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## **Peri-dialytic Cystatin C Measurement Using Low-Flux Membranes to Estimate Residual Kidney Function in Incident Hemodialysis**

**Ji Won Lee**, Daun Song, Se-Hee Yoon, Sung-Ro Yun, Won Min Hwang, Yohan Park  
Department of Internal Medicine-Nephrology, Konyang University Hospital, Korea, Republic of

**Objectives :** With growing interest in incremental hemodialysis (HD), residual kidney function (RKF) is a key determinant of dialysis prescription. Conventional RKF assessment requires interdialytic urine collection for more than 24 hours to calculate urea/creatinine clearance, but prolonged collections are often impractical. Cystatin C and beta-2 microglobulin ( $\beta 2M$ ), relatively larger middle molecules, are expected to show negligible clearance with low-flux membranes; therefore, when low-flux membranes are used, peri-dialytic concentrations of these markers may better reflect RKF and help estimate clearance-based RKF.

**Methods :** Eighteen incident HD patients were enrolled, and all dialysis sessions were performed using low-flux membranes. After initiation of incremental HD, between days 8 and 10, blood samples were obtained immediately post-dialysis and before the subsequent session for blood urea nitrogen, creatinine, cystatin C, and  $\beta 2M$ . Urine volume and collection time were recorded from immediately after the day-8 session to immediately before the day-10 session, and urea/creatinine clearance was calculated as the reference RKF (Figure 1).

**Results :** Linear regression models predicting clearance-based RKF were developed using (1) pre-dialysis cystatin C (CysCpre) plus pre-dialysis  $\beta 2M$  ( $\beta 2Mpre$ ), (2) averaged cystatin C (CysCavr) plus averaged  $\beta 2M$  ( $\beta 2Mavr$ ) (mean of post- and pre-dialysis values), and (3) CysCavr alone. Performance was assessed by distributional similarity (mean $\pm$ SD), Spearman's rho between measured and predicted RKF, root mean square error (RMSE), and P40 accuracy (predictions within  $\pm 40\%$  of measured RKF). The CysCavr-only model showed the best overall performance (rho=0.701, RMSE=2.18, P40=44.4%) (Table 1).

**Conclusions :** In incident HD patients treated with low-flux membranes, peri-dialytic cystatin C can estimate clearance-based RKF and may provide a practical blood-based alternative to prolonged urine collection. Larger prospective datasets are needed to refine and validate these models.

table 1.JPG

| Model | Predictors             | Mean $\pm$ SD   | Spearman's Coefficient | RMSE | P40 (%) |
|-------|------------------------|-----------------|------------------------|------|---------|
| RKF   | -                      | 3.79 $\pm$ 2.45 | -                      | -    | -       |
| M1    | CysCpre, $\beta 2Mpre$ | 3.39 $\pm$ 3.05 | 0.639                  | 2.46 | 16.7    |
| M2    | CysCavr, $\beta 2Mavr$ | 3.29 $\pm$ 2.70 | 0.614                  | 2.21 | 22.2    |
| M3    | CysCavr                | 3.23 $\pm$ 2.54 | 0.701                  | 2.18 | 44.4    |

RKF residual kidney function, RMSE root mean square error, SD standard deviation

table 1.JPG



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Admission clinical assessment  
and laboratory testing



D1  
1<sup>st</sup> HD  
2hr

D2  
2<sup>nd</sup> HD  
3hr

D3

D4  
3<sup>rd</sup> HD  
4hr

After HD session  
BUN, Cr, CysC,  $\beta$ 2M

Before HD session  
BUN, Cr, CysC,  $\beta$ 2M

D8  
HD  
4hr

D10  
HD  
4hr

Urine collection  
Urine collection time  
Urine urea, Urine Cr for RKF