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Review Article

Role of training and monitoring and its effect on infusion-related peripheral thrombophlebitis in a teaching hospital

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ABSTRACT

There were several benefits of infusion catheter, but the complications are also too common and the earliest is thrombophlebitis. Several factors are associated with thrombophlebitis. Monitoring along with training or awareness among staff is one of the vital things to reduce thrombophlebitis incidence. The main aim of this current study is to measure the effect of the monitoring and training in peripheral infusion associated Thrombophlebitis across the hospital. The study was done in a 750-bed teaching hospital in eastern India in 2018 over six months. A total of 24 different clinical areas were identified including 7 critical, 3 semi-critical, and 14 non-critical areas. All patients were monitored using a matrix method of monitoring for incidence of thrombophlebitis daily. Data were collected for zero-, three- and six-month incidence for analysis. Monthly data were used for training needs assessment every month. For statistical analysis Microsoft excel software was used for simple statistics and t test for a p value. The total number of thrombophlebitis were coming down from 42 to 16. The changes mainly occur in the non-critical areas from 67% to 25% compared to critical and semi-critical areas. The changes in month 0 and month 3 ($p<0.05$) month 0 and month 6 were statistically significant ($p<0.05$). Though the current study is of a very short duration, the findings were in support of the multivariable approaches described by several scientists. It concluded that with proper training and monitoring can decrease the thrombophlebitis.

Keywords: Thrombophlebitis, Phlebitis, Infusion, Superficial, Matrix method, Monitoring, Training need assessment

INTRODUCTION

Thrombophlebitis following peripheral intravenous (IV) infusion is not a new condition. The condition was described in 1930 by Warthen followed by Peter F Jones in 1957, Lewis et al and so many others.[1,2] Problems associated with infusion therapy were cited by Wright in 1980.[3] Several factors were considered for thrombophlebitis like, the effect of Millipore, toxicity of rubbers and plastics, duration or indwell time of cannulation, the caliber of veins, use of fine bore catheter, type of infusion and medicine, etc.[4-11] Although the histological and clinical features were described by Woodhouse long back in 1980, the exact cause for individuals is still difficult to ascertain.[12,13] Several studies showed various treatment modalities like heparin topical solution and gel, the mix of heparin and hydrocortisone (Movelat), heparinoid cream, heparin and Diclofenac quick penetrating solution, sesame oil etc.[14-18] including use of novel short catheter, infrared thermography technique for vein detection, clinically indicated and routine replacement etc.[19-21] Despite an age-old issue, thrombophlebitis is still a major concern in patient care as the evidence for treatment is limited and of low quality to assess its effectiveness.[22-25] In this study, the author applied the matrix method monitoring for training need assessment and monitoring of the staff in a tertiary care teaching

hospital as described by Mondal et al.[26,27] The main aim of the current study is to measure the effect of monitoring and training in peripheral infusion associated thrombophlebitis across the hospital.

METHODOLOGY

The study is observational in the form of a matrix method of monitoring, the peripheral IV line thrombophlebitis incidence. In the current study total of 24 different areas were identified to monitor Infusion-related Thrombophlebitis in a 750-bed teaching hospital in Eastern India during 2018. Infusion-related thrombophlebitis included the use of an IV cannula for both IV infusion as well as an IV injection and only the peripheral type of IV-line, central lines were excluded. Category-wise based on the patient acuity, there were seven critical, three semi-critical, and 14 non-critical areas included (Table 1). Various ICUs (Intensive Care Units) were categorized as critical areas; HDUs (High Dependency Units), labour rooms, and deluxe wards were categorized as semi-critical areas; and other general wards were categorized as non-critical areas. However, the operation theatre, recovery room, and nursery were not included in the study, and the emergency was included as a critical area. a register was introduced to keep a daily record of thrombophlebitis monitoring in all 24 areas. At the end of the month, a report was made and considered for next month's training schedule preparation. The training was given to doctors, nurses, and housekeeping staff on a daily basis in two-time, mornings and afternoons before starting each duty shift. As a good housekeeping helps to reduce microbial growth, housekeeping staff training is also included.[28] The course duration was 15-20 minutes with pre and post-test evaluations. Type of teaching was mainly microteaching and hands-on and the contents were different for different categories of personnel based on role. In initial months starting from March 2018 all the above staff were trained and for next month onwards matrix method monitoring report was considered to prioritize the weaker area's staff. Every month Infusion-related thrombophlebitis was recorded and analysed in MS excel 2010 using simple statistics and t test statistics were applied to determine the significance of changes in zero, third, and sixth months.

OBSERVATIONS

In this study, it was found that in the initial month (Zero month) or the baseline, the infusion-related thrombophlebitis incidence was eight in critical care areas, six in semi-critical areas, and 28 in non-critical areas, a total of 42 incidents reported. After the implementation of matrix method monitoring and training, it was reduced to 23 in the Third month, and in the sixth month, it came down to 16. However, the changes are more in non-critical areas compared to critical and semi-critical areas (Table 1).

Overall, the incidence of thrombophlebitis incidence was reduced over time (Figure 1). It was found that overall, the training and monitoring have a positive effect on staff and patient care concerning thrombophlebitis.

Table 1: Category wise incidence reporting of infusion thrombophlebitis over time.

Category of areas based on clinical condition	Number of areas considered	Number of incidences of superficial infusion thrombophlebitis		
		Month zero (March 2018) (%)	Month three (June 2018) (%)	Month six (September 2018) (%)
Critical	7	8 (19)	7 (30)	9 (56)
Semi-critical	3	6 (14)	1 (5)	3 (19)
Non-critical	14	28 (67)	15 (65)	4 (25)
Total	24	42 (100)	23 (100)	16 (100)

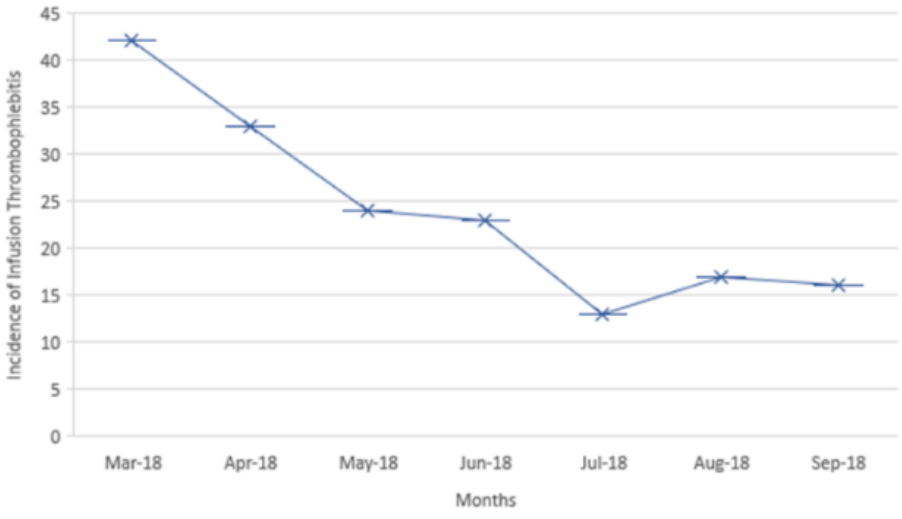

Figure 1: Infusion related thrombophlebitis incidence over time.

DISCUSSION

In this study, it was found that the application of the matrix method of monitoring to assess the training need and regular training reduced the infusion-related thrombophlebitis in the hospital over time. The incidence of thrombophlebitis was reduced in total from 42 in the starting month to 23 in the third month and 16 in the sixth month. When statistically analysed it was found that the changes of month 0 and month 3 ($p<0.05$) [t (23) =-2.16, p=0.041] and month 0 and month 6 were statistically significant ($p<0.05$) [t (23)=-2.33, p=0.029], but the changes between month 3 and month 6 were not statistically significant ($p<0.05$) [t (23)=-0.96, p=0.347]. While analysing the data based on the clinical condition of the criticality, it was found that the changes in the critical care areas were not statistically significant ($p<0.05$) [for month 0 and 3: t (6)=-0.420, p=0.689; for month 0 and 6: t(6)=0.31, p=0.766; and for month 3 and 6: t (6)=0.4, p=0.703]. Due to the paucity of data, semi critical care areas t-test was not calculated. However, in non-critical care areas, statistically significant changes were found from month three to month six ($p<0.05$) [t (13)=-3.015, p=0.009]. However, the changes between month zero with three and six were not statistically significant ($p<0.05$) [for month 0 and 3: t (13)=-1.63, p=0.127; for month 0 and 6: t (13)=-2.79, p=0.01]. Overall, the changes in thrombophlebitis incidence were mainly effective after the implementation of the matrix method of monitoring along with training of the staff in non-critical areas compared to critical and semi-critical areas. A recent systematic review and meta-analysis with 70 observational studies and 33 random trials including 76,977 catheters, concluded that peripheral infusion catheter-related complications are common globally and suggested the need for multi-specialty efforts to address the same.[24] Another very recent study described failure analysis of 11,830 peripheral infusion catheters and addressed the multivariable approach of patient, provider, and device characteristics as the cause of catheter failure.[25] The same study cited that catheter infusion-related complications may vary with the site of insertion, the bore of the needle, providers nurses and doctors, and antibiotics or medicine. This is relevant in the current study result context. The current study also showed that there are significant changes ($p<0.05$) in thrombophlebitis in non-critical areas but very minimal changes in semi-critical and critical areas, though the training and monitoring were implemented for all areas seamlessly. Multivariable may be one of the explanations for the findings of the current study. As already mentioned not all the areas of the hospital were included in this study. Short (only six-months) duration and high attrition rate of Nurses and doctors may affect the result in different setup. However, the application of the matrix method of monitoring can improve thrombophlebitis incidence in non-critical areas significantly.

CONCLUSION

Peripheral IV catheters are an essential medical device in day-to-day patient care. However, these catheters are highly prone to complications leading to thrombophlebitis and failure. Numerous approaches support multivariable patient, provider, and device characteristics model as the fact of thrombophlebitis or complications. The current study also supported the multivariable approaches and concluded that proper training and proper monitoring (use of matrix method) can reduce thrombophlebitis or catheter-related complications. Though very old issue, and a lot many efforts and focus have been given towards venous catheter-related complications, still lot must be done yet for better patient care.

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