MAKU J. Health Sci. Inst. 2023, 11(2): 221-228.
doi: 10.24998/maeusabed.1325676

Mehmet Akif Ersoy University
Journal of Health Sciences Institute
http://dergipark.gov.tr/maeusabed

Research Article / Araştırma Makalesi

Determination of Phlebitis Rate with Visual Infusion Phlebitis Diagnostic Scale: An Observational Study

Görsel İnfüzyon Flebit Tanılama Skalası ile Flebit Oranının Belirlenmesi: Gözlemsel Bir Çalışma

Elçin EFTELİ[1*], Handan ÖZDEMİR[1]

[1]Burdur Mehmet Akif Esoy University, Faculty of Health Sciences, Department of Fundamentals of Nursing, Burdur, Türkiye

Abstract: Phlebitis is the inflammation of the tunica intima layer of the vein and is a common preventable complication of peripheral intravenous catheters. The aim of this study was to determine the rate of phlebitis development in patients with peripheral intravenous catheters implantation using the Visual Infusion Phlebitis Diagnostic Scale and to determine the associated factors. The study was conducted in the internal and surgical clinics of a state hospital hospital between September 1, 2022 and February 1, 2023. The 'Patient Information Form', 'Peripheral Intravenous Catheter Evaluation Form' and 'Visual Infusion Phlebitis Diagnosis Scale' were used to collect the study data. In 30.3% of the patients with PIC, phlebitis developed and 48.9% of the phlebitis cases were grade 1. The variables such as sex and presence of a chronic disease did not affect the development of phlebitis. Phlebitis development was more common in patients in the 40-64 age group, on the wrist, on the left arm and on the actively used arm, in sites where the peripheral intravenous catheters was inserted in two or more attempts, in patients in whom 16 Fr or 18 Fr catheters were inserted, and in patients taking antibiotics.

Keywords: Phlebitis, intravenous cathat, Phlebitis Diagnostic Scale, Intravenaous Access.

Öz: Flebit; venin tunika intima tabakasının inflamasyonudur ve yaygın görülen önlenebilir bir periferik intavenöz katater komplikasyonudur. Çalışmada periferik intavenöz katater takılı olan hastalarda flebit gelişme oranlarının ile belirlenmesi ve ilişkili faktörlerin ortaya konması amaçlanmıştır. Çalışma, 1 Eylül 2022-1 Şubat 2023 tarihleri arasında bir devlet hastanesinin dahili ve cerrahi kliniklerinde yürütülmüştür. Veriler 'Hasta bilgi formu', 'Periferik İntravenöz Kateter Değerlendirme Formu' ve 'Görsel İnfizyon Flebit Tanılama Skalası' ile toplanmıştır. Hastalara uygulanan 122 PİK girişiminin %30.3'ünde flebit geliştiği ve gelişen flebitlerin % 48,9'unun 1. Derece flebit olduğu belirlenmiştir. Cinsiyet ve kronik hastalık varlığının flebit oluşumunu etkilemediği, 40-64 yaş grubunda, el bileğinde, sol tarafta ve aktif olarak kullanılan tarafta, ikinci veya tekrarlı denemelerde, 16 ve 18 numara kateterle takılan periferik intavenöz kataterlerde ve antibiyotik kullanan hastalarda flebit oluşumunun arttığı belirlenmiştir.

Anahtar Kelimeler: Flebit, İntravenöz katater, Flebit tanılama skalası, İntravenöz girişim.

*Corresponding author : Elçin EFTELİ e-mail : eulker@mehmetakif.edu.tr
Geliş tarihi / Received : 11.07.2023 Kabul tarihi / Accepted: 02.08.2023

Introduction

Peripheral intravenous catheters (PIC) are used to administer some drugs, to replace fluid and electrolyte loss, to regulate acid-base balance, to administer blood and blood products, and to provide total parenteral nutrition (Craven et al., 2015). Although PIC practices are among the frequently used nursing practices, they lead to some complications. Among these complications, phlebitis and infiltration are the most common, but they can be prevented if the care of the PIC area is inserted is performed regularly and properly (Gallant and Schultze, 2006).

Phlebitis is the inflammation of the tunica intima layer of the vein and is a common preventable complication of PIC (Craven et al., 2015). Post-infusion phlebitis develops within 24-96 hours after the termination of PIC application (Urbanetto et al., 2017). Phlebitis development rates differ from one sample group to another and

To cite this article: EFTELİ E, ÖZDEMİR H. (2023). Determination of Phlebitis Rate with Visual Infusion Phlebitis Diagnostic Scale: An Observational Study. MAKU J. Health Sci. Inst., 11(2), 221-228.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

there are many factors associated with the development of phlebitis. Among these factors are the type of the catheter, drug irritation, antibiotic use, the person's age and sex, fluid flow rate, frequency of drug use, anatomical region the catheter is inserted, and other infections in the patient (Urbanetto et al., 2017).

Nurses assume an important role in the prevention of the development of PIC-related phlebitis and infiltration, and in the provision of appropriate care if phlebitis has developed. The development of PIC complications causes patients to be exposed to unnecessary diagnostic procedures and treatment, and prolonged hospitalization, to experience stress, and increases the workload of health personnel and the cost of health expenditures. In order to prevent PIC complications, nurses should adopt good and preventive care practices and be able to make an urgent decision on care in case a complication occurs.

In the present study, the authors aimed to determine the rate of phlebitis development in patients with PIC by administering the Visual Infusion Phlebitis Diagnostic Scale and to reveal the related factors.

Materials and Methods

Design and setting

This cross-sectional study was conducted in the internal and surgical clinics of a public hospital between September 1, 2022 and February 1, 2023.

Sample

The study included 122 catheterized patients hospitalized in internal and surgical clinics between the above mentioned dates. Patients hospitalized in intensive care clinics were excluded from the study due to multiple interventions and the presence of central catheters. They were monitored for phlebitis development for 3 days after catheter insertion. After the study was completed, post power analysis was performed, which demonstrated that the sample had adequate power (80%). Standardized effect sizes determined by Cohen were used to determine the power of the sample size (Cohen et al., 2007).

Data Collection Tools

The 'Patient Information Form', 'Peripheral Intravenous Catheter Evaluation Form' and 'Visual Infusion Phlebitis Diagnosis Scale' were used to collect the study data.

***Patient Information Form**:* The form prepared by the researchers based on the literature is administered to determine patients' socio-demographic characteristics such as age and sex. It is also used to determine whether the patient has a chronic disease.

***Peripheral Intravenous Catheter Assessment Form**:* The form developed by the authors of this study is used to question the catheter size, the catheter insertion site, the body area where the catheter is inserted, the body side that the patient actively uses, the success at the first attempt, and the use of antibiotics. It is also used to question whether the previous insertion was performed on the same vein.

Visual Infusion Phlebitis Diagnosis Scale (GIFTS): The GIFTS was developed by Gallant and Schultze in 2006. The language and content validity study of the Turkish version of the GIFTS was performed by Paşalıoğlu and Kaya (2014).The GIFTS used to observe the catheter for possible risks and/or the relevant symptoms in case phlebitis develops in patients in whom PIC is inserted includes the following five grading steps:

Grade 1: At this grade, there are no signs of phlebitis such as pain, redness, or edema. The only recommendation is to observe the catheter.

Grade 2: At this grade, early signs of phlebitis such as redness smaller than 2.5 cm around the catheter and pain on palpation occur. It is recommended to replace the catheter with a new one.

Grade 3: It is the middle stage of phlebitis. At this grade, there is redness which is greater than 2.5

To cite this article: EFTELİ E, ÖZDEMİR H. (2023). Determination of Phlebitis Rate with Visual Infusion Phlebitis Diagnostic Scale: An Observational Study. MAKU J. Health Sci. Inst., 11(2), 221-228.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

cm, but smaller than 5 cm around the intravenous (IV) region. There is also pain on and/or around the IV region, and stiffness around it when the region is palpated. It is recommended to replace the catheter with a new one, to notify the physician and to provide the treatment ordered by the physician.

Grade 4: It is the advanced phlebitis or initial stage of thrombophlebitis. At this grade, there is redness of 5 cm or more in the IV region, pain and stiffness on or around the IV region when the region is palpated. It is recommended to replace the catheter with a new one, to notify the physician and to provide the treatment ordered by the physician.

Grade 5; It is the advanced stage of thrombophlebitis. At this grade, there are signs of grade 4 phlebitis and signs of purulent drainage. It is recommended to replace the catheter with a new one, to notify the physician and to provide the treatment ordered by the physician.

Data analysis

The statistical analysis of the data obtained in the present study was performed on the computer using the Statistical Package for the Social Sciences (SPSS) 16.0 (SPSS Inc., Chicago, IL, USA) program. Descriptive statistics were given as numbers and percentages, and the Chi-square test was used to compare the presence of phlebitis according to independent variables.

Ethical consideration

Before the study was conducted, ethical approval from Burdur Mehmet Akif Ersoy University Non-Interventional Research Ethics Committee (Date: 11/05/2022 and Decision no: GO 2022/715), permission to conduct the study from Burdur State Hospital where the study was to be conducted and written informed consent from the patients or their relatives who agreed to participate in the study were obtained.

Table 1. Patient characteristics

	n	%
Age		
18-39	24	19.7
40-64	70	57.4
65 and older	28	23.0
Sex		
Female	70	57.4
Male	52	42.6
Chronic disease		
Yes	89	73
No	33	27
Clinic		
Internal	48	39.3
Surgical	74	60.7

Results

In the study, 122 patients with PIC were included. Of them, 57.4% were women and in the age group of 40-64 years, 73% had at least one chronic disease and 60.7% were hospitalized in surgical clinics (Table 1). In all the patients, nurses preferred the upper extremity to insert the PIC. The PIC was mostly inserted in the 30.3% forearms of the patients, in the left arm of 76.2% of the patients, and in the arm that was not actively used in 73% of them. The PIC was inserted in the first attempt in 59.8% of the patients, and 42.6% of the PICs were inserted in the previous insertion site. The 22 Fr catheters were inserted in 38.5% of the patients, and 37.7% of the patients were administered antibiotics via PIC (Table 2).

According to the analysis of the phlebitis development in terms of the clinic where the patients were hospitalized, their sex, and the presence of a chronic disease demonstrated that there was no statistically significant difference between them (Table 3, $p>0.05$).

Table 2. Peripheral intravenous catheterization and related factors.

Variables	n	%
Catheter insertion site		
Dorsal face of the hand	29	23.8

To cite this article: EFTELİ E, ÖZDEMİR H. (2023). Determination of Phlebitis Rate with Visual Infusion Phlebitis Diagnostic Scale: An Observational Study. MAKU J. Health Sci. Inst., 11(2), 221-228.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

Wrist	34	27.9
Forearm	37	30.3
Antecubital region	22	18.0
Catheter inserted side		
Right	29	23.8
Left	93	76.2
Actively used arm		
Yes	33	27
No	89	73
Success in the first attempt	73	59.8
Yes	49	40.2
No		
Previous insertion in the same vein	52	42.6
Yes	70	57.4
No		
Catheter number (Fr.)		
16	2	1.6
18	31	25.4
20	42	34.4
22	47	38.5
Antibiotic administration		
Yes	46	37.7
No	76	63.3
Phlebitis No		
Grade 1	85	69.7
Grade 2	23	18.9
Grade 3	10	8.2
Grade 4	4	3.3
Grade 5	0	

According to the analysis of the phlebitis development in terms of the age groups of the patients, phlebitis development was higher in the 40-64 age group than it was in the other age groups and the difference was statistically significant (Table 3, $p<0.05$).

According to the analysis of the phlebitis development in terms of the sites where the PIC was inserted, phlebitis development was more common on the wrist, left arm and actively used arm, and the difference was statistically significant (Table 3, $p<0.05$).

According to the analysis of the phlebitis development in terms of the number of PIC insertion attempts, phlebitis development was more common if there were two or more attempts, or if the previous insertion had been performed on the same vein. The difference was statistically significant (Table 3, $p<0.05$).

According to the analysis of the phlebitis development in terms of the size of the catheters, phlebitis developed in all the patients in whom 16 Fr or 18 Fr catheters were inserted (Table 3, $p<0.05$).

Discussion

In our study, 122 peripheral intravenous catheter insertions were analyzed and the factors affecting the development of phlebitis were determined. In 30.3% of the patients with PIC, phlebitis developed and 48.9% of the phlebitis cases were grade 1. Our review of studies revealed that the incidence of phlebitis ranged between 1% and 77.5% (Couzigou et al., 2005; Lanbeck et.al., 2004; Palefski and Stoddard, 2001; Curran et al., 2000; Lundgren et. al., 1996). Phlebitis developed in 28.2% of 195 PIC insertions in Berse et al.'s (2020) study, in 43.2% of 110 patients in Braga et al.'s (2018) study, in 10% of 361 PIC insertions in Urbenotto and May's (2016) study, and in 31.8% of 317 PIC insertions in Atay et al.'s (2018) study. The Infusion Nurses Society states that if the incidence of phlebitis is less than 5% it is acceptable: however, the rate of phlebitis is above this limit in studies in the literature (INS, 2019). This high incidence of phlebitis probably stems from the different factors originating from the patient and the application. In several studies, most of the phlebitis cases were grade 1 (Berse et. al., 2020; Urbanetto and May, 2019; Atay et. al., 2018; Braga et. al., 2018;). Our study findings are consistent with those in the literature. Most of the phlebitis cases are grade 1 because phlebitis can be noticed early. The Infusion Nurses Society recommends that PICs should be checked at least every 8 hours.

To cite this article: EFTELİ E, ÖZDEMİR H. (2023). Determination of Phlebitis Rate with Visual Infusion Phlebitis Diagnostic Scale: An Observational Study. MAKU J. Health Sci. Inst., 11(2), 221-228.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

According to the results of our study the sex variable had no effect on phlebitis development, which was consistent with the results of other studies (Berse et. al., 2020; Uslusoy and Mete, 2008). However, in some other studies in the literature, it is reported that phlebitis is more common in women (Wallis et. al., 2014; Saini et. al., 2011). Thus, the effect of sex on the development of phlebitis is controversial.

As was indicated in several studies, the presence of a chronic disease affected the development of phlebitis (Atay et. al., 2018; Erdoğan and Denat, 2016); however, it did not affect the development of phlebitis in our study.

In the literature, it is stated that phlebitis is more common in older people, especially when it is accompanied by chronic diseases, due to the deterioration of the vascular structure and weakening of the immune system; however, in our study, the rate of phlebitis was higher in the 40-64 age group. While phlebitis was more common in individuals over 65 years of age in Berse et al.'s 82020) study, in Uslusoy and Mete's (2008) study, no relationship was determined between age and phlebitis development.

In the present study, the nurses preferred the forearm, left arm and arm that was not actively used to insert PIC, and phlebitis development was more common on the wrist and actively used arm. Contrary to our findings, in Berse et al.'s (2020) study, the site where the catheter was inserted had no effect on the development of phlebitis, but phlebitis developed more on the inactive arm. On the other hand, Atay et al. (2018) did not determine any difference between the actively and inactively used arms in terms of phlebitis development and the site where the catheter was inserted. However, in Buzatto et al.'s (2016) study, there was no difference between the right and left arms in terms of phlebitis development. As in our study, in several studies, phlebitis developed more in the actively used arm and in the joint areas because catheters inserted in these sites would be exposed to trauma more, and the use of the cubital vein and forearm veins reduced the risk of phlebitis development (Cicolini et. al., 2014; Do Rego Furtado, 2011; Uslusoy and Mete, 2008).

In our study, phlebitis development was more common in sites where the PIC was inserted in two or more attempts, or if the previous insertion was performed on the same vein. Simin et al. (2019) reported that two or more unsuccessful attempts increased the occurrence of phlebitis. In the insertion of peripheral intravenous catheter, failure of blood flow to the PIC during the insertion, failure to administer fluid, occurrence of swelling or pain in the insertion area, and the need for a new catheter are considered as the indications of unsuccessful intervention. Unsuccessful attempts suggest that either the patient's vessel walls are thin and delicate, or the nurse's knowledge and experience are inadequate (Aydın and Arslan 2018; Kuş and Büyükyılmaz, 2018). In addition, as the number of attempts made to the same vein for the insertion of PIC increases, the vein is exposed to trauma more and becomes more vulnerable to infection, and the risk of phlebitis increases as the intima layer of the vein is damaged (Webster et. al., 2015; Saini et. al., 2011).

In our study, phlebitis development was observed in all of the patients in whom 16 Fr or 18 Fr catheters were inserted. In several studies in the literature, it is reported that thick and long catheters increase the risk of phlebitis development as they cause more trauma to the vessel (Nyika et.al., 2018; Do Rego Furtado 2011). However, in some other studies, the size of the catheter is indicated to have no effect on phlebitis formation (Berse et al., 2020; Buzatto et. al., 2016; Salgueiro-Oliveira et. al., 2012). In the literature, it is recommended that the diameter of a PIC should not exceed 45% of the vessel diameter if the catheter is inserted in the vessels in the upper extremities because these vessels are thinner and delicate (Turkish Society for Hospital Infections and Control, 2019; Sharp et. al., 2015; Chopra et. al., 2014).

To cite this article: EFTELİ E, ÖZDEMİR H. (2023). Determination of Phlebitis Rate with Visual Infusion Phlebitis Diagnostic Scale: An Observational Study. MAKU J. Health Sci. Inst., 11(2), 221-228.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

Table 3. Comparison of phlebitis development according to patient characteristics and some factors related to PIC.

	Phlebitis development		**Test X^{2*}**	**p**
Variables	**No**	**Yes**		
	n (%)	n (%)		
Age				
18-39	22 (91.7)	2 (8.3)		
40-64	43 (61.4)	27 (38.6)	7.787	0.020**
65 and older	20 (71.4)	8 (28.6)		
Sex				
Female	49 (70)	21 (30)	0.008	0.927
Male	36 (69.2)	16 (30.8)		
Chronic disease				
Yes	62 (69.7)	27 (30.3)	0.000	0.997
No	23 (69.7)	10 (30.3)		
Clinic				
Internal	36 (75)	12(25)	1.063	0.303
Surgical	49 (66.2)	25 (32.8)		
Catheter insertion site				
Dorsal face of the hand	26 (89.7)	3 (10.3)		
Wrist	2 (5.9)	32 (94.1)	91.409	0.000**
Forearm	35 (94.6)	2 (5.4)		
Antecubital region	22 (100)	0 (0)		
Catheter inserted side				
Right	26 (98.7)	3 (10.3)	7.189	0.007**
Left	59 (63.4)	34 (36.6)		
Actively used arm				
Yes	0	33 (100)	103.920	0.000**
No	85 (95.5)	4 (4.5)		
Success in the first attempt				
Yes	69 (94.5)	4 (5.5)	53.111	0.000**
No	16 (32.7)	33 (67.3)		
Previous insertion in the same vein				
Yes	19 (36.5)	33 (63.5)	47.087	0.000**
No	66 (94.3)	4 (5.7)		
Catheter number (Fr.)				
16	0 (0)	2 (100)		
18	0(0)	31 (100)	104.873	0.000**
20	38 (90.5)	4 (9.5)		
22	47 (100)	0 (0)		
Antibiotic administration				
Yes	12 (26.1)	34 (73.9)	66.387	0.000**
No	73 (96.1)	3 (3.9)		

*x^2 = Chi-Square test, **$p<0.05$.

In our study, the use of antibiotics by the patients increased the development of phlebitis. Similarly, in their study, Urbanetto et al. (2016) determined that antibiotics led to the development of phlebitis, probably due to the fact that the pH of antibiotics is different from that of the blood and that they cause chemical trauma to the tunica intima.

Conclusion

In our study, the rate of phlebitis development was above the rate determined by the Infusion Nurses

To cite this article: EFTELİ E, ÖZDEMİR H. (2023). Determination of Phlebitis Rate with Visual Infusion Phlebitis Diagnostic Scale: An Observational Study. MAKU J. Health Sci. Inst., 11(2), 221-228.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

Society, most of them were grade 1 phlebitis, and the variables such as sex and presence of a chronic disease did not affect the development of phlebitis. Phlebitis development was more common in patients in the 40-64 age group, on the wrist, on the left arm and on the actively used arm, in sites where the PIC was inserted in two or more attempts, in patients in whom 16 Fr or 18 Fr catheters were inserted, and in patients taking antibiotics. To reduce the rate of phlebitis development, we recommend that reliable measurement tools should be used, that the signs and symptoms in the PIC region should be regularly and continuously observed, that nurses should regularly participate in applied trainings in order to improve their knowledge and skills, and that future studies to be carried out to determine different risk factors should include larger samples.

References

Atay, S., Sen, S., Cukurlu, D., 2018. Phlebitis related peripheral venous catheterization and the associated risk factors. Nigerian Journal of Clinical Practice 21(7), 827–831.

Aydın, S., Arslan, G.G., 2018. Hemşirelerin periferal intravenöz kateter girişimlerine ilişkin bilgi düzeylerinin incelenmesi. Dokuz Eylül Üniversitesi Hemşirelik Fakültesi Elektronik Dergisi 11(4),290-299.

Berse, S., Tosun, B., Tosun, N., 2020. Periferik intravenöz katetere bağlı flebit oranının ve etkileyen faktörlerin değerlendirilmesi. Dokuz Eylül Üniversitesi Hemşirelik Fakültesi Elektronik Dergisi 13(3), 160-169.

Braga, L., Parreira, P., Oliveira, A. S. S., ónico, L. D. S., Arreguy-Sena, C., Henriques, M. A., 2018. Phlebitis and infiltration: Vascular trauma associated with the peripheral venous catheter. Latino-Americana de Enfermagem 26(2), 1–8.

Buzatto, L. L., Massa, G. P., Peterlini, M. A. S., Whitaker, I. Y., 2016. Factors associated with phlebitis in elderly patients with amiodarone intravenous infusion. Acta Paulista de Enfermagem 29(3), 260-266.

Chopra, V., Ratz, D., Kuhn, L., Lopus, T., Lee, A., Krein, S., 2014. Peripherally inserted central catheter-related deep vein thrombosis: contemporary patterns and predictors. Journal of Thrombosis and Haemostasis 12, 847-54.

Cicolini, G., Simonetti Comparcini, D., Labeau, S., Blot, S., Pelusi, G., Di Giovanni, P., 2014. Nurses' Knowledge of evidence-based guidelines on the prevention of peripheral venous catheter-related ınfections: A multicentre survey. Journal of Clinical Nursing 23(17–18), 2578–2588

Cohen, L, Manion, L, Morrison, K., 2007. The ethics of educational and social research. In: Research Methods in Education. (Cohen L. eds.) NewYork NY: Routledge,20-50.

Couzigou, C., Lamory, J., Salmon-Ceron, D., Figard, J., Vidal-Trecan, G. M., 2005. Short peripheral venous catheters: Effect of evidence-based guidelines on insertion, maintenance and out comes in a university hospital. Journal of Hospital infection 59(3), 197-204.

Craven, F. R., Hirnle, J. C., Jensen, S. 2015. *Hemşirelik esasları insan sağlığı ve fonksiyonları.* (Çev. N. Uysal ve E. Çakırcalı). Ankara: Palme Yayıncılık. 464-487.

Curran, E. T., Coia, J. E., Gilmour, H., McNamee, S., Hood, J., 2000. Multi-center research surveillance project to reduce infection/phlebitis associated with peripheral vascular catheters. Journal of Hospital Infection 46(3), 194-202.

Do Rego Furtado, L. C., 2011. Incidence and predisposing factors of phlebitis in a surgery department. British Journal of Nursing 20(14), 16-25.

Erdoğan, C. B., Denat, Y., 2016. Periferik intravenöz kateter komplikasyonlarından flebit ve hemşirelik bakımı. Journal of Human Rhythm 2(1), 6-12

Gallant, P., Schultz, A. A. 2006. Evaluation of a visual infusion phlebitis scale for determining appropriate discontinuation of peripheral intravenous catheters. Journal of Infusion Nursing 29(6), 338-345.

Infusion Nurses Society. 2011. Infusion Nursing Standards of Practice. (The official publication of the Infusion Nurses Society). Journal of Infusion Nursing 34(1), 1-110.

Kuş, B., Büyükyılmaz, F., 2018. Visual infusion phlebitis assessment scale: Study of independent inter-observer compliance. Florence Nightingale Journal of Nursing 26(3), 179–186.

Lanbeck, P., Odenholt, I., Paulsen, O., 2004. Perception of risk factors for infusion phlebitis among Swedish Nurses: A questionnaire study. Journal of Infusion Nursing 27(1), 25-30.

Lundgren, A., Wahren, L.K., Ek. A. C., 1996. Peripheral intravenous lines: time in siturelated to

complications. Journal of Infusion Nursing 19(5), 229-38.

Nyika, M. L., Mukona, D., Zvinavashe, M., 2018. Factors contributing to phlebitis among adult patients admitted in the medical-surgical units of a central hospital in Harare, Zimbabwe. Journal of Infusion Nursing 41(2), 96–102

Palefski, S. S., Stoddard, G. J., 2001. The infusion rate and patient complication rates of peripheral catheters. Journal of Infusion Nursing 24(2), 113-23.

Pasalioğlu, K. B., Kaya H., 2014. Catheter indwell time and phlebitis development during peripheral ıntravenous catheter administration. Pakistan Journal Medical Science 30(4),725–730.

Saini, R., Agnihotri, M., Gupta, A., Walia, I., 2011. Epidemiology of infiltration and phlebitis. Nursing and Midwifery Research Journal 7(1), 22-33.

Salgueiro-Oliveira, A., Parreira, P., Veiga, P., 2012. Incidence of phlebitis in patients with peripheral intravenous catheters: The influence of some risk factors. Australian Journal of Advanced Nursing 30(2), 32–39.

Sharp, R., Cummings, M., Fielder, A., Mikocka-Walus, A., Grech, C., Esterman, A., 2015. The catheter to vein ratio and rates of symptomatic venous thromboembolism in patients with a peripherally inserted central catheter (PICC): a prospective cohort study. International Journal of Nursing Studies 52, 677-85.

Simin, D., ilutinović, D., Turkulov Brkić S., 2019. Incidence, severity and risk factors of peripheral intravenous cannula induced complications: An observational prospective study. Journal of Clinical Nursing 28, 1585-1599.

Türk Hastane İnfeksiyonları ve Kontrolü Derneği, 2019. Ulusal Damar Erişimi Yönetimi Rehberi. Hastane İnfeksiyonları Dergisi. 23 (1), 1-54.

Urbanetto, J. S., May, T. A., 2016. Incidence of phlebitis associated with the use of peripheral IV catheter and following catheter removal. Latino-Americana de Enfermagem 24(2746), 1-9.

Uslusoy, E., Mete, S., 2008. Predisposing factors to phlebitis in patients with peripheral intravenous catheters: A descriptive study. Journal of the American Academy of Nurse Practitioners 20(4),172–180.

Wallis, M. C., McGrail, M., Webster, J., Marsh, N., Gowardman, J., Playford, E. G., Rickard, C. M., 2014. Risk factors for peripheral intravenous catheter failure: a multivariate analysis of data from a randomized controlled trial. Infection Control & Hospital Epidemiology 35(1),63-8.

Webster, J., McGrail, M., Marsh, N., Wallis, M. C., Ray-Barruel, G., Rickard, C. M., 2015. Postinfusion phlebitis: Incidence and risk factors. Nursing Research and Practice 691934, 1-3.