EFFECT OF THE PHLEBITIS ASSESSMENT SCALE ON THE INCIDENCE OF PHLEBITIS RATE ON PERIPHERAL INFUSION: A SYSTEMATIC REVIEW

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Abstract
Phlebitis is a common complication of peripheral intravenous cannulation. To assess phlebitis, carried out by using a phlebitis assessment scale. There're many scales of phlebitis assessment, however there's no uniformity in their use, causes the incidence rate of phlebitis is increasing to reach. Purpose: To identify the effect of phlebitis assessment scale used in clinical settings. Design: We conducted a systematic review from 3 world online libraries (Pubmed, Science direct, Ebsco) until June 2020. The research used was in English, type of research randomized controlled trials, prospective cohort, and cross-sectional. Occur 267 articles found based on keywords. After exclusion resistance, 9 articles including the criteria inclusion and analyzed using the phlebitis assessment scale of the research.
Conclusion: Phlebitis scale assessments found in the selected studies have diversity, on types and applications, has an impact on difference in incidence rate and output assessment. Two studies used definition in determining phlebitis (22.2%), 1 of a study used a scale based on a rating system (11.1%). Other studies used the severity level of 6 studies (66.7%). The scale of the phlebitis assessment contributed to the differences in the incidence of phlebitis in surveillance, causes assessment of phlebitis scale not standardized with expected output.

Keywords: Assessment, Catheterization, Peripheral Intravenous Cannulation.

1. Introduction

Peripheral infusion for injection of fluids and drugs is the most common procedure performed in hospitalized patients worldwide. One of the complications that often occurs is phlebitis, which is inflammation of the veins which may occur mechanically, chemically or due to the presence of bacteria, besides phlebitis can also cause a series of unwanted effects, such as significant pain, impaired venous access in the future, as well as bloodstream infections (Barruel et al., 2014). The impact of the incidence of phlebitis can be detrimental to patients and the hospital, while the impact of phlebitis on patients is an increase in length of stay (LOS), increases the length of therapy, increases treatment costs, causes patient discomfort, and causes the risk of other health problems (complications). Whereas for hospital institutions, it is an increased burden on health workers, the risk of prosecution (malpractice), and can
reduce the image and quality of hospital services, so that continuous efforts are needed to prevent or overcome the problem of phlebitis.

There are many instruments for the assessment of phlebitis. In this case, it can be divided into three groups, namely instruments using definition, a system of severity levels, and a scoring system Göransson et al., (2017) In his research, the phlebitis rate generated by the definition was 11.7%, with a 33.6% severity system, and 30.9% by the scoring system. The proportions produced by the instrument using the definition differ significantly with both the severity level and the scoring system. The number of phlebitis rating scales that can be used, each hospital is free to determine the rating scale to be used.,. However, this causes a difference in the output of the survey carried out. This requires a systematic review of the literature, in order to identify, assess, and interpret previous findings regarding the diversity of scales of phlebitis assessment. The purpose of this review is to identify the means of assessing the phlebitis scale assessment and describing the diversity of use of phlebitis assessment scales in clinical settings.

Phlebitis is a type of health infection related to health care. Phlebitis mostly occurs in patients who use intravenous infusion. The practical ability of nurses as health workers, who insert infusions, provide drug administration therapy, and monitor the incidence of phlebitis every day, is an important part of preventing phlebitis from becoming an infection. Nurses’ knowledge and skills regarding health services automatically fulfill patient safety principles. Their knowledge and skills about the treatment, care and prevention of phlebitis should be enhanced to control health care related infections. (Theresia and Wardani, 2015)

Phlebitis is caused by inflammation of the veins at the site of the cannula access. These events are caused by mechanical, chemical, and infectious causes. Mechanical phlebitis is related to the selection of a cannula to a vein because it can create friction and inflammation if the size of the cannula does not match the vein. Chemical phlebitis is caused by drugs, fluids infused through the cannula, pH and the osmosis of the drug and fluid are also chemical factors that cause phlebitis. In addition, infectious phlebitis is caused by the entry of bacteria into the blood vessels. (Higginson, 2011) Phlebitis is characterized by inflammation of the vein wall and can be accompanied by symptoms such as edema, pain, and erythema, near the infusion site or along the affected vein, which often develops into palpable venous cord, intense redness, tenderness and fever.

Microorganisms can be transmitted by the hands of health care workers (mostly nurses), by droplets or by airborne infections. Approximately two million patients suffering from phlebitis in the hospital for two years, resulting in financing the problem nearly 4.5 billion dollars in one year and causing a case mortality of more than 19,000 cases in one year (Theresia and Wardani, 2015).

Continuous efforts are needed to prevent or overcome the problem of phlebitis, so that health services, especially nursing, can be improved in the hope of achieving predetermined standards. In addition, neglect of phlebitis control can lead to a longer duration of hospitalization, which can increase the economic burden on patients. Therefore, we need research on how the influence of the scale of the assessment of phlebitis to suppress the occurrence of phlebitis, especially in peripheral infusion.

2. Method

This research is a systematic review using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) method which is carried out systematically by following the correct research stages or protocols. The procedure carried out in this systematic review consists of several stages, including: 1) Creating a research question using PICO (Patient, Intervention Comparison, Outcome). 2) Literature search strategy, 3) Inclusion or Exclusion Criteria, 4) Studies Selection.

2.1 Making Research Questions

The problem to be examined in this study is "How does the scale of the assessment of phlebitis affect the incidence rate of phlebitis in peripheral infusions", so based on PICO the research questions are as follows,

P = peripheral infusion
I = Incidence rate phlebitis
C = No comparison or intervention other
O = The effect of the phlebitis assessment scale
Based on this procedure, at the research question stage, the keywords assessment, catheterization, peripherals, infusions and intravenous were used.

2.2 Literature Search and Search Strategy

Furthermore, the literature search stage was carried out, which was carried out through Pubmed, Sciencedirect, and Ebsco with literature limitations until June 2020, all literature in this study used English. The methods used in the systematic review were randomized controlled trials, prospective cohort, and cross-sectional.

2.3 Inclusion or Exclusion Criteria

The next stage is the inclusion or exclusion criteria, from the three databases used in the literature search, the articles were sorted. Sorting was carried out based on the suitability of the search objectives, the similarity of articles by title, phlebitis that was not related to iv catheters, not in adult patients, inaccessible full text, and time of publication of the article (last 10 years).

Phlebitis assessment scales that are often used in research include Visual Infusion Phlebitis (VIP), Infusion Nurses Society (INS), Maddox, Baxter, Lipman, and Dinley. In general, the assessment of phlebitis on this scale is based on observation. The VIP and INS scales are the most widely used scales, but there is no phlebitis rating scale which has excellent validity and reliability (Barruel et al., 2014).

2.4 Studies Selection

After all the literature was obtained, then the appropriate literature was selected based on the inclusion and exclusion criteria in the previous stage, so that in the study selection stage 9 articles were obtained.

3. Results

3.1 Incidence Rate of Phlebitis

The incidence rate for the incidence of phlebitis around the world varies. INS states that the tolerance limit for the incidence of phlebitis is below 5%. However, some literatures mention a very wide range, namely between 1.3% to 61.2% (Ferrete-Morales et al., 2010).

3.2 Scale of Phlebitis Assessment

There are various scales of phlebitis assessment. Ray-Barruel, Polit, Murfield, and Rickard (2014) said that there are at least 71 phlebitis rating scales. Some researchers use previously published scales; others modify existing phlebitis scales or create their own phlebitis scales. However, the overall phlebitis rating scale is divided into three types. First based on definition, second based on severity level, third based on grading system. Most of the signs and symptoms of phlebitis on the assessment scale have similarities. These include pain, erythema, edema, purulent drainage, and palpable veins around the infusion catheter. The symptoms required for phlebitis also vary widely. Only erythema was reported as a symptom of phlebitis on each scale.

Phlebitis scale assessment can be carried out by the nurse in charge, IPCN, or IPCN to carry out surveillance. Several institutions apply different operational standards in the implementation of the phlebitic scale assessment, both the frequency and the standard for the phlebitic scale used. There are those who determine the scale of phlebitis every shift, but there are also those who do not set a certain standard on the frequency of assessments, only based on complaints from patients. On the other hand, the use of the phlebitic scale also varies. There are those who use definition limits in their phlebitic surveillance, there are those who use the VIP scale and the INS scale. There are more variations, there are also those who apply just one symptom to indicate phlebitis, some also apply at least 2 symptoms when they are found just declared phlebitis. In addition, policies regarding recorded phlebitis also vary.
Some were included in the incidence data per infusion catheter. There are also those who enter incidence data per patient, even though phlebitis has occurred more than once.

3.3 Assessment of Phlebitis Scale based on Definition

Research Rickard et al. (2010), if examined further, using the scale of the assessment of phlebitis using the definition taken from Maki and Ringer (1991). Phlebitis is defined as discomfort due to the presence of at least 2 symptoms felt by the patient being infused, such as pain, erythema, tenderness, swelling, purulence, and venous palpability. The application of using this scale is by directly asking the patient who has the infusion on whether there is pain or not and then palpating the vein where the intravenous catheter is inserted. The incision site was assessed quantitatively for pain, tenderness, erythema, purulence, swelling, and palpable veins. If there are two or more signs or symptoms at the catheter insertion site, this indicates phlebitis. The decision to remove the intravenous catheter rests with the doctor.

3.4 Assessment Based on Severity

Phlebitis assessment scale based on the severity, the VIP scale and INS scale were obtained. These two assessment scales are commonly used to determine the degree of phlebitis even though there are differences in the ratings. The VIP scale assesses the presence / absence of six symptoms: pain, erythema, swelling, induration, venous palpation and pyrexia. A formal assessment of a modified version of the VIP scale was carried out in the United States in 2006 by Gallant and Schultz (2006). Then, Jackson calibrated the scores 1-6 to 0–5; a score of 5 indicates purulent drainage, redness, and a palpable vein greater than 7.6 cm. Phlebitis is presumed to be present if the VIP score is ≥ 2, with related recommendations for changing or releasing the infusion.

Based on Gallant and Schultz (2006), inter-rater reliability was assessed by correlating the VIP scores of each study nurse with the principal investigator, the senior clinical nurse. Type of correlation (Pearson r, Spearman rho, intraclass) was not reported. The number of infusion catheter assessments included in the inter-rater reliability checks was also not reported. Each nurse is said to achieve an acceptable correlation of inter-rater reliability ≥ 0.85. However, inter-rater reliability was not calculated among the nurses themselves, which is a more standard approach.

In terms of validity, content validity index, is not provided. The criteria or validity of the scale construct were not discussed. However, the inter-rater reliability assessment can be interpreted as the validity of the test criteria. Gallant and Schultz concluded that their version of the VIP scale is a reliable and valid measure for assessing intravenous catheters. The reliability of the test-retest was not checked. This study yielded some information about the validity of the criteria, but the specificity and sensitivity of the VIP scale were not tested. Construct validity was not considered.

The current INS scale contains a progressive score from 0 (asymptomatic) to 4 (all symptoms present: pain, erythema, edema, scar formation, palpable venous cord > 2.54 cm long and purulent drainage). A score of 1 or more is considered phlebitis. There are several studies that use this phlebitis assessment scale. Although widely used, the INS scale has limited scrutiny for its statistical assessments. On the INS scale, the reported kappa value is 0.45, which is considered 'moderate'. The Spearman correlation is 0.39.

3.5 Assessment Based on the Rating System

Based on the search for articles, it was found that 1 study used PVC ASSESS to assess the scale of phlebitis. ASSESS PVC consists of 45 items which are grouped into three main sections with subsections (Ahlqvist et al., 2010). Of the 45 items in, 39 had a dichotomous (Yes / No, i.e., whether or not the item was assessed in the question) and six had alternative politomized responses. The size of erythema and / or palpable vein was measured in millimeters with a multiplier copied on the ASSESS PVC instrument. There are also introductory questions about general aspects (when, where and who did the assessment) and patient characteristics (year of birth, gender and dominant hand).
For the statistical assessment of ASSESS PVC statistics, the statistical information obtained is limited. In 80% the kappa items are substantially almost perfect (0.61-1). The TH sign of erythema falls within a reasonable range (kappa = 0.40). In the retest-test reliability analysis P (A) was in the good and very good range (0.80-1.0) and kappa varied from moderate to near perfect (0.41-1.0) in 95% of items. However, reliability tests in reviewing documentation have not been carried out (Ahlqvist et al., 2010).

4. Discussion

Based on the results of the literature review, of the three types of phlebitis assessment scales above, there are advantages and disadvantages in their clinical use. It cannot be denied that the use of instruments by definition is much easier and less time consuming. However, in practice, not all hospitals report phlebitis in the same way.

The incidence of phlebitis is an indicator of the quality of hospital health services, especially in the field of nursing services. According to the Ministry of Health of the Republic of Indonesia the incidence of phlebitis is the result of comparing the number of phlebitis incidents with the number of patients receiving intravenous therapy with a standard value of ≤ 1.5%.

Until now, the exact number of phlebitis incidence in the world has not been fully published. The incidence of phlebitis in Portugal in 2010 was 11.09% (Salgueiro, 2010). Meanwhile, the incidence of phlebitis in Brazil in 2015 was very high at 55.6% (Urbanetto, 2017). Furthermore, the amount of phlebitis in Turkey in 2018 was 31.8% (Atay, 2018).

The percentage of phlebitis that occurs in Asia also does not show a definite figure, but the Centers for Disease Control and Prevention (CDC) that the incidence of phlebitis every year reaches 10%. The highest incidence of phlebitis occurs in developing countries, such as India (21.91%), Iran (14.20%), the Philippines (10.10%), and Indonesia (9.80%). The results of other studies stated that the incidence of phlebitis in the Philippines reached 23.38% (Gargar, 2017). From the description of the phlebitis incidence rate in the world, Asia, and Indonesia that has been described above, it can be concluded that there is no definite figure to set as a guideline. All hospitals in any country are at risk of experiencing incidence of phlebitis.

The impact of the incidence of phlebitis can be detrimental to patients and the hospital, while the impact of phlebitis on patients is an increase in length of stay (LOS), increases the length of therapy, increases treatment costs, causes patient discomfort, and causes the risk of other health problems (complications) Whereas for hospital institutions, it is an increased burden on health workers, the risk of prosecution (malpractice), and can reduce the image and quality of hospital services, so that continuous efforts are needed to prevent or overcome the problem of phlebitis., so that health services, especially nursing can be improved in the hope of achieving predetermined standards.

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PVC ASSESS has not been widely used in Indonesia, it is more common to see the use of the VIP scale or the INS scale. The advantage of the VIP scale compared to the INS scale is that it provides recommendations for actions related to assessment, making it easier to provide recommendations for infusion removal actions. However, in terms of identifying statistical tests, the data obtained were still quite difficult to access.

On the other hand, PVC ASSESS is a fairly comprehensive scale of phlebitis assessment because it includes documentation. However, its use is not as easy as using a definition or a severity scale. The drawback is that utilization in Indonesia is still not optimal.

The rates of phlebitis varied widely in this study. This can be attributed in part to the absence of a universally accepted scale with strong reliability. Based on this description, the use of the phlebitis assessment scale is still the choice of each institution. However, further research is needed on the scale of the phlebitis assessment so that there is uniformity and consistency so that the surveillance process can run optimally and the expected output can be maximized.
5. Conclusion

Through this systematic review, previous research data related to the effect of the scale of the phlebitis assessment on the incidence of phlebitis rate in peripheral infusions, the previous findings were analyzed to assess the effectiveness of clinical interventions in the form of a phlebitis assessment scale by combining the results of several randomized control trials (RCTs). Through this analysis it is possible to find out how the scale of phlebitis may have contributed to the difference in the reported incidence of phlebitis.

The many scales for phlebitis assessment, but none have been thoroughly validated for use in clinical practice and the lack of consensus on measures for phlebitis may have contributed to the differences in reported incidence rates of phlebitis. Thus, making the surveillance not optimal. Most researchers only pay attention to patient factors, chemicals, mechanical factors, and nurses in determining the causes of phlebitis. In fact, the difference in the use of the phlebitis assessment scale can also be one of the causes of the difference in the range of incidence rates for phlebitis.

Phlebitis scale assessment is used in surveillance activities. But how will produce effective data if the instruments used are not standardized. Therefore, effective surveillance activities will provide basic information for the management and prevention of infection at peripheral infusion. No scale assessment for phlebitis is perfect. In this study, the authors do not suggest that one scale is better than the other. The author has focused on 3 types of assessment scales. The scales are familiar to many and have proven uses with each of them can be used by nurses. Thus, in the absence of a "perfect" assessment, the authors recommend further research so that there is uniformity in the assessment of phlebitis.

Conflicts of Interest: There is no conflict of interest.

References


