Infusion phlebitis, perceptions of risk factors among Nurses in the Najran hospitals; a cross sectional study

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Abstract

This study evaluated the perceptions of nurses for the risk factors of infusion phlebitis. A convenience sampling of hospital nurses from different departments and wards in Najran hospitals, Kingdom of Saudi Arabia, were recruited. A survey was conducted using a validated questionnaire measuring the nurses' perceptions of the risk factors associated with infusion phlebitis.

A total of 131 questionnaires were evaluated. The study participants had sufficient knowledge about the infusion phlebitis, in particular how big the problem is, risk factors associated with the increased risk of infusion phlebitis, and importance of some measures that can reduce the risk. The nurses needed an update about the updated CDC guidelines and research findings for some risk factors such as infusion rate, and time of infusion.

Key Words: Infusion phlebitis; nurse; catheter; thrombophlebitis; needle; infection; perception; cannulation; infusate

Introduction

Infusion Phlebitis (IP) is considered as one of the top ranked complications of peripheral Intravenous (I.V) cannulation (Khoso, 2021) . IP is associated with serious adverse effects such as hospital-acquired infections such as bacteremia, thrombosis and hematoma which the literature invites closer monitoring of their assessment and treatment (Capdevila et al., 2016). I.V cannulation (of hospitalised patients via peripheral intravenous catheters to maintain body fluid fluids is a daily clinical practice by nurses (P. Lanbeck, I. Odenholt, & O. Paulsen, 2004; Li, Liu, & Qin, 2016). It involves the administration through superficial veins of nutritional fluids, blood components, medication, and other agents (Mermel, 2017). They are widely used with more than 200 million insertions in the USA alone, and accounts to more than 90% of the intravascular devices in hospitalised patients (Mermel, 2017). The most common adverse effect of this procedure is the inflammation of the veins, known as IP is characterised by pain, swelling, warmth, redness at the site of the cannulated vein and often thrombosis (Karadeniz, Kutlu, Tatlisumak, & Özbakkaloğlu, 2003; P. Lanbeck et al., 2004). Patients with IP may experience excruciating pain, prolonged therapy, slower recovery and thus prolonged hospital stay (Li et al., 2016).

A number of studies assesed the risk factors asscociated with IP, and the the incidence varied ranging between 2% to more than 50% (Milutinovic, Simin, & Zec, 2015). According to these studies, the risk factors associated with the IP were: length of the catheter, administered drugs, duration of catheterization, pH and osmolality of the infusate and rate of flow (Li et al., 2016; Niel-Weise, Stijnen, & van den Broek, 2010). Other factors that were assessed as the role of infused drugs, rate of flow, age, gender and medical history (Niel-Weise et al., 2010).

Studies have shown that the skills of the nurses who insert the IV catheters is critical for the incidence of phlebitis (Gorski, 2007). Such information is of great importance to guide policymakers about quality assurance and nurses understanding of perceived risk factors associated with the IP. (Karadeniz et al., 2003). In Saudi Arabia, previous research findings have highlighted the importance of improving knowledge about II risk factors (Mohammed & James, 2018), especially as IP has been found to be the number one complication of peripheral intravenous catheterization (Abolfotouh, Salam, Ala'a Bani-Mustafa, & Balkhy, 2014).

In the Kingdom of Saudi Arabia, available research findings showed higher rates of IP locally than reported internationally with antibiotics infusion being the second top administered infusate (Abolfotouh et al., 2014).

As there is paucity of data about IP in the Saudi hospital settings, our study aimed to asses nurses' perceptions of common risk factors of IP in the Najran Province, with special interest in antibiotics infusion.

Methods:

Study Design

This cross-sectional study was conducted in six public hospitals; King Khaled Hospital (KKH), Najran General Hospital (NGH), Maternity and Children Hospital (MCH), Shrorah General Hospital (SGH), Ydamah General Hospital (YGH), Habona General Hospital (HGH) in the Najran province, Kingdom of Saudi Arabia. A convenience sampling was used to administer a validated questionnaire developed and validated by (Peter Lanbeck, Inga Odenholt, & Otto Paulsen, 2004) during the period January-December 2020 (Appendix A). The questionnaire was not copyrighted; hence, no permission was needed. The questionnaire has been used locally in a sample of nurses before (Mohammed & James, 2018). It comprised of 14 questions assessing perceptions (beliefs and attitudes) about IP risk factors. The Ministry of Health, Kingdom of Saudi Arabia, granted the institutional approval to administer the health-care workers' questionnaire (IRB Log Number: 20-06M).

Sampling, questionnaire design and data collection

The inclusion criteria were nurses from any department and with any specialty from the recruited hospitals. According to the latest Annual Statistical Book published by the Ministry of Health (1438 H, 2017) there are 7 hospitals that encompass 2610 nurses in Najran City (Health, 2017).In order to achieve international representative standard of a sample size based on published literature (Hosseinialhashemi, Kermani, Palenik, Pourasghari, & Askarian, 2015), a minimum of 140 participants were needed to achieve confidence interval of 5% and a confidence level of 95%.

The survey comprised of two sections: demographics and IP perceptions among nurses with a total of 21 questions, with 'yes or no', single and multiple choices (Peter Lanbeck et al., 2004). The survey was administered by paper based trained interviewers along with information sheets that were visiting the recruited sites and the data were entered by interviewers into a predesigned spreadsheet. Anonymity was maintained by creating a key identifier generated at random, as first letter of the hospital/primary healthcare center followed by number for each survey.

Statistical analysis

Descriptive statistics were used to analyse the frequency, mean, standard deviation responses on the variables of interest using the R statistical software (R version 3.6, Copyright© 2019 The R Foundation for Statistical Computing). Chi-squared test of independence was used to asses health care inter-disciplinary differences. A p-value greater than 0.05 will be considered statistically not significant.

Results

A total of 131 nurses completed this survey of whom 75% were females (n=98). In the demographics section of the survey, 47% were between the age of 31-40 (n=62) years old, followed by the age group 20-30 (34%, n=44), 41-50 (17%, n=22) and least group greater than 50 years old (2%, n=3). The participated nurses work in 6 hospitals in Najran, with a median of 22 recruited nurses per hospital. The surveyed nurse's main field of work was intensive care unit (27%, n=35), obstetrics (15%, n=20), outpatient clinics (15%, n= 16), emergency room (8%, n=10), paediatrics (6%, n=8) and other (32%, n=42). Sixty-nine percent (n=90) of the respondents received formal training about IP in the last three years.

In the second part of the survey about perceptions of nurses for thrombophlebitis, 91% (n=119) considered thrombophlebitis in peripheral veins as a big problem. The majority thought a peripheral venous catheter should not be placed in place for longer than 72 hours (92%, n=121). More than 60 minutes of infusion rate of drugs was considered a high risk of thrombophlebitis (62%, n=131). Many think skills acquired in venepuncture can decrease the risk for thrombophlebitis (n=77 %, n=101). In addition, routines for documentation of the insertion of a peripheral venous catheter, and the choice of dressing and in-line filters were perceived to decrease the risk for thrombophlebitis, 92% (n=120), 71% (n=93) and 89% (n=117) respectively. Lastly, the use of short-time infusion

for the administering of drugs was perceived to decrease the risk thrombophlebitis than bolus injection, (79%, n=103 versus 18%, n=23).

Saline (47%, n=62) was the most preferred infusion fluid followed by water (41%; n=54) to dilute a vessel irritating drug in order to decrease the risk for thrombophlebitis. A high concentration of the drug was perceived as the highest risk to increase thrombophlebitis (60%, n=78), followed by cold fluid (48%, n=63), followed high osmolarity (33%, n=43, and high Ph of the drug (18%, n=24). Plastic and long catheters were considered the better qualities to decrease the risk for thrombophlebitis over metal and short ones, 49%; n=64 versus 3%; n=4 and 31% (n=40) versus 9%, n=12, respectively. The forearm and the hand were considered the two most important sites to decrease thrombophlebitis, 47% (n=62) and 32% (n=42) respectively. The final part of the survey was ranking the factors that increase the risk of thrombophlebitis. (Table 1)

Questions	Options	*n* (%)
Do you think thrombophlebitis in peripheral veins is	Big problem	119 (91%)
	Medium problem	11 (8%)
	Small problem	1 (1%)
Which infusion rate do you recommend for a drug that often causes thrombophlebitis	0-15 min	35 (27%)
	16-30 min	8 (6%)
	31-60 min	7 (5%)
	>60 min	81 (62%)
Do you think that a peripheral venous catheter should not be placed in place for longer than	24 hrs	3 (2%)
	48 hrs	7 (5%)
	72 hrs	121 (92%)
Do you think that a skilled vein puncture decreases the risk for thrombophlebitis	Yes	101 (77%)
	No	27 (21%)
	Don't know	3 (2%)
Do you think that routines for documentation of the insertion of a peripheral venous catheter decreases the risk for thrombophlebitis	Yes	120 (92%)
	No	8 (6%)
	Don't know	3 (2%)
Do you think that the choice of dressing affects the risk for thrombophlebitis	Yes	93 (71%)
	No	37 (28%)
	Don't know	1 (1%)
Do you think in-line filters can decrease the risk for phlebitis	Yes	117 (89%)
	No	8 (6%)
	Don't know	6 (5%)
If the same drug can be given both as bolus injection and short-time infusion, which way do you think decreases the risk for thrombophlebitis	Bolus injection	23 (18%)
	short-time infusion	103 (79%)
	Don't know	5 (4%)
Which of the following factors in an infusion fluid or a drug preparation do you think increases the risk for thrombophlebitis	High pH	24 (18%)
	Low pH	3 (2%)
	High Osmolarity	43 (33%)
	Low Osmolarity	2 (2%)
	High concentration of the drug	81 (61%)
	Low concentration of the drug	4 (3%)
	Cold fluid	63 (48%)
	Room temperature fluid	3 (2%)
Which of the following qualities of the peripheral venous catheter do you think decreases the risk for thrombophlebitis	Short catheter	12 (9%)
	Long catheter	40 (31%)
	Coarse bore catheter	5 (4%)
	Fine bore catheter	6 (5%)
	Plastic catheter	64 (49%)
	Metal catheter	4 (3%)
Which of the following sites do you think decreases the risk for thrombophlebitis	Hand	42 (32%)
	Wrist	16 (12%)
	Forearm	62 (47%)
	Foot	2 (2%)
	Leg	1 (1%)
	Antecubital fossa	8 (6%)
In which infusion fluid do you dilute a vessel irritating drug in order to decrease the risk for thrombophlebitis	5% Glucose	15 (11%)
	Saline	62 (47%)
	Sterile water	54 (41%)
Which of the following factors do you think increases the risk for thrombophlebitis	Male gender	7 (5%)
	Female gender	7 (5%)
	Malignancy	17(13%)
	Rheumatic disease	10 (8%)
	Venous insufficiency	46 (35%)
	Arterial insufficiency	11 (8%)
	Diabetes Mellitus	44 (34%)
	Infectious disease	13 (10%)
	High age	26 (20%
	Children	6 (5%)
	Obesities	62 (47%)
	Cachexia	1 (1%)
	Alcoholism	6 (5%)
	Immobilization	4 (3%)
	Thromboembolic disease	33 (25%)
	Former Thrombophlebitis	45 (34%)

Table 1 Frequency (%) of answers to the survey

Discussion

This cross-sectional study aimed to assess nurses' perceptions about IP risk factors. Most of the participants were females (75%) which is consistent with the local (Abolfotouh et al., 2014) and international literature (Peter Lanbeck et al., 2004; Milutinovic et al., 2015) .

Most of the study participants have undergone a formal training about IP in the past three years, and many of the nurses had at least 10 years of experience which reflects the type of answers. This is consistent with locally produced findings (Mohammed & James, 2018) .

Recommendations of the Infusion Nurses Society (INS) that IP rate should not exceed 5%, and phlebitis higher than grade 2 (grading system for monitoring infusion; at grade 2 two of the following are evident; pain at IV site and redness requires intervention in the hospital setting (Society, 2011). In this study the majority of the nurses (91%) considered that IP is a major problem which is much higher than was reported in (Peter Lanbeck et al., 2004) at 59% and (Li et al., 2016) at 61% but this was similar to a local study conducted in neighboring Jazan hospitals in Saudi Arabia (Mohammed & James, 2018).

In the current study, almost all the nurses (92%) believed that replacement of the catheter more than 3 days to prevent the irritation of the vein, which is similar to what was reported in the study in China (Li et al., 2016) at 96% and much higher than a Swedish study (Peter Lanbeck et al., 2004) at 18% and Serbian study (Milutinović, Simin, & Zec, 2015) at 33%, and higher than the study in Jizan (Mohammed & James, 2018) at 72%. Replacement of the catheter routinely is thought to decrease the risk of IP and systemic infections (Webster, Osborne, Rickard, & Marsh, 2019). However, according to the CDC guidelines the replacement of the peripheral intravenous (IV) should not be more frequent than every 72-96h (Miller & O'Grady, 2012). Interestingly a recent study by Webster et al. (2019) found no evidence to support the CDC recommendation.

In the current study, almost 50% of the nurses considered that the plastic material could reduce the risk of IP, similar to what was reported by Peter Lanbeck et al. (2004), followed by long catheters (also made of plastic), which shows a high degree of awareness of the use of this material, which is significantly higher to what was reported by Li et al. (2016) at 23%. Studies have reported that the type of the catheter, in particular fine-bore, can reduce the risk of IP (Everitt & McMahon, 1997). Lately, the use of new types of technologies to manufacture the plastic material have reduced the risk significantly (Li et al., 2016).

In terms of catheter placement, 44% of the nurses considered hand and wrist as insertion sites decrease the risk for thrombophlebitis, and lower to what is reported elsewhere (Li et al., 2016). This shows that the nurses' level of understanding of insertion sites was not high to the recommended CDC guidelines. However, in 2014 a large multicentre-study found that phlebitis risk varies by site and the preferred anatomical insertions sites are antecubital fossa and forearm veins (Cicolini et al., 2014) . Interestingly, the answers to use the hand and the wrist were more likely to be from age category between 31-40 years old (chi square statistic=6.66, $P<0.05$) than younger age category, which is associated with the level of experience. Successful intravenous management plays a big role in the reduction of the risk of IP, and the guidelines recommend the use of upper extremities for insertion of peripheral catheters (O'Grady et al., 2011). According to the CDC guidelines, catheter insertion in the antecubital fossa or forearm is associated with more risk of IP than the hand or wrist (Miller & O'Grady, 2012).

High pH (18%) and high osmolarity (33%) was considered to increase the risk factor for IP and neglected the risks of low pH and low osmolarity. This was inconsistent with international research findings which showed that most of the nurses believed that high concentration of the drug and cold fluid increases the risk of IP which is similar to what was reported previously (Peter Lanbeck et al., 2004). Published literature have shown that administration of a drug or fluid with high and low pH and osmolarity can increase the risk of phlebitis (Chee & Tan, 2002).

With regards to infusion duration, the majority of the nurses (79%) believed that short time infusion decreases the risk of IP over bolus injection, which was higher than reported elsewhere (Li et al., 2016).

The reduction in incidence of local venous toxicity was tested in a randomised clinical trial by injecting 1-min bolus of vinorelbine in comparison with 6-min drip. The study found no significant difference on the effect of reduction of risk of venous toxicity with 1-min and 6-min infusion (Yoh et al., 2007). Shortening the infusion time of a drug have been associated with decreasing the odds of the risk of phlebitis (Simamora, Pinsuwan, Alvarez, Myrdal, & Yalkowsky, 1995; Yoh et al., 2007). Likewise, in reducing the incidence risk of drug induced phlebitis.

Sixty-two % of the respondents believed that infusion of a long period (>60 mn) for a drug often causes thrombophlebitis would reduce the risk of IP which is similar to what is reported by Peter Lanbeck et al. (2004) at 63% and higher to what was reported by Li et al. (2016) at 54%, which indicates that the knowledge of this subject needs to be updated.

In the current study 89% of the nurses were certain that think in-line filters can decrease the risk for phlebitis, which is significantly higher than a recent studies at 42% and 23% respectively (Li et al., 2016; Mohammed & James, 2018).

With regards to the use of I.V in-line filters to remove contaminants from IV solutions, the majority of the participants (89%) thought that in-line filters can decrease the risk for phlebitis, which is significantly higher than a recent studies at 42% and 23% respectively (Li et al., 2016; Mohammed & James, 2018). In-line filter use has been documented as an effective approach (Ball, 2003). However, in 2010 a systemic review of 1633 randomised controlled trials, the evidence of their use was not strong enough and uncertain (Niel-Weise et al., 2010).

Furthermore, the majority of respondents believed that that dressing type have an effect similar to what was reported in other surveys (Peter Lanbeck et al., 2004; Li et al., 2016; Milutinovic et al., 2015). However, according to the CDC guidelines, there is no evidence to support that the type of dressing has an effect on the risk of IP.

Finally, in terms of documentation importance, the majority of respondents (92%) saw this as an important risk factor for IP. This was consistent with multiple studies findings which have indicated that routine documentation significantly decreases the risk of IP especially when done by the regular attending nurse (Li et al., 2016).

Limitations:

Our research findings may have been affected by selection bias. The majority of participants were females. Although this gender over-representation was consistent with the literature, it is not representable for the male nurses. Furthermore, the majority of respondents were working in intensive care units where more awareness of IP is common.

Conclusion

In conclusion, this study presented an important set of data about the perceptions of the nurses in Najran the Kingdom of Saudi Arabia towards IP. The responses were positive, however a better understanding of the risk factors associated with IP is needed. Most of the nurses have received a formal training about IP in the past three years which evidently have increased their perception of the answers in comparison with other studies.

References

Abolfotouh, M. A., Salam, M., Ala'a Bani-Mustafa, D. W., & Balkhy, H. H. (2014). Prospective study of incidence and predictors of peripheral intravenous catheter-induced complications. Therapeutics and clinical risk management, 10, 993.

Ball, P. A. (2003). Intravenous in-line filters: filtering the evidence. Current Opinion in Clinical Nutrition & Metabolic Care, 6(3), 319-325.

Capdevila, J. A., Guembe, M., Barberán, J., de Alarcon, A., Bouza, E., Farinas, M. C., . . . Kestler, M. (2016). 2016 Expert consensus document on prevention, diagnosis and treatment of short-term peripheral venous catheter-related infections in adults. Cirugía Cardiovascular, 23(4), 192-198.

Chee, S., & Tan, W. (2002). Reducing infusion phlebitis in Singapore hospitals using extended life end-line filters. Journal of Infusion Nursing, 25(2), 95-104.

Cicolini, G., Manzoli, L., Simonetti, V., Flacco, M. E., Comparcini, D., Capasso, L., . . . Eltaji Elfarouki, G. (2014). Phlebitis risk varies by peripheral venous catheter site and increases after 96 hours: a large multi-centre prospective study. Journal of advanced nursing, 70(11), 2539-2549.

Everitt, N., & McMahon, M. (1997). Influence of fine-bore catheter length on infusion thrombophlebitis in peripheral intravenous nutrition: a randomised controlled trial. Annals of the Royal College of Surgeons of England, 79(3), 221.

Gorski, L. A. (2007). Infusion nursing standards of practice. Journal of Infusion Nursing, 30(3), 151-152.

Health, M. o. (2017). ANNUAL STATISTICAL BOOK. Kingdom of Saudi Arabia. Retrieved from https://www.moh.gov.sa/en/Ministry/Statistics/book/Documents/ANNUAL-STATISTICAL-BOOK-1438H.pdf

Hosseinialhashemi, M., Kermani, F. S., Palenik, C. J., Pourasghari, H., & Askarian, M. (2015). Knowledge, attitudes, and practices of health care personnel concerning hand hygiene in Shiraz University of Medical Sciences hospitals, 2013-2014. American journal of infection control, 43(9), 1009-1011.

Karadeniz, G., Kutlu, N., Tatlisumak, E., & Özbakkaloğlu, B. (2003). Nurses' knowledge regarding patients with intravenous catheters and phlebitis interventions. Journal of Vascular Nursing, 21(2), 44-47.

Khoso, A. H. (2021). Associated Risk Factors of Phlebitis among Registered Nurses at PMC Hospital Nawabshah, Experience and Education Based Study. Saudi J Nurs Health Care, 4(2), 37-42.

Lanbeck, P., Odenholt, I., & Paulsen, O. (2004). Perception of risk factors for infusion phlebitis among Swedish nurses: a questionnaire study. J Infus Nurs, 27(1), 25-30.

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.

Li, X.-F., Liu, W., & Qin, Y. (2016). Nurses' perception of risk factors for infusion phlebitis: A cross-sectional survey. Chinese Nursing Research, 3(1), 37-40.

Mermel, L. A. (2017). Short-term peripheral venous catheter–related bloodstream infections: a systematic review. Clinical Infectious Diseases, 65(10), 1757-1762.

Miller, D. L., & O'Grady, N. P. (2012). Guidelines for the prevention of intravascular catheter-related infections: recommendations relevant to interventional radiology for venous catheter placement and maintenance. Journal of vascular and interventional radiology: JVIR, 23(8), 997.

Milutinovic, D., Simin, D., & Zec, D. (2015). Risk factor for phlebitis: a questionnaire study of nurses' perception. Rev Lat Am Enfermagem, 23(4), 677-684. doi:10.1590/0104-1169.0192.2603

Milutinović, D., Simin, D., & Zec, D. (2015). Risk factor for phlebitis: A questionnaire study of nurses' perception. Rev Lat Am Enfermagem, 23(4), 677-684.

Mohammed, E. K., & James, S. (2018). A Cross Sectional Study To Assess Nurse's Perception of Risk Factors For Infusion Phlebitis In Selected Hospitals, Jazan, Saudi Arabia.

Niel-Weise, B. S., Stijnen, T., & van den Broek, P. J. (2010). Should in-line filters be used in peripheral intravenous catheters to prevent infusion-related phlebitis? A systematic review of randomized controlled trials. Anesth Analg, 110(6), 1624-1629. doi:10.1213/ANE.0b013e3181da8342

O'Grady, N. P., Alexander, M., Burns, L. A., Dellinger, E. P., Garland, J., Heard, S. O., . . . Pearson, M. L. (2011). Summary of recommendations: guidelines for the prevention of intravascular catheter-related infections. Clinical Infectious Diseases, 52(9), 1087-1099.

Simamora, P., Pinsuwan, S., Alvarez, J. M., Myrdal, P. B., & Yalkowsky, S. H. (1995). Effect of pH on injection phlebitis. Journal of pharmaceutical sciences, 84(4), 520-522.

Society, I. N. (2011). Infusion Nursing Standards of Practice (2011) (Vol. 34): Untreed Reads.

Webster, J., Osborne, S., Rickard, C. M., & Marsh, N. (2019). Clinically-indicated replacement versus routine replacement of peripheral venous catheters. Cochrane Database of Systematic Reviews(1).

Yoh, K., Niho, S., Goto, K., Ohmatsu, H., Kubota, K., Kakinuma, R., . . . Nishiwaki, Y. (2007). Randomized trial of drip infusion versus bolus injection of vinorelbine for the control of local venous toxicity. Lung Cancer, 55(3), 337-341.

Appendix A
Nurses' Perceptions of Infusion Phlebitis

1. **Personal ID**:** 2. **Date:**

3. **Facility:** Hospital 4. **City/Country:** Najran/ Kingdom of Saudi Arabia

5. **Gender:** ☐ Female ☐ Male

6. **Age:** ☐ years

7. **Department (please select the department which best represents yours):**

☐ Internal medicine ☐ Surgery ☐ Intensive care unit ☐ Mixed medical/surgical
☐ Emergency unit ☐ Obstetrics ☐ Paediatrics ☐ Long-term/rehabilitation
☐ Outpatient clinic ☐ Other

8. **Did you receive formal training about infusion phlebitis in the last three years?** ☐
Yes ☐ No

9. **Do you think thrombophlebitis in peripheral veins is?**

☐ A big problem ☐ A medium problem ☐ A small problem

10. **Which infusion rate do you recommend for a drug that often causes thrombophlebitis?**

☐ 0-15 min ☐ 16-30 min ☐ 31-60 min ☐ >60 min

11. **Do you think that a peripheral venous catheter should not be placed in place for longer than?**

☐ 24 hours ☐ 48 hours ☐ 72 hours

12. **Do you think that a skilled vein puncture decreases the risk for thrombophlebitis?**

☐ Yes ☐ No ☐ Don't know

13. **Do you think that routines for documentation of the insertion of a peripheral venous catheter decreases the risk for thrombophlebitis?**

☐ Yes ☐ No ☐ Don't know

14. **Do you think that the choice of dressing affects the risk for thrombophlebitis?**

☐ Yes ☐ No ☐ Don't know

15. **Do you think in-line filters can decrease the risk for phlebitis?**

☐ Yes ☐ No ☐ Don't know

16. **If the same drug can be given both as bolus injection and short-time infusion, which way do you think decreases the risk for thrombophlebitis?**

☐ Bolus injection ☐ Short-time infusion ☐ Don't know

17. **Which of the following factors in an infusion fluid or a drug preparation do you think increases the risk for thrombophlebitis? (you can select multiple choices)**

a. ☐ High pH ☐ Low pH
b. ☐ High osmolality ☐ Low osmolality
c. ☐ High concentration of the drug ☐ Low concentration of the drug
d. ☐ Cold fluid ☐ Room temperature fluid

18. **Which of the following qualities of the peripheral venous catheter do you think decreases the risk for thrombophlebitis? (you can select multiple choices)**

a. ☐ Short catheter ☐ Long catheter
b. ☐ Coarse bore-catheter ☐ Fine bore-catheter
c. ☐ Plastic catheter ☐ Metal catheter

19. Which of the following sites do you think decreases the risk for thrombophlebitis? (you can select multiple choices)

☐ Hand ☐ Wrist ☐ Forearm ☐ Foot
☐ Leg ☐ Antecubital fossa

20. In which infusion fluid do you dilute a vessel irritating drug in order to decrease the risk for thrombophlebitis? (you can select multiple choices)

☐ 5% Glucose ☐ Saline ☐ Sterile water ☐ Don't know

21. Which of the following factors do you think increases the risk for thrombophlebitis? (you can select multiple choices)

a. ☐ Male gender ☐ Female gender
b. ☐ Malignancy ☐ Rheumatic disease
c. ☐ Venous insufficiency ☐ Arterial insufficiency
d. ☐ Diabetes Mellitus ☐ Infectious disease
e. ☐ High age ☐ Children
f. ☐ Obesities ☐ Cachexia
g. ☐ Alcoholism ☐ Immobilization
h. ☐ Thromboembolic disease ☐ Former Thrombophlebitis