemodialysis dialysate, a low-efflux filter, and slow ultrafiltration to optimize hemodynamic stability while maintaining effective solute removal. SLED sessions lasted approximately eight hours, with a blood flow rate of 200 ml/min and a dialysate flow rate of 350 ml/min.
CVVHD, in contrast, was conducted using a slow-flow hemodialysis system equipped with a specialized high-flux filter and dialysis kits. This method incorporated both convective and diffusive solute clearance mechanisms, allowing for continuous removal of metabolic waste and fluid balance control. CVVHD was administered using available multi-filtrate dialysis machines in Egypt, which were adapted for critically ill patients requiring prolonged dialysis support.

Potential risks and outcome parameters
Both dialysis modalities carry potential risks, including hypotension during the procedure and arrhythmias resulting from fluid and electrolyte shifts. Patients were closely monitored for any adverse events, and immediate medical interventions were implemented if required.
The primary outcome parameters included improvement of renal function and overall hemodynamic stability after dialysis. The effectiveness of each modality in stabilizing blood pressure, reducing fluid overload, and optimizing renal function markers was carefully analyzed. Secondary outcomes in-

cluded the resolution of sepsis in affected patients, improvement in cardiac function, and a reduction in morbidity and mortality associated with AKI.

Statistical analysis

Data management and statistical analysis were done using SPSS version 27 (IBM, Armonk, New York, United States). Quantitative data were assessed for normality using the Shapiro-Wilk test and direct data visualization methods. According to normality, quantitative data were summarized as means and standard deviations. Categorical data were summarized as numbers and percentages. Quantitative data were compared between the groups using an independent t-test for parametric variables and the Mann-Whitney U test for non-parametric variables. Categorical data were compared using the chi-square or Fisher's exact test. Logistic regression analysis was performed to identify independent predictors of mortality, arrhythmia, and hypotension, with results presented as beta coefficients, odds ratios (OR), and 95% confidence intervals (CI). All statistical tests were two-sided. P-values less than 0.05 were considered significant.

Results

Patients in the SLED group and the CVVHD group demonstrated no significant differences in baseline characteristics, including age distribution (p=0.794) and gender (p=1.000). Additionally, there was no significant difference in the prevalence of cardiomegaly (63.3% vs 50%, p=0.297) or ischemic heart disease (80% vs 86.7%, p=0.488) between the two groups. Although ejection fraction (EF) was slightly higher in the SLED group, this difference was not statistically significant (0.53±0.14 vs 0.47±0.10, p=0.061) (**Table 1**).

Regarding hemodialysis efficiency, the CVVHD group exhibited significantly lower pre-dialysis creatinine levels (4.0±1.6 vs 6.6±3.0 mg/dl, p<0.001) and post-dialysis creatinine levels (2.3±0.7 vs 4.8±2.0 mg/dl, p<0.001) compared to the SLED group. Similarly, post-dialysis urea levels were significantly lower in the CVVHD group (72±26 vs 109.8±60.0 mg/dl, p=0.003). Moreover, the urea reduction ratio (URR) and creatinine reduction ratio (CRR) were significantly higher in the CVVHD group (p=0.006 and p=0.001, respectively) (**Table 1**).

Electrolyte and acid-base balance parameters showed no significant differences between the groups for sodium (Na) and potassium (K) levels before and after dialysis. However, bicarbonate (HCO_3^-) levels changed significantly more in the SLED group (17%±5 vs 4%±0.6, p<0.001). Pre- and post-dialysis pH values did not differ significantly between the two groups (p=0.074 and p=1.000, respectively) (**Table 1**).

Patients in the SLED group exhibited a significantly lower ultrafiltration volume compared to those in the CVVHD group (2.2±0.52 vs 3.3±0.34 l, p<0.001). Similarly, the percentage change in central venous pressure (CVP) was significantly higher in the SLED group compared to the CVVHD group (40%±4.2 vs 33%±3.6, p<0.001). There was no significant difference between the two groups in terms of hypotension occurrence (p=0.121), arrhythmia incidence (p=0.105), need to pause hemodialysis (p=0.781), and complete stoppage of hemodialysis (p=0.774). Pre-dialysis and post-dialysis mean blood pressure (MBP) did not differ significantly (p=0.079 and p=0.051, respectively). There was also no significant difference in pre-dialysis or post-dialysis CVP (p=0.758 and p=0.932, respectively). The need for vasopressor support before and after dialysis showed no significant difference between the groups (p=0.259 and p=0.695, respectively) (**Table 2**).

Patients in the SLED group had a significantly longer duration of mechanical ventilation compared to those in the CVVHD group (5.53±1.83 vs 3.25±1.25 days, p<0.001). Additionally, the duration of ICU stay was significantly prolonged in the SLED group compared to the CVVHD group (9.5±4.8 vs 6.4±1.46 days, p=0.001). The need for mechanical ventilation did not differ significantly between the two groups (p=0.117). There was no significant difference in patient outcomes, with similar discharge (36.7% vs 36.7%) and mortality rates (63.3% vs 63.3%) in both groups (p=1) (**Table 3**).

Patients with an APACHE II score >30 had a significantly higher risk of mortality, with an odds ratio of 2.8 (95% CI 1-11.8, p<0.001). The presence of arrhythmia was also associated with increased mortality risk, with an odds ratio of 2.4 (95% CI 1-7.8, p<0.05). Hypotension was a significant predictor of mortality, with an odds ratio of 1.9 (95% CI 1.2-6.9, p<0.05). Additionally, the need for vasopressors was associated with a higher mortality risk, with an odds ratio of 1.5 (95% CI 1.1-2.2, p<0.05) (**Table 4**).

Patients with a history of ischemic heart disease had a significantly higher risk of developing arrhythmia, with an odds ratio of 1.4 (95% CI 1-6, p<0.05). Hypotension was also a significant predictor of arrhythmia, with an odds ratio of 1.1 (95% CI 1.0-5, p<0.05) (**Table 5**).

Patients with a history of ischemic heart disease had a significantly higher risk of developing hypotension, with an odds ratio of 1.1 (95% CI 1.0-6,

$p<0.05$). The use of vasopressors was also associated with an increased risk of hypotension, with an odds ratio of 1.1 (95% CI 1.0-4.8, $p<0.05$) (**Table 5**).

Discussion

In this study, we compared CRRT and SLED in the management of hemodynamically unstable patients with AKI. A total of 60 patients were included, with 30 undergoing CRRT and 30 undergoing SLED. The two modalities were evaluated based on clinical parameters, including the APACHE II score, mean blood pressure, vasopressor use, fluid status, cardiac function, and the presence of ischemic heart disease. Laboratory parameters assessed included serum urea, serum creatinine, URR, CRR, serum potassium, serum sodium, pH, and bicarbonate levels. Additionally, intra-procedural complications such as hypotension episodes, arrhythmia occurrence, and the need to terminate dialysis were recorded. The mortality rate in each group was also analyzed. There were no significant differences between the two groups in terms of age distribution, cardiac status, or APACHE II scores. Furthermore, hemodynamic tolerability did not differ significantly between CRRT and SLED, a finding consistent with previous studies. Fieghen et al. (8) conducted a randomized trial of 39 ventilated critically ill patients with oliguric AKI, comparing continuous veno-venous hemofiltration (CVVH) with extended daily dialysis. Their findings, along with those of Borisov et al., (9) indicated that fluid removal and hemodynamic parameters remained comparable across the treatment modalities. However, Fieghen et al. (8) observed a higher incidence of hypotensive episodes in patients undergoing SLED.

In our study, CRRT demonstrated superior solute removal, with a URR of 40% and a CRR of 38%, compared to 29% and 25%, respectively, in the SLED group. These findings aligned with those of Fieghen et al., (8) who reported that blood urea nitrogen levels below 60 mg/dl were challenging to maintain with daily IHD in patients weighing over 80 kg but could be achieved with CRRT. Similarly, Berbece and Richardson (10) found that SLED provided solute clearance comparable to CRRT at a significantly lower cost.

Correction of metabolic acidosis is a frequent challenge in critically ill patients. Our study showed that SLED was more effective in increasing serum bicarbonate levels (17%) compared to CRRT (4%). This difference may be attributed to the substitution fluids used in each modality: CRRT frequently utilizes lactate-based buffers, which can contribute to lactic acidosis in patients with tissue hypoperfusion or liver failure, whereas SLED typically employs bicarbonate-based buffers. Naorungroj et al. (11) reported a slightly greater base excess in patients receiving CRRT, although the difference was clinically negligible.

CRRT exhibited a greater ability to remove excess fluid, with an average ultrafiltration volume of 3.3 liters, compared to 2.2 liters with SLED. These findings align with those of Claure-Del Granado et al. (12) However, Fieghen et al. (8) reported no significant difference in water removal between CRRT and SLED, suggesting that both modalities can achieve effective volume control, depending on clinical application.

Our study found no significant differences in survival rates between patients treated with SLED and those treated with CVVHD, provided there were no disparities in baseline comorbidities (as reflected by similar APACHE II scores). These results are consistent with the HemoDiafe study, (13) which randomized 360 patients with AKI and multi-organ dysfunction syndrome to either IHD or CVVHD. At 60 days, survival rates were nearly identical in both groups (32% vs 33%). Furthermore, the incidence of hypotensive episodes was comparable between the two modalities.

A study by Dennen et al. (14) initially reported higher mortality rates associated with CRRT. Upon adjusting for confounders such as higher APACHE II scores and liver failure, no significant difference in survival remained. One observational study (14) suggested an increased mortality risk with CRRT, though this may have been influenced by incomplete adjustment for illness severity.

This study had several limitations. The relatively small sample size might limit the statistical power to detect differences between the two modalities. The study lacked long-term follow-up to assess renal recovery, patient survival beyond hospital discharge, and potential complications. Additionally, while efforts were made to adjust for confounders, residual confounding variables may still have influenced the results. Lastly, as an observational study, causal inferences regarding the superiority of one modality over the other cannot be definitively established. Future multicenter randomized controlled trials with larger cohorts and extended follow-up are needed to confirm these findings.

Conclusions

Although CRRT has long been considered superior to IHD, this perceived advantage has not translated into improved survival rates. The primary benefits of CRRT—hemodynamic stability, enhanced fluid control, and superior solute removal—can also be achieved with SLED. Additionally, SLED is a cost-effective alternative that allows patient mobility, facilitating nursing care, and other medical interventions. Our findings indicated that SLED was a well-tolerated and feasible RRT modality for critically ill patients with AKI. Within the limitations of this study, SLED demonstrated comparable hemodynamic tolerability to CRRT and achieved high rates of prescribed therapy completion.

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Conflict of interest
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Table 1. Comparison of baseline characteristics, hemodialysis efficiency, and electrolyte changes between the studied groups

	SLED group (n=30)	CVVHD group (n=30)	p-value
Age (years), n (%)			
- <40	0 (0.0%)	1 (3.3%)	0.794
- 41-50	4 (13.3%)	4 (13.3%)	
- 51-60	6 (20%)	6 (20%)	
- >61	20 (66.7%)	19 (63.3%)	
Gender, n (%)			
- Male	19 (63.3%)	19 (63.3%)	1
- Female	11 (36.7%)	11 (36.7%)	
Cardiomegaly, n (%)	19 (63.3%)	15 (50%)	0.297
Ischemic heart disease, n (%)	24 (80%)	26 (86.7%)	0.488
EF, mean±SD	0.53±0.14	0.47±0.10	0.061
Efficiency of hemodialysis, mean±SD			
- Creatinine pre (mg/dl)	6.6±3.0	4.0±1.6	<0.001*
- Creatinine post (mg/dl)	4.8±2.0	2.3±0.7	<0.001*
- Urea pre (mg/dl)	156.9±80.0	125.5±52	0.076
- Urea post (mg/dl)	109.8±60.0	72±26	0.003*
- URR	0.29±0.16	0.40±0.14	0.006*
- CRR	0.25±0.12	0.38±0.16	0.001*
Electrolytes and pH, mean±SD			
- Na pre (mEq/l)	134.7±6	137.7±8	0.106
- Na post (mEq/l)	137.9±5.6	138±5	0.942
- Na change (%)	2±0.7	1.7±0.5	0.061
- K pre (mEq/l)	4.9±0.93	4.7±0.85	0.388
- K post (mEq/l)	4.2±0.4	4.2±0.5	1
- K change (%)	12±3.6	10.5±3.2	0.093
- HCO3 pre (mEq/l)	14.7±7	16.2±5	0.343
- HCO3 post (mEq/l)	17.8±4	16.9±5	0.445
- HCO3 change (%)	17±5	4±0.6	<0.001*
- pH pre	7.2±0.16	7.28±0.18	0.074
- pH post	7.3±0.06	7.3±0.06	1

Legend: SLED=sustained low-efficiency dialysis; CVVHD=continuous veno-venous hemodialysis; EF=ejection fraction; URR=urea reduction ratio; CRR=creatinine reduction ratio; Na=sodium; K=potassium; HCO3=bicarbonate.
*Significant p-value.

Table 2. Comparison of hemodynamic stability, arrhythmia occurrence, and dialysis tolerance between the studied groups

	SLED group (n=30)	CVVHD group (n=30)	p-value
Hypotension, n (%)			
- No	18 (60%)	12 (40%)	0.121
- Yes	12 (40%)	18 (60%)	
Arrhythmia, n (%)			
- No	24 (80.0%)	21 (70%)	0.105
- Sinus tachycardia	2 (6.7%)	1 (3.3%)	
- AF	2 (6.7%)	0 (0.0%)	
- Arrest	2 (6.7%)	8 (26.7%)	
Need to hold HD, n (%)			
- No	21 (70%)	20 (66.7%)	0.781
- Yes	9 (30%)	10 (33.3%)	
Stoppage of HD, n (%)			
- No	22 (73.3%)	21 (70%)	0.774
- Yes	8 (26.7%)	9 (30%)	
APACHE II score, n (%)			
- 15-20	3 (10%)	1 (3.3%)	0.102
- 20-25	8 (26.7%)	2 (6.7%)	
- 25-30	3 (10%)	9 (30%)	
- 30-35	9 (30%)	10 (33.3%)	
- >35	7 (23.3%)	8 (26.7%)	
Blood pressure, mean±SD			
- MBP pre (mmHg)	76±6	73±7	0.079
- MBP post (mmHg)	85.3±13	79.1+11	0.051
- MBP change (%)	14±5	12±3.4	0.075
- Mean UF (l)	2.2±0.52	3.3±0.34	<0.001*
- CVP Pre (mmHg)	20.7±7	21.3±8	0.758
- CVP Post (mmHg)	12.9±5	13±4	0.932
- CVP change (%)	40±4.2	33±3.6	<0.001*
Vasopressor need pre, n (%)			
- No	11 (36.7%)	7 (23.3%)	0.259
- Yes	19 (63.3%)	23 (76.7%)	
Vasopressor need post, n (%)			
- No	10 (35.7%)	6 (27.3%)	0.695
- The same	10 (35.7%)	9 (40.9%)	
- Decreased	5 (17.9%)	6 (27.3%)	
- Increased	3 (10.7%)	1 (4.5%)	

Legend: SLED=sustained low-efficiency dialysis; CVVHD=continuous veno-venous hemodialysis; AF=atrial fibrillation; HD=hemodialysis; APACHE=Acute Physiology and Chronic Health Evaluation; SD=standard deviation; MBP=mean blood pressure; UF=ultrafiltration; CVP=central venous pressure.
*Significant p-value.

Table 3. Comparison of mechanical ventilation requirement, ICU stay, and clinical outcomes between the studied groups

	SLED group (n=30)	CVVHD group (n=30)	p-value
Need of MV, n (%)	26 (70.0%)	21 (86.7%)	0.117
Duration of MV (days), mean±SD	5.53±1.83	3.25±1.25	<0.001*
Duration of ICU stay (days), mean±SD	9.5±4.8	6.4±1.46	0.001*
Outcome, n (%) - Discharged - Died	 11 (36.7%) 19 (63.3%)	 11 (36.7%) 19 (63.3%)	1

Legend: ICU=intensive care unit; SLED=sustained low-efficiency dialysis; CVVHD=continuous veno-venous hemodialysis; MV=mechanical ventilation; SD=standard deviation.
*Significant p-value.

Table 4. Relationship between mortality versus different risk factors by logistic regression analysis

	Beta coefficient	Odds ratio (95% CI)	p-value
APACHE II score>30	1.4	2.8 (1-11.8)	<0.001*
Arrhythmia	0.98	2.4 (1-7.8)	<0.05*
Hypotension	0.45	1.9 (1.2-6.9)	<0.05*
Vasopressor need	0.89	1.5 (1.1-8)	<0.05*

Legend: CI=confidence interval; APACHE=Acute Physiology and Chronic Health Evaluation.
*Significant p-value.

Table 5. Relationship between arrhythmia versus different risk factors by logistic regression analysis

	Beta coefficient	Odds ratio (95% CI)	p-value
History of ischemic heart disease	0.48	1.4 (1-6)	<0.05*
Hypotension	0.35	1.1 (1.0-5)	<0.05*

Legend: CI=confidence interval.
*Significant p-value.

Table 6. Relationship between hypotension versus different risk factors by logistic regression analysis

	Beta coefficient	Odds ratio (95% CI)	p-value
History of ischemic heart disease	0.78	1.1 (1.0-6)	<0.05*
Vasopressor use	0.2	1.1 (1.0-4.8)	<0.05*

Legend: CI=confidence interval.
*Significant p-value.

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