Impact of Early vs. Late Initiation of Continuous Renal Replacement Therapy on Composite Outcomes Including AKD and Mortality: A Multicenter Propensity-Matched Cohort Study(LINKA cohort)

Sei-hong Min[1], Sung Gyun Kim[1], Jung Nam An[1], Sejoong Kim[2*]
[1] Division of Nephrology, Department of Internal Medicine, Hallym University Sacred Heart Hospital, Anyang, Republic of Korea
[2] Department of Internal Medicine-Nephrology, Seoul National University Bundang Hospital, Korea, Republic of
* Corresponding author

Background

- The **optimal timing** for initiation of **continuous renal replacement therapy (CRRT)** in patients with acute kidney injury (AKI) remains controversial, especially when assessing long-term kidney outcomes and mortality.

- This study aims to evaluate the impact of early versus late CRRT initiation on **composite outcomes of acute kidney disease (AKD) or death**.

Method

- This retrospective multicenter cohort study included 852 patients with baseline creatinine ≤ 4 mg/dL who received CRRT across eight tertiary hospitals.

- **Early initiation** was defined as **CRRT initiation before reaching KDIGO stage 3 or severe oliguria(urine output < 0.3 mL/kg/hr over 24 hours)**. Patients were categorized into early and late initiation groups. Propensity score matching (1:1 nearest-neighbor without caliper) was conducted using demographic, clinical, and laboratory covariates.

- The primary outcome was a **composite of AKD (defined as serum creatinine increase ≥ 50% from baseline at 3 months) or death before 3-month follow-up**.

- Multivariable logistic regression analysis was performed to adjust for residual confounding. Stratified analyses were also conducted according to baseline creatinine level (low vs. high, based on median value).

Result

- After matching, 746 patients (373 early, 373 late) were included. **The incidence of the composite outcome was significantly lower in the early CRRT group (OR 0.40, 95% CI 0.28–0.57; p < 0.001).**

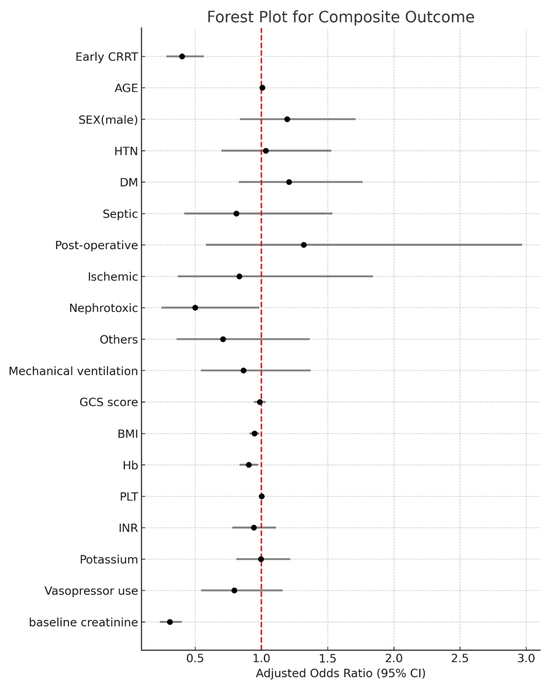
- In stratified analysis, the protective effect of early CRRT remained significant in the low baseline creatinine subgroup (OR 0.46, 95% CI 0.29–0.72), as well as in the high creatinine group (OR 0.38, 95% CI 0.21–0.68).

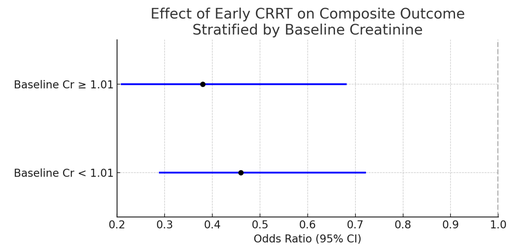
- Interaction analysis demonstrated a significant interaction between early CRRT and baseline creatinine levels (p for interaction = 0.044), suggesting **enhanced benefit in patients with lower baseline kidney function**.

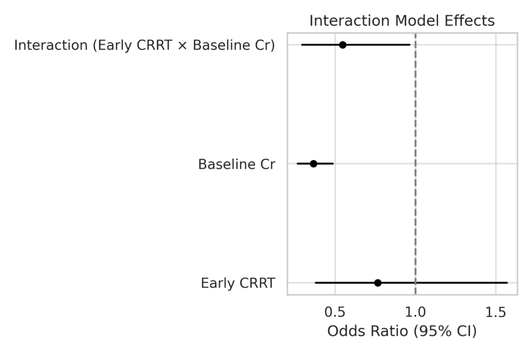
- Otherwise, early CRRT was not significantly associated with reduced 90-day mortality alone (adjusted OR 0.69, p = 0.27).

Result

Composite outcomes







Conclusion

- Early initiation of CRRT was associated with a **significantly reduced risk of composite adverse outcomes including AKD.**

- The benefit was more pronounced among patients with lower baseline serum creatinine, highlighting **the importance of individualized timing strategies in CRRT initiation.**

References

- Kellum JA, Lameire N, Aspelin P, et al. Kidney disease: Improving global outcomes (KDIGO) acute kidney injury work group. KDIGO clinical practice guideline for acute kidney injury. *Kidney Int Suppl*. 2012;2(1):1-138.
- Zarbock A, Kellum JA, Schmidt C, et al. Effect of early vs delayed initiation of renal replacement therapy on mortality in critically ill patients with acute kidney injury: The ELAIN randomized clinical trial. *JAMA*. 2016;315(20):2190–2199.
- Barbar SD, Clere-Jehl R, Bourredjem A, et al. Timing of renal-replacement therapy in patients with acute kidney injury and sepsis. *N Engl J Med*. 2018;379(15):1431–1442.
- STARRT-AKI Investigators. Timing of initiation of renal-replacement therapy in acute kidney injury. *N Engl J Med*. 2020;383(3):240–251.
- Khwaja A. KDIGO clinical practice guidelines for acute kidney injury. *Nephron Clin Pract*. 2012;120(4):c179–c184.
- Chawla LS, Bellomo R, Bihorac A, et al. Acute kidney disease and renal recovery: consensus report of the ADQI 16 Workgroup. *Nat Rev Nephrol*. 2017;13(4):241–257.
- Gaudry S, Hajage D, Schortgen F, et al. Initiation strategies for renal-replacement therapy in the intensive care unit. *N Engl J Med*. 2016;375(2):122–133.
- Mehta RL, Pascual MT, Soroko S, et al. Spectrum of acute renal failure in the intensive care unit: the PICARD experience. *Kidney Int*. 2004;66(4):1613–1621.
- Hsu CY, Chertow GM, McCulloch CE, Fan D, Ordonez JD, Go AS. Nonrecovery of kidney function and death after acute on chronic renal failure. *Clin J Am Soc Nephrol*. 2009;4(5):891–898.