New devices – like the toSense CoVa™ Monitoring System (the ‘Necklace’) – make non-invasive measurements prior to and during dialysis possible. The purpose of this study was to investigate if adverse events can be identified prior to occurrence through non-invasive monitoring. Additional objectives were to estimate ‘dry weight’ and to determine if evaluation of physiological parameters would identify hyperkalemia. The Necklace (Figure 1) is a non-invasive device that measures vital signs, thoracic impedance (TI) [1], stroke volume (SV), and cardiac output (CO) [2]. A non-invasive system will also sufficiently measure blood pressure (BP) and SpO2 [3]. All measured data are wirelessly sent via a Gateway and then forwarded to a Web-based System.

During dialysis, it made frequent measurements of SV, CO, TI, heart rate (HR), and 37 patients receiving dialysis at UF Health Shands Hospital (Inpatients; Table 2) were monitored using the Necklace during one or more dialysis sessions. Demographic information and a summary of the data captured are presented in Table 1. Before dialysis, research personnel applied the Necklace to patients. In this study the difference between pre- and post-weight and TI changes during dialysis were calculated. Hypotheses and UF recommendations were evaluated. Early analysis indicates that net fluid removed correlates better with changes in weight, as compared to TI. However, weight is not always available. While this parameter is currently the best estimator for UF goals, too much fluid, or not enough, may be removed when the weight is the only metric. Evaluation of the trends in TI and SV, and BP during a dialysis session may provide insights into a patient’s true dry weight, and therefore guide UF rate as well as UF goals. For patients with normal ejection fraction, it is expected that TI would drop during sessions versus net fluid removed, while the CO is unchanged, which may indicate that the UF rate could be increased and along with possibly the UF goal. Our hypothesis, as well as rate and goal recommendations for UF, are shown in Table 2. Further data analysis and additional trials are needed to confirm these hypotheses and UF recommendations.

During dialysis, SV and CO were measured. A next-generation system will also measure thoracic impedance (TI) [1], stroke volume (SV), and cardiac output (CO) [2]. A non-invasive system will also sufficiently measure blood pressure (BP) and SpO2 [3]. All measured data are wirelessly sent via a Gateway and then forwarded to a Web-based System.