Residual Urine Volume in Hemodialysis Patients: International Trends, Predictors and Outcomes in the DOPPS

Manfred Hecking1, Keith McCullough2, Friedrich Port3, Hiroyasu Yamamoto4, Michael Y. Jadoul5, Loreto Gesualdo6, Michelle Wong5, Bruce Robinson1

1Medical University of Vienna, Nephrology & Dialysis, Vienna, Austria; 2Arbor Research Collaborative for Health, Ann Arbor, United States; 3Division of Nephrology and Hypertension, Department of Internal Medicine, Jikei University School of Medicine, Tokyo, Japan; 4University of Louvain Medical School, Leuven, Belgium; 5University of Bari, Bari, Italy; 6University of British Columbia; 7University of Michigan, Ann Arbor, United States.

Background / Goal

- Residual urine volume (RUV) decline after hemodialysis initiation has received limited attention in hemodialysis, and preventive actions are matter of debate.

Methods

- **Sample**
  - 21,199 hemodialysis patients from 12 countries in DOPPS phases 2.5 (2002-2015):
    - Europe: Belgium, France, Germany, Italy, Spain, Sweden, United Kingdom
    - North America: United States, Canada

- **Analysis**
  - **Model:** Cox regression models
  - **Outcome:** Patient all-cause mortality
  - **Exposure:** Reported RUV at study baseline
  - **Adjustments:** age, sex, race (Black vs non-Black), vintage (continuous + indicator for vintage > 1), body mass index, region (North America, Europe, Japan), serum creatinine, and thirteen comorbidities: congestive heart failure, cancer, other cardiovascular, cerebrovascular disease, coronary artery disease, diabetes, gastro-intestinal bleeding, hypotension, lung disease, neurologic disease, psychiatric disorder, and recurrent cellulitis or gangrene.

- **Results**
  - Table: Distributions of patient factors by vintage, region, and reported RUV (<200 ml/day vs ≥200 ml/day).
  - Figure 1: % patients with reported RUV ≥200 ml/day, among prevalent cross-section of patients at the start of each DOPPS phase.
  - Figure 2: Adjusted mortality hazard ratio of reported RUV ≥200 ml/day (versus <200 ml/day), by region and by DOPPS phase.
  - Figure 3: Interaction between diuretic use and reported RUV’s effect on mortality (p = 0.05).

Summary / Conclusions

- Maintenance of RUV differs by region and vintage, but has remained relatively stable in the DOPPS since 2002.
- Many patients on dialysis for two years or more have RUV, this may previously have been under-recognized.
- The relationship between RUV and survival appears to be dose-dependent.
- RUV seems to be beneficial among patients on diuretics and patients without lung disease, neurologic disease, psychiatric disorder, and recurrent cellulitis or gangrene.

**Table:** In this largest international analysis to date, few of the analyzed variables seemed to be consistently associated with RUV, but a substantial time trend identified over DOPPS phases (Figure 1). Among patients on dialysis less than 1 year, 59% reported RUV ≥200 ml/day, decreasing to 45%, 36% and 17% on dialysis 1-1.9 years, 2-2.9 years, and ≥3 years, respectively (Figure 1).

- Table: In this largest international analysis to date, few of the analyzed variables seemed to be consistently associated with the presence of reported RUV ≥200 ml/day across regions and vintage categories. Statistical significance was not consistently reached throughout all regions and vintage categories, even for the ‘discrete’ association between diuretic use and presence of reported RUV ≥200 ml/day.

**Figure 1:** % patients with reported RUV ≥200 ml/day, among prevalent cross-section of patients at the start of each DOPPS phase.

**Figure 2:** Adjusted mortality hazard ratio of reported RUV ≥200 ml/day (versus <200 ml/day), by region and by DOPPS phase.

**Figure 3:** Interaction between diuretic use and reported RUV’s effect on mortality (p = 0.05)