

FACTORS ASSOCIATED TO ULTRAFILTRATION IN PERITONEAL DIALYSIS

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OBJECTIVES

- Daily ultrafiltration (UF) during peritoneal dialysis, which is a crucial indicator of the treatment adequacy, is difficult to predict for individual patients.
- There are some known factors associated with daily UF, as patient transport type by PET, but not much is known about possible other factors.
- The objective of this study was to examine which data on patient status can be associated with UF and to look for the best model that would predict UF based on those data.

METHODS

- Daily dialysate collections with four different combinations of dialysis fluid were performed in 99 CAPD patients.
- Each patient did PET test with glucose 2.27% and four daily collections with three daily exchanges of glucose 1.36% glucose and the night exchange of:
 - 1) glucose 1.36% (G1 schedule),
 - 2) glucose 2.27% (G2 schedule),
 - 3) glucose 3.86% (G3 schedule), and
 - 4) icodextrin 7.5% (Ico schedule).
- The infused volumes and dwell times were selected according to individual prescriptions. Daily UF was calculated as the daily removed volume minus the daily infused volume.

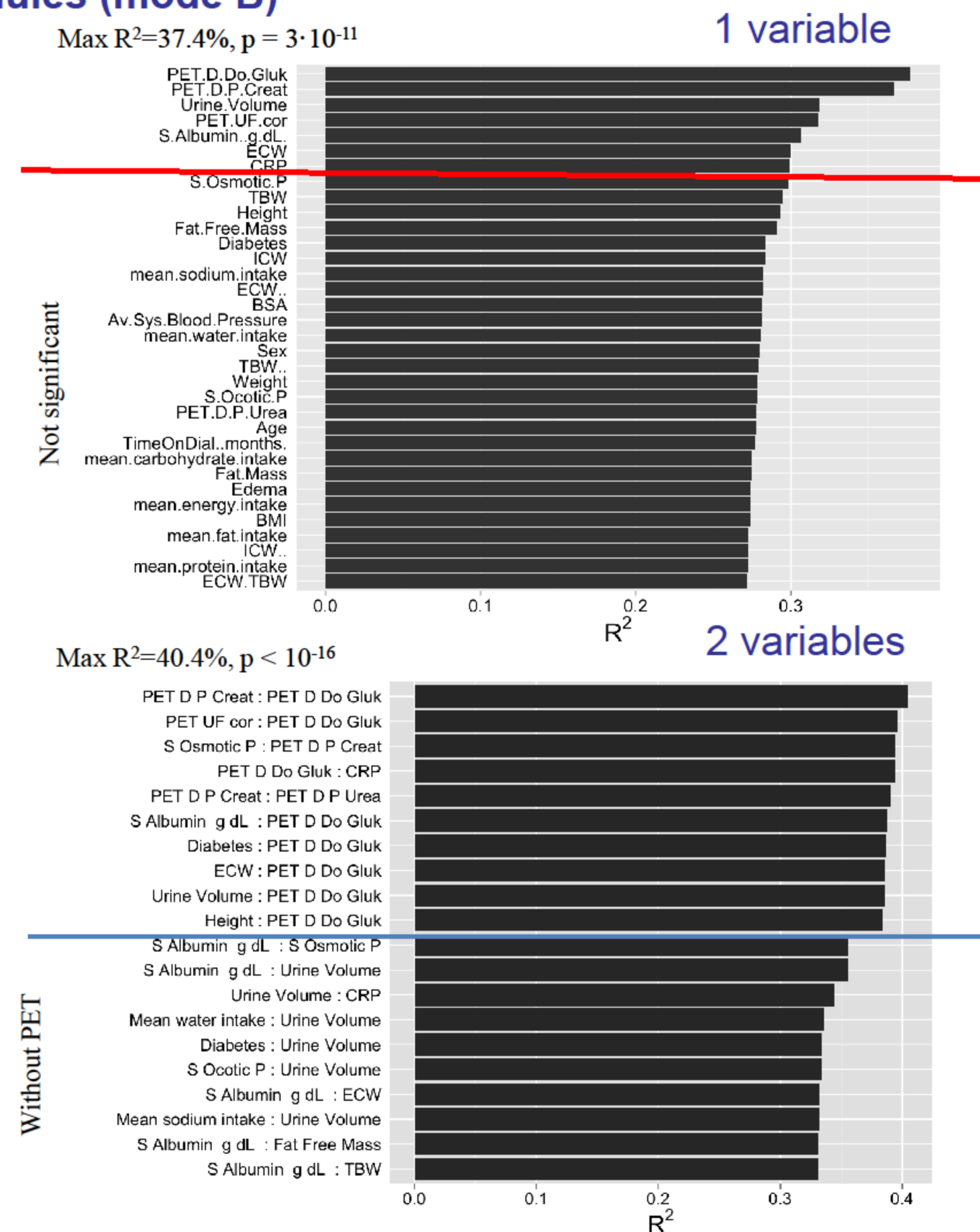
RESULTS

Importance of variable according to the mixed linear regression model

GENERAL DATA	P value	Adjusted R ² %	PET DATA	P value	Adjusted R ² %
Sex	0.17	30.5	PET UF	9.2·10 ^{-06**}	32.5
Time on Dialysis	0.80	29.8	PET D/P Creatinine	8.3·10 ^{-10***}	39.7
Age	0.35	30.7	PET D/P Urea	0.42	32.7
Diabetes	0.04	30.0	PET D/Do Glucose	3.3·10 ^{-11***}	39.7
Weight	0.15	30.0	Urine Volume	3.4·10 ^{-05**}	32.8
Height	0.0094	32.1			
BSA	0.084	30.2	BLOOD DATA	P value	Adjusted R ² %
BMI	0.26	29.4	Serum Albumin	0.00066*	33.1
			Serum Oncotic Pressure	0.120	38.0
			Serum Osmotic Pressure	0.00068*	43.5
BODY COMPOSITION	P value	Adjusted R ² %	Mean Systolic BP	0.054	30.6
Fat Mass	0.68	29.6	Serum CRP	0.00038*	31.6
Fat Free Mass	0.0046	30.7			
TBW/BW	0.24	30.6	DIETARY DATA	P value	Adjusted R ² %
TBW	0.0027	31.3	Mean energy intake	0.10	29.7
ECW/BW	0.16	31.3	Mean protein intake	0.36	29.4
ECW	0.00079*	32.0	Mean carbohydrate intake	0.098	29.9
ICW/BW	0.97	29.4	Mean fat intake	0.24	29.5
ICW	0.027	30.1	Mean sodium intake	0.0063	31.5
ECW/TBW	0.97	29.4	Mean water intake	0.0083	32.1
Edema	0.81	29.8			

Error median 290 – 339
Not significant if p > 0.0015

Linear regression with slope dependent on schedule for 3 glucose schedules (mode B)



- The best single predictors of daily UF in all models were PET data (D/D0 glucose, D/P creatinine, UF).
- Other statistically significant single predictors were: serum osmotic pressure, serum CRP, serum albumin, urine volume, extracellular fluid volume, 3rd space volume, Na in dialysate, serum iCa, at least for some models.
- However, the predictions from all models were similar and low with R² about 0.3.
- The prediction for glucose schedules (B mode) was slightly better than for all four schedules (A mode).

- No statistically significant predictors were found for Schedule Ico.
- Strong correlation was found between the amount of daily removed sodium and daily ultrafiltration.
- The best prediction based on two variables was for PET D/D0 glucose combined with PET D/P creatinine.
- The best prediction based on three variables was for PET D/D0 glucose combined with PET D/P creatinine and serum osmotic pressure (A mode) or serum CRP (B mode).

STATISTICAL METHODS

- Based on the analysis of the single correlation with daily UF, 34 variables from 84 were selected for the final statistical analysis related to PET data, antropomorfology and blood and dialysate composition.
- Bonferroni correction for multiple comparisons was applied with statistical significance if p<0.0006 for 84 variables and p<0.0015 for 34 variables.
- Four statistical models were analyzed: linear regression, linear regression with slope dependent on schedule with and without nonlinear Box-Cox transformation, and mixed linear regression (patient dependent intercept)
- Each model was analyzed in three ways: for all 4 schedules (A mode) , for 3 schedules with glucose fluids (B mode), and for Ico schedule alone (C mode).
- In addition, other approaches, as nonlinear models and the prediction of the increment in UF over G1 schedule, were also examined but without any substantial improvement of the results.

CONCLUSIONS

- PET data provide the most valuable single predictors of daily UF (except for schedule Ico alone).
- Serum albumin, serum osmotic pressure and inflammation (serum CRP) are associated with daily UF.
- These variables improve UF prediction by multivariable regressions.
- The best predictions have determinant coefficient R² about 40% and median error about 300 mL.

