# An international survey of pediatric and neonatal clinicians' vascular access practice: PediSIG assessment of vascular access, education, and support (PAVES) catheter selection

**Title: An International Survey of Pediatric and Neonatal Clinician's Vascular Access Practice: PediSIG Assessment of Vascular Access, Education, and Support (PAVES)**

**Authors:** Davis, Mary Beth Hovda[1,2], Girgenti, Constance[3], Takashima. Mari[2]; Ullman, Amanda J[3,4]

**Affiliations**:

[1] University of Iowa Stead Family Children's Hospital; Iowa City, Iowa, USA

[2] Alliance for Vascular Access Teaching and Research (AVATAR); Menzies Health Institute Queensland; Griffith University; Queensland; Australia

[3] Vygon US, Landsdale, Pennsylvania, USA

[4] Amita Medical Center; Joliet, Illinois, USA

[4] School of Nursing and Midwifery; Griffith University; Queensland; Australia

**Corresponding Author:** Mary Beth Hovda Davis MSN, RN, VA-BC

**Present/Permanent Address:** 200 Hawkins Drive, 11-2323 SFCH, Iowa City, Iowa, 52242

**Funding:** No funding

**Acknowledgments:** Cindy Anderton, PediSIG membership,

**Word Count: 2396**

**ABSTRACT (250 words)**

**Background:** Despite evidence to support best practice in neonatal and pediatric venipuncture delivery and procedural support, there are inconsistencies in practice. To inform future research, education and workforce innovation, the Association for Vascular Access Pediatric Special Interest Group (PediSIG) developed and undertook a survey to describe the current vascular access practice for clinicians caring for neonatal and pediatric patients.

**Objective:** Describe the current state of workforce models, training, and clinical practices surrounding pediatric and neonatal vascular access.

**Design:** Cross-sectional, electronic survey using convenience sampling.

**Settings:** International clinicians who provide vascular access (peripheral intravenous catheter insertion, venipuncture for blood sampling) for neonatal and pediatric patients.

**Methods:** An electronic survey was developed by the PediSIG. The survey covered workforce models, clinician training and competency, pain relief, procedural support, and device securement. The electronic survey was then distributed to the PediSIG membership and shared amongst several neonatal/pediatric email lists. Data were analyzed descriptively, with an exploration of association between clinical outcomes, workforce and training.

**Results:** There were 242 responses from five countries showing a wide variance of practice. Workforce models showed many different team names and responsibilities along with a variance of personnel and staffing hours. Clinician training was described as four hours or less by 44% (n=69) of respondents. Less than half of the responses (47%; n=99) reported having a formal procedure to escalate a patient to an expert care and not having a set number of max attempts

before escalation. Only 2/3 (n=115) of respondents said they had a standardized protocol for pain control and procedural support with only 13% (n=23) and 15% (n=27), respectively, self-reported that they always followed the protocol.

**Conclusions:** The respondents reported a wide variance in neonatal and pediatric vascular access procedures, and the resources used to support this practice. Core standards need to be developed to help guide the neonatal and pediatric clinician, and their institutions. The standards should encompass recommendations for workforce models, proper training, competency, insertion guidelines, pain control, procedural support, and access to vascular access specialists to provide the best care for every neonate and child.

**Keywords:** neonate, pediatric venipuncture, peripheral venous catheterization, evidence-based practice, PICC line catheterization, procedural pain, vascular access

## BACKGROUND

Vascular access, such as blood sampling and peripheral intravenous (PIV) catheter insertion, is a common experience for the hospitalized neonate and child that requires procedural skill by the inserter. Despite its frequent occurrence, each patient presents with unique underlying conditions, along with an often acute need for access. Venipuncture and vascular access are considered basic nursing skills, but it can also be a complex, time-sensitive, and technically difficult procedure that needs to be performed successfully within a limited time [1] Due to limited communication abilities, unpredictable behavior, activity levels, and small vessel sizes, the venipuncture and PIV insertion is even more complex for neonates and children [2].

Vascular access is a painful procedure that can have lifelong implications for neonates and children if not managed properly. Additionally, needle fear associated with PIV and venipuncture procedures is prevalent in children, and may increase with age if not managed [3]. Knowing the distress vascular access can cause, it is important to emphasize care and comfort during vascular access device procedures to support the neonate and child and family during a necessary, but frequently painful experience. The America Society for Pain Management Nursing Position Statement [4] highlights this necessity, stating that healthcare professionals have a responsibility to collaborate, advocate and intervene to provide optimal comfort management before, during and after procedures for patients of all ages.

Despite vascular access being a common procedure, there are wide variations in practice. The clinician performing the procedure can be a range of healthcare professionals from bedside nurses to physicians. Workforce models vary with some institutions utilizing a subgroup of skilled clinicians who specialize in vascular access to provide this service while others train

every healthcare provider with the expectation they become proficient and maintain competency in PIV insertion. The standard procedure for insertion varies amongst providers and can utilize a variety of vein visualization tools to the use of ultrasound depending on resources and provider skill set. Overall, research has suggested that clinicians who place PIVs frequently, such as those in dedicated vascular access services, demonstrate better success rates and fewer attempts at venipuncture for IV placement [5, 6] However, a recent Cochrane Systematic Review [7] highlighted that there is inadequate evidence to support the widespread benefit of dedicated vascular access teams .

The Infusion Nursing Society (INS) Standards of Practice for Infusion Therapy highlight that the healthcare organization is responsible for ensuring clinician competency initially (before providing patient care) and on an ongoing basis [8]. However, the metrics for assessing competency can be difficult to determine and there is a wide variation in each organization's training program. Via this survey, the Association for Vascular Access (AVA) Pediatric Special Interest Group (PediSIG) aimed to provide an assessment of the current state of neonatal and pediatric vascular access practice, including any variation in practice impacting clinical outcomes, to inform future research, education and workforce innovation.

## METHODS

### Aims

The aims of the study were to examine the current state of workforce models, training, and clinical practices surrounding neonatal and pediatric vascular access. This information can then be used to inform practice development opportunities.

### Study design

A cross sectional survey was developed to describe current practice of clinicians who provide vascular access for neonatal and pediatric patients.

**Participants**

Clinicians who are currently practicing and who have a position caring for neonatal and/or pediatric patients were invited to complete the online survey.

**Instruments and data collection**

PediSIG Assessment of Venipuncture Education and Support (PAVES) survey was developed by expert clinicians in the Association for Vascular Access (AVA) PediSIG Executive Leadership Council. Following a review of the existing literature on neonatal and pediatric vascular access, questions were developed and prioritized via robust discussion. The survey was piloted through the PediSIG Council and assessed for feasibility (including time for completion), clarity of questions, and data collection ease. The final survey consisted of a combination of 51 multi choice and open-ended questions. Key themes for the survey were listed in the following categories: demographics of clinician, role of clinician, vascular access team (VAT) demographics, initial training of clinician, competency of clinician, clinical practice, pain control and procedural support. Participation was voluntary, and responses were collected anonymously. The survey was collated via the Survey Monkey™ (SVMK) platform.

The survey was distributed via the AVA PediSIG membership mailing list, and PediSIG members were asked to forward on as appropriate to colleagues. Social Media (i.e., Facebook, Twitter) was used to further promote the survey via the AVA platforms. The survey was open for six months, from January to June, 2018.

## Data Analysis

Descriptive statistics have been used to report the survey results (counts, percentages; mean, standard deviation [SD]; median, interquartile ranges [IQR]), relevant to data characteristics and distribution. Associations between clinical outcomes (clinician report of PIVC attempts) and workforce and training were assessed using Chi square. Variables with a $p<0.05$ were considered significant. Missing data are described throughout the results tables. The analysis was undertaken using Stata (version 13; StataCorp, College Station, TX).

## Ethical Considerations

Human Research Ethics Committee (HREC) approval was provided by Griffith University in January 2018 (2018/064) and the survey was distributed through the PediSIG membership, industry partner email lists, and promoted through the AVA social media sites. The survey was kept open for six months.

# RESULTS

## Participant demographics

There were 242 respondents in total, across 5 countries. Most participants identified themselves as a vascular access clinician working with a vascular access team. When asked to list the name of their team/service there were 190 unique entries. Most common themes are names were based on tasks instead of specialty, with IV team and PICC team being the most common name.

*<insert Table 1>*

**Neonatal and pediatric vascular access workforce, training and competency**

Approximately 12% of participants reported having all venipuncture attempts are performed by a vascular access team. Other models included having the bedside nurse attempt initial access or the bedside nurse assesses the difficulty and escalates difficult access to an expert clinician. In terms of work force, 44% of participants reported having 5 or less full time equivalent (FTE) positions dedicated to vascular access, with around 37% of clinicians stating they had greater than 5. Only 65% reported having a formalized training program and the most common format for training was a preceptor/mentorship program. For program training, 44.8% stated that their training was typically less than 4 hours.

For initial competency validation, 85% of respondents said it was required and 61% stated that they required an observed 1-5 PIVs to be placed with a mentor before independent insertion was allowed. For ongoing training, 47% reported that they had no annual competency requirements.

*<insert Table 2 and 3>*

**Clinical practice**

As reported in Tables 4 and 5, less than half of respondents reported a formal algorithm or criteria in place to escalate a patient who needed an expert PIV inserter, and only 53% reported having a set number for PIV attempts before escalating to central or alternate access. On average (median), respondents reported exceeding the algorithms set number of PIV insertion attempts 10% of the time (IQR 5-35).

There was no significant difference between reported number of FTE in workforce or having a dedicated vascular access team, and the percentage of time the clinician reported exceeding their attempts per their algorithm or the provision of procedural support. There was significance association between an organization having more than 5 FTE positions and an organization offering formalized training (Chi 8.46; p=0.004).

*<insert Table 4 and 5>*

PIV securement was standardized in a little over half of the participants, with the arm board and securement dressing being the most common securement methods.

**Procedural support**

Over 60% of respondents (n=115) said they had a standardized protocol for vascular access pain management, with only 12.7% (n=23) stating that the protocol is always followed and 15.5% (n=28) reporting the protocol is never followed. The most common forms of pain control were numbing cream and sucrose solution, with 85.6% (n=155) of respondents selecting those options.

Procedural support was standardized in 60.8% (n=110) of responses, with only 14.9% (n=27) of respondents stating procedural support was always used. Around 60% of the time procedural support was provided by a child life specialist, and 55.8% of respondents stated they had access to procedural support staff 7 days a week.

When asked what types of sedation were provided the 59.7% responded with intranasal or oral midazolam. Almost half (46%; n=69) stated they would use an anesthesia consult, while 71% (n=113) reported that they had no set number of attempts before considering sedation.

*<insert Table 6>*

## DISCUSSION

This is the first survey designed to target pediatric vascular access clinicians to assess their current practice. Previous international surveys have been conducted to assess for perspectives of the consumer, relating to PIV practices [9] and central venous access device site care [10]. There has not been a survey conducted in which a current practicing clinician in neonatal or pediatric vascular access self-assesses their vascular access insertion, securement, and procedural support practice.

In describing aspects of the vascular access team (VAT) there were 190 unique entries for name of team, often not defining the comprehensive lists of duties survey participants reported providing to patients. As the model pertains to vascular access initiation, many participants reported the bedside nurse being the first attempt for vascular access with the vascular access team being the next attempt. Only 25% of respondents reported that a vascular access specialist provides all vascular access needs. Less than half of the respondents reported having 24/7 coverage for vascular access coverage, with a recent global study identifying pediatric vascular access specialist teams being most common in the US. [11] For those who answered that they did not have a vascular access team, vascular access is provided by the bedside RN in most of the responses.

Education and training have a significant impact on procedural skill and patient outcomes. Most respondents said that they did have a formalized training program offered at their hospital with the primary method of training being preceptorship/mentoring at the bedside. However, most training was answered as being less than 4 hours. Advanced procedural skill acquisition can require significant time investment. A recent example of this has been the introduction of ultrasound-guided PIV insertion, where procedural competency has been demonstrated to require dedicated education and practice [12, 13] Within the current survey, most respondents reported that they required observed competency prior to independent placement of a vascular access device, with 61% of the respondents reporting they require 1-5 observations. However, there was a wide variation in the requirement for ongoing or annual competency, with a majority reporting no annual competency required. Only about 19% of respondents state having a mandated yearly minimum of PIV insertion to maintain competency.

Practice variation was also evident in the resources available to support escalation of patients with difficult IV access (DIVA). Less than half of respondents reported having a formal procedure to escalate a patient to an expert clinician. There was a wide variation in practice as to how many total attempts the clinician performs before escalating to a central venous access device or alternative access. Similarly, Schults et al [14] recently reported only 16% of clinicians (n=23) globally used a DIVA scale, with resources used for the identification and escalation of children with DIVA are unstandardized or are inconsistently used. Further study is needed to streamline processes for DIVA identification and escalation to the appropriate clinicians, to improve patient safety and experience.

PIV securement practice was also variable. Only around half of the responses reported their hospital mandated a standard method to secure a PIV, which leads to a lack of institutional

standardization and increase variations in practice and outcomes. There is also a wide variation in methods used for pain relief, with only 63.5% of respondents said they had a standardized protocol for pain management and only 12% of respondents said their protocol was always followed. On average respondents felt that pain management modalities were being used around 60% of the time with most responses saying they used numbing cream and oral sucrose solution. A systematic literature review suggests that in the neonatal population, oral sucrose with a nonnutritive suck is effective for vascular access procedures with numbing cream also being effective. Of note the literature review also mentioned that the patient environment was also an important factor and that in order to achieve maximum effectiveness [15].

**Limitations**

The main limitation of this survey is that the participants were gathered from a convenience sample supplied by a list serv. Some of the responses could represent the same workplace or vascular access team, but as this survey assesses a clinician's personal practice, we didn't feel a need to limit responses by institution. We also had limited responses from non-US based clinicians. Together this limits the generalizability of the survey to other countries, however provides a useful description of the current state of peripheral vascular access at this moment in time.

## CONCLUSION

Our study shows a wide variance in what neonatal and pediatric clinicians are self-reporting as their peripheral vascular access practice. Becoming proficient in PIV insertion in the wide range of neonatal and pediatric patient sizes and developmental levels is challenging.

Developing the necessary expertise requires hours of training and mentorship. The majority of training programs were reported at being 4 hours or less with a low number of mentored insertions before the clinician was allowed to operate independently. Despite there being a national standard requiring ongoing competency [8], a little less than half of respondents reported requiring any annual competency.

Evidence shows that neonatal and pediatric patients require pain relief and procedural support [3, 4]. As pediatric vascular access specialists, we need to ensure that children receive appropriate procedural pain-relieving measures and emotional support for every needlestick experience they encounter. This is necessary to prevent negative long-term effects of health care, including sustained needle phobia, noncompliance with medical treatment, and avoidance of health care as an adult[3]. Core standards for pediatric vascular access need to be developed to help guide the neonatal and pediatric clinicians in proper training, procedural support, and access to vascular access specialists to provide the best care for every neonate and child.

**Table 1: Participant demographics**

| | *N* | *%* |
|---|---|---|
| **Country** | N=242 | |
| United States of America | 226 | 93.4 |
| Australia | 10 | 4.1 |
| Canada | 3 | 1.2 |
| Mexico | 2 | 0.8 |
| Oman | 1 | 0.4 |
| **Type of Institution** | N=237 | |
| Pediatric hospital | 139 | 58.6 |
| University hospital | 39 | 23.2 |
| Private hospital | 39 | 16.5 |
| Clinic | 4 | 1.7 |
| **Title of respondent** | N=242 | |
| Vascular Access Team member | 100 | 41.3 |
| Registered nurse | 65 | 26.9 |
| Clinical nurse specialist | 16 | 6.6 |
| Nurse manager | 16 | 6.6 |
| Assistant nurse manager | 5 | 2.1 |
| Other | 40 | 16.5 |
| **Role** | N=207 | |
| Vascular Access Clinician | 89 | 43.0 |
| Manager | 23 | 11.1 |
| Nurse Educator | 15 | 7.2 |
| Resource Nurse | 28 | 13.5 |
| Other | 52 | 25.1 |
| **Patient population** | N=207 | |
| Neonatal | 147 | 71.0 |
| Pediatric | 187 | 90.3 |
| Adult | 76 | 36.7 |
| **Number of pediatric beds** | N=209 | |
| <100 | 72 | 34.4 |
| 101-200 | 56 | 26.8 |
| 201-300 | 33 | 15.8 |
| >300 | 37 | 17.7 |
| None | 11 | 5.3 |
| **Number of neonatal intensive care beds** | N=206 | |
| <20 | 34 | 16.5 |
| 21-40 | 46 | 22.3 |
| >41 | 103 | 50.0 |
| None | 23 | 11.2 |

**Table 2: VAT Demographics**

| | *N* | *%* |
|---|---|---|
| **Vascular access model** | N=209 | |
| Initial vascular access is attempted by the bedside nurse then escalated to expert resources as needed | 85 | 40.7 |
| Difficulty assessed initially-difficult venipuncture automatically escalated to expert clinician, non difficult attempted by bedside nurse | 80 | 38.3 |
| Vascular access team provides all vascular access | 25 | 12.0 |
| Junior MD/Resident provides vascular access | 4 | 1.9 |
| Other | 15 | 7.2 |
| **If no VAT in place, who performs the vascular access functions?** | N=89 | |
| Bedside Registered Nurse | 72 | 80.9 |
| Charge/ Nurse leader | 33 | 37.1 |
| Medical Doctor | 32 | 36.0 |
| Nurse Practitioner | 27 | 30.3 |
| Resident | 22 | 24.7 |
| Clinical Nurse specialist | 17 | 19.1 |
| Other | 17 | 19.1 |
| **Number of FTE positions dedicated for vascular access** | N=209 | |
| 0 | 25 | 12.0 |
| 1-2 | 30 | 14.3 |
| 3-5 | 37 | 17.7 |
| >5 | 77 | 36.8 |
| Don't know | 40 | 19.1 |
| **Licensure of the clinician providing vascular access service** | N=209 | |
| Registered Nurse | 201 | 96.2 |
| Nurse Practitioner | 17 | 8.1 |
| Medical Doctor | 10 | 4.8 |
| Emergency Medical Technician | 7 | 3.3 |
| Other | 9 | 4.3 |
| **Title of the person providing vascular access service** | N=209 | |
| Registered Nurse | 94 | 45.0 |
| Vascular Access Clinician | 65 | 31.1 |
| IV Team Member | 45 | 21.5 |
| Medical Doctor | 5 | 2.4 |
| **Days covered by the service** | N=209 | |
| Monday | 198 | 94.7 |

| | | |
|---|---|---|
| Tuesday | 198 | 94.7 |
| Wednesday | 196 | 93.8 |
| Thursday | 198 | 94.7 |
| Friday | 196 | 93.8 |
| Saturday | 155 | 74.2 |
| Sunday | 141 | 67.5 |
| None | 14 | 6.7 |
| **Holiday coverage** | N=209 | |
| Yes | 147 | 70.3 |
| **Hours covered by the service** | N=209 | |
| 0700-1100 | 202 | 96.6 |
| 1100-1500 | 201 | 96.2 |
| 1500-1900 | 174 | 83.2 |
| 1900-2300 | 130 | 62.2 |
| 2300-0300 | 98 | 46.9 |
| 0300-0700 | 96 | 45.9 |

**Table 3: Training and Competency**

| | *N* | *%* |
|---|---|---|
| **Formalized training for pediatric and/or neonatal vascular access offered at work** | N=198 | |
| Yes | 129 | 65.1 |
| **If yes, who is qualified to attend the training?** | N= 189 | |
| Anyone Interested | 29 | 15.3 |
| All clinicians who have completed initial orientation | 42 | 22.2 |
| All clinicians hired | 42 | 22.2 |
| As decided by unit management team | 52 | 27.5 |
| N/A | 58 | 30.7 |
| **At what point do they receive their training?** | N=154 | |
| Immediately upon hire | 47 | 30.5 |
| After a set time determined by administration | 38 | 24.7 |
| After core competencies are achieved | 37 | 24.0 |
| When staff member requests to attend | 32 | 20.8 |
| **Format of training** | N=156 | |
| Preceptorship/mentoring at bedside observation with skills demonstration at bedside | 127 | 81.4 |
| Lecture-in person attendance | 90 | 57.7 |
| Simulation-in person | 83 | 53.2 |
| Electronic/video-learning management system | 39 | 25.0 |
| **Content included:** | N=153 | |
| Insertion procedure | 149 | 97.4 |
| PIV care and maintenance | 133 | 86.9 |
| Device selection/indications | 129 | 84.3 |
| Documentation | 129 | 84.3 |
| Infusion related complications | 116 | 75.8 |
| Procedural support/distraction modality | 120 | 78.4 |
| Pain control | 112 | 73.2 |
| Pediatric anatomy and physiology | 112 | 73.2 |
| **Training hours** | N=154 | |
| <4 hours | 69 | 44.8 |
| 5-8 hours | 35 | 22.7 |
| >9 hours | 50 | 32.5 |
| **Does your facility require observed competency validation prior to** | N=199 | |

| | | |
|---|---|---|
| **independent placement of a vascular access device?** | | |
| Yes | 170 | 85.4 |
| **What is the number of peripheral IVs to be placed with mentor before placing independently?** | N=199 | |
| 0 | 26 | 13.1 |
| 1-5 | 122 | 61.3 |
| 6-10 | 29 | 14.6 |
| 11-15 | 7 | 3.5 |
| 16+ | 15 | 7.5 |
| **What is the annual competency requirement?[a]** | N=196 | |
| No annual competency required | 93 | 47.4 |
| Observed competency validation | 70 | 35.7 |
| Minimum number of completed procedures | 55 | 28.1 |
| Completion of learning management systems | 39 | 19.9 |
| Verbalized understanding of competency | 28 | 14.3 |
| Attendance at class | 20 | 10.2 |
| **In order to maintain competency, does your institution mandate a yearly minimum requirement for number of PIV insertions?** | N=196 | |
| Yes | 37 | 18.9 |

[a]Multiple responses per participant

**Table 4: PIV procedure and escalation algorithm**

| | *N* | *%* |
|---|---|---|
| **Do you have any formal procedure algorithm or set criteria in place to escalate a patient who require an expert clinician?** | N=209 | |
| Yes | 99 | 47.4 |
| **What resources do you utilize to obtain difficult venous access?**[a] | N=209 | |
| Vein visualization technology | 152 | 72.7 |
| Ultrasound | 182 | 87.1 |
| Expert clinician | 145 | 69.4 |
| Physician/License Independent Practitioner | 43 | 20.6 |
| Vascular Access Specialist | 161 | 77.0 |
| **At what number of total attempts for a PIV do you escalate to a central line and/or refer to alternative access?** | N=207 | |
| <5 | 84 | 40.6 |
| 5-10 | 21 | 10.1 |
| >10 | 3 | 1.4 |
| No set number | 99 | 47.8 |
| **What is the percentage of time that you have exceeded your set algorithm attempts in order to obtain access due to clinical situation?** Median (IQR) | N=158 | |
| | 10% (5-35) | |

[a]Multiple responses per participant; IQR: Interquartile range

**Table 5: Peripheral intravenous catheter securement**

| | *N* | *%* |
|---|---|---|
| **Does your hospital mandate a standard method to secure PIV?** | N=194 | |
| Yes | 106 | 54.6 |
| No | 39 | 20.1 |
| Recommended, not mandated | 49 | 25.3 |
| **Are there variations allowed based on patient age?** | N=194 | |
| Yes | 142 | 73.2 |
| No | 34 | 17.5 |
| N/A | 18 | 9.3 |
| **What devices do you utilize to secure a PIV?[a]** | N=194 | |
| Arm board | 177 | 91.2 |
| Securement dressing | 152 | 78.3 |
| Steri-strips/tape | 100 | 51.5 |
| Burn net or stockinette | 77 | 39.7 |
| Clear plastic dome | 65 | 33.5 |
| Engineered securement dressing | 48 | 24.7 |
| Engineered Securement Device | 44 | 22.7 |
| Tissue Adhesive | 42 | 21.6 |
| Arm cuff | 22 | 11.3 |
| Other | 19 | 9.8 |

[a]Multiple responses per participant

**Table 6: Pain Control and Procedural Support**

| | *N* | *%* |
|---|---|---|
| **Do you have a standardized protocol for vascular access pain management?** | N=181 | |
| Yes | 115 | 63.5 |
| **How consistently is it being followed?** | N=181 | |
| Never | 28 | 15.5 |
| Rarely | 11 | 6.1 |
| Sometimes | 51 | 28.2 |
| Often | 68 | 37.6 |
| Always | 23 | 12.7 |
| **What percent of the time are pain management modalities being utilized?** Mean (SD) | N=181 | |
| | 59.6% | (SD 28.8) |
| **What does your institution utilize for pain control for PIV insertion?[a]** | N=181 | |
| Numbing cream | 155 | 85.6 |
| Vibration Device | 77 | 42.5 |
| Vapocoolant | 76 | 42.0 |
| Lidocaine injector | 76 | 42.0 |
| Oral sucrose solution | 155 | 85.6 |
| My institution doesn't utilize options for pain control | 6 | 3.3 |
| **Do you have a standardized protocol for vascular access procedural support?** | N=181 | |
| Yes | 110 | 60.8 |
| **How consistently is the protocol being used?** | N=181 | |
| Never | 6 | 3.3 |
| Rarely | 6 | 3.3 |
| Sometimes | 31 | 17.1 |
| Often | 61 | 33.7 |
| Always | 27 | 14.9 |
| N/A | 50 | 27.6 |
| **What percent of the time is procedural support and/or distraction being used by a dedicated staff member?** Median (IQR) | N=181 | |
| | 65% | (44-88) |
| **For the majority of vascular access procedures, procedural support and/or distraction is provided by** | N=181 | |
| Child Life Specialist | 107 | 59.1 |
| Staff member | 34 | 18.8 |
| Parent/caregiver | 12 | 6.6 |
| Any available | 23 | 12.7 |
| None | 5 | 2.8 |

| | | |
|---|---|---|
| **What days are covered by your procedural support and/or distraction staff?** | N= 181 | |
| 5 days a week, Monday to Friday only | 80 | 44.2 |
| 7 days a week | 101 | 55.8 |
| **Does your procedural support and/or distraction staff provide holiday coverage?** | N=181 | |
| Yes | 92 | 50.8 |
| **What hours are your procedural support and/or distraction staff available? [a]** | N=181 | |
| 0700-1100 | 178 | 98.3 |
| 1100 - 1500 | 172 | 95.0 |
| 1500 - 1900 | 113 | 62.4 |
| 1900 - 2300 | 53 | 29.3 |
| 2300 - 0300 | 26 | 14.4 |
| 0300 - 0700 | 26 | 14.4 |
| **Do you provide any of the following forms of sedation as needed?[a]** | N= 149 | |
| Nitrous Oxide | 31 | 20.8 |
| Intra nasal versed | 89 | 59.7 |
| Oral versed | 89 | 59.7 |
| Anesthesia consult | 69 | 46.3 |
| Other | 48 | 32.2 |
| **After how many attempts do you consider escalation to sedation?** | N=159 | |
| No set number | 113 | 71.1 |
| 0 | 9 | 5.7 |
| 1 | 4 | 2.5 |
| 2 | 12 | 7.5 |
| 3 | 7 | 4.4 |
| 4 | 6 | 3.8 |
| 5+ | 8 | 5.0 |

[a]Multiple responses per participant

## References:


1. Park SM, Jeong IS, Kim KL, Park KJ, Jung MJ, Jun SS. The Effect of Intravenous Infiltration Management Program for Hospitalized Children. *J Pediatr Nurs.* 2016;31:172-178.
2. Clark E, Giambra BK, Hingl J, Doellman D, Tofani B, Johnson N. Reducing risk of harm from extravasation: a 3-tiered evidence-based list of pediatric peripheral intravenous infusates. *J Infus Nurs.* 2013;36:37-45.
3. Diener ML, Lofgren AO, Isabella RA, Magana S, Choi C, Gourley C. Children's distress during intravenous placement: The role of child life specialists. *Children's Health Care.* 2019;48:103-119.
4. Czarnecki ML, Turner HN, Collins PM, Doellman D, Wrona S, Reynolds J. Procedural pain management: a position statement with clinical practice recommendations. *Pain Manag Nurs.* 2011;12:95-111.
5. Frey AM. Success rates for peripheral i.v. insertion in a children's hospital. Financial implications. *J Intraven Nurs.* 1998;21:160-165.
6. Marsh N, Webster J, Larsen E, et al. Expert versus generalist inserters for peripheral intravenous catheter insertion: a pilot randomised controlled trial. *Trials.* 2018;19:564.
7. Carr PJ, Higgins NS, Cooke ML, Mihala G, Rickard CM. Vascular access specialist teams for device insertion and prevention of failure. *Cochrane Database Syst Rev.* 2018;3:Cd011429.
8. Society IN. Infusion therapy standards of practice. *Journal of Infusion Nursing.* 2016.
9. Cooke M, Ullman AJ, Ray-Barruel G, Wallis M, Corley A, Rickard CM. Not "just" an intravenous line: Consumer perspectives on peripheral intravenous cannulation (PIVC). An international cross-sectional survey of 25 countries. *PLoS One.* 2018;13:e0193436.
10. Broadhurst D, Moureau N, Ullman AJ. Central venous access devices site care practices: an international survey of 34 countries. *J Vasc Access.* 2016;17:78-86.
11. Ullman AJ, Takashima M, Kleidon T, Ray-Barruel G, Alexandrou E, Rickard CM. Global pediatric peripheral intravenous catheter practice and performance: A secondary analysis of 4206 catheters. *J Pediatr Nurs.* 2019.
12. Stolz LA, Cappa AR, Minckler MR, et al. Prospective evaluation of the learning curve for ultrasound-guided peripheral intravenous catheter placement. *J Vasc Access.* 2016;17:366-370.
13. Brummelte S, Grunau RE, Chau V, et al. Procedural pain and brain development in premature newborns. *Annals of Neurology.* 2012;71:385-396.
14. Schults J, Rickard C, Kleidon T, Paterson R, Macfarlane F, Ullman A. Difficult Peripheral Venous Access in Children: An International Survey and Critical Appraisal of Assessment Tools and Escalation Pathways. *Journal of nursing scholarship : an official publication of Sigma Theta Tau International Honor Society of Nursing / Sigma Theta Tau.* 2019;51:537-546.
15. Lago P, Garetti E, Bellieni CV, et al. Systematic review of nonpharmacological analgesic interventions for common needle-related procedure in newborn infants and development of evidence-based clinical guidelines. *Acta Paediatrica.* 2017;106:864-870.