

Seasonal Trends of Inflammatory Markers: Does The Hemodialysis Access Play A Role?



Schantel Williams¹, Jochen G. Raimann¹, Yuedong Wang², Len Usvyat³, Peter Kotanko^{1,4}, and Frank Maddux³,
¹Renal Research Institute, New York, USA; ²Department of Statistics and Applied Probability, University of California, Santa Barbara, USA;
³Fresenius Medical Care-North America, Waltham, USA; ⁴Icahn School of Medicine, New York, USA

Background

- Seasonality of inflammatory markers in hemodialysis (HD) patients is well established (Guinsburg 2015). Furthermore it is well documented that those with a central venous catheters (CVC) as the primary dialysis access have higher levels of inflammatory markers as compared to those with arteriovenous fistulas or arteriovenous grafts and studies have shown hospitalizations due to access related infections increase in the summer (*Peer Kidney Care Initiative, 2015*). The relationship between vascular access type and seasonal variation of inflammatory markers has not been established and it is yet unclear if there is a seasonality in the prevalence of CVC as the primary access and if this has an additive effect on the seasonal variation of inflammatory markers. Here we analyze the seasonality of inflammatory markers and assess whether this variation coincides with seasonal variation of HD access prevalence.

Methods

- All patients receiving HD in Fresenius Medical Care North America (FMCNA) clinics from 1/2010 to 12/2014 were included in this study. Results from routine clinical measurements of inflammation were taken from the electronic medical records. Studied parameters included: neutrophils, lymphocytes, neutrophil-lymphocyte ratio (NLR), white blood cell count (WBC), albumin and enPCR. Monthly averages of these tests were calculated and plotted over the calendar year. The seasonal trend was estimated using separation of systematic trends over time by development of partial spline model (*Wang, 2011*). Each parameter analyzed was categorized by the seasonal trend: winter high, summer low (WHSL), winter low, summer high (WLSH), spring high, fall low (SHFL).

Results

- 354,572 patients were studied over a period 60 months. There were more CVC patients in spring and more non-CVC patients in the late summer (Fig. 1a). Considering dialysis access type usage, it would be expected to see more infection and spikes in inflammation surrounding CVC usage. However the following results were found: neutrophils, NLR and nutritional markers followed a WHSL trend (Fig. 1 b – d), WBC had a SHFL trend, and lymphocytes followed a WLSH trend. NLR peaked in January and WBC peaked late winter (March). Taken together, vascular access type did not have an impact on the seasonal variability of inflammatory markers.

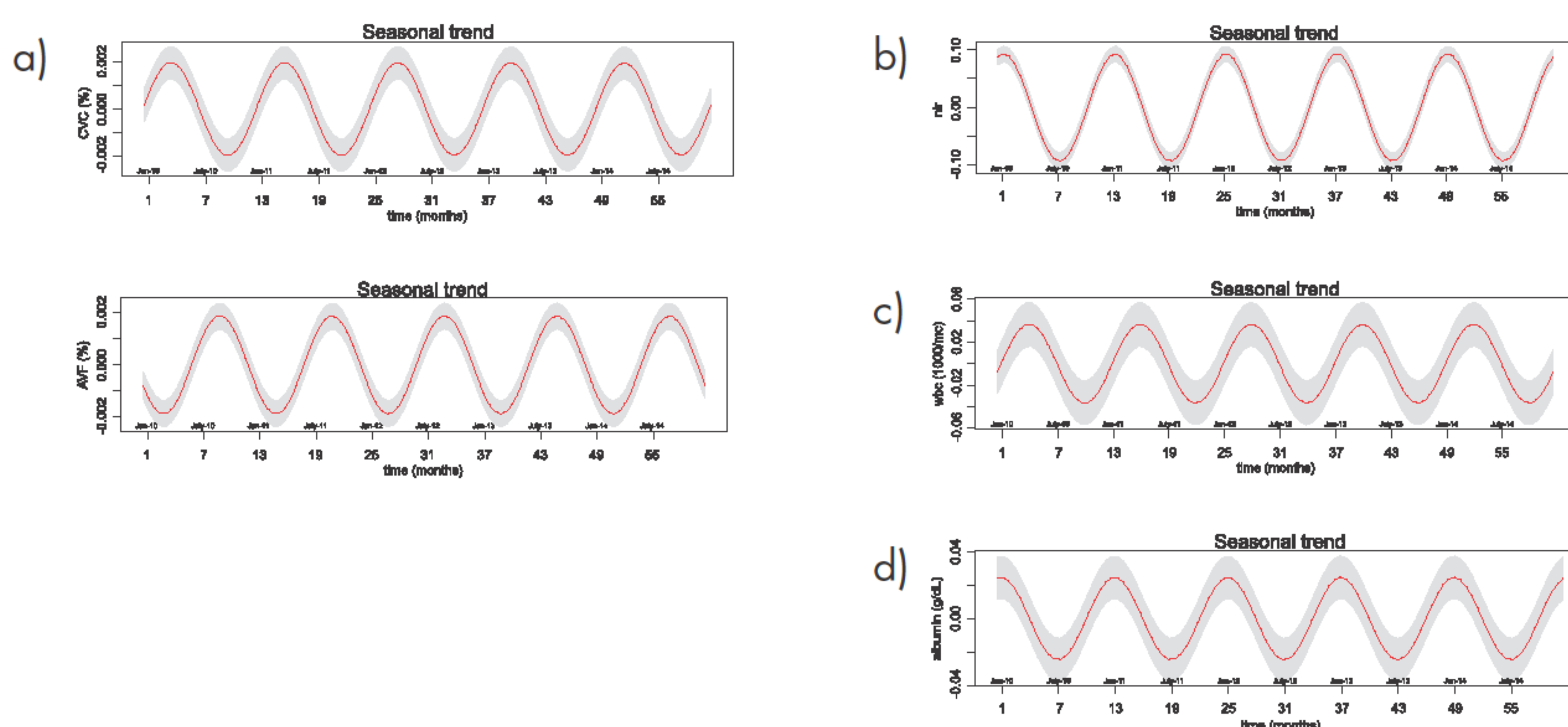


Figure 1 Seasonal Trends of CVC & AVF Usage and Inflammatory Markers:

- a) Central Venous Cather and Arteriovenous Fistula
- b) Neutrophil-to-Lymphocyte Ratio
- c) White Blood Cell Count
- d) Albumin

Discussion

- This analysis of data from a large US HD population corroborates the notion that inflammation is higher in the winter, which may, amongst other reasons including the seasonal variation of immunity (Dopico 2015), possibly be related to the cold and flu season. Based on our observations dialysis access type does not seem to coincide with seasonal changes of inflammation. In future studies additional markers of inflammation as well as analysis of seasonal trends by geographic region is needed. Seasonal variations of inflammatory markers may be useful information for clinicians to assist with more targeted interventions.

References

- Seasonal variations in mortality and clinical indicators in international hemodialysis populations from the MONDO registry. Guinsburg AM, Usvyat LA, Etter M, Xu X, Thijssen S, Marcelli D, Canaud B, Marelli C, Barth C, Wang Y, Carioni P, van der Sande FM, Kotanko P, Kooman JP; Monitoring Dialysis Outcomes (MONDO) consortium. *BMC Nephrol.* 2015 Aug 14;16:139. doi: 10.1186/s12882-015-0129-y.
- Seasonality of Hospitalizations for Pneumonia, Influenza, and Dialysis Access Infection *Peer Kidney Care Initiative, 2015* (CDRG and the Chief Medical Officers of 13 US Dialysis Providers), Minneapolis, MN NKF 2015 Spring Clinical Meetings Abstracts AKJD
- Wang Y. *Smoothing Splines: Methods and Applications.* New York, NY: CRC Press, Taylor & Francis Group; 2011.
- Xaquín Castro Dopico, Marina Evangelou, Ricardo C. Ferreira, Hui Guo, Marcin L. Pekalski, Deborah J. Smyth, Nicholas Cooper, Oliver S. Burren, Anthony J. Fulford, Branwen J. Hennig, Andrew M. Prentice, Anette-G. Ziegler, Ezio Bonifacio, Chris Wallace, John A. Todd. Widespread seasonal gene expression reveals annual differences in human immunity and physiology. *Nature Communications*, 2015; 6: 7000 DOI:10.1038/ncomms8000

Poster: SP610 | Topic: L8. Dialysis. Protein-energy wasting, inflammation and oxidative stress.
Schantel Williams, RN, schantel.williams@rriny.com; Jochen Raimann, MD PhD, Jochen.raimann@rriny.com
Renal Research Institute | 315 E 62nd ST 4th floor | NY, NY 10065

