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Study and Evaluation of the Practice of Peripheral Intravenous Cannula (PIC) amongst Interns in Various Hospitals of Maharashtra

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ABSTRACT:Aim: This study is mainly concerned with procedural knowledge and further care of peripheral intravenous cannulation (PIC) amongst the interns. It helps to determine the lacunae in the training and practice of interns towards the care and maintenance of IV cannula. Intravenous cannulation is a common procedure performed by the interns in every hospital and closely associated with the risk of nosocomial infections if standard care is not provided.

Design: A prospective study about Intern's knowledge and practice towards care and maintenance of peripheral intravenous cannula was assessed using a validated semi-structured, self-administered questionnaire through Google form distributed by social media links. Data was analysed through the SPSS program.

Results: Majority of the interns have satisfactory knowledge about insertion and maintenance of peripheral intravenous cannulation. Yet, the remaining group was lacking the proper knowledge and practice. This could be a potential risk factor for patient safety. There is a need for proper training and practice using Mannequins for adults as well as paediatric PIC lines.

Keywords: PIC line, IV cannula, Interns, Nosocomial Infections.

I. INTRODUCTION

Peripheral intravenous cannulation is an integral part of the in-patient care during the entire hospital stay.[1] It is the most common and essential intravenous (IV) device, frequently used in medical practices. Intravenous (IV) cannula involves puncturing the patient's skin with a needle and inserting a polyurethane cannula into a patient's vein so that drugs can be infused directly into the bloodstream.[2]

In most medical colleges, Interns play a vital role in establishing the IV line and maintaining it. Most of the interventions and prevention strategies such as insertion, monitoring, and assessing peripheral venous catheter sites are part of routine rounds of the interns. They should be aware of the prevention, early detection, treatment, and management of local and systemic complications supported by dynamic evidence-based practice guidelines.[14]

IV Cannulas are available in various colours, each of which corresponds to the size of the tube (14G to 24G). The required size depends on the drug infused or the velocity of the infusion. In addition, the patient's veins size may dictate the cannula gauge. Peripheral IV cannulation is a core clinical skill to know and is frequently examined upon, in medical school.[3]

The Peripheral IntravenousCannula (PIC) is usually inserted into a metacarpal vein on the dorsum of the hand or the cephalic or basilic vein.[4] Femoral veins should be avoided because of the higher density of skin flora in this area, which would put the patient at increased risk of infection.[5]

It is estimated that approximately 60% of hospital inpatients annually undergo peripheral IV cannulation to receive therapeutic IV medication.[6] Since the procedure involves breaching of the skin and leaving a foreign body in the vein, patients are exposed to several risks, one of which is infection.[3] There are several other potential complications associated with the use of peripheral cannulae, including obstruction, extravasations of the drug in the tissue, hematoma, air embolism, phlebitis.[7] Phlebitis, associated with peripheral cannula is an

inflammatory condition defined by the presence of at least two of the following symptoms: local pain, redness, swelling, palpable thrombosis of the catheterized vein.[8] The most common form of secondary infection in a peripheral cannula is the migration of pathogens present in the skin (often commensal flora) to the cannula insertion site, which eventually colonizes it.[9]

The most important factor in avoiding infection is the use of strict aseptic precautions while cannula insertion, manipulation, maintenance, and then removal.[10] Surgical asepsis includes practices that keep objects and areas completely free of organisms, known as sterile technique.[11] Surgical asepsis aims at destroying all microorganisms and spores.[12] Aseptic technique is a method employed to maintain asepsis and protect the patient from health care-associated infections. The aseptic technique is defined as "a set of practices and procedures performed under carefully controlled conditions with the goal of minimizing contamination by pathogens".[13]

Hence, considering the correlation between the practice of aseptic technique and the fall in hospital infection rates, has prompted to conduct this study on the interns, who routinely perform the PIC procedure.

II. AIM & OBJECTIVES -

1.To assess the level of knowledge among the interns after required orientation to the program with regards to simple procedure of peripheral IV cannulation.
2.To analyse, evaluate the type of care instituted by the interns while practicing the peripheral IV cannulation procedure.
3.To conclude if they need more guidance and training further on.

III. MATERIALS & METHODS

This prospective study was carried out amongst the interns of various medical colleges across Maharashtra. The research design incorporated qualitative methodologies to find out the in-depth descriptive information about care and maintenance of peripheral intravenous cannulation. The questionnaire consisted of respondents' demographic data followed by knowledge on care and maintenance of peripheral intravenous catheter.

This preformed & pretested questionnaire was randomly shared as a Google form through various social media links and responses were collected anonymously after obtaining their consent from the Month of January 2021 to March 2021 & stored in Microsoft Excel Sheet.

Inclusion criteria:
1. MBBS Interns who were enrolled for a 12 months training programme at Government or Private Medical Colleges across Maharashtra.
2. The year of enrollment was 2020-21.
3. Interns must have attended orientation and induction programmes.

Exclusion criteria:
1. Interns from faculty other than MBBS
2. Interns who have extension / from previous year.
3. Interns who have not attended orientation programme.

IV. RESULTS

Our prospective study included 74 interns from various colleges in Maharashtra who were assessed regarding knowledge about intravenous cannulation, complication and documentation. All the interns consented to participate in the study before attempting the questionnaire ahead.

Majority of them i.e. 73% (53) interns were belonging to the government hospitals, while 27% (21) were from private hospitals. 54% (40) of the interns received the training before performing the peripheral IV cannulation whereas 46% (34) did not receive any training for the same.64%(47) interns felt confident to perform the procedure whereas 36%(27) were not confident.

It was observed that 83% (61) of the interns had the knowledge that the cannula of gauge 18G and 20G are suitable to use for adult peripheral intravenous cannulation out of which 9%(7) did not know & 8%(6) were unsure.Majority of them i.e. 83%(61) were aware about the sizes used for paediatric IV cannulations whereas 5%(4) did not know while 12%(9) were unsure about the same. Awareness about the commonest site for cannulation was 98%(73)Most of the 68% (50) interns explained the patient regarding maintenance of the IV cannula while 25%(19) did not explain. 7%(5) were unsure about such protocol.

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Awareness about use of splint to stabilize the IV site in paediatric and unco-operative patients was 78%(58) whereas 7%(5) didn't use the splint while 15%(11) were unsure.

The importance of washing hands before IV cannulation was known to 88%(65) out of which 9%(7) were unaware of any such practice & 3%(2) were unsure .

Significant 93%(69) group of interns knew the essentiality of skin prepping before the procedure while 4%(3) did not know and 2%(2) were unsure.

Most of the 98(73) interns knew that the use of gloves reduces the chances of infection while 2%(1) was not aware of it.74%(55) responded positively on the usage of transparent dressing to detect the early signs of phlebitis, 7%(5) did not agree and 19%(14) were unsure of this practice.

Majority of 89%(66) interns agreed that higher number of attempts during cannulation increased the chances of nosocomial infection. 4%(3) reported no about the same while 7%(5) were unsure.

89%(66) participants agreed to the fact that surrounding environment cleanliness influences the chances of site infection. 8%(6) did not agree while 3% (2) were unsure about his fact.

Awareness about the change of IV cannula every 72 hours reduces the incidence of thrombophlebitis, irrespective of evidence of the same was 56% (42) while 15% (11) did not know and 29% (21) were unsure.

Also 89% (66) interns knew that strong /irritant medications caused phlebitis. 4% (3) did not know while 7% (5) were unsure.

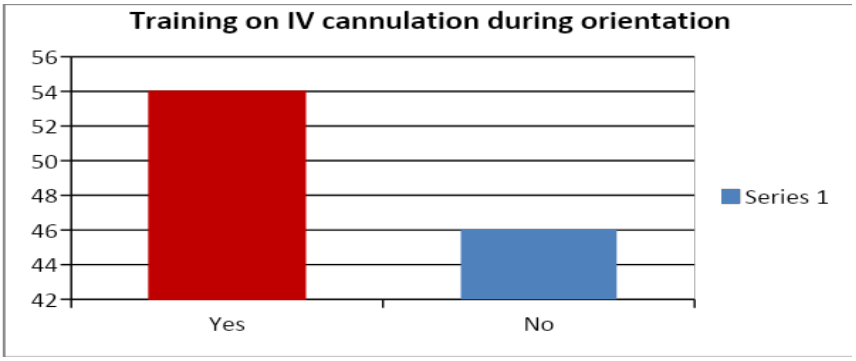
87% (64) interns agreed that a normal saline flush after every medication reduced the chances of thrombophlebitis. 5% (4) did not agree while 8% (6) were unsure.74% (55) interns changed the cannula at the first sign of phlebitis while 11% (8) did not change. 15% (11) were not sure.

Only 16% (12) interns wrote date, time, site, size, due date change and name of person cannulated. 76% (56) did not mention any details. 8%(6) were unsure. 45%(33) interns were aware of Universal infection control guidelines while 39% (29) were unaware of any such document. 16% (12) were unsure.

V. TABLES & FIGURES

1. Training on IV cannulation during orientation

Training on IV cannulation during orientation	No.	%
Yes	40	54 %
No	34	46 %
Total	74	100 %



2. Carrying out IV cannulation confidently

Carrying out IV cannulation confidently	No.	%
Yes	47	64
No	27	36

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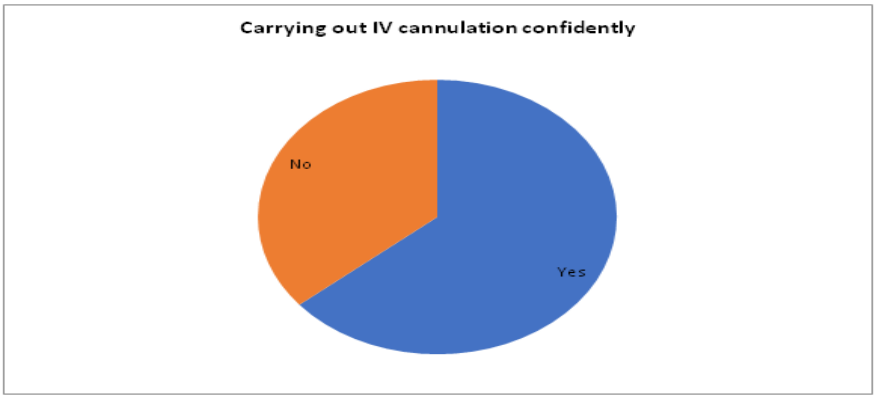
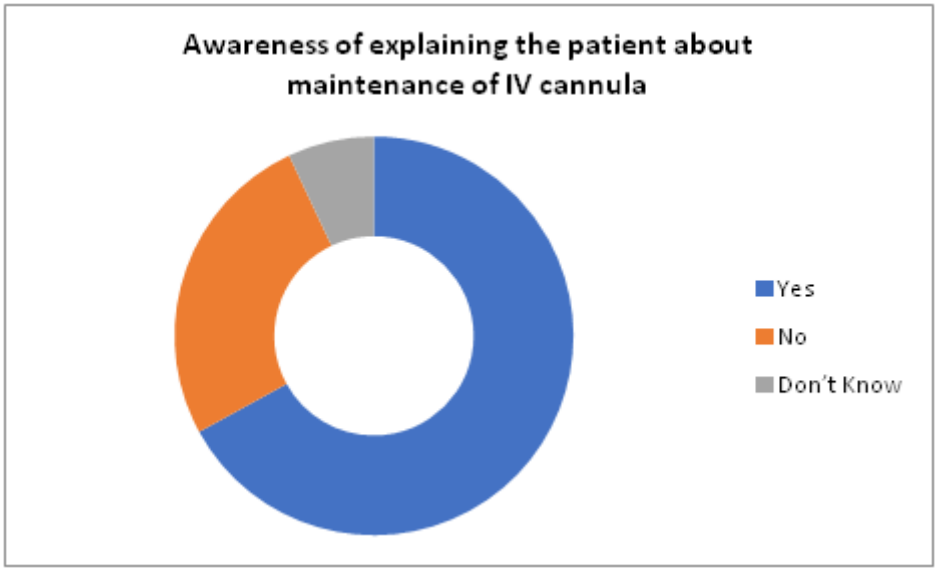
Total	74	100%



3. Awareness of explaining the patient about maintenance of IV cannula

Awareness of explaining the patient about maintenance of IV cannula	No.	%
Yes	50	68
No	19	25
Don't know	5	7
Total	74	100



4. Awareness about wearing gloves during the procedure to reduce chances of infection

Awareness about wearing gloves during the procedure to reduce chances of infection	No.	%
Yes	73	98
No	1	2
Total	74	100

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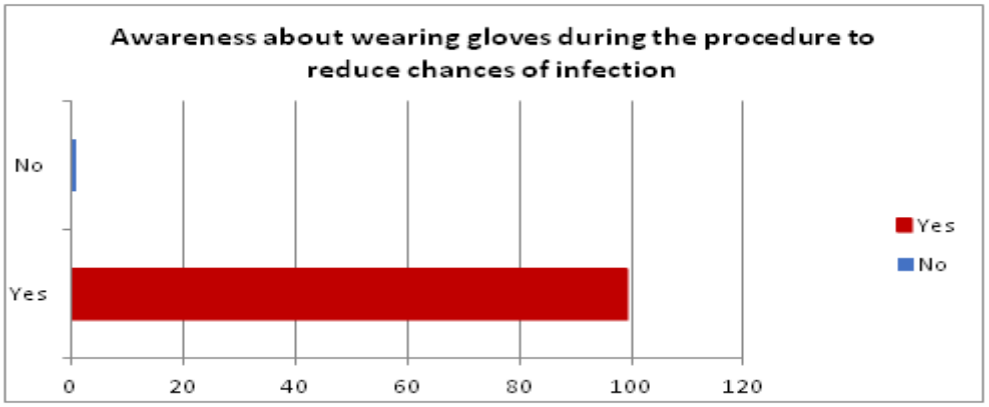
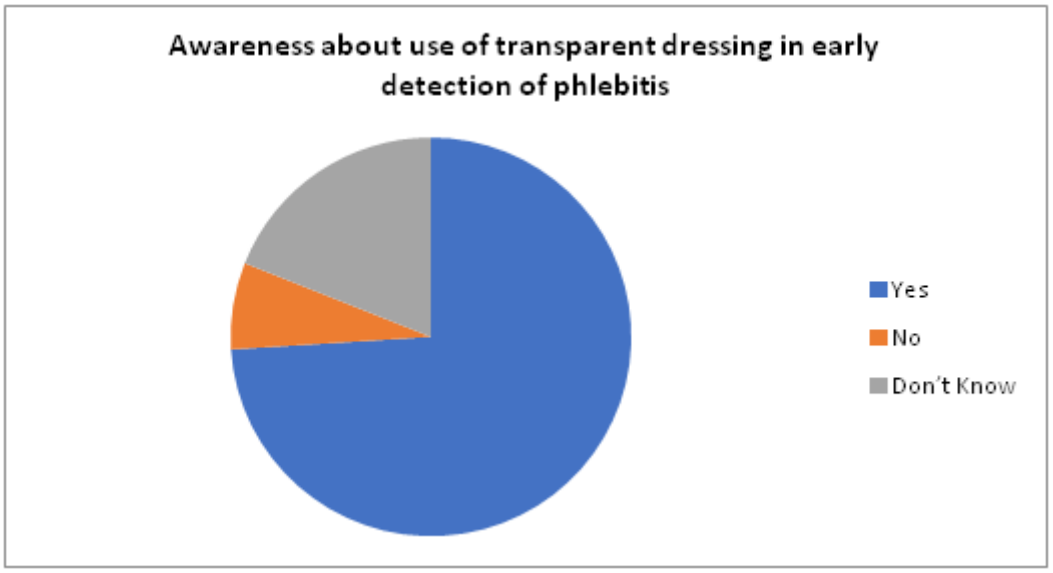


5. Awareness about use of transparent dressing in early detection of phlebitis

Awareness about use of transparent dressing in early detection of phlebitis	No.	%
Yes	55	74
No	5	7
Don't know	14	19
Total	74	100



6. Awareness about relation of attempting higher number of cannulation & increase in the chances of nosocomial infection

Awareness about use of transparent dressing in early detection of phlebitis	No	%
Yes	66	89
No	03	4
Don't know	05	7
Total	74	100

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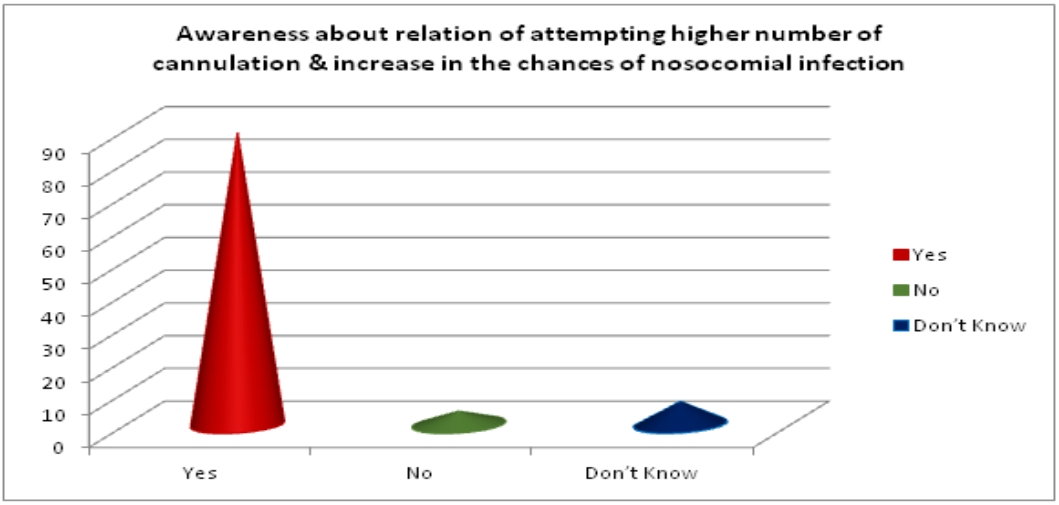
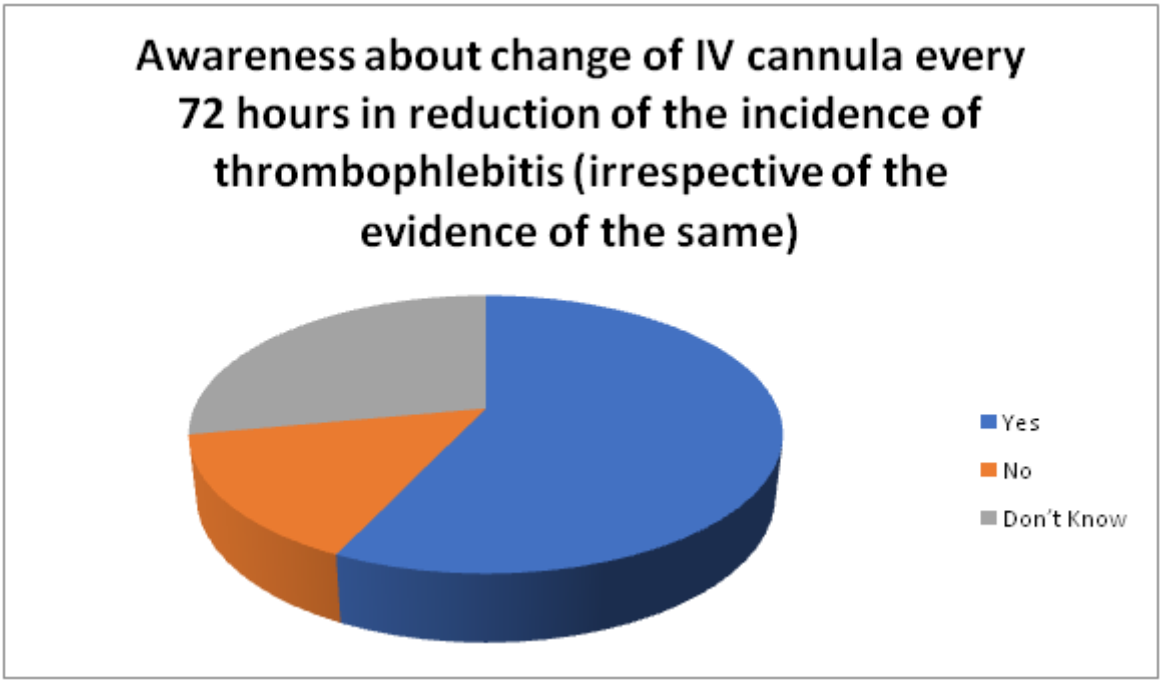


7. Awareness about change of IV cannula every 72 hours in reduction of the incidence of thrombophlebitis (irrespective of the evidence of the same)

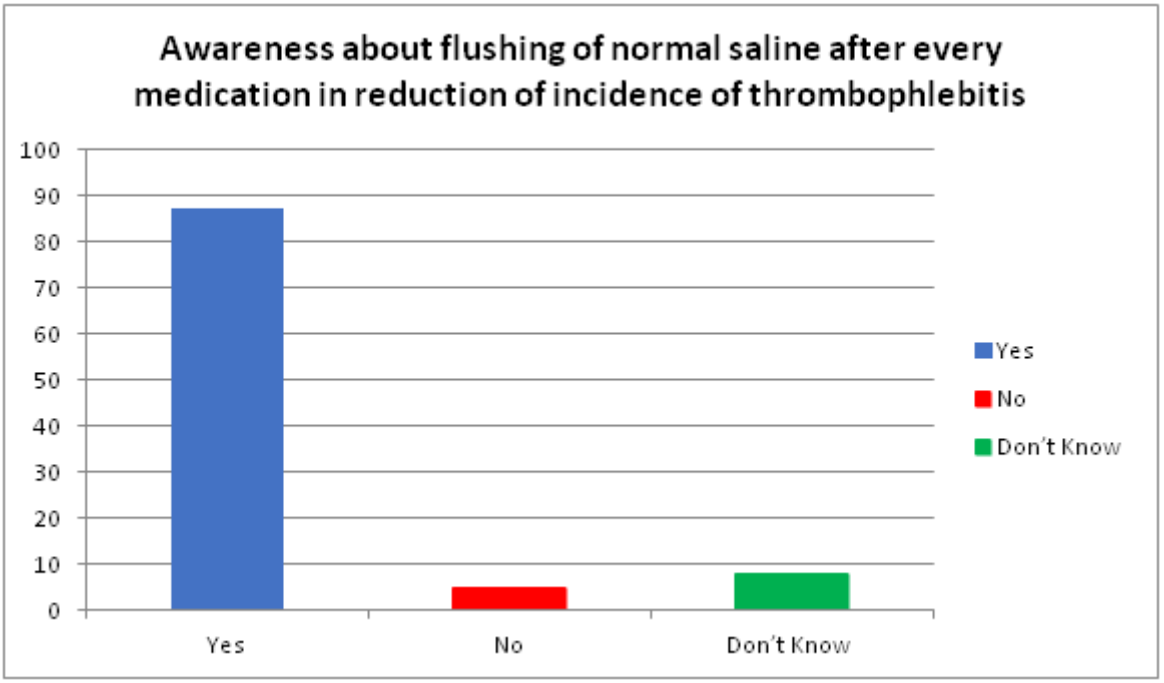
Awareness about change of IV cannula every 72 hours in reduction of the incidence of thrombophlebitis (irrespective of the evidence of the same)	No.	%
Yes	42	56
No	11	15
Don't know	21	29
Total	73	100



8. Awareness about flushing of normal saline after every medication in reduction of incidence of thrombophlebitis

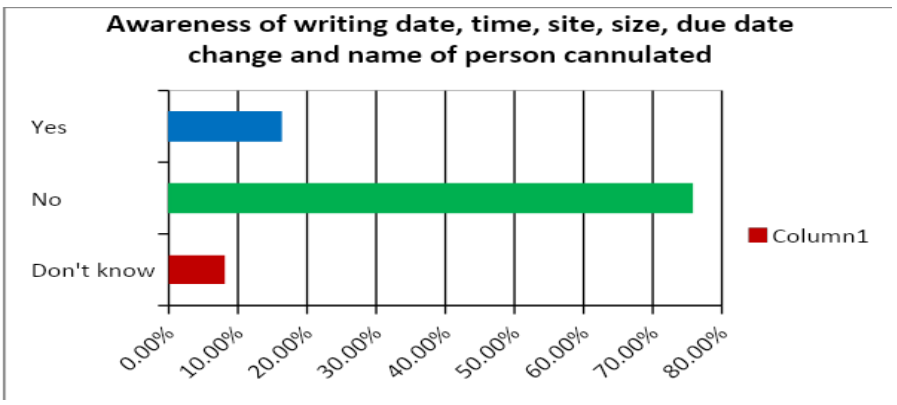
Awareness about flushing of normal saline after every medication in reduction of incidence of thrombophlebitis	No.	%

Yes	64	87
No	04	5
Don't know	06	8
Total	74	100



9. Awareness of writing date, time, site, size, due date change and name of person cannulated

Awareness of writing date, time, site, size, due date change and name of person cannulated	No.	%
Yes	12	16
No	56	76
Don't know	06	8
Total	74	100



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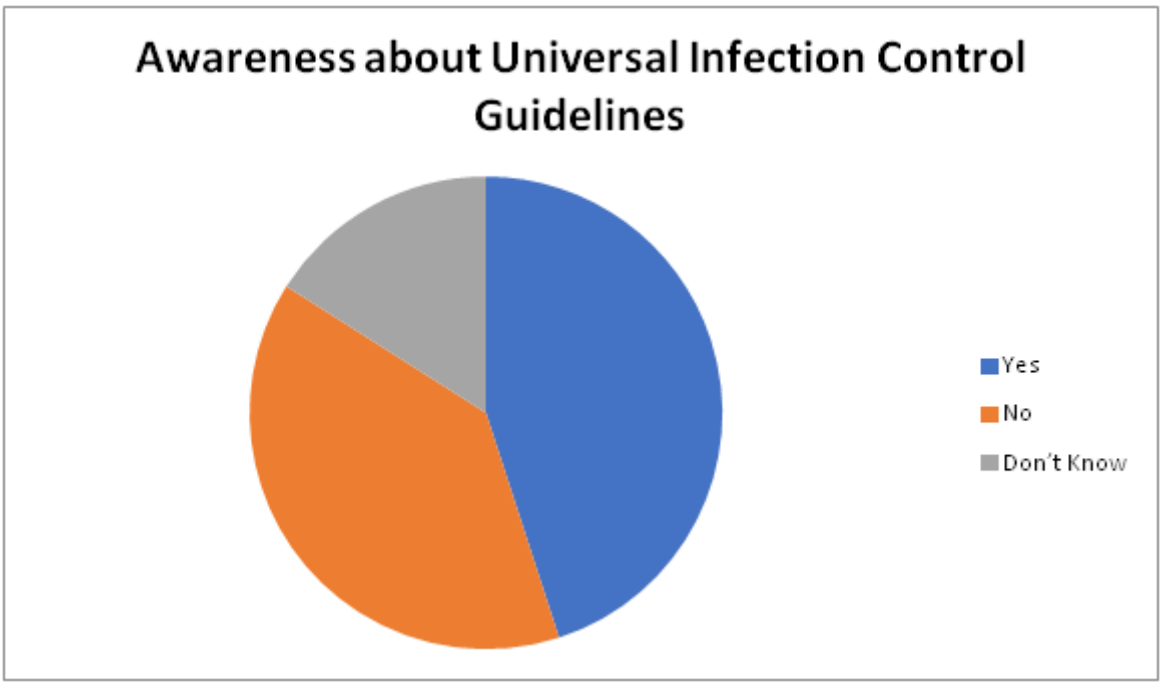
10. Awareness about Universal Infection Control Guidelines

Awareness about Universal Infection Control Guidelines	No	%
Yes	33	45
No	29	39
Don't know	12	16
Total	74	100



VI. DISCUSSION & CONCLUSION

The current study assesses the knowledge and practices regarding caring and maintaining PIC among the interns of various government and private medical colleges in Maharashtra. One of the most common clinical skills performed by medical professionals and paramedics is peripheral intravenous cannulation (PIC)[1]. Lack of knowledge of nosocomial infection, its prevention and proper care among interns may become a barrier in following the standard evidence-based guidelines for preventing IV catheter-related infections. Despite the known complications of PICs, there are still interns who are not practicing according to the standard protocols and are undertaking an incorrect way of insertion, maintenance as well as removal of IV cannula.

The Centers for Disease Control (CDC) published the second edition of Guidelines for the Prevention of Intravascular Catheter-Related Infections in the year 2002, replacing its original guideline published in 1996. The 2002 CDC guideline now has been revised and updated again and published in 2011.[14] It was prepared by a working group of members from professional organizations representing the disciplines of critical care medicine, infectious diseases, healthcare infection control, surgery, anaesthesiology, interventional radiology, pulmonary medicine, paediatric medicine and nursing. [15]

The goal was to provide evidence-based recommendations for preventing catheter-related infections[14]. Main emphasis was to educate healthcare personnel regarding the indications for intravascular catheter use, proper procedures for the insertion and maintenance of intravascular catheters, and appropriate infection control measures to prevent intravascular catheter-related infections, and to periodically assess knowledge of and adherence to guidelines for all personnel

involved in the insertion and maintenance of intravascular catheters. [14]

Choosing the IV route and selecting an appropriate size of vascular access device are the most important factors in preventing IV site infection.[16] In this study, 54% (40) of the interns received the training before performing the peripheral IV cannulation whereas 46% (33) did not receive any training for the same. 64%(47) interns felt confident to perform the procedure. 98%(73) of the interns had the knowledge of the site selection for the cannula. The PIC is usually inserted into a metacarpal vein on the back of the hand or a vein in the lower arm, either the cephalic or basilic vein. However, femoral veins should be avoided because of the higher density of skin flora in this area, which would put the patient at increased risk of infection [14]. The CDC guidelines suggest to use an upper-extremity site for catheter insertion in adults and to replace a catheter inserted in a lower extremity site to an upper extremity site as soon as possible. In pediatric patients, the upper or lower extremities or the scalp (in neonates or young infants) can be used as the catheter insertion site. [17,18]

Selection of catheters on the basis of the intended purpose and duration of use, known infectious and non-infectious complications (e.g., phlebitis and infiltration), and experience of individual catheter operators is recommended. [16-19]

It was observed that 83 (61) of the interns had the knowledge that the cannula of gauge 18G and 20G are suitable to use for adult peripheral intravenous cannulation out of which 9(7) didn't know & 8%(6) were unsure.Majority of them i.e. 83%(61) were aware about the sizes used for pediatric IV cannulations whereas 5%(4) did not know while 12%(9) were unsure about the same

In our study, the awareness about the change of IV cannula every 72 hours reduces the incidence of thrombophlebitis, irrespective of evidence of the same was 56% (42) while 15% (11) did not know and 29% (21) were unsure.

However it is recommended to evaluate the catheter insertion site daily by palpation through the dressing to assess the tenderness and by inspection if a transparent dressing is in use. Gauze and opaque dressings should not be removed if the patient has no clinical signs of infection. If the patient has local tenderness or other signs of possible CRBSI (catheter related bloodstream infection) , an opaque dressing should be removed and the site inspected visually. (Category II evidence). [20] It is advised to remove peripheral venous catheters if the patients develops signs of phlebitis (warmth, tenderness, erythema or palpable venous cord), infection, or a malfunctioning catheter. [21]

In this study, 74% (55) interns changed the cannula at the first sign of phlebitis while 11% (8) did not change. 15% (11) were not sure. Many interventions have been developed to reduce the incidence of phlebitis such as including new catheter materials and innovative methods for securing the catheter but the most widely practiced intervention is the routine replacement of the catheter.[4,22-23]

The CDC guidelines also recommend that peripheral intravenous catheter should be removed or replaced every 12–72 hr to avoid complications such as Thrombophlebitis. [14-15] Awareness and hence early recognition of risk factors for the development of phlebitis can reduce complications, which improves the quality of care, patient safety, patient satisfaction and at the same time reduces the length of hospital stay and the overall cost of health care [25]

The CDC provides guidelines for protection against infection of the peripheral catheters which includes good hand hygiene before catheter insertion or maintenance either through the use of waterless, alcohol-based hand-rub or an antibacterial soap and water with adequate rinsing, along with proper aseptic technique during catheter manipulation.[15]

Hand washing is the cost-effective measures to minimize nosocomial infection [26] . In this study 88% (65) knew the importance of hand washing before IV insertion. 89%(66) participants agreed to the fact that surrounding environment cleanliness influences the chances of site infection. 98%(73) of the interns agreed on wearing non-sterile gloves during insertion of IV cannula. And, 93%(69) of the respondents knew skin preparation at the insertion site is required before IV cannula insertion.Majority of 89%(66) interns agreed that higher number of attempts during cannulation increased the chances of nosocomial infection.

Recommended catheter dressing regimen is that either sterile gauze or sterile, transparent, semi-permeable dressing should be used to cover

the catheter site [27-30]. If the patient is diaphoretic or if the site is bleeding or oozing, use a gauze dressing until this is resolved [27-30]. Replace catheter site dressing if the dressing becomes damp, loosened, or visibly soiled [27-28]. Do not use topical antibiotic ointment or creams on insertion sites, except for dialysis catheters, because of their potential to promote fungal infections and antimicrobial resistance [30,31]. Do not submerge the catheter or catheter site in water. Showering should be permitted if precautions can be taken to reduce the likelihood of introducing organisms into the catheter (e.g., if the catheter and connecting device are protected with an impermeable cover during the shower) [32,33]. 74%(55) responded positively to the usage of transparent dressing to detect the early signs of phlebitis, 7%(5) did not agree and 19%(14) were unsure of this practice.

Accurate documentation like the date and time of cannula insertion, labelling IV equipment and fluid containers with date and time they are opened to ensure they have changed appropriately demonstrate better cannula care, encourage research-based standardized practice and provide guidance as well as evidence of competence [34-35]

In our study Only 16% (12) interns wrote date, time, site, size, due date change and name of person who cannulated. 76% (56) did not mention any details. 8%(6) were unsure.

Also 89% (66) interns knew that strong & irritant medications caused phlebitis. 4% (3) did not know while 7% (5) were unsure.87% (64) interns agreed that a normal saline flush after every medication reduced the chances of thrombophlebitis. 5% (4) did not agree while 8% (6) were unsure.Most of the 68% (50) interns explained the patient regarding maintenance of the IV cannula. Educating patients on how to care IV cannula also helps to reduce the risk of infection. Among 74 interns, only 45%(33) interns were aware of Universal infection control guidelines.

VII. CONCLUSION

The risk and complications of PIC could result in nosocomial infection, contributing to morbidity and mortality of the patient. So, in the clinical practice, the interns must be well trained and made aware of recent guidelines of the institute regarding every aspect of IV cannulation. In this study, most interns were having an acceptable level of knowledge of insertion, maintenance and removal of peripheral IV cannulation but there were still some interns who lacked in this aspect which could be a potential risk factor for patient safety. This may be attributed to the fact that they were not trained practically in the procedure. The knowledge imparted to most interns was by the attending House officer during their duty hours. Their knowledge towards care and maintenance of IV cannula was very limited which might result in practicing incorrect methods and hence harmful for the patients. The results should sensitize the authorities to improve interns training and education programmes, according to clinical risk management perspectives.

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