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Original article

Nurses' perception of risk factors for infusion phlebitis: A cross-sectional survey

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ABSTRACT

Objective: The aim of the present study was to investigate Chinese nurses' perception of risk factors for phlebitis.
Methods: A convenience sample of hospital nurses was recruited in Beijing, China. Data were collected using a demographic information questionnaire and a questionnaire measuring nurses' perception of risk factors for infusion phlebitis.
Results: It was found that knowledge of risk factors for infusion phlebitis was incomplete, even among experienced nurses in the study participants. A high rate of incorrect answers to questions about the pH of fluid (89.9%), gauze or polyurethane catheter dressings (79.1%), and steel needles for drug infusion (76.3%) was observed.
Conclusions: These findings suggest that nurses should be trained about the risk factors for infusion phlebitis.

1. Introduction

Among hospital inpatients, intravenous fluid therapy is the most common invasive procedure. More than 90% of patients in hospitals receive IV therapies through certain forms of intravenous device.[1] The most common complication is infusion phlebitis, which is defined by pain, erythema (redness of the skin), swelling, and palpable thrombosis of the cannulated vein.[2] Patients with infusion phlebitis may experience more pain, longer wait for therapy, slower recovery, and extended stays in the hospital.[3]

A number of studies of risk factors for infusion phlebitis have been published recently. According to these studies, risk factors for infusion phlebitis include the infusion set and catheter material, location of the catheter, duration of catheterization, pH and osmolality of the fluid and presence of contaminants in the infusion solutions.[4] The role of drugs, rate of flow, using continuous infusion to maintain catheter patency and host factors such as gender, age, and medical history have also been explored.[5]

In 1984, Tomford observed that the skill of the IV nurses who insert the catheter affects the incidence of phlebitis.[6] Several studies have also indicated that well-trained IV therapists and routine documentation are associated with a lower risk of catheter infection than is seen with regular nurses.[5]

Evidence suggests that nurses' knowledge of infusion phlebitis and its risks factors may influence the risk for infusion phlebitis in hospitals.[7] So our study, performed in Beijing, China, investigated nurses' perception of the risk factors for infusion phlebitis.

2. Methods

This cross-sectional study was carried out from July 2013 to September 2013 in the International Medical Service of Peking Union Medical College Hospital, China. PUMC Hospital is a large tertiary hospital with 1800 beds. The International Medical Service is a setting that includes surgical and medical departments, maternal child health sections, and outpatient and emergency departments. We used a convenience sample. All (140) nurses of the IMS who provided informed consent were included.

The questionnaire assessing perception of risk factors for infusion phlebitis was developed by Lanbeck and colleagues.[8] As it was not copyrighted, permission was not necessary to use and modify some of their items for our study. A preliminary forward-back translation of this original version was performed to establish semantic and conceptual equivalence in the Chinese context. The new instrument consisted of two sections: (1) demographic information,

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including gender, age, years of experience, and education level, and (2) nurses' perception of risk factors for infusion phlebitis. 14 questions in this questionnaire addressed perceived risk factors for infusion phlebitis, listing several answer options. Completion of the questionnaire took approximately 15–20 min. The questionnaire's face validity was 1.0. To assess the reliability of the questionnaire, a pilot test-retest study with a three-week interval was performed. Item reliability was good, with Cohen's $K > 0.6$.

Statistical analysis was performed using SPSS 17.0. All data were recorded as average ± standard deviation or percentage. The Pearson correlation and Fisher's exact test for differences between groups were used for inferential statistics. Values of $P < 0.05$ were considered significant.

3. Results

3.1. Sample characteristics

Of the 140 enrolled participants, 139 (99.3%) responded. Only one nurse declined to return the questionnaire. 100% of the participants were clinical nurses and 99.3% of them were female. The population was young, with a median age of 30.09 years. Participants averaged 8.44 ± 5.50 years of experience. Approximately 33.1% of the study population held a junior college diploma and 2.2% of the study population had graduated from a secondary nursing school; 62.6% of the nurses held a bachelor's degree, while 2.2% held a master's degree. Regarding job rank, 27.3% of the respondents were nurses, 59.7% were nurse practitioners, and 12.9% were nurses in charge or at higher level. Most participants worked in maternal child health sections and surgical departments (34.5% and 28.1%, respectively). Demographics and participants' characteristics are summarized in Table 1.

3.2. The results of the survey

The multiple-choice questions, response options and observed answers are shown in Table 2. The results showed that 47.5% of the nurses thought that phlebitis is a large problem, while 51.1% thought that it is a medium problem; 96.4% of the nurses agreed that a peripheral venous catheter should not be in place for longer than 72 h; 70.5% of the nurses thought that a skilled vein puncture decreases the risk for phlebitis and 69.1% also agreed that routines for documenting the insertion of a peripheral venous catheter decreases the risk for phlebitis. 79.1% of the participant answered that the dressing affects the risk for phlebitis. Almost half of the nurses (56.8%) thought a bolus injection can decrease the risk for phlebitis.

By analyzing the 14 answers to the questionnaire, a high rate of incorrect answers were found to be related to the questions about the pH of fluids (89.9%) and about the use of gauze or polyurethane catheter dressings (79.1%) and steel needles for drug infusion (76.3%) (Table 2). After analyzing nurses' perceptions about the risk factors for phlebitis, we observed a difference as a function of the respondents' level of education and work experience.

Table 1
Sample characteristics of 139 nurses of PUMC hospital in Beijing, China.

Characteristics	*n* (%)
Gender	
Male	1 (0.7)
Female	138 (99.3)
Age	
<30 years	58 (41.7)
30–40 years	70 (50.4)
≥40 years	11 (7.9)
Experience	
<5 years	39 (28.1)
5–10 years	51 (36.7)
11–19 years	45 (32.4)
≥20 years	5 (3.6)
Highest level of nurse education	
Secondary nursing school	3 (2.2)
Junior college	46 (33.1)
Bachelor	87 (62.6)
Master	3 (2.2)
Job rank	
Nurse in charge and higher	18 (12.9)
Nurse practitioner	83 (59.7)
Nurse	38 (27.3)
Healthcare setting	
Medical	38 (27.3)
Surgical	39 (28.1)
Maternal child health sections	48 (34.5)
Emergency Outpatient	14 (10.1)

4. Discussion

Phlebitis is the most common complication of intravenous catheters, and it can lead to many problems, including higher costs of therapy and longer hospital stays. In our study, almost all of the nurses believed that phlebitis was a large or medium problem. The results indicated that phlebitis is the most common side effect in clinical practice and the nurses have to pay enough attention to it.

4.1. Patient-specific factors

Female sex, old age, “poor quality” peripheral veins and the presence of underlying medical disease (cancer, immunodeficiency) appear to increase the risk of peripheral vein infusion phlebitis.[9,10] However, only 5.7% of the nurses in our study knew that female sex is a risk factor. 70.7% of the nurses knew the risk increases with old age, 64.1% knew the risk increases in patients with cancer and 87.1% knew that immobilization increases the risk.

4.2. Duration catheter retention

Currently, routine replacement of the catheter is thought to reduce the risk of phlebitis and bloodstream infection.[11] CDC guidelines recommend replacement of peripheral intravenous (IV) catheters no more frequently than every 72–96 h, and most hospitals in China follow this recommendation. In our study, almost all of the nurses believed that a catheter should be replaced no less frequently than 72–96 h, and peripheral catheters are replaced every 72 h to prevent irritation of the vein in our hospital. However, Webster's study in 2013[11] found no evidence to support the current practice of routinely changing catheters every three to four days.

4.3. Catheter type

It has been reported that fine-bore catheters can decrease the risk of phlebitis. The use of newer plastic materials has reduced the importance of this factor.[12] In this study, the nurses' answers did not reflect current knowledge. Only 23.6% of the nurses believed that plastic materials could reduce the incidence of phlebitis. This finding may explain why nurses still use metal needles for infusion in clinical practice in China, while many countries use needles only for taking blood. 54.3% of the nurses knew of the risk associated with fine-bore catheters, while 46.4% of the nurses knew of the risk associated with long catheters.

Nurses with college education, as opposed to nurses with higher education (Bachelor's and Master Degree), were less aware that the cannula's material could affect the incidence of phlebitis (Fisher's exact test = 20.22, $P = 0.00$).