

# Observational in-vivo evaluation of the Neutron™ needlefree catheter patency device and its effects on catheter occlusions in a home care setting

## BACKGROUND

Despite continued efforts by healthcare practitioners, occlusions in central line catheters (CVCs and PICCs) remain a significant issue that can result in delays in critical patient care, increased risk of infection, and an increase in healthcare costs.

While the average rate of occlusions among central line patients in the United States is approximately 25%,<sup>1,2</sup> many patient populations are affected by disproportionately high rates of catheter occlusion that can negatively impact care. One such population is home care patients, whose age, acuity levels, and co-morbidities—combined with a care setting that by its very nature provides less direct clinical oversight—can lead to higher occlusion rates among this population. One outcomes analysis involving more than 50,000 home infusion patients reported “more than one third of the catheters studied (44%) reflected occlusions occurring in fewer than 7 days.”<sup>3</sup>

One important cause of catheter occlusion is blood reflux, or when blood backs up into a catheter. Blood reflux can lead to an intraluminal thrombus, which results in an inability to infuse IV fluids or medications and an inability to withdraw blood. Blood reflux can be caused by external factors such as an IV bag running dry or an infusion pump stopping, connecting and disconnecting a syringe or administration set, or syringe plunger rebound. However, reflux can also be caused by internal changes in patient venous pressure resulting from movement, coughing, sneezing, and vomiting. Home care patients may be especially susceptible to internal factors that can cause reflux.

In an effort to reduce the incidence of catheter occlusions among this at-risk patient population, Sharp Home Care in San Diego, CA implemented a three-month trial of the Neutron™ catheter patency device (ICU Medical, Inc.). The Neutron is a new needlefree vascular access device and is the only device that has received clearance by the FDA to claim the ability to prevent both internal and external causes of blood reflux into a catheter.

The Neutron device utilizes a unique design that integrates anti-reflux technology into an intuitive, easy-to-use needlefree connector design. Other technologies currently on the market are limited in their ability to effectively address all causes of reflux. Positive displacement needlefree IV connectors, for example, only impact blood reflux caused by connecting and disconnecting a syringe or an administration set.

## MATERIALS AND METHODS

Sharp Home Care is part of the Malcolm Baldrige Quality Award-winning Sharp Health System. The group serves a more elderly and high acuity patient population than that of its sister group, Sharp Home Infusion Services. In addition to chronic pain management therapy, IV antibiotics administration, and total parenteral nutrition (TPN) patients, Sharp Home Care treats many patients, including chemotherapy patients and those suffering from Crohn’s Disease, whose treatments leave them more susceptible to blood clotting and catheter occlusions.

Prior to converting from the MaxPlus® positive displacement needlefree connector (CareFusion) to the Neutron on all central line catheters, the clinical team at Sharp tracked occlusion management patients and reported three months of baseline data that included both the total number of occlusion patients and the percentage of the total population that these patients represented. When converting to Neutron, there were no other changes made to clinical protocol—such as clamping, flushing, or swabbing—and no additional technology changes were made so that the only variable pre- and post-conversion would be the connector itself. After converting to Neutron, the clinical team gathered three months’ worth of occlusion data in the same way they had prior to conversion.

## RESULTS

In the three months following conversion to the Neutron catheter patency device, Sharp Home Care experienced a 50.7% reduction of catheter occlusions. The average catheter occlusion rate with MaxPlus the three months prior to conversion was 32.9%. The average occlusion rate in the four months following conversion to Neutron was 16.2%. The transition month of July was not counted in these results because during that month patients had a mix of MaxPlus and Neutron connectors attached to their catheters.

TABLE

	MaxPlus			Neutron			
	April	May	June	July	August	September	October
Occlusion Management Patients	7	7	12	6	8	7	8
Total Patients	22	31	27	26	52	43	47
Occlusion Percentage Rate	31.8	22.6	44.4	23.1	15.4	16.3	17.0
Average MaxPlus Occlusion Percentage Rate				32.9%			
Average Neutron Occlusion Percentage Rate				16.2%			
On Average Neutron Lowered Occlusion Rates				50.7%			

The clinicians leading the Neutron trial reported that there is a 1:1 relationship between the reduction of catheter occlusions and the use of a tissue plasminogen activator (tPA) to breakdown of blood clots and maintain catheter patency. Accordingly, the Neutron was able to contribute to a 50.7% reduction in the use of tPA with this patient population.

## CONCLUSION

The Neutron catheter patency device can help enhance patient care and safety by reducing the risk of catheter occlusions, allowing clinicians to minimize delays in therapy and procedures and decrease the need for and risks of expensive declotting agents such as tPA to maintain catheter patency.

### References

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3. Moureau N, Poole S, et al. Central Venous Catheters in Home Infusion Care: Outcomes Analysis in 50,470 Patients 13-10:1009-1016, October 2002