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# The Effectiveness of an Intravenous Protection Dressing in Reducing Peripheral Intravenous Catheter-Related Phlebitis in Pediatric Patients

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**ABSTRACT**

**Objective(s):** To assess the effectiveness of the I.V. House Ultra Dressing in reducing peripheral intravenous catheter-related phlebitis in pediatric patients, and to evaluate the correlation between pediatric sociodemographic, clinical characteristics and the protective efficacy of the dressing.

**Methods:** A quasi-experimental, post-test-only study design was conducted in the pediatric wards of Tikrit Teaching Hospital and Balad General Hospital within the Salah Al-Din Health Department in Iraq. The study was carried out between December 1, 2024, and February 1, 2025. Using a non-probability purposive sampling method, 64 pediatric patients were recruited and divided equally into a study group (n = 32) and a control group (n = 32). The study group received the I.V. House Ultra Dressing protection device, while the control group received the standard traditional hospital dressing. Phlebitis scores were evaluated every 12 hours from the initiation of intravenous therapy until catheter removal using the Visual Infusion Phlebitis Scale VIPS. Data were analyzed via descriptive and inferential statistics using SPSS version 26.

**Results:** The study demonstrated a statistically significant difference in phlebitis scores and clinical signs between the two groups (P = 0.000). Over a three-day observation period, highly significant differences were maintained, with the study group demonstrating a marked decrease in the incidence and severity of phlebitis compared to the control group.

**Conclusion:** The application of the I.V. House Ultra Dressing effectively reduces the development and severity of phlebitis associated with peripheral intravenous catheters in pediatric patients.

**Recommendations:** Institutional protocols should integrate specialized intravenous protection dressings, such as the I.V. House Ultra Dressing, into standard pediatric nursing care. Furthermore, structured training programs should be implemented for healthcare workers, and future research should assess nurse and parental satisfaction regarding this baseline intervention.



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# فاعلية ضماد الحماية الوريدية في تقليل التهاب الوريد المرتبط بالقسطرة الوريدية الطرفية لدى الأطفال المرضى


## المستخلص

**الأهداف:** تقييم فاعلية ضماد الحماية الوريدية في تقليل التهاب الوريد المرتبط بالقسطرة الوريدية الطرفية لدى الأطفال، وتحديد العلاقة بين تأثير هذا الضماد والمميزات الديموغرافية والسريرية للمرضى.

**منهجية البحث: تم** استخدام تصميم دراسة شبه تجريبية في مستشفى تكريت التعليمي ومستشفى بلد العام التابعين لدائرة صحة صلاح الدين في العراق، للفترة من ١ كانون الاول ٢٠٢٤ إلى ١ شباط ٢٠٢٥ في أجنحة الأطفال. تم اختيار عينة غرضية غير احتمالية مكونة من ٦٤ طفلاً، مقسمين بالتساوي إلى مجموعتين: مجموعة الدراسة ($n = 32$) والمجموعة الضابطة.($n = 32$) تم تطبيق جهاز حماية الوريد على مجموعة الدراسة، بينما استخدمت المجموعة الضابطة الضماد التقليدي المعتمد في المستشفى. تم تقييم وتسجيل درجات التهاب الوريد لكلا المجموعتين كل ١٢ ساعة بدءاً من بداية العلاج الوريدي وحتى إزالة القسطرة باستخدام مقياس التهاب الوريد البصري .(VIPS) حُللت البيانات إحصائياً (الاحصاء الوصفي والاستدلالي) عبر برنامج SPSS الإصدار ٢٦.

**النتائج: كشفت** الدراسة عن وجود فروق ذات دلالة إحصائية عالية ($P = 0.000$) في درجات وعلامات التهاب الوريد بين مجموعتي الدراسة والضابطة على مدار ثلاثة أيام، حيث أظهرت مجموعة الدراسة انخفاضاً ملحوظاً في معدلات التهاب الوريد مقارنة بالمجموعة الضابطة.

**الاستنتاج:** يوضح البحث أن ضماد حماية الوريد فعال للغاية في تقليل التهاب الوريد لدى الأطفال المرتبط بالقسطرة الوريدية الطرفية.

**التوصيات:** ضرورة تدريب الكوادر التمريضية ومقدمي الرعاية الصحية على تطبيق أجهزة حماية الوريد المتطورة في أجنحة الأطفال، وتقييم مستوى رضا الممرضين وأولياء الأمور عن الرعاية الأساسية المقدمة.


**الكلمات المفتاحية:** ضماد حماية الوريد، التهاب الوريد، الاطفال، القسطرة الوريدية الطرفية.

## Introduction

The insertion and clinical maintenance of peripheral intravenous catheters (PIVCs) are fundamental interventions for pediatric patients requiring hospital-based medical therapies (1). PIVC insertion stands as one of the most common yet highly invasive nursing procedures performed globally (2), with utilization rates ranging between 58% and 87% among hospitalized populations (3). Although PIVCs are indispensable and often life-saving, they present a high risk of localized complications including infiltration, extravasation, and phlebitis primarily driven by endothelial layer damage resulting from mechanical movement, poor stabilization, or chemical irritation. Compounding this issue, evidence indicates that up to 50% of patients experience device-related complications that necessitate premature PIVC removal (4). Pediatric populations are uniquely vulnerable to PIVC complications due to distinct physiological and developmental characteristics (5). Children, particularly infants under one year of age, exhibit fragile blood vessels, narrower venous lumen spaces, a higher ratio of subcutaneous body fat, and an increased rate of involuntary movement, which significantly escalates the risk of catheter displacement and subsequent vascular injury (5, 6). Furthermore, the procedural distress experienced by the child and corresponding parental anxiety present additional technical and monitoring challenges for clinical staff (6). Among these complications, phlebitis the inflammation of the internal endothelial tunica of a vein is heavily prevalent (7). Phlebitis can serve as a precursor to localized thrombus formation, severe pain, and systemic infection (8). While

guidelines from the Centers for Disease Control and Prevention (CDC) historically recommended routine PIVC replacement every 72 to 96 hours in adults to mitigate such risks, no standardized, time-bound replacement window exists for pediatric cohorts; instead, catheters are maintained as long as clinically indicated (9).

Vascular complications remain highly prevalent in the Middle east countries; for instance, a descriptive study in Jordan evaluating 307 pediatric patients across five government hospitals reported a phlebitis rate of 53.4% (n = 164) (10). Consequently, contemporary nursing research focuses on implementing specialized securement devices e.g., StatLock IV Ultra, SorbaView SHIELD and advanced dressings to safely extend catheter dwell times up to 96 hours, thereby minimizing patient discomfort and reducing healthcare costs (11). The I.V. House Ultra Dressing (I.V. House, Chesterfield, USA) represents an innovative engineering solution designed to stabilize the catheter hub, protect the insertion site from external friction, and permit continuous visual inspection without dressing disruption (11).

Nurses have primary clinical accountability for preventing phlebitis via strict hand hygiene, appropriate vein selection, proper catheter gauge matching, aseptic insertion techniques, and frequent site assessments (9). Utilizing a tape- and latex-free protection device like the I.V. House Ultra Dressing alongside traditional splints offers a promising mechanism to optimize site security and reduce complication rates in pediatric patients (12, 9).

**Research Question:** Does the utilization of an intravenous protection device (I.V. House Ultra Dressing) significantly reduce the incidence and severity of phlebitis associated with peripheral intravenous catheters in pediatric patients compared to traditional dressings?

## Methods

### Study Design

A quasi-experimental design utilized a post-test only approach for both groups (study and control). The aim was to assess the efficacy of using an I.V. House ultra-dressing to reduce phlebitis related to peripheral intravenous catheters in pediatric patients.

### Setting of the study

The study was conducted within the pediatric wards of two major healthcare institutions under the Salah Al-Din Health Department in Iraq: Tikrit Teaching Hospital and Balad General Hospital.

### Study Sample and Sampling

A non-probability purposive sampling method was used to select a total of 64 pediatric patients, divided equally into two groups: 32 in the study group and 32 in the control group. The sample was non-random.

The sample size was determined using a conventional formula for proportions, assuming a 50% population proportion to ensure maximum variability, with a 5% margin of error and an 85% confidence level. The study group received intravenous house ultra-dressing, while the control group received traditional dressing.

The following inclusion criteria were applied for sample selection:

**1. Criteria for Inclusion:**

1. Pediatric patients aged between 2 and 34 months.
2. Indication for continuous intravenous therapeutic interventions.
3. Intravenous catheter remaining in situ for a targeted period of 72 hours.

**2. Criteria for Exclusion:**

1. Presenting with a history of dermatological infections, active skin lesions, or prior phlebitis.
2. Documented hypersensitivity or history of allergic reactions to adhesives or components of the ultra-dressing.

3. Chronic immunological, metabolic, or severe vascular conditions capable of confounding the timeline of phlebitis onset.
4. Co-morbid hematological disorders compounding bleeding or clotting risks (e.g., hemophilia, thrombocytopenia).

**Study Instruments**

Data collection was structured using a two-part instrument:

**Part I: Sociodemographic and Clinical Profile:** Captured data on patient age, sex, residency, and anatomical cannula insertion site.

**Part II: The Visual Infusion Phlebitis Scale (VIPS):** Formulated by Jackson, VIPS is a validated, internationally recognized six-point tool used to standardize the assessment of localized infusion site inflammation (9). Scores range from 0 to 5 as follows:

0: No signs of phlebitis.
1: Possible first signs of phlebitis (mild erythema or pain).
2: Early stage of phlebitis (pain at site with erythema or swelling).
3: Medium stage of phlebitis (pain at site, erythema, swelling, and palpable venous cord).
4: Advanced stage of phlebitis or initiation of thrombophlebitis (all prior signs with erythema extending along the vein path).
5: Advanced stage of thrombophlebitis (thrombosed vein, severe pain, systemic pyrexia).

The instrument used by the researcher after obtaining the approval from the original researcher by assistance of specialist's technologist.

**Data Collection and Intervention(s)**

The study took place from December 1st, 2024, to February 1st, 2025. Following the acquisition of informed consent from maternal caregivers, all pediatric patients underwent PIVC placement. Standardized 24-gauge cannulas were utilized across both groups to eliminate gauge-related mechanical confounding. Insertion procedures were executed exclusively by senior pediatric nurses who had completed specialized training in pediatric IV therapy. To protect vascular integrity, a maximum of two insertion attempts per patient was strictly enforced; if unsuccessful, a secondary veteran nurse completed the task. All procedures were conducted under rigorous aseptic conditions in accordance with local institutional protocols.

**Study Group Intervention**: Immediately following insertion, the I.V. House Ultra Dressing was applied over the catheter site according to the manufacturer's technical specifications, requiring no additional adhesive taping (13). Per manufacturer guidelines, the dressing was paired with a TLC Ultra-Splint to provide optimal mechanical immobilization.

**Control Group Intervention**: Following insertion, the catheter was secured utilizing standard hospital protocol, consisting exclusively of traditional zinc oxide adhesive plasters.

All sites were clinically audited and scored using the VIPS tool every 12 hours from the exact hour of cannulation up to 72 hours (3 days) or until premature catheter failure necessitated extraction.

**Ethical Considerations**

After obtaining ethical approval from the Research Ethics Committee at the College of Nursing, University of Baghdad, the study was initiated in accordance with institutional guidelines and ethical standards for research involving human participants, the Ministry of Health agreed to ethical considerations for conducting the research, and the Scientific Committee at the Salah Al-Din Health Department, for demonstrating that the study adhered to moral norms. Each caregiver for pediatric participants in the study was informed of the study purpose and the right to protect their personal data, before their consents were obtained. Signed an agreement to participate in the study. Also, the

researcher receiving approval from Iranian Registry of Clinical Trial (IRCT20241123063810N1).

**Statistical Data Analysis**

The data was analyzed using SPSS (Statistical Package for Social Sciences) version 26. The differences between the study and control groups were identified using descriptive statistics (frequency, percentage, standard deviations) and inferential statistics (Chi-square test, t-test).

**Results**

**Table (1): Statistical Results of the Demographic Characteristics and Cannula Insertion Site for the Sample in the Study**

| Demographic | Category | Study Group | | Control Group | |
|---|---|---|---|---|---|
| | | Freq | % | Freq | % |
| Sex | Male | **20** | **62.5** | **22** | **68.8** |
| | Female | 12 | 37.5 | 10 | 31.3 |
| Age | (2-12) months | **28** | **87.5** | **28** | **87.5** |
| | (13- 23) months | 2 | 6.3 | 2 | 6.3 |
| | (24-34) months | 2 | 6.3 | 2 | 6.3 |
| Residency | Rural | **23** | **71.9** | **26** | **81.3** |
| | Urban | 9 | 28.1 | 6 | 18.8 |
| Cannula Insertion Site | Wrist | **15** | **46.9** | **21** | **65.6** |
| | Forearm | 8 | 25.0 | 5 | 15.6 |
| | Foot | 9 | 28.1 | 6 | 18.8 |

**F**=Frequency, **%**= Percentage

As shown in Table 1, male patients constituted the majority of both the study group (62.5%) and the control group (68.8%). The predominant age bracket across both cohorts was 2–12 months (87.5%). A substantial majority of participants resided in rural areas (71.9% in the study group and 81.3% in the control group). Anatomically, the wrist was the most frequent site of cannulation, accounting for 46.9% of insertions in the study group and 65.6% in the control group.

**Table (2): Statistical t-test Differences Results between Study and Control Groups for three-time Days regarding Intravenous House Ultra Dressing**

| Days | | Mean | Std. D. | t-test | P. value | Sign |
|---|---|---|---|---|---|---|
| Day 1 | Study Group | 0.000 | 0.00 | - 7.048 | **0.000** | **HS** |
| | Control Group | 0.677 | 0.84 | | | |
| Day 2 | Study Group | 0.336 | 0.13 | - 17.529 | **0.000** | **HS** |
| | Control Group | 0.772 | 2.72 | | | |
| Day 3 | Study Group | 0.499 | 0.41 | - 22.718 | **0.000** | **HS** |
| | Control Group | 0.716 | 3.94 | | | |

Std. D.= Standard Deviation, S + Sign=Significant at P. value ≤ 0.05 level, HS= High Significant

Table 2 highlights that highly significant statistical differences ($P = 0.000$) were observed between the study group and the control group consistently across all three days of observation. The study group maintained consistently lower mean phlebitis scores, demonstrating the clinical efficacy of the I.V. House Ultra Dressing.

**Table (3): Chi-Square Correlation Between Demographic Profiles and Phlebitis Scores (Study Group)**

| Demographic | Day 1 | | Day 2 | | Day 3 | |
|---|---|---|---|---|---|---|
| | $X^2$ | P. value | $X^2$ | P. value | $X^2$ | P. value |
| **Sex** | 0.441 | 0.886 | 0.305 | 0.581 | 0.009 | 0.926 |
| **Age** | 6.823 | 0.651 | 0.653 | 0.519 | 0.167 | 0.683 |
| **Cannula insertion site** | 3.874 | 0.759 | 2.057 | 0.658 | 5.064 | 0.079 |
| **Residency** | 3.662 | 0.697 | 0.022 | 0.882 | 0.276 | 0.599 |

**$X^2$= chi-square, Sign=Significant at P-value ≤ 0.05 level, S=Significant, NS=non-significant**

Table (3) shows the statistical correlation between the study group's demographic characteristics and the cannula insertion site on the second and third days about intravenous house ultra-dressing. At the p-value ≤ 0.05 level, the variables show no statistically significant correlation with the study group.

**Table (4): Chi-Square Correlation Between Demographic Profiles and Phlebitis Scores (Control Group)**

| Demographic | Day 1 | | Day 2 | | Day 3 | |
|---|---|---|---|---|---|---|
| | $X^2$ | P. value | $X^2$ | P. value | $X^2$ | P. value |
| Sex | 0.431 | 0.806 | 2.879 | 0.411 | 2.332 | 0.312 |
| Age | 6.723 | 0.851 | 2.644 | 0.852 | 3.012 | 0.556 |
| Cannula insertion site | 1.874 | 0.759 | 10.105 | 0.120 | 2.170 | 0.705 |
| Residency | 4.662 | 0.997 | 10.205 | 0.107 | 5.926 | 0.409 |

$X^2$= chi-square, Sign=Significant at P. Value ≤ 0.05 level, S=Significant, NS=non-significant

The correlation analysis presented in this table indicates that, the baseline demographic variables and anatomical insertion site exhibited no statistically significant correlation ($P > 0.05$) with the development or severity of phlebitis across the observation timeline.

## Discussion

According to the study finding, Table (1) showed the findings regarding sex, with a larger number of males than females in every groups. Males were the majority of participants in the control group. Similarly, in the study group, the majority of participants were males (14).The findings of these studies align with our study in terms of sex. This revealed a higher presence of male

participants than females among pediatric patients.

The most common age range in both the control and study groups is 2-12 months. More than half of the participants in the two groups were aged 2-12 months. This result is consistent with a study by Shaker (15) this result indicated that 57.8% of the pediatrics included in the study were between 1 and 36 months old.

For both groups, the majority resided in rural areas, which is in line with Gudnadottir's findings (16). Who noticed that 78.1% of children resided in rural areas . However, this result is not agreeable with a study by Naser and Al-Fayyadh (17) which found that most of the participants resided in urban areas. According to the researcher's point of view, children in rural areas are more likely to be exposed to environmental and microbiological factors, and lack access to adequate health care services.

According to the Cannula Insertion Site, the results indicate that peripheral IV cannulas were placed in the wrist of most study and control group participants. However, peripheral IV cannulas were inserted in the foot and forearm of less than half of both groups. This outcome aligns with a study conducted by Suliman and his colleagues (10). Which found that most catheters were placed in various locations, with the wrist serving as a main insertion site. According to the researcher's point of view, this preference is consistent with more general patterns in clinical practice, where the wrist is frequently selected for patient comfort and ease of access.

The primary inferential outcome of this research (Table 2) demonstrates that the application of the I.V. House Ultra Dressing significantly lowers both the incidence and severity of phlebitis compared to standard zinc oxide dressings. This finding is consistent with research by Atay and Yilmaz Kurt (18) and Aziz (19), which demonstrated that transparent film and specialized protective coverings reduce phlebitis rates by allowing continuous visual inspection of the insertion site without disturbing the dressing matrix. This allows for earlier clinical recognition of mechanical or chemical endothelial issues.

However, this finding contrasts with a randomized controlled trial by Büyükyılmaz et al. (11), which noted no statistically significant variation in pediatric phlebitis scores when deploying an identical protective device. This discrepancy may stem from differences in sample size, baseline nursing protocols, or compliance with specialized pediatric care bundles. Conversely, our findings align with studies by Cho et al. (20). Ravindra and Patel (21), Shilpa et al. (22), and Anggraeni et al. (23), which collectively show that implementing advanced stabilization techniques or specialized topical barriers consistently reduces vascular intimal inflammation. Safely maintaining PIVCs for up to 72 hours minimizes repeated needle stick trauma, reduces risk factors for nosocomial infection, decreases hospital stays, and lowers overall medical costs (24,25).

Table (3) shows how the findings were reflected in the correlation between phlebitis scoring and age, sex, and cannula insertion sites and residency. Through this study, the researcher aimed to determine potential contributing factors to varying phlebitis scores during a three-day period. Regarding age, the findings indicate that there is no significant correlation between phlebitis score and age. The findings of the study are consistent with those of studies carried out by Jacinto and associates. (26). Who concluded that there was no significant association between age and the incidence of phlebitis.

This result is inconsistent with a study by Fitriyanti (27). Research indicates a link between age and the occurrence of phlebitis. As individuals age, various bodily functions change, affecting their physical, biological, psychological, and social well-being. One significant physical change is the decline of the immune system. Children's defense mechanisms develop as they mature. Infants and toddlers, who have smaller veins and more active movements, are more prone to catheter displacement, which can result in phlebitis.

According to the findings, there is no significant correlation between sex and the phlebitis score on the second and third days, which is consistent with a study conducted by Erdogan and Denat (28), that found that the incidence of phlebitis in the study and control groups is not significantly correlated with sex.

This study's results disagree with Komaling findings (29) who concluded that the reason why sex affects a patient's risk of developing phlebitis is not well explained. However, because of their smaller blood vessels, larger fat deposits, and hormones like progesterone and estrogen that compromise blood vessel integrity, women are more likely to develop phlebitis. In contrast, males tend to have fewer fat deposits in their blood vessels due to higher activity levels, which makes them less at risk for phlebitis.

This finding aligns with a study conducted by Sharifi-Ardani and colleagues (30) findings, there was no significant correlation between the intervention and control groups' phlebitis severity and variables like age and sex.

Regarding the peripheral IV cannula insertion site there is not a statistically significant correlation between in the control and study groups in terms of phlebitis scoring. This study's results align with Diwakar, Kumar, and others (31) who found no significant impact of the PVC insertion site on the development of phlebitis (p value > 0.5) between the two groups.

Regarding the residency, according to the study's findings, there was a statistically significant correlation between the control and study groups. However, no significant correlation was found between the study group and phlebitis scoring. This result is not consistent with a previous study that found no statistically significant indicators of PIVC complications in infants (32).

## Conclusion

This study demonstrates that the utilization of the I.V. House Ultra Dressing provides a statistically and clinically effective mechanism for reducing the incidence and severity of peripheral intravenous catheter-related phlebitis in pediatric patients. By enhancing catheter stabilization and preventing mechanical friction, this protective device optimizes vascular longevity and minimizes the need for repeated, traumatic cannulation procedures in pediatric populations.

## Recommendations

Researchers recommend: it is essential that nurses and other healthcare professionals receive training on how to apply the I.V. House Ultra Dressing on pediatric patients. Additionally, it is important to assess how satisfied pediatric nurses or parents are when basic care is provided, such as changing dressings, bathing, or administering medication. Further research with larger, diverse pediatric cohorts is needed to validate these findings and assess long-term effects on phlebitis incidence and patient comfort. Currently, the I.V. House Ultra Dressing is unavailable in Iraq; its procurement by the Iraqi Ministry of Health could enhance pediatric care by stabilizing (PIVCs) and reducing phlebitis risk.

## Limitations

This study its implementation faced multiple difficulties. Key challenges included, among others, The I.V. House Ultra Dressing is not locally available in Iraq, and so electronic importation is required for the study. This logistical constraint could limit broader clinical implementation unless procurement protocols are modified. The research was conducted exclusively at two hospitals (Tikrit Teaching Hospital and Baled General Hospital), which may limit the generalizability of the findings to broader populations or diverse healthcare environments. Financial constraints further restricted the study by limiting the number of participants, potentially affecting the statistical power and wider applicability of the results.

## Conflicts of interest

The authors declare that there is no conflict of interests regarding the publication of this review article.

## Ethical Approval

The authors state that their systematic literature review did not require ethical approval. This research is based on a master thesis, adhering to established protocols.

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**Author contribution**

RQM designed, conducted, and analyzed the study, and drafted the manuscript. AQM supervised the research and provided critical review.

**Data availability statement**

The data that support the findings of this study are available from the authors, but restrictions apply to the availability of these data, which were used under license for the current study and are not publicly available. However, the data can be obtained from the authors upon reasonable request and with appropriate permissions.

**References**

1. Kuş B, Büyükyılmaz F. Effectiveness of vialon biomaterial versus teflon catheters for peripheral intravenous placement: A randomized clinical trial. Japan Journal of Nursing Science. 2020;17(3):e12328.

2. Mihala G, Ray-Barruel G, Chopra V, Webster J, Wallis M, Marsh N, et al. Phlebitis signs and symptoms with peripheral intravenous catheters: incidence and correlation study. Journal of Infusion Nursing. 2018;41(4):260–3.

3. Chopra V, Flanders SA, Saint S, Woller SC, O'Grady NP, Safdar N, et al. The Michigan Appropriateness Guide for Intravenous Catheters (MAGIC): results from a multispecialty panel using the RAND/UCLA appropriateness method. Ann Intern Med. 2015;163(6_Supplement):S1–40.

4. Keskin A, Eskimez Z. Effect of Skin Antiseptics Used in Peripheral Intravenous Catheter Application on Phlebitis Development: A Double-Blind Randomized Controlled Trial. Clinical and Experimental Health Sciences. 2024;14(2):406–13.

5. Özalp Gerçeker G, Kahraman A, Yardimci F, Bilsin E, Binay Ş, Çevik Özdemir HN, et al. Infiltration and extravasation in pediatric patients: A prevalence study in a children's hospital. J Vasc Access. 2018;19(3):266–71.

6. Bitencourt ES, Leal CN, Boostel R, Mazza V, Felix JVC, Pedrolo E. Prevalence of phlebitis related to the use of peripheral intravenous devices in children. Cogitare Enferm. 2018;23(1):e49361.

7. Hidayat AAA, Sukadiono S, Wijayanti E. Predictor Factors of Phlebitis Incidence for Children in Hospital Private in Sidoarjo, Indonesia. Systematic Reviews in Pharmacy. 2020;11(5):249–53.

8. Naik SH, Wani D, Yasmin B. A study to assess the occurrence and risk factors of Phlebitis among peripheral intravenous cannulated patients admitted in Emergency Wards of SKIMS, Soura, Srinagar with a view to develop Phlebitis Prevention Protocol. Trends in Nursing Administration and Education (2348-2141). 2022;11(1):5–15.

9. Kumar P, Dhar A, Banik S, Saha A, Banik A, Biswas P, et al. Incidence of phlebitis among children having peripheral intravenous line in selected hospital, Siliguri. 2023;

10. Suliman M, Saleh W, Al-Shiekh H, Taan W, AlBashtawy M. The incidence of peripheral intravenous catheter phlebitis and risk factors among pediatric patients. J Pediatr Nurs. 2020;50:89–93.

11. Büyükyılmaz F, Şahiner NC, Cağlar S, Eren H. Effectiveness of an intravenous protection device in pediatric patients on catheter dwell time and phlebitis score. Asian Nurs Res (Korean Soc Nurs Sci). 2019;13(4):236–41.

12. Clinical Evidence | I.V. House [Internet]. [cited 2025 Apr 26]. Available from: https://www.ivhouse.com/education/clinical-evidence

13. Delivering on the Promise of Improved Patient Safety and Increased Nurse Efficiency 1

[Internet]. 2022. Available from: www.ivhouse.com

14. Shawq AH. Effectiveness of Deep Breathing Technique on Pain Level of School Children during Catheterization. Medical Journal of Babylon. 2024;21(Suppl 1):S120–5.

15. Shaker NZ. Monitoring Peripheral Intravenous Catheters Complications in Pediatric Patients in Erbil City/Iraq. Erbil Journal of Nursing and Midwifery. 2022;5(2):105–13.

16. Gudnadottir G. Paediatric sleep-disordered breathing-diagnostics and treatment. 2018.

17. Naser SA, Al-Fayyadh S. Impact of Shot Blocker on Alleviating Peripheral Intravenous Cannulation Associated Pain among School-Aged Children: A Randomized Controlled Trial. The Malaysian Journal of Nursing (MJN). 2024;16(2):74–86.

18. Atay S, Yilmaz Kurt F. Effectiveness of transparent film dressing for peripheral intravenous catheter. J Vasc Access. 2021;22(1):135–40.

19. Aziz A. Comparison The Use Transparent Dressing With Conventional Fixation on Phlebitis Rates In Rumkitban 05.08. 03 Sidoarjo. Journal of Scientific Research, Education, and Technology (JSRET). 2022;1(2):472–8.

20. Cho YH, Yen LL, Yu KL, Chang CC, Chen HL. Reducing the incidence of phlebitis related to intravenous injection in pediatric patients. Hu Li Za Zhi. 2015;62(3):49.

21. Ravindra HN, Patel KD. A quasi experimental study to evaluate effectiveness of glycerin magnesium sulphate dressing on phlebitis among patients undergoing peripheral intravenous infusion in selected hospital, Vadodara. International Journal of Medical Research & Health Sciences. 2015;4(3):527–30.

22. Kaur M, Kaur L. A quasi experimental study to assess the effect of hot application on phlebitis among patients on intravenous therapy at selected hospitals, Jalandhar, Punjab, 2014. International Journal of Nursing Education. 2015;7(4):11–4.

23. Anggraeni R, Suryati Y, Nurjanah N. The Effect of Aloe vera Compress in Reducing the Degree of Phlebitis among Hospitalized Children in Indonesia. Iranian Journal of Neonatology. 2021;12(3).

24. Jeong IS, Jeon GR, Lee MS, Shin BJ, Kim YJ, Park SM, et al. Intravenous infiltration risk by catheter dwell time among hospitalized children. J Pediatr Nurs. 2017;32:47–51.

25. Lim EYP, Wong CYW, Kek LK, Suhairi SSBM, Yip WK. Improving the visibility of intravenous (IV) site in pediatric patients to reduce IV site related complications–An evidence-based utilization project. J Pediatr Nurs. 2018;41:e39–45.

26. Jacinto AK de L, Avelar AFM, Wilson AMMM, Pedreira M da LG. Phlebitis associated with peripheral intravenous catheters in children: study of predisposing factors. Escola Anna Nery. 2014;18:220–6.

27. Fitriyanti S. FAKTOR YANG MEMPENGARUHI TERJADINYA PHLEBITIS DI RUMAH SAKIT BHAYANGKARA TK II HS SAMSOERI METOJOSO SURABAYA. UNIVERSITAS AIRLANGGA; 2014.

28. Erdogan BC, Denat Y. The development of phlebitis and infiltration in patients with peripheral intravenous catheters in the neurosurgery clinic and affecting factors. Int J Caring Sci. 2016;9(2):619.

29. Komaling C, Kumaat L, Onibala F. Hubungan Lamanya Pemasangan Infus (Intravena) Dengan Kejadian Flebitis Pada Pasiendi Irina F Blu Rsup Prof. Dr. RD Kandou Manado. Jurnal Keperawatan UNSRAT. 2014;2(1):107199.

30. Sharifi-Ardani M, Yekefallah L, Asefzadeh S, Nassiri-Asl M. Efficacy of topical chamomile on the incidence of phlebitis due to an amiodarone infusion in coronary care patients:

a double-blind, randomized controlled trial. J Integr Med. 2017;15(5):373–8.

31. Diwakar K, Kumar S, Srivastava P, Uddin MW, Mishra S. Reduction in the incidence of infusion-related phlebitis in a pediatric critical care unit of Eastern India: A quality improvement initiative. Med J Armed Forces India. 2024;80(1):46–51.

32. Baye ND, Teshome AA, Ayenew AA, Amare TJ, Mulu AT, Abebe EC, et al. Incidence, time to occurrence and predictors of peripheral intravenous cannula-related complications among neonates and infants in Northwest Ethiopia: an institutional-based prospective study. BMC Nurs. 2023 Dec 1;22(1).