Outcome of Hyperkalemia in the Emergency Department: Impact of Hyperkalemic Severity, Renal Function and CHF on Survival

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Abstract

Background: Hyperkalemia is common and lethal electrolyte disorder with little known long-term consequences. This was retrospective, observational study of hospitalized patients with initial serum K > 5.3 mEq/L. 143 consecutive episodes of hyperkalemia were analyzed in 133 patients. Survival was analyzed by parameters of renal dysfunction (admit eGFR), CHF, admit K and EKG abnormalities.

Methods: Hazard ratios (HR) for mortality were computed by Cox proportional hazards multivariate regression. Primary end point, all-cause mortality determined by Social Security Death Index and medical record review.

Results: Admit eGFR was the most powerful predictor of mortality. The effect of renal function was nonlinear(figure 1).

Highest mortality is eGFR group of 15-59 HR 6.92. More severe renal impairment with eGFR <15 HR 4.10 and AKI requiring hemodialysis (HD) HR 3.67. ESRD had lower mortality HR 1.33(table 1).

Hyperkalemic severity had a modest effect(figure 2). Compared to patients Admit K 5.3-5.9 mEq/L, patients with K 6-7, HR 2.21 ($p=0.0210$) and K >7.0, HR 2.62 ($p=0.0521$). History of CHF, increased mortality by univariate analysis ($p<0.0001$) (figure 3)but CHF had no independent effect in HD patients. In non-HD patients, CHF had an independent effect when both admit eGFR and K were added to the model, but was no longer significant when age parameter was added(table 1). Patients with EKG abnormalities had higher K ($p<0.003$), but these changes did not impact mortality ($p=0.126$).

Conclusions: Survival in hyperkalemic patients is predicted by lower admit eGFR in a non-linear fashion. ESRD patients exhibited lower mortality perhaps reflecting adaptation to chronic hyperkalemia. CHF has an additive effect on mortality in non HD patients. We emphasize that 86% of the mortality was after discharge. This extraordinary mortality necessitates the need to develop risk stratification strategies in the long-term care of the hyperkalemic patients.

Figure 1- admit eGFR and mortality (Kaplan-Meier curve)

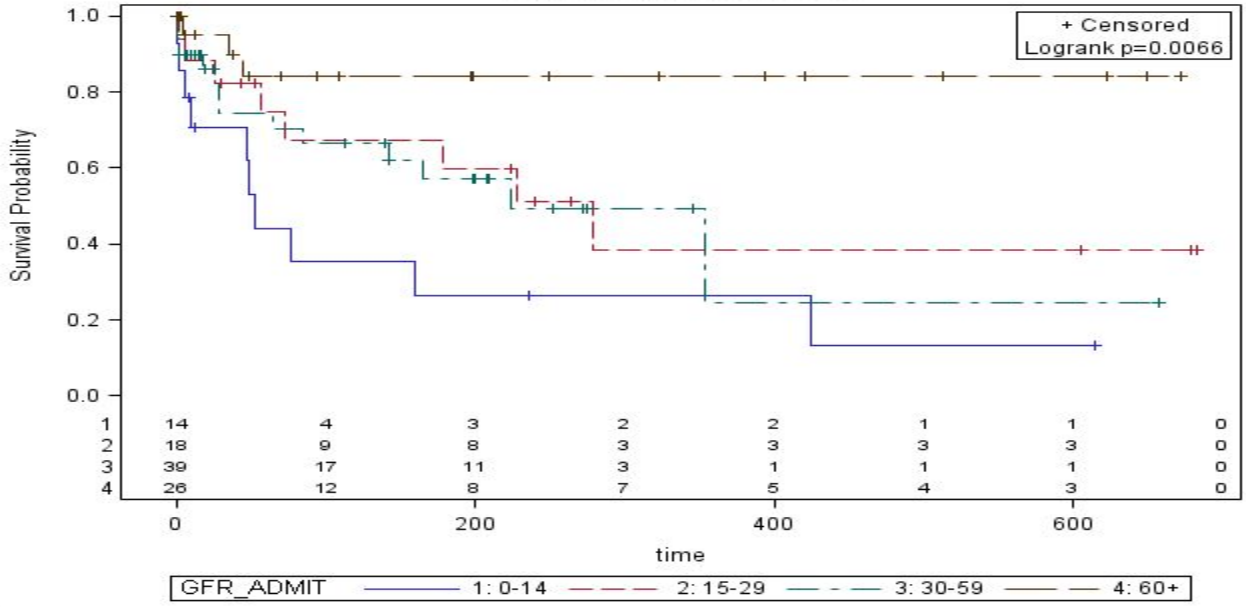

Figure 2 -Severity of hyperkalemia and mortality (Kaplan-Meier curve)

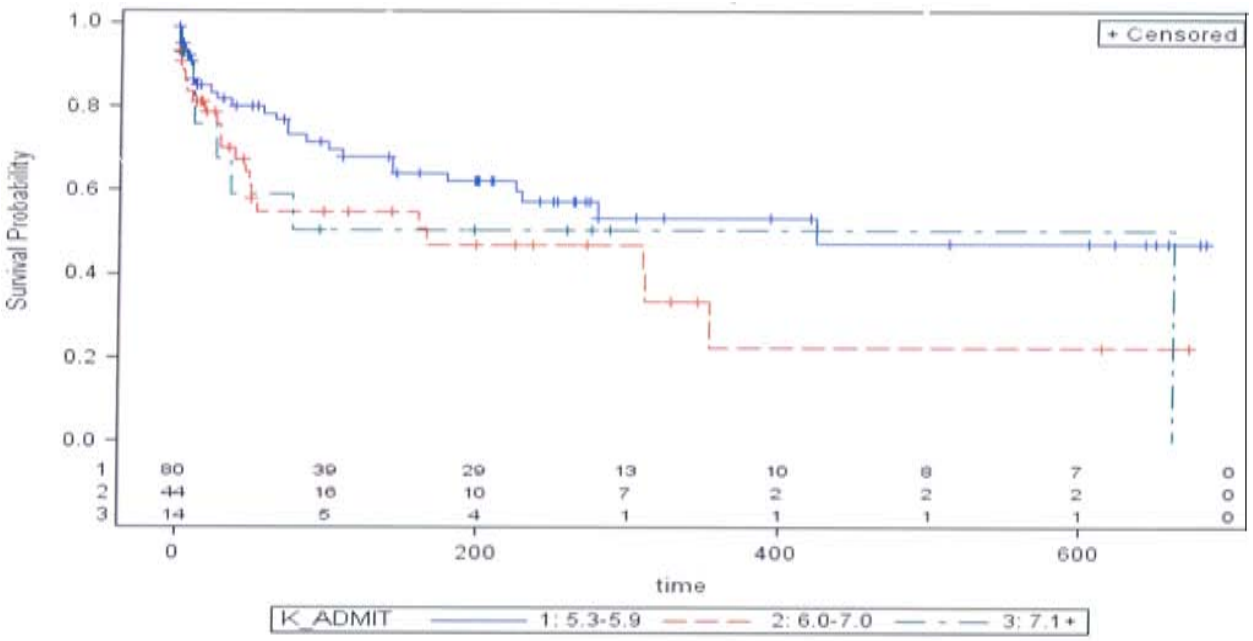

Figure 3 –CHF and mortality (Kaplan Meier curve)

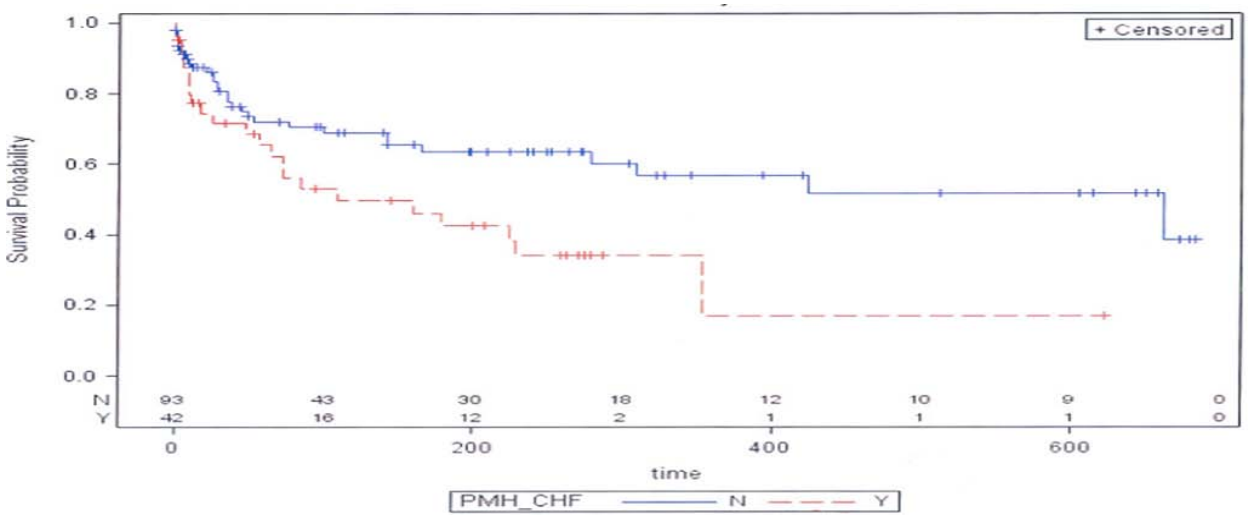

Table 1

Hazard ratios for mortality using Cox Proportional Hazards Multivariate Regression Model	
GFR <15	4.098
GFR 15-29	6.917
GFR 30-59	6.566
GFR ≥ 60	(Ref=1)
AKI needing RRT	3.666
Chronic RRT/ESRD	1.333
No HD	(Ref=1)
CHF	1.048
No CHF	(Ref=1)
Age	1.035
K 6-7	2.214
K >7	2.618
K 5.3-5.9	(Ref=1)