QUALITY IMPROVEMENT PROJECT TO CONFIRM THE ACCURACY OF A VOLUMETRIC ULTRAFILTRATION SYSTEM

Robert Isom, MD, Kathy Cagan, RN, BSN, CNN, Marlys Ludlow, RN, MSN, CNN

Susan Murphy, RN, BSN, CNN, Xingxing Chen, MD

Background

Critically ill patients with acute kidney injury or end-stage renal disease requiring renal replacement therapy (RRT) are often fluid overloaded, depending on the need for fluid resuscitation in the course of their illness. Fluid overload may manifest with pulmonary edema, pleural effusions, or diffuse congestion with anasarca and may hinder progress during weaning from mechanical ventilation, or participation in physical therapy. For such patients, the optimal RRT modality for mobilizing fluid quickly yet safely is not known. In our institution, we commonly employ a strategy of daily RRT with intermittent hemodialysis sessions (including ultrafiltration (UF)) alternating on non-dialysis days with a session of UF alone, with the goal of rendering the patient clinically euvolemic with time. The NxStage System One device ("NxStage") was originally developed for use in home hemodialysis. NxStage uses a proprietary volumetric balance chamber system for measuring and reporting effluent volume in real-time. We could find no published reports documenting the accuracy of NxStage's reported effluent volume at the end of an intermittent UF session, when compared with a criterion standard of physically collecting and directly measuring the effluent volume.

Methods

As part of an internal QA project, we measured total effluent volumes in 75 consecutive UF treatments, and compared the nurse-recorded volume at the end of a treatment session against that reported by the machine.

When the measured effluent volumes were compared with machine reported volumes, the line of identity had a slope of 1.0 with an R-squared value of 0.99. (figure 1) In a Bland-Altman Plot, we found that the 95% limits of agreement between the two methods of fluid measurement ranged from -0.16L to 0.16L with no bias at higher or lower UF volumes. (figure 2)

Results

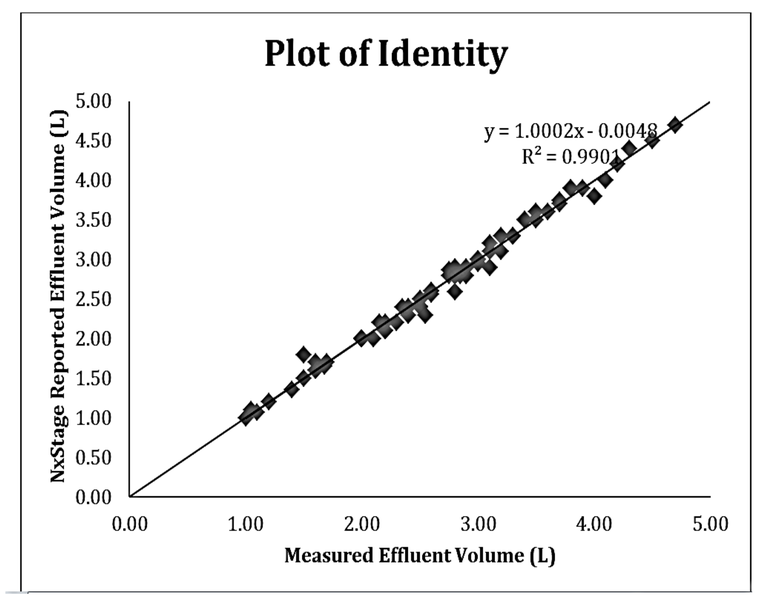

Figure 1

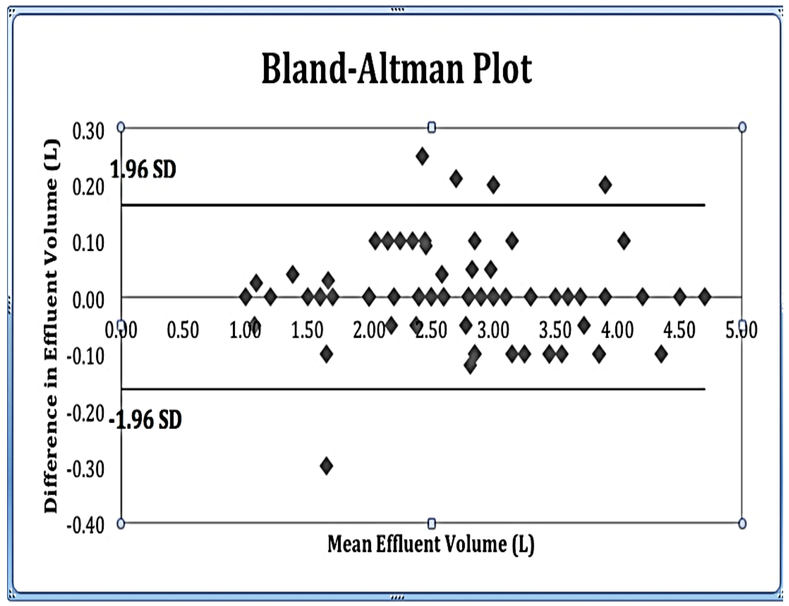

Figure 2

Conclusion

We conclude that the volumetric system employed by NxStage for effluent volume measurement is highly accurate and allows the clinician to rely on machine-reported effluent volumes with a high degree of confidence.

Bibliography

Murray, Patrick, MD, CRRT Volumetric Balancing Fluid Management for the ICU. www.Nxstage.com

Acknowledgements

Stanford Dialysis Staff Nurses