Evaluation of the Trajectory of Peritoneal Dialysis Patients
A Multi-State Approach

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⌗ INTRODUCTION

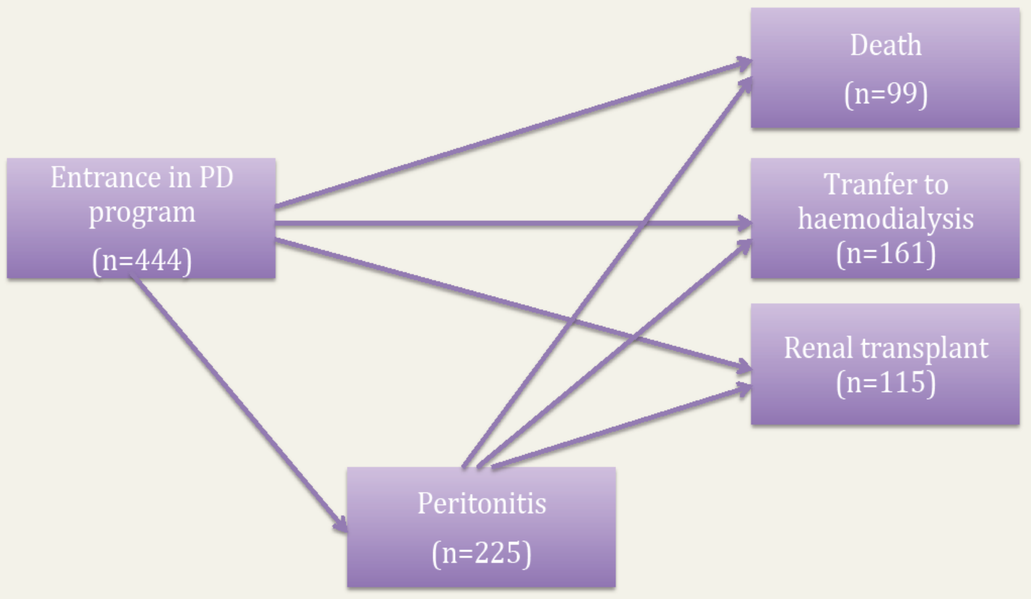
The evaluation of peritoneal dialysis programs, given their complexity, must be addressed using an adequate and flexible statistical analysis considering all the relevant clinical information. Multi-state model for survival data taking competing risks into account is an adequate alternative approach to the classic survival models and presents several advantages. Multi-state modeling allows to assess how specific prognostic factors may influence different phases of the disease process, which is usually ignored using the classical approach of survival analysis.

⌗ OBJECTIVES

To estimate the effect of prognostic factors (gender, age, diabetes and previous renal replacement therapy) on different phases of the disease considering a multi-state competing risk model for peritoneal dialysis patients.

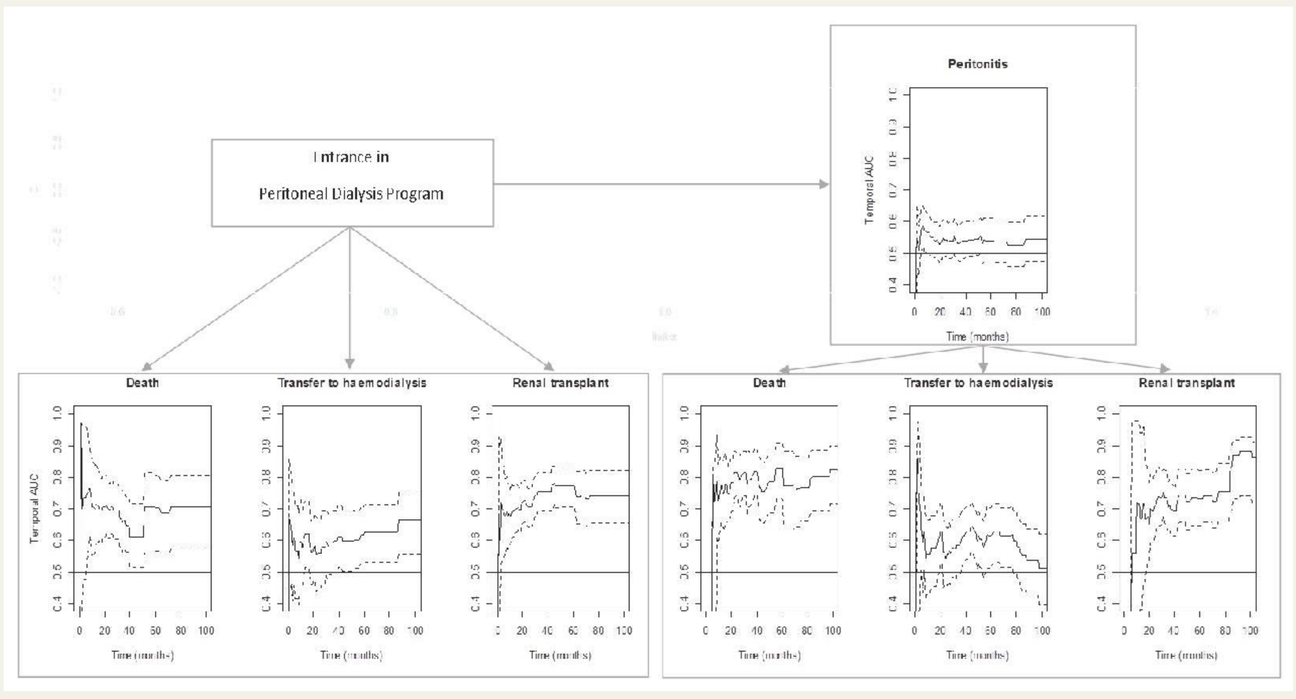
⌗ METHODS

The sample comprises patients included in a university hospital peritoneal dialysis program, between October 1985 and June 2011. A multi-state model was considered with the following events: 1. Peritonitis; 2. Death without peritonitis; 3. Transfer to haemodialysis without peritonitis; 4. Renal transplant without peritonitis; 5. Death after peritonitis; 6. Transfer to haemodialysis after peritonitis; 7. Renal transplant after peritonitis. Gender, age, previous renal replacement therapy and diabetes were considered as potential prognostic factors of survival time for each event previously described. Time-dependent ROC curves were obtained in order to evaluate the predictive accuracy of the model.



⌗ RESULTS

Analyzing the effect of prognostic factors in the survival time for each the events included in the multi-state model, we found that diabetes was a significant predictor for the transitions Entrance-Death and Peritonitis-Death. Patients with diabetes have a higher risk of death, without or with experiencing a peritonitis episode, compared to those patients without diabetes (HR=2.42, 95%CI 1.29-4.51 and HR=2.41, 95%CI 1.27-4.57 respectively). Additionally, previous renal replacement therapy was a significant predictor for the transitions Entrance-Death and Entrance-Peritonitis. Patients with a previous renal replacement therapy have a higher risk of death without peritonitis (HR=1.93, 95%CI 1.05-3.53) and a higher risk of peritonitis (HR=1.33, 95%CI 1.01-1.76) when compared with those patients without a previous renal replacement therapy. Finally, patients older than 55 years have a significantly higher risk of death (without and with peritonitis) and a significantly smaller risk of transplant (without and with peritonitis) when compared to those with 55 years (reference value). There is no evidence of statistical differences in the risk of transfer to haemodialysis (without and with peritonitis) for patients older than 55 years when compared to those having 55 years. The analysis of temporal AUC allowed us to conclude that the considered model presents a high degree of validity for some transitions, namely: Entrance-Death, Entrance-Renal transplant, Peritonitis-Death and Peritonitis-Renal transplant.



⌗ CONCLUSIONS

Multi-state modeling offers a flexible tool for the study of covariate effects simultaneously on different events. These models describe the disease/recovery process of patients in more details, thus yielding more insight in the evaluation of trajectory of peritoneal dialysis patients. In peritoneal dialysis research, this methodology can be beneficial in the analysis of relevant clinical predictors of death or change of modality. The application of this methodology combined with time-dependent ROC curves revealed several conclusions not previously reported when using standard statistical methodologies.

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