

Introduction

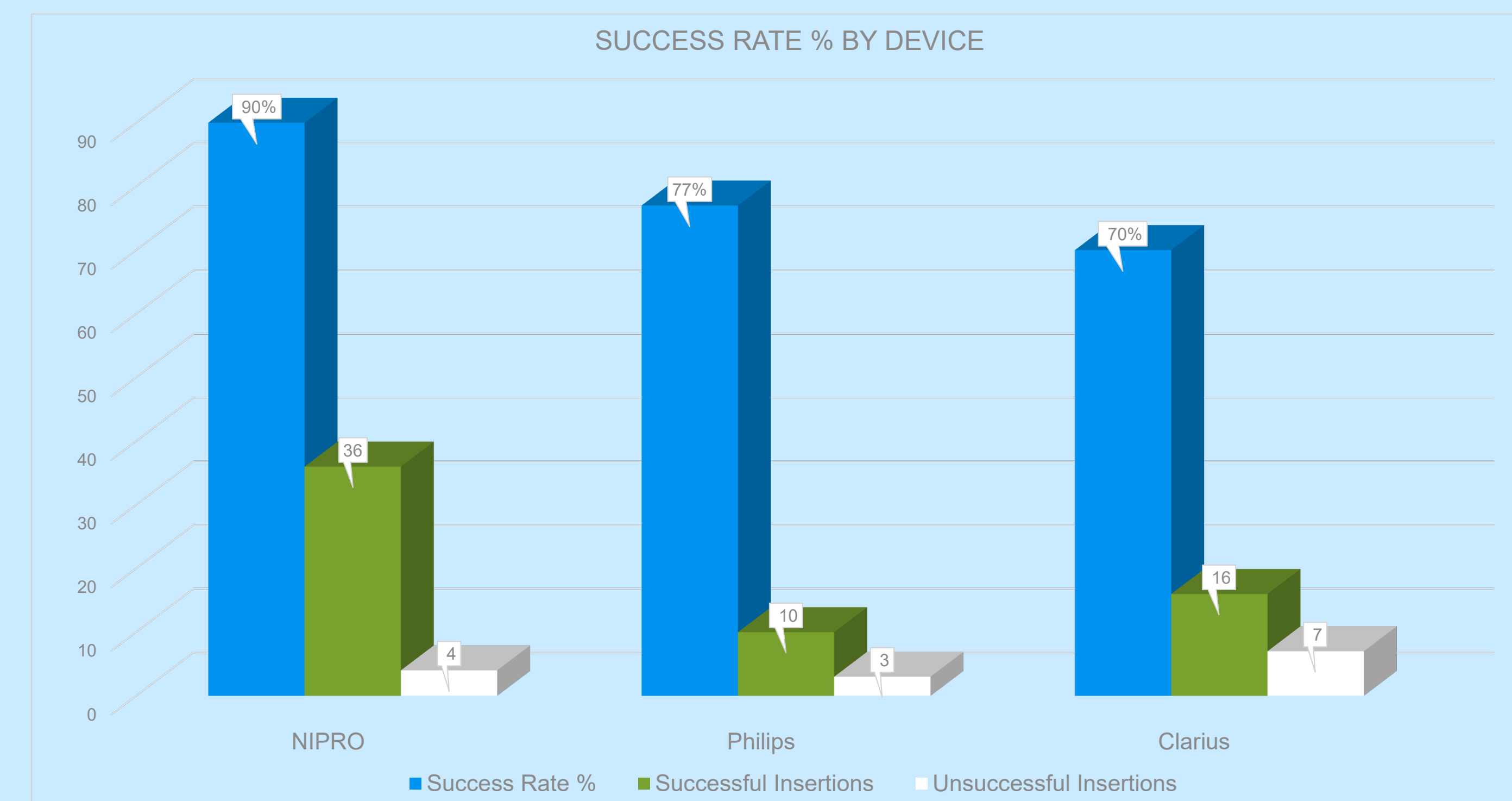
Peripheral intravenous (PIV) catheter insertion is among one of the most common invasive procedures in patients in the emergency department, inpatient ward, and intensive care units (ICUs)¹. PIV insertion based on traditional landmarking (presence of visible or palpable veins), is complicated by causing delays in patient care or failure rates in up to 26% of patients, often due to factors including body habitus, age, or chronic comorbidities². Thus, ultrasound devices can aid providers in placing PIV catheters and have demonstrated to improve the rate of success during insertion³. At a regional health care facility in Ontario, Canada, three ultrasound devices were trialled by ICU RNs to determine the most appropriate device to implement and provide subsequent education on regarding ultrasound guided PIV insertion throughout the health care facility. The use of ultrasound guided technology provides an increase in insertion success rates, decreases the number of attempts, increases dwell time, and in turn, improves patient satisfaction. The aim of this quality improvement study was to determine the most appropriate ultrasound device to implement at a regional acute care facility. Device selection was based on device ease of use, advantages, disadvantages, and successful insertion attempts.

Methods

A total of 76 insertions were completed across three devices on various units across the acute care facility. The product, number of successful attempts, unsuccessful attempts, success rate, ease of use on a scale of 1 to 5, as well as the advantages and disadvantages of each device were documented by RN staff. The success rates for each device was determined using the percentage of successful IV insertions among the total number of IV insertions documented.

Results

Device 1 (IP-ECHO, Nipro Canada, Ontario, Canada) had a success rate of 90%, Device 2 (L20 HD₃, Clarius, British Columbia, Canada) had a success rate of 70%, and Device 3 (Lumify, Philips, Ontario, Canada) had a success rate of 77%. Both Device 1 and 3 had an ease of use of 4 on a scale of 1 to 5, and Device 2 had an ease of use of 2.5 on a scale of 1 to 5. Advantages and disadvantages included topics related to battery life, connectivity, visualization (gain/depth), ultrasound probe temperature, functionality, and ergonomics. The main advantages to Device 1 were related to functionality, ergonomics, connectivity and that no additional viewing device or application was required for use.



NIPRO	Philips	Clarius
<p>Pros</p> <ul style="list-style-type: none"> • Light and easy to maneuver • Learning technique from product Clinical Specialist/rep • Size of the screen • Ergonomic feel • Probe/screen integrated • Easy start up <p>Cons</p> <ul style="list-style-type: none"> • Battery life • Image grainy at times • Buttons not easily accessible to change gain/magnification/freeze 	<p>Pros</p> <ul style="list-style-type: none"> • Easy set-up <p>Cons</p> <ul style="list-style-type: none"> • Cord of ultrasound probe in the way • Lengthy start up time • Difficult to visualize needle tip, even after gain/depth adjusted • Difficult to prop up screen, separate screen was heavy and kept falling 	<p>Pros</p> <ul style="list-style-type: none"> • Large screen • Clear picture <p>Cons</p> <ul style="list-style-type: none"> • Screen froze during insertion • Connectivity issues • No internal fan, so ultrasound probe because hot to touch quite quickly • Placement of on/off button was not ideal, was easy to accidentally push when scanning/inserting

Conclusions

Device 1 was found to have the highest success rate, followed by Device 2. Devices 1 and 2 had an equivalent ease of use score, higher than Device 3. The acute care facility utilized this data to determine which device to implement for ultrasound guided IV insertion starting with RNs in the ICU, and potentially the rest of the facility. In conclusion, Device 1 was determined by acute care facility to be the most appropriate device to implement. The plan for education regarding ultrasound guided PIV insertion within the acute care facility will be to educate RN members of the Critical Care Outreach Team first, followed by all RNs in the ICU.



References

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- ³ Millington, S.J., Hendin, A., Shiloh, A.L., & Koenig. (2020). Better with ultrasound: Peripheral Intravenous Catheter Insertion. *CHEST Journal*, 157(2), 369-375.