

Patient Satisfaction with Nurse Placed Ultrasound Guided Peripheral IV

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Abstract

Objective: Ultrasound (US) guidance for procedures is a well-established adjunct that improves the quality of patient care. Specifically, we assess the impact of nurse performed ultrasound-guided peripheral IV (USGPIV) placement on patient satisfaction with the procedure.

Methods: We performed a randomized, prospective controlled study. 10 emergency department (ED) nurses were trained on USGPIVs which included a didactic and supervised placement of 10 US-guided IVs on live subjects. Another cohort of 10 ED nurses received a didactic on using traditional techniques to obtain IVs on difficult vascular access patients. Adult patients were enrolled based on strict inclusion criteria which identified them as having difficult vascular access. Once enrolled, the subjects were randomized into either the US-guided arm or the standard of care (SOC) arm, where the designated study trained nurses carried out peripheral IV placement. If the study nurse failed at IV placement, then a rescue IV was attempted by a non-study provider. The study was stopped once an IV was successfully placed. The patient was given a brief verbal survey to rate their experience from 1-10 (1 was poor and 10 was excellent) regarding the IV technique used by the study nurse.

Results: 124 subjects were enrolled and randomized. 62 patients remained in the US-guided study arm and 53 patients in the SOC arm (2 were excluded due to lack of study nurse availability, and 7 patients were lost to follow-up). The median patient satisfaction in the US-guided group was 10 versus 8 for the SOC arm ($p=0.04$)

Conclusion: Our study demonstrated that patient satisfaction is enhanced when nurses utilize the US-guided approach compared to the SOC palpation technique to establish an IV in difficult access patients. We recommend that nursing staff incorporate this method to IV access in difficult patients to enhance the quality of their patient care experience.

Keywords: Ultrasound guided IV; Peripheral IV; Patient satisfaction

Introduction

Patient satisfaction is a valued and highly sought after predictor of quality of care in the emergency department [1,2]. Attaining high patient satisfaction scores comes with financial incentives for hospitals. Since 2007 the Centers for Medicare and Medicaid Services (CMS) has tied portions of hospital reimbursement to quality measures based on how patients rate their hospital experience on the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) patient satisfaction survey [3,4]. There are numerous factors that weigh into a patient's satisfaction of their experience in the ED, both interpersonal and technical. A survey of 618 ED patients by Rhee et al. demonstrated that nurse technical performance corresponded significantly with overall patient satisfaction [5]. The placement of an intravenous catheter is one of the most widely used, and important technical skills undertaken by nurses. Successful IV access facilitates patient care, allowing for the administration of lifesaving medications, fluids and antibiotics. Despite the regularity in which nurses place IVs, sometimes this fundamental intervention can be difficult to achieve in a subset of patients known to have poor vascular access.

The failure to obtain an IV in patients presents a unique challenge in the emergency department. These patients with difficult IV access

generally consume significant time as they can require as much as 30 minutes and upwards to obtain vascular access using traditional blind technique [6,7]. Furthermore these patients also consume significant resources – usually requiring multiple needle sticks by multiple providers. Delays in obtaining IV access, can lead to a prolonged treatment course and potentially place the patient at risk for decompensation during the period when IV access is not available. Common alternatives to the failed blind IV placement include continued attempts at blind IV placement by a more experienced nurse or IV team, placement of a central venous catheter (CVC), or placement of an ultrasound guided peripheral IV (USGIV). The placement of USGIVs has quickly become the rescue method of choice for failed blind IV access, mostly due to its improved safety profile when compared to riskier alternatives such as CVC [8,9]. USGIV placement not only reduces the number of CVCs needed simply to obtain vascular access but, in doing so, also reduces the incidence of complications posed by CVC placement such as infection, large artery puncture, and pneumothorax [10,11]. Typically, physicians are delegated to the task of obtaining an USGIV when blind IV placement fails– which is often time consuming, disrupts work flow and takes away from patient care. To alleviate this additional workload from physicians, there has been a recent push to train ancillary staff in the placement of USGIV.

Nurses in the ED are at the forefront of obtaining vascular access and are highly skilled at obtaining blind IV access on patients with difficult access. It would only seem natural to provide nurses with the additional skill of utilizing ultrasound to guide IV placement in this patient population. Several centers have developed protocols in training nurses in USGIV placement and previous research has shown that nurse placed USGIV has comparable success rates to physicians [12-16]. However, there is currently limited research comparing nurse placed USGIV versus standard blind IV placement. We propose a randomized, prospective study comparing patient satisfaction in IV placement by a nurse using either USGIV or blind technique. Specifically we are targeting difficult access patients because it is in this population that using ultrasound as an adjunct has the greatest clinical benefit and potential to impact patient satisfaction.

Methods

Study design

This was a prospective, non-blinded, randomized observational study assessing patient satisfaction with nurse-performed ultrasound-guided versus blind technique for IV placement in difficult access patients.

Setting and population

The study was conducted at a single site, tertiary care, level I trauma center with an annual Emergency Department census greater than 125,000 visits. Patient enrollment took place from November 2014 to July 2015. This study was approved by the institutional review board at our institution and signed informed consent was obtained by a trained researcher for each enrolled patient.

Nurse enrollment and training

All ED registered nurses with at least 2 years of experience and in good clinical standing were notified of the study. Nurses who volunteered to participate were randomized into either the US-guided or the SOC method of obtaining peripheral IVs. Nurses were assigned to a study arm using block randomization from the SAS program by bio-statistical staff at the Research Institute. The study nurses had no previous formal training in ultrasound or ultrasound for vascular access. The experimental group of 10 nurses underwent training on US-guided peripheral IVs which included a didactic and supervised placement of 10 US-guided IVs on live patients. Supervision of US-guided IV placement was performed by ultrasound trained emergency physicians and a cohort of ultrasound credentialed nursing leadership. The control group of 10 nurses were given a didactic on using traditional techniques to obtain peripheral IVs on difficult vascular access patients.

Patient enrollment

A convenience sample of patients, presenting to the ED, were enrolled and randomized into one of the two proposed IV cannulation methods— US guided peripheral IV placement or SOC. Initial screening was carried out by the ED staff, shortly after patient arrival. Research assistants carried out recruitment and enrollment during regular business hours on weekdays.

Patients eligible for the study were required to meet all of the inclusion and exclusion criteria outlined in Figure 1. Study

participation was purely voluntary and written informed consent was obtained. Upon receiving consent, sealed envelopes containing the randomized IV access technique were revealed at bedside. The randomization scheme with varying block sizes was created by a biostatistician using a computer-generated program. After randomization, the appropriate study-trained nurse was attained to attempt placement of a peripheral IV. A functional IV was confirmed by extraction of non-pulsatile blood and/or infusion of a normal saline flush, without evidence of extravasation. If the study nurse failed at IV placement, then a rescue peripheral IV was attempted by a non-study nurse using either the US-guided or SOC technique or ultimately a peripherally inserted central catheter (PICC) placed by the hospital PICC team or a CVC placed by a physician. The study was stopped once a functional IV was successfully placed.

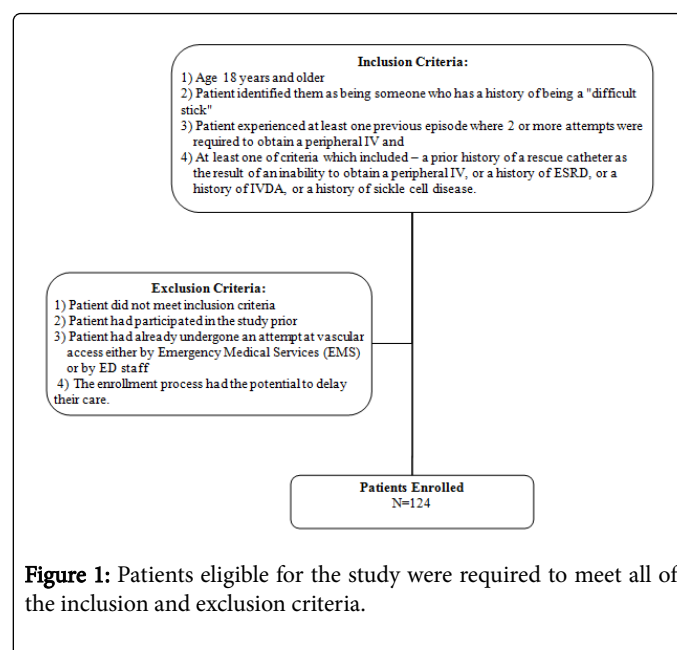


Figure 1: Patients eligible for the study were required to meet all of the inclusion and exclusion criteria.

Data collection

The data collection at bedside from both study arms included past medical history (ESRD, Sickle Cell disease, IVDA), blood pressure and heart rate on arrival. The data collected through the electronic medical record included age, gender and body mass index (BMI).

Once a functional IV was established, trained research staff provided the patient with a brief verbal survey evaluating their satisfaction with the IV technique used by the study nurse. All patients were asked to rate their experiences on a scale from 1-10 where 1 was considered poor, 5 was fair, and 10 was excellent.

Data analysis

The two study arms were compared on demographic characteristic and satisfaction data. To compare results between the two study arms, Wilcoxon rank sum tests were used for continuous data while chi-square or Fisher's exact tests were used for categorical data. Intent-to-treat analysis was used. The SAS System for Windows v9.3 was used to calculate all statistical tests with the exception of the confidence interval for the odds ratio, which was calculated using StatXact 10. Two-sided p-values <0.05 were considered statistically significant.

Results

A total of 124 patients were enrolled and randomized into the study. 62 patients remained in the US-guided study arm and 53 patients in the SOC arm (2 were excluded due to lack of study nurse availability, and 7 patients were lost to follow-up).

When comparing our patient demographic there was no significant differences in age, gender, obesity defined as BMI \geq 30, history of IVDA, history of ESRD, history of sickle cell disease, heart rate, mean arterial pressure. Detailed patient demographics are listed in Table 1.

	USGPIV (n=63)	SOC (n=59)	p-value (for overall group)
Age (median years)	61	62	(0.96)**
Gender			(0.83)*
Male	16 (25.4%)	16 (27.1%)	
Female	47 (74.6%)	43 (72.9%)	
Medical History			
Obesity (BMI \geq 30)	36	30	(0.49)*
IVDA	3	1	(0.62)**
ESRD	16	12	(0.37)*
Sickle Cell	1	1	(1.00)**
HR (median)	84	88	(0.46)**
MAP (median)	91	95	(0.28)**
USGPIV=Ultrasound-Guided Peripheral IV SOC= Standard of Care IVDA=IV Drug Abuse ESRD= End-Stage Renal Disease HR=Heart Rate MAP=Mean Arterial Pressure *chi-squared analysis **wilcoxon rank sum analysis ++fisher's exact analysis			

Table 1: The median patient satisfaction with IV technique in the US-guided group was 10 compared with 8 for the SOC arm (p=0.04).

Discussion

Improving patient satisfaction is at the forefront of providing quality care in the emergency department. The emergency department is frequently under scrutiny to find ways to improve patient satisfaction, which is a metric that is routinely monitored through patient surveys such as Press Ganey. Similar to the implementation of HCAHPS, there is much anticipation that soon patient satisfaction in the ED will be tied to financial reimbursements from CMS, especially given that in 2016 CMS begun testing its own ED survey, the Emergency Department Patient Experience of Care (EDPEC) Surveys [17]. We present a means to improve this patient experience metric in the ED. Since nurses place the majority of IVs in the ED, it would be helpful for

nurses to be educated in alternative methods to blind IV placement technique when challenged with a patient known to have difficult IV access. Our study selected a strictly defined population of patients who have the most difficult vascular access. In this patient population, we showed that when nurses initiated IV access using either USGIV versus the blind technique, these patients were more satisfied in the placement of an USGIV.

When nurses can provide an improved experience with IV placement under ultrasound guidance, there are many associated positive effects on overall ED experience both from the perspective of the patient and the nurse. As nurses become more skilled at placing USGIVs in patients with difficult vascular access, it has the potential to decrease patient wait times for diagnostic tests including the results of blood tests and radiographic imaging requiring IV access such as CAT scans. Furthermore, increased use of USGIV placement by nursing staff, reduces the need to place patients at risk of undergoing more invasive procedures to obtain IV access such as a CVC. This not only reduces the incidence of complications associated with CVC placement, but also reduces the time and resources allocated to the procedure as well as the associated costs. Lastly, from a nursing standpoint, nurse placed USGIVs expands a nurse's skill set by adding a new and improved arsenal for obtaining IV access in difficult vascular access patients. Additionally it also provides nurses with substantial autonomy in that they no longer need to interrupt physicians to obtain IV access unless in the case of CVC placement.

There have been previous studies which have reported patient satisfaction comparing USGIV to blind IV technique. However, these studies evaluated USGIVs placed by either physicians or ED technicians (EDT), not by nurses. Two studies, one randomized and the other nonrandomized, showed physician placed USGIVs had higher patient satisfaction scores of 8 and 8.7 (out of 10) compared to blinds IVs with scores of 7 and 5.7 (out of 10) [7,18]. Similarly, a nonrandomized study of USGIVs placed by EDTs showed improved patient satisfaction scores of 7.7 (out of 10) versus 4.4 (out of 10) for blind IV placement [19]. Another EDT study, which was observational, reported a mean score of 9.2 out of 10 for overall patient satisfaction with the USGIV procedure and 4.4 out of 5 satisfaction score with USGIV when compared to a patient's experiences with any previous blind IV techniques [20].

We ask the question: why does it matter that patients with poor IV access are more satisfied with nurses placing USGIVs compared to the traditional blind technique? The answer may be explained by current studies which show that patients experience varying degrees of stress, anxiety and pain during the placement of peripheral IVs [21-23]. A large study of 1.7 million satisfaction reports conducted by Wolosin showed that patients were dissatisfied with IV placement [24]. In this study, patients scored the skill of the person placing the IV low on a scale of "likelihood of recommending." Given patients' poor overall perception of IV placement, that dissatisfaction would only worsen in a patient with risk factors for poor vascular access who typically can require 3.6 attempts for successful IV placement by blind technique and can require upwards of 120 minutes to obtain access when multiple providers are involved [6, 19]. Examples of patients at risk for poor IV access include those with comorbid obesity, injection drug use, and end stage renal disease [25-28]. With the rising prevalence of these conditions, we predict that patients with difficult IV access are only going to become more prevalent over time [29-31]. Given this predicament, it would behoove a hospital system to train staff that place IVs, the majority of whom are nurses, in more comforting IV

placement techniques in patients with known difficult vascular access, such as USGIV.

Conclusions

Our study demonstrated that patient satisfaction is enhanced when nurses utilize the US-guided approach compared to the SOC palpation technique to establish an IV in difficult vascular access patients. We recommend that nursing staff incorporate this method to IV access in difficult patients to enhance the quality of their patient care experience. The impact on overall ED satisfaction needs further exploration.

Ethical Declaration

The study authors had full access to all the data in the study, take responsibility for the integrity of the data and the accuracy of the data analysis as well as the decision to submit for publication. This manuscript, as submitted or its essence in another version, is not under consideration for publication elsewhere, and will not be published elsewhere while under consideration by Emergency Medicine – Open Access. The authors have no commercial associations or sources of support that might pose a conflict of interest. All authors have made substantive contributions to the study, and all authors endorse the data and conclusions.

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