

INTERMITTENT HEMODIALYSIS PRACTICES, ALBUMIN PRIMING VARIATION, AND OUTCOMES IN A RESOURCE-LIMITED ICU

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Introduction

Intermittent hemodialysis (IHD) remains a cornerstone modality for kidney replacement therapy in resource-limited intensive care units (ICUs), where continuous kidney replacement therapy (CKRT) is frequently unavailable. In hemodynamically unstable patients, IHD is commonly delivered as sustained low-efficiency dialysis (SLED).

Although the conventional SLED prescription typically spans 6–8 hours, in our setting treatment sessions are often truncated to approximately 4 hours due to workforce and resource constraints. While such modifications may enhance feasibility, evidence regarding their impact on dialysis adequacy remains limited. Furthermore, to improve hemodynamic tolerability, lower blood and dialysate flow rates are frequently employed, and albumin priming is occasionally utilized despite uncertain clinical benefit. The implications of these pragmatic adaptations on intradialytic hypotension (IDH) have not been well defined.

Objectives

This study aims to describe the delivery of IHD in a resource-limited ICU, with particular emphasis on treatment adequacy, hemodynamic safety (IDH occurrence), priming strategies, and their association with IDH.

Materials & Methods

Data extracted from Medical records for all patients prescribed with IHD in the ICU (UNICU and GICU) in Hospital Kuala Lumpur between 1st Jan – 31st Mar 2025



- 88 patients underwent IHD treatments using Fresenius 4008s and 5008s hemodialysis machines
- 167 IHD sessions ; 166 analysed as one discarded due to missing dialysis data
- Data analysed per treatment session on treatment adequacy, hemodynamic safety (IDH occurrence), priming strategies, and its association with IDH, comparing between AKI and ESKD, whenever relevant.

Terminologies

- IDH is defined as the need for intervention for hemodynamic instability (significant reduction in UF rate or terminating KRT) or increased vasopressor use
- Total UF achieved is defined as $\geq 80\%$ UF prescribed achieved
- ESKD is defined as those who are on long term KRT during hospitalisation

Results



88 patients underwent IHD

- AKI (n) : 68
- ESKD (n) : 20



166 IHD sessions

- 40 treatments for ESKD
- 126 treatments for AKI

Variable	AKI (n= 68)	ESKD (n= 20)
Age	61.5 [55.0 - 71.0]	59.0 [43.0- 67.0]
Gender	Male : 30 (68.2 %) Female : 14 (31.8 %)	Male : 23 (609.7%) Female : 10 (30.3%)
Weight (kg)	72.5 [65.8 - 80.0]	64.3 [52.0 - 75.0]
Comorbidities		
• DM	44	15
• HPT	9	3
• CCF	2	1
• Chronic Lung Disease	3	3
• Stroke	4	0
• Chr Liver Disease	6	2
• IHD	9	3
• CKD	15	20
• Dyslipidemia	15	5
• Malignancy	2	0
SOFA Score	10.0 [8.0- 13.0]	6.0 [6.0- 9.0]
Albumin (g/dl)	18.0 [15.0 - 20.2]	21.0 [19.0-27.0]
Lactate (mmol/l)	1.2 [0.7 -1.9]	0.8 [0.7 - 1.4]

Table 1 : Demographic data comparing between AKI and ESKD who underwent IHD in the ICU between 1st Jan 2025 to 31st March 2025

Dialysis Prescriptions	AKI (n= 126)	ESKD (n= 40)
Qb (mls/min)	180 [100- 250]	180 [160 - 200]
Qd (mls/min)	300 [200 - 500]	300 [300 - 500]
Duration prescribed (hours)	4	4
Anticoagulation		
• Heparin	16 (12.7%)	5 (12.5%)
• None	110 (87.3%)	35 (87.5%)
Priming agents (n,%)		
• 0.9% Saline	97 (77 %)	36 (90 %)
• 5% Albumin	24 (19 %)	4 (10 %)
• $\geq 20\%$ Albumin	5 (4.0 %)	0
Treatments with NetUF prescribed	86/126	31/40
Total net UF prescribed (mls/ hours prescribed)	250 (IQR 0 - 375)	375 (IQR 125 - 500)
Intradialytic hypotension (IDH) $\chi^2(1, N=166) = 1.38, p = 0.239$	67 (53.2%)	17 (42.5%)

Table 2 (above) : Hemodialysis prescriptions and IDH occurrence between AKI and ESKD group.

Chart 1 (below) : Primary diagnosis by AKI and ESKD distributions

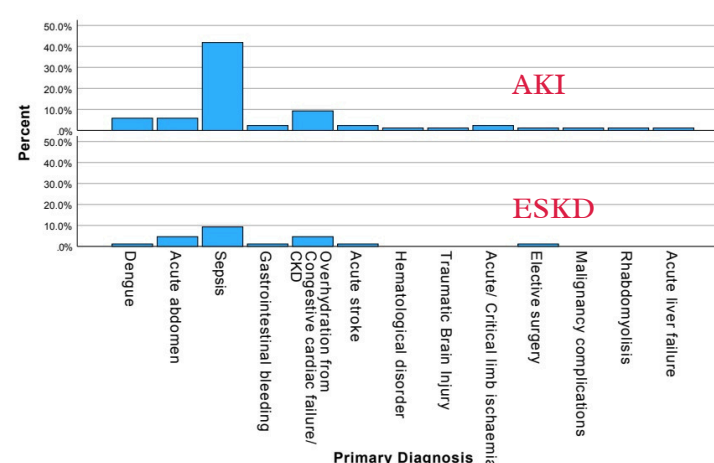


Chart 2 : Incidence of Intradialytic Hypotension (IDH) by Priming Strategy

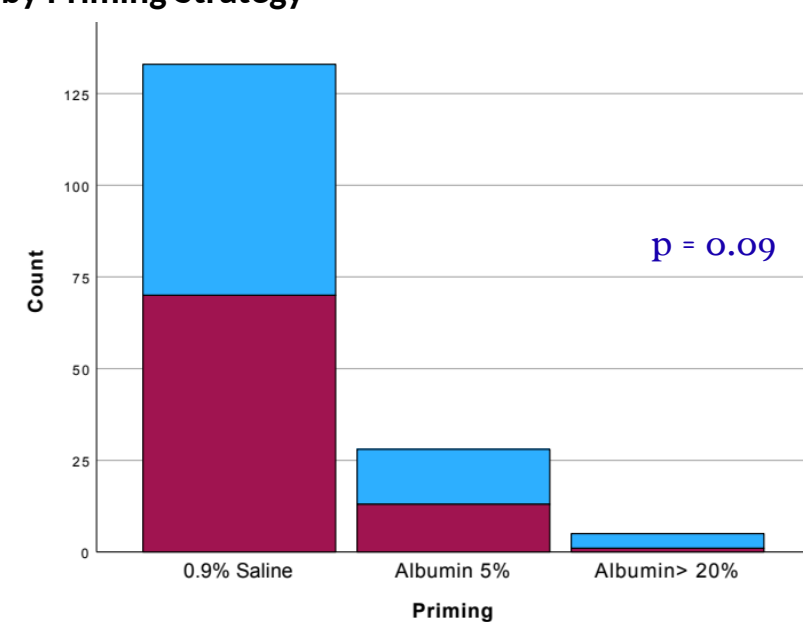
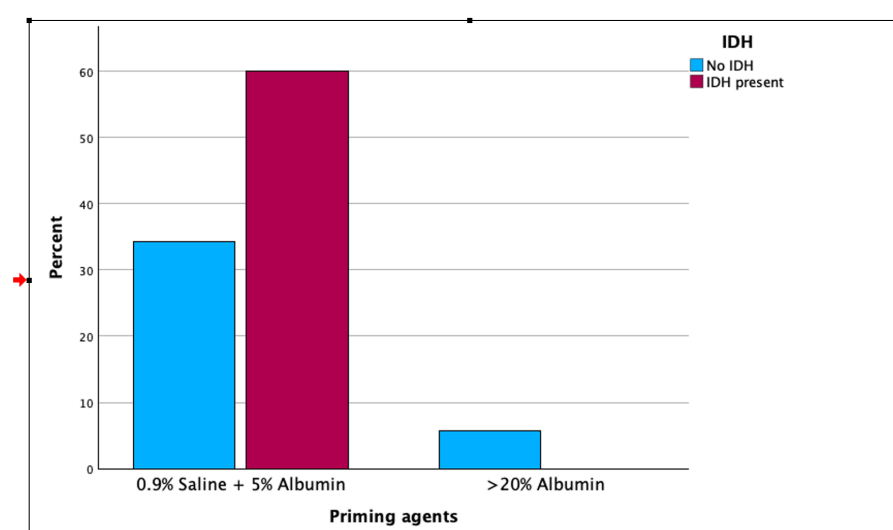


Chart 3 and Table 3 (below) : Impact of priming agents on intradialytic hypotension in patients with SOFA >11 and Hypoalbuminemia < 30



Subgroup (SOFA >11 & Albumin <30)	OR for IDH with IV Albumin	95% CI	p-value
Primed with IV Albumin >20% vs other	0.36	0.23-0.57	0.07-0.15

Conclusion

Our study found that intradialytic hypotension (IDH) occurred in approximately one-third of intermittent hemodialysis sessions. Higher SOFA scores (>11) showed a trend toward increased risk of IDH, whereas hypoalbuminemia (<30 g/L) alone was not a consistent predictor. Notably, albumin priming ($>20\%$) demonstrated a potential protective effect against IDH in the highest-risk subgroup (SOFA >11 and hypoalbuminemia), although statistical significance was not achieved, most likely due to the small sample size. The main limitation of this study is its single-centre, retrospective design, which reduced statistical power and may have underdetected true associations, thereby limiting firm conclusions. Nevertheless, a key strength lies in the real-world data obtained from a pragmatic ICU setting where resources are constrained and practice variations exist, making the findings highly relevant to similar healthcare environments.

These results suggest a potential role for optimising albumin priming strategies to reduce hemodynamic instability during dialysis in critically ill, hypoalbuminemic patients with high SOFA scores, particularly in resource-limited settings (manpower, CRRT availability). Larger, prospective studies are warranted to confirm these preliminary observations.

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