

## NUMBER OF DIALYSIS SESSIONS WITH HIGH ULTRAFILTRATION RATE ARE ASSOCIATED WITH POOR OUTCOMES IN AN INTERNATIONAL POPULATION OF HEMODIALYSIS PATIENTS

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### Background

Rapid correction of interdialytic weight gain during hemodialysis (HD), expressed as “ultrafiltration rate” (UFR) > 10 ml/kg/h has been associated with poor outcomes (Saran; KI 2006, Movilli; NDT 2007). Mechanisms proposed include arrhythmias secondary to cardiac stunning, hypotensive episodes and electrolyte disturbances. Repetitive dialysis sessions with a high UFR may be associated with an increasing risk for mortality.

### Methods

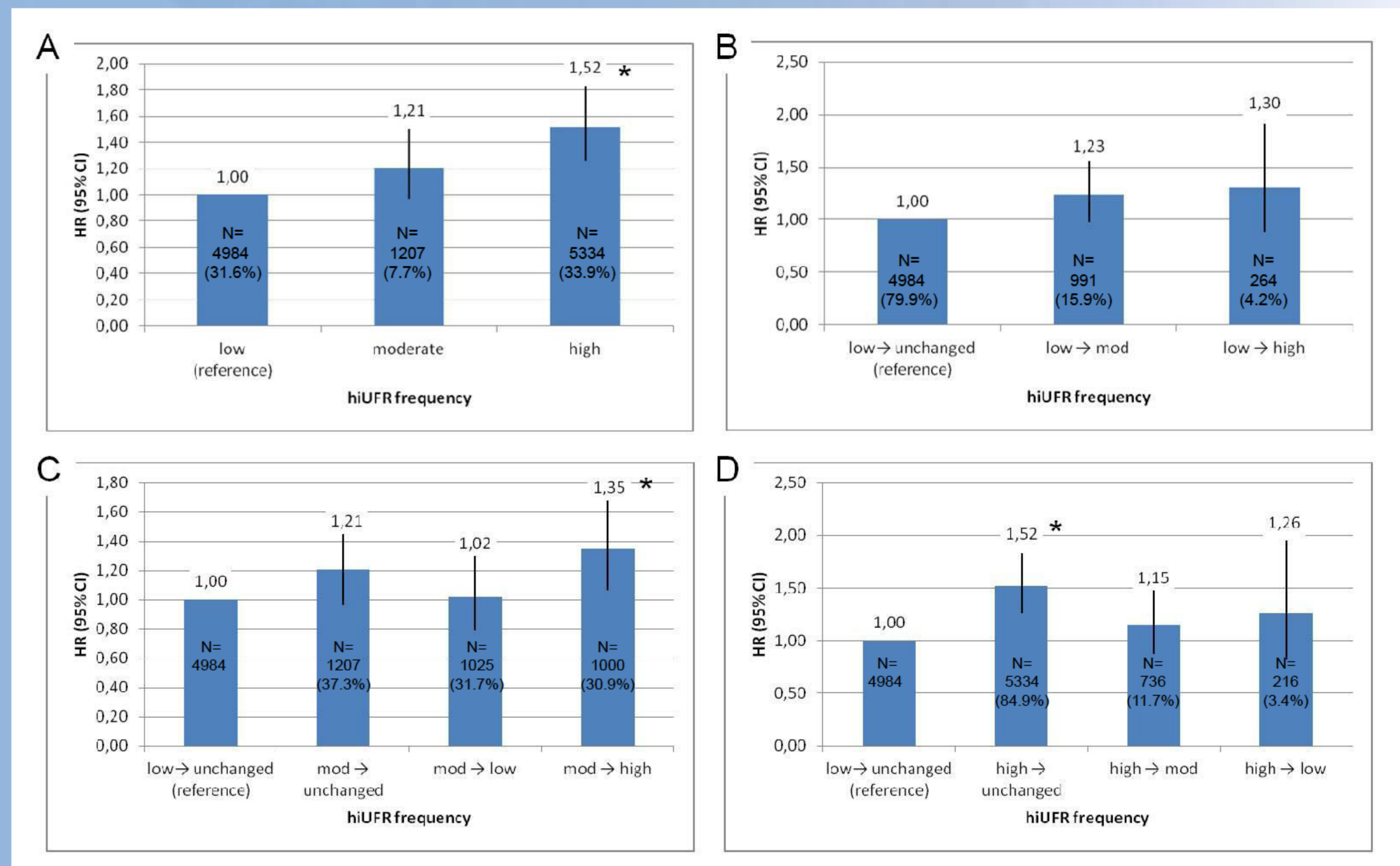
MONitoring Dialysis Outcomes (MONDO) is an international research collaboration to study longitudinal outcomes of HD patients in various regions of the world. It consists of HD databases from Renal Research Institute (RRI) clinics in the US, Fresenius Medical Care (FMC) clinics in Europe (EU), Asia Pacific (AP), and Latin America (LA), KfH clinics in Germany, clinics of Imperial College in UK, Hadassah Medical Center in Israel, and of University of Maastricht, The Netherlands (Usvyat, Blood Purification 2013).

Databases from RRI and KfH were queried to find all incident hemodialysis patients who had their first in-center treatment between 1/2000 and 12/2010 and who survived at least 12 months on HD (“baseline”). The fraction of sessions with net UFR > 10ml/kg/h (“high-UFR session; hiUFR”) was computed on a per patient basis in the first 6 months and between months 7 and 12 on HD. Patients were then stratified into nine groups depending on the proportion of hiUFR sessions during the first and second half of the baseline period, respectively.

Patient survival was assessed in months 13 to 24 from HD initiation. Cox proportional hazards models adjusted for age, gender, diabetic status, albumin, post-dialysis body weight, and hemoglobin were constructed to assess associations of hiUFR frequency during the first and second half of baseline, respectively, and survival.

### References

- Usvyat, L. A., Y. S. Haviv, et al. (2013). "The MONitoring Dialysis Outcomes (MONDO) Initiative." *Blood Purification* 35(1-3): 37-48.
- Saran, R., J. L. Bragg-Gresham, et al. (2006). "Longer treatment time and slower ultrafiltration in hemodialysis: associations with reduced mortality in the DOPPS." *Kidney Int* 69(7): 1222-8.
- Movilli, E., P. Gaggia, et al. (2007). "Association between high ultrafiltration rates and mortality in uraemic patients on regular haemodialysis. A 5-year prospective observational multicentre study." *Nephrol Dial Transplant* 22(12): 3547-52.



**Mortality and frequency of high-UFR sessions:** A) patients were grouped according to the frequency of high UFR sessions (“hiUFR”; average UFR >10ml/kg/h) in their first year on dialysis: low (<5% of all treatments received), moderate (5-20%), high (>20%). Mortality increased with more frequent hiUFR sessions. B) – D): Relationship between change in hiUFR frequency from the first to the second half of the baseline period, and mortality risk; B) increasing frequency of hiUFR from low to moderate or high appeared to be associated with higher mortality risk; C), D) at any level of baseline frequency, a reduction of hiUFR frequency in the subsequent 6 months appeared to reduce, and an increase appeared to increase HR of death compared to patients who remained in their respective category throughout the first year. Patients whose hiUFR frequency increased from moderate to high, and those whose frequency stayed high had significantly higher mortality risks than patients with consistently low frequencies of hiUFR. (\*: p<0.05, \*\*: p<0.001 compared with reference)

### Results

We studied 15,757 patients. Mean age was 64.9 years, 59.5% were male, 53.2% diabetic. Average UFR was 7.9 and 8.2 ml/kg/h during baseline and follow up, respectively. Patients who received a high (>20%) proportion of hiUFR treatments over the first year on HD showed a 52% increase in risk of death compared to patients who received a low proportion of hiUFR treatments (<5%)(Fig.1A). Approximately one fourth (26.9%) of all patients experienced an increase or a decrease of hiUFR sessions between the first and second 6 months on HD. Regardless of the hiUFR category in the first 6 months on HD, patients whose hiUFR sessions subsequently increased tended to have higher mortality risks, while patients whose hiUFR frequency decreased appeared to have lower mortality risks compared to patients who stayed in their respective categories.

### Discussion and Conclusion

It has been shown that the ratio of weight reduction to treatment time per dialysis session, expressed as an average net UFR of > 10 ml/kg/h, is associated with increased mortality (Saran; KI 2006, Movilli; NDT 2007). Our international study expands on this finding and shows that this risk varies with the number of treatments that are performed at or above this UFR. Incident patients who received more than 20% of HD sessions – or about three or more per month for a typical HD schedule – with a high UFR had increased mortality. If frequency of these sessions was reduced to less than 5% in the following half year, risk was not significantly increased compared to patients who had always received only few hiUFR sessions. Rapid weight reduction on dialysis is often a consequence of high interdialytic weight gain, which by itself is associated with mortality. These findings underscore that weight gain and treatment time are interrelated and point to the importance of balancing the necessary intervention of fluid removal with potential adverse effects of dialysis, such as aggressive UFR. Further studies need to define more clearly the best strategies for optimizing fluid management on dialysis.

