

## **Emergency nurse use of ultrasound guidance for vein cannulation: a three site quality improvement initiative and registry**

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**Background:** AHS suggests a limit of four attempts at traditional peripheral vascular access, however there are limited current options at many sites for these patients. Between 10 and 25 percent of patients present to the emergency department (ED) with difficult to cannulate veins. In these patients ultrasound guided catheter placement decreases the number of IV attempts, decreases time to successful IV placement, improves patient satisfaction, and in adult patients decreases central line use. Emergency nurses have been shown to successfully employ ultrasound-guided peripheral vascular access. Physician and Nursing clinical practice guidelines place a high recommendation for this practice. Despite the evidence and recommendations, in Canadian EDs, with notable exceptions there remains minimal standard procedural uptake or ED research.

**Implementation:** For difficult peripheral intravenous access a standardized ultrasound guided nurse performed procedure was implemented in 2016 at the University of Alberta (UAH) ED, in 2017 to the Royal Alexandra Hospital (RAH) ED, and in 2018 the Misericordia Community Hospital (MCH) ED. An education module was created that included didactic learning and an exam, approximately one hour of in-person training which included vessel and structure identification and cannulation practice on a gel model until competence was achieved, and finally three successful mentored starts prior to independent practice. Mentorship ensured good technique was followed, provided additional tips to improve practice, and most importantly ensured an IV attempt was on a patient with veins amenable to a novice ultrasound provider attempt (e.g. if a patient was assessed to be a challenging ultrasound start with limited vein options the mentor would place the IV in much the same way as traditional IV placement mentoring). The ultrasound technique taught was a single operator, short access or traverse approach with dynamic tip tracking where the catheter needle tip is continually visualized as the target vessel is cannulated. Catheter placement is confirmed with the catheter tip visualized intraluminal and with an ultrasound visualized saline flush. This study reports on the first 30 nurses trained at the UAH, 12 at the RAH and 6 at the MCH.

**Evaluation Methods:** A quality improvement (QI) registry documented complications and was used to improve education, training, and procedural success. The two QI study objectives were 1) to determine ultrasound program success for all sites by comparing QI results to historic results from other programs 2) to determine if an abbreviated training regimen (shorter than previously documented for adult patients in Canada) can be used to train nurses in EDs with minimal support or pre-existing experience with UGIVC.

Staff who had achieved independent practice voluntarily completed a tracking form whenever an ultrasound procedure occurred. Completed forms were assessed on a continual basis for any opportunities for improvement. Qualitative feedback was also obtained from informal interviews, a focus group, and a survey of the newly trained nurses. Feedback was thematically analyzed and grouped into themes for reporting. Data and trends from the registry were used to reinforce

education to promote greater procedural success. Also identified were questions to add to the tracking form to improve the usefulness of the registry. Ongoing review will identify if these efforts improve practice. Opportunities for system improvements were managed through consultation with all stake holders including nursing management, CNEs, physicians, and bedside nurses. Program evaluation will shape all aspects of the program development.

**Results:** At the UAH, RAH, and MCH respectively; the mean number of failed IV attempts [SD] before UGIV was: 4.2 [2.5]; 3.4 [2.1]; 4.77 [2.9]; while first pass success by novice provider (1-10 UGIV starts) was 76%; 66%; and 62%. Success increased rapidly with the number of starts and plateaued after 100. Complications occurred in 4/374 (1%) starts. Qualitative feedback suggests that provider and patient positioning, and equipment preparation improve individual success; engaged staff and a QI registry improve program success; even in cases with more reported pain, patients prefer UGIV to traditional placement.

### **Advice and Lessons Learned**

- 1) Creating an ultrasound guided peripheral IV program and quality registry that supports emergency nurse use of this procedure is possible. First pass and overall catheter success rates and low reported complications are reassuring.
- 2) The quality registry has provided useful data to support practice and suggest modifications to the education and site specific system level supports provided. An example of system feedback is that newly trained staff need to have a clinical assignment that allows the opportunity to utilize the procedure. Also enough mentors are required to support new staff. A third interesting system issue identified is the possible effects of the training on traditional difficult IV placement skill and how to best support this.
- 3) Emergency physicians and nurse champions can play a key supportive role to ensure the success of the program.