“ENHANCING PHLEBITIS DETECTION IN PAEDIATRIC PATIENTS THROUGH ROUTINE PHYSICIAN INSPECTIONS – A PROSPECTIVE OBSERVATIONAL STUDY”

By

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DISSERTATION SUBMITTED TO SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH, TAMAKA, KOLAR, KARNATAKA

In partial fulfillment of the requirement for the degree of

DOCTOR OF MEDICINE

IN

PAEDIATRICS

Under The Guidance Of

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ENHANCING PHLEBITIS DETECTION IN PAEDIATRIC PATIENTS THROUGH ROUTINE PHYSICIAN INSPECTIONS: A PROSPECTIVE OBSERVATIONAL STUDY ABSTRACT BACKGROUND: Phlebitis (inflammation of the vein) is a common complication of peripheral intravenous (IV) cannulation, particularly among the pediatric population 1 Its prompt recognition is essential to avoid complications such as thrombophlebitis, bloodstream infections, and increased length of stay. Although nurses routinely monitor IV sites, doctors inspecting the IV sites may improve detection of phlebitis and minimize negative outcomes associated with the complication. OBJECTIVE: To assess the impact of a routine physician inspection of the peripheral IV site on the identification of phlebitis in hospitalized children at a tertiary care hospital and to determine risk factors related to the condition. METHODS: Twenty-four month prospective observational study was conducted at R.L. Jalappa Hospital & Research Centre. A total of 237 children (aged 1 month to 12 years) requiring IV cannulation were included. Phlebitis was determined using the Visual Infusion Phlebitis (VIP) score, and nurses monitored once every 8 hours (3 times daily) and doctors inspected twice daily. The FLACC and Wong-Baker pain scores were used when appropriate. RESULTS:A total of 237 children were assessed, with phlebitis diagnosed in 33 samples (13.92%). The nurse detected 14 phlebitis cases (5.9%), and the doctor identified 19 phlebitis cases; however, the statistical significance showed that the number of cases the doctor identified was higher than the number of samples the nurse identified ($p < 0.05$). More phlebitis was observed in younger children (≤3 years). CONCLUSION: Regularly performed physician inspection was superior to nursing alone in detecting phlebitis in children. Since younger children are more likely to develop phlebitis, monitoring is vital. There is a need to explore a dual surveillance model that incorporates nursing and physician assessment to prevent diagnosis from being missed. It is expected that the clinical outcome will also improve. I INTRODUCTION Phlebitis is due to inflammation of a vein, which is a frequent complication of the peripheral IV catheters (PIVCs). Among complications related to IV intravenous cannulation (IV) are extravasation and thrombophlebitis in pediatric patients1. Symptoms include discomfort, pain, erythema, and swelling at the catheter insertion site. If untreated, phlebitis may develop into advanced infections or even systemic complications. Early diagnosis and treatment is necessary to avoid such outcomes. Phlebitis in pediatric patients presents unique challenges. Due to the fragility of puny veins, immature immune systems, and failure of children to accurately communicate pain or discomfort, diagnosis of phlebitis becomes complicated. The basis of phlebitis is pathophysiological, where an inflammatory response occurs following injury to endothelial cells. There are multiple causes of endothelial engagement: the catheter may produce mechanical trauma, infusion may lead to chemical irritation, or the patient may have a microbial infection. An inflammatory process follows and produces the classic signs of pain, swelling, and redness. Risk factors for pediatric phlebitis are related to catheter characteristics, such as size, material, or duration of placement, and patient factors, such as age, comorbidities, and vein fragility. Specific medications, especially hyperosmolar or irritant drugs, increase this risk. Other factors, such as poor catheter management, lack of hygiene, and infrequent inspection of the filament, lengthen exposure to phlebitis. Regular physician examination is an important intervention for the identification and management of phlebitis. Although the nursing team undertakes regular observations, physicians provide a broader perspective. By utilizing routine inspections, the early signs of phlebitis can be recognized and treated swiftly, which helps to prevent complications. Children are significantly more likely to be affected by complications resulting from phlebitis. While there have been some limited studies exploring peripheral venous cannulation adverse events (PVCAE), there are sparse data available for the exclusively pediatric group .2,3 PVACEs are routinely recorded on nursing observations using the Visual Infusion Phlebitis (VIP) score.4,5 By using the VIP score tool to assess early signs of phlebitis and removal of PIVCs, the rate has been effectively lowered below the acceptable benchmark of five percent6. This study aims to evaluate the impact of routine physician inspection on the detection rates of phlebitis in pediatric patients. AIMS & OBJECTIVES AIMS: To evaluate the effectiveness of routine physician inspection in enhancing the detection of phlebitis in pediatric patients. OBJECTIVES: Identify phlebitis in children aged 1 month to 12 years who required IV cannulation by using VIP Scores. • To determine phlebitis in children aged between 1 month and 12 years of age requiring IV cannulation by applying VIP scores by doctors. • To compare rates of phlebitis between the observations by nurses and doctors. • To determine the factors associated with phlebitis REVIEW OF LITERATURE Definition: Phlebitis is defined as the inflammation of a vein, typically occurring in response to mechanical, chemical, or infectious irritation. It is a common complication in pediatric patients undergoing IV therapy, leading to pain, erythema, warmth, and swelling at the site of catheter insertion. Phlebitis can significantly impact patient comfort and may increase the risk of bloodstream infections and systemic complications if not promptly managed. As stated by the Infusion Nurses Society (INS), the acceptable rate of phlebitis should be 5% or lower5,6. In 1998, the first INS phlebitis scale was created, categorizing phlebitis according to the severity of symptoms through a standardized grading system7. Early detection and intervention are essential in preventing the progression to more severe forms. Classification of Phlebitis: Phlebitis can be classified into different types based on its underlying cause. Understanding these classifications aids in early identification, appropriate management, and prevention of complications. The four main types of phlebitis are Mechanical Phlebitis, Chemical Phlebitis, Infectious/Bacterial Phlebitis, and Post-Infusion Phlebitis8. Mechanical Phlebitis: Mechanical phlebitis occurs in response to physical trauma and irritation of the vein wall. This is most often associated with the movement or misplacement of IV catheters. Causes: ? Poor catheter placement ? Large or stiff catheters ? Catheter insertion at a flexion site (e.g., elbow, wrist) ? Frequent movement of the catheter ? Prolonged use of the catheter ? Poor vein selection Clinical Features: ? Localized pain and tenderness ? Erythema along the vein path ? Swelling at the insertion site ? Palpable venous cord in severe cases Chemical Phlebitis: Chemical phlebitis is caused by the infusion of medications or fluids that irritate the vein wall. Hyperosmolar, acidic or alkaline substances can lead to damage of the endothelial lining of the vein that can precipitate inflammation Causes: ? Administration of hypertonic solutions (e.g., total parenteral nutrition). ? Chemotherapy drugs. ? Potassium chloride, calcium gluconate or antibiotics ? Rapid infusion rates ? Insufficient dilution of medications Clinical Features: ? Pain and burning sensation during infusion ? Redness and warmth around the catheter site ? Swelling and localized discomfort ? No systemic signs of infection initially Infectious Phlebitis: Infectious phlebitis, or septic phlebitis, occurs when the IV catheter or infusion site has been contaminated with bacteria. Infectious phlebitis can lead to serious complications such as bloodstream infections and sepsis. Causes: ? Poor aseptic technique during catheter insertion ? Prolonged catheter dwell time ? Contaminated IV fluids or medications ? Immunocompromised state in pediatric patients Clinical Features: ? Pain and erythema with purulent discharge at the insertion site ? Swelling and warmth over the vein ? Fever, chills, and tachycardia ? Systemic signs of infection in severe cases Post-Infusion Phlebitis: Post-infusion phlebitis typically occurs 48 to 96 hours after the removal of the catheter. It occurs from a delayed response to irritation or inflammation from the IV therapy Causes: ? Residual irritation from infused medications ? Inflammatory response to catheter materials ? Minor vein wall trauma during catheter removal ? Inadequate vein rest or care post-removal Clinical Features: ? Persistent redness and tenderness along the vein ? Mild swelling at the former catheter site ? No systemic signs of infection ? Symptoms gradually subside without intervention Pathophysiology of Phlebitis: Phlebitis relates to the inflammation of the wall of the vein - mainly the endothelium layer.It is brought on by bacterial infections, chemical irritation from infused solutions, or mechanical trauma from catheters9. Histamine, prostaglandins, and cytokines are among the inflammatory mediators released as a result of the initial endothelial damage. This causes vasodilation, increases vascular permeability, and attracts neutrophils and macrophages. This inflammatory reaction results in warmth, erythema, swelling, and localized pain. The coagulation cascade is triggered, and fibrin deposits are formed when platelets attach to the injured endothelium. This may occasionally result in thrombophlebitis. If infectious phlebitis is not treated right away, it could develop into a systemic infection. The length of catheter use, the kind of medication infused, and the patient's immune response are some of the variables that affect the degree of inflammation and the emergence of complications. INCIDENCE OF PHELBITIS: In a study conducted by Bitencourt et al10, the prevalence of phlebitis among children aged 0 to 2 years was 34%. In this regard, there is a great deal of variation in the literature; some studies report phlebitis rates of 1.5□, 2.75□, and

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ACKNOWLEGEMENT

I would like to thank God for giving me the opportunity, strength, and courage throughout the post-graduation and to complete my dissertation.

I express my heartfelt and humble gratitude to my beloved guide **Dr.Sudha Reddy V.R**, HOU and Professor, Department of Paediatrics who hand picked this topic for me and graced study officially with his constant support and expert advice, his encouragement, wise constructive judgment the painstaking effort to weed out errors and his affection during course of study leaves me permanently indebted to him.

I express my deep sense of gratitude and humble thanks to my senior Professors, **Dr. K.N.V. Prasad, Dr.Krishnappa, Dr. Narendra, Dr. James Daniel S, Dr.Srikanth** for their advice and encouragement throughout the study.

My heartfelt thanks to Assistant Professors **Dr.Bhanuchand,Dr.Karthik, Dr.Abhishek** for their practical tips, invaluable advice and constant encouragement. I would like to thank my senior Residents **Dr Pravallika, Dr.Pallavi** for their guidance and support.

I extend my sincere thanks to my beloved senior **Dr.Ram** for constantly supporting me and helping me through in and out and **Dr.Jahnavi** for supporting me through out . I extend my sincere thanks to all seniors **Dr.Kamal, Dr Sai Teja, Dr.Mouna, Dr.Karthik & Dr.Rana** for

sharing their immense knowledge. I am thankful for their valuable guidance and helping me with my dissertation.

I would like to express my gratitude to my close friends **Dr.Teja, Dr.Deepthi, Dr.Varsha, Dr.Deepak, Dr.Vishaka, Dr Bhargavi** for their support and love. Heartfelt thanks to my juniors **Dr.Akhila,Dr.Indra,Dr.Pravallika, Dr.Aswini, Dr.Venkatesh, Dr.Supreeth**, I would express my deepest gratitude to my beloved parents **Mr.Ram Gopal Rao , Mrs.Rajeetha** and my sister **Ms.Saanvi** for constantly believing in me and whose love, blessings made me the person what I am today.

I would like to thank **Mrs.Gayathri, Mr.Jagannath** who had helped me in the clerical work.

Lastly, I would like to express my gratitude to all my interns and nurses of pediatric ward and patients who were part of this study without whose support this study wouldn‘t have been possible.

Date: DR MALRAJ SAI ROHIT

LIST OF ABBREVIATIONS

Glossary	Abbreviations
VIP	Visual infusion phlebitis
FLACC	Face, Legs, Activity, Cry, and Consolability
BMI	Body mass index
IV	Intravenous
CRBSI	Catheter-related bloodstream infections
NSAID	Non-steroidal anti-inflammatory drug
ICU	Intensive care unit
PICU	Paediatric intensive care unit
NICU	Neonatal intensive care unit
INS	Infusion Nurses Society
aPTT	Activated partial thromboplastin time
PT	Prothrombin time
DVT	Deep vein thrombosis
SPSS	Statistical Package for the Social Sciences
CBC	Complete blood count
MRI	Magnetic resonance imaging

CT	Computed tomography
PIVC	Peripheral IV catheters
PVCAE	Peripheral venous cannulation-related adverse effects
CVC	Central venous catheters
PICC	Peripherally inserted central catheter
CDC	Centers for Disease Control and Prevention
WBC	White blood cell
CRP	C-reactive protein
ESR	Erythrocyte sedimentation rate
LMWH	Low-molecular-weight heparin
CECT	Contrast-enhanced computed tomography
USG	Ultrasonography
PDSA	Plan-do-study-act

TABLE OF CONTENTS

S. No	Table of contents	Page no
1	INTRODUCTION	1
2	AIMS & OBJECTIVES	4
3	REVIEW OF LITERATURE	6
4	MATERIAL & METHODS	45
5	RESULTS	52
6	DISCUSSION	63
7	CONCLUSION	69
8	LIMITATIONS	71
9	SUMMARY	73
10	BIBLIOGRAPHY	75
11	ANNEXURES	80

LIST OF FIGURES

S.No	Name of the Figures	Page.No
1	Colour coding for IV Cannula	**19**
2	The VIP Scoring System	**30**
3	INS Phlebitis Scale	**32**
4	Distribution of age among the study population	**53**
5	Gender distribution among the study population	**54**
6	Distribution based on the site of the cannula	**55**
7	Distribution based on the indwelling time of the cannula	**56**
8	Distribution based on the size of the cannula	**57**
9	Distribution based on the IV fluids given and medications administered	**58**

LIST OF TABLES

S.No	Table Description	Page.No
1	Cannula colour codes and specifications	**18**
2	The visual infusion phlebitis score	**48**
3	Distribution of subjects based on age	**53**
4	Distribution of subjects based on gender	**54**
5	Distribution of subjects based on the site of the cannula	**55**
6	Distribution of subjects based on the indwelling time of the cannula	**56**
7	Distribution of subjects based on the size of the cannula	**57**
8	Distribution of subjects based on intravenous (IV) fluids and medication administered	**58**
9	Distribution of occurrence of phlebitis (VIP score ≥ 2) detected by nurses & physicians	**59**
10	Comparison of age groups in phlebitis and non-phlebitis groups	**59**
11	Comparison of gender in phlebitis and non-phlebitis groups	**60**
12	Comparison of cannula sites in phlebitis and non-phlebitis groups	**60**
13	Comparison of cannula size in phlebitis and non-phlebitis groups	**61**
14	Comparison of the indwelling time of the cannula in the phlebitis and non-phlebitis groups	**61**
15	Comparison of IV fluids and medications administered in phlebitis and non-phlebitis groups	**62**

ENHANCING PHLEBITIS DETECTION IN PAEDIATRIC PATIENTS THROUGH ROUTINE PHYSICIAN INSPECTION -A PROSPECTIVE OBSERVATIONAL STUDY

ABSTRACT

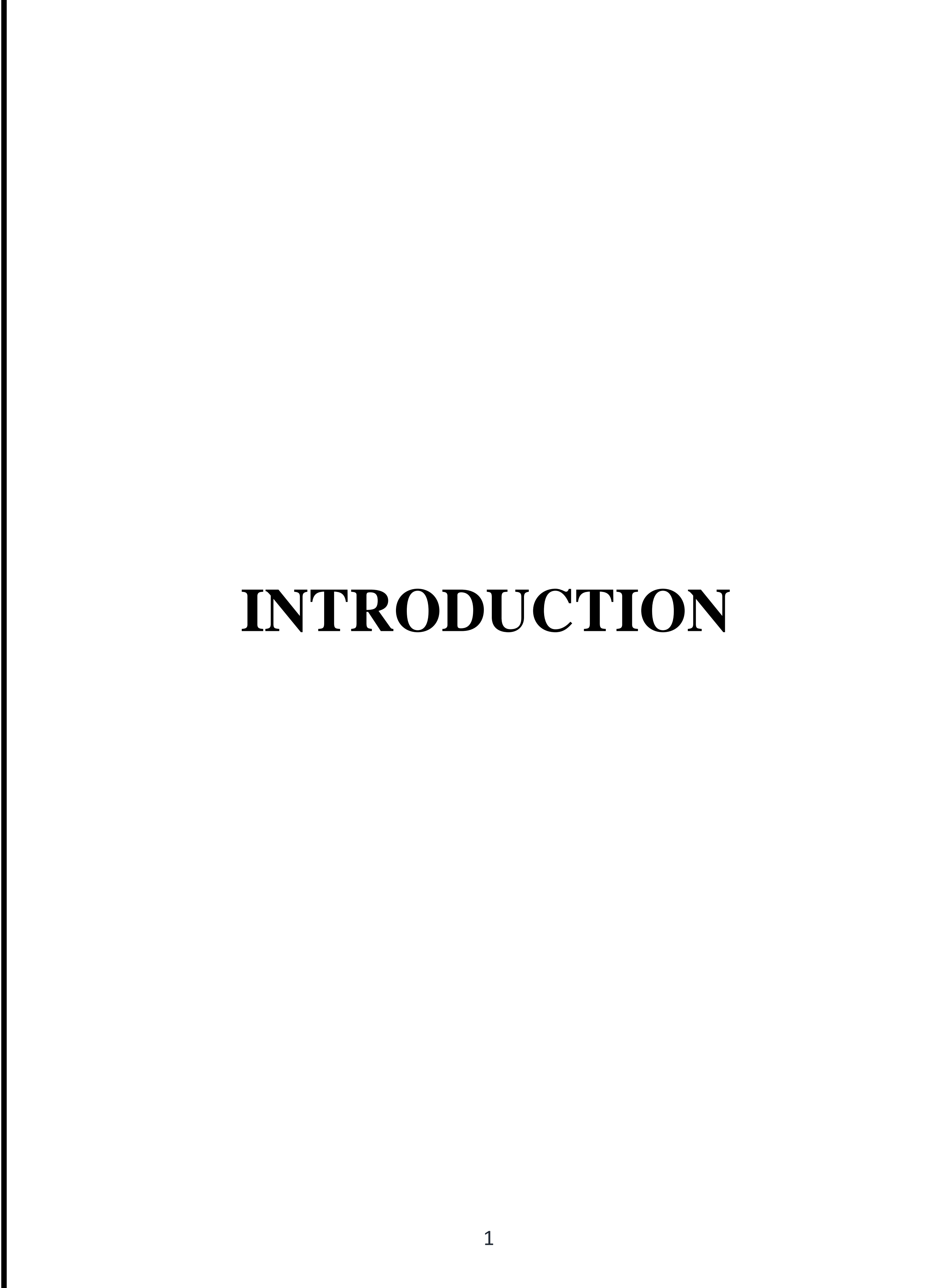
BACKGROUND: Phlebitis (inflammation of the vein) is a common complication of peripheral intravenous (IV) cannulation, particularly among the paediatric population [1] Its prompt recognition is essential to avoid complications such as thrombophlebitis, bloodstream infections, and increased length of stay. Although nurses routinely monitor IV sites, doctors inspecting the IV sites may improve detection of phlebitis and minimize negative outcomes associated with the complication.

OBJECTIVE: To assess the impact of a routine physician inspection of the peripheral IV site on the identification of phlebitis in hospitalized children at a tertiary care hospital and to determine risk factors related to the condition.

METHODS: A twenty-four-month prospective observational study was conducted at R.L. Jalappa Hospital & Research Centre. A total of 237 children (aged 1 month to 12 years) requiring IV cannulation were included. Phlebitis was determined using the Visual Infusion Phlebitis (VIP) score, and nurses monitored once every 8 hours (3 times daily) and doctors inspected twice daily. The FLACC and Wong-Baker pain scores were used when appropriate.

RESULTS: A total of 237 children were assessed, with phlebitis diagnosed in 33 samples (13.92%). The nurse detected 14 phlebitis cases (5.9%), and the doctor identified 19 phlebitis cases; however, the statistical significance showed that the number of cases the doctor identified was higher than the number of cases the nurse identified ($p < 0.05$). More phlebitis was observed in younger children (≤3 years).

CONCLUSION: Regularly performed physician inspection was superior to nursing alone in detecting phlebitis in children. Since younger children are more likely to develop phlebitis, monitoring is vital. There is a need to explore a dual surveillance model that incorporates nursing and physician assessment to prevent diagnosis from being missed. It is expected that the clinical outcome will also improve.



INTRODUCTION

INTRODUCTION

Phlebitis is due to inflammation of a vein, which is a frequent complication of the peripheral IV catheters (PIVCs). Among complications related to IV intravenous cannulation (IV) are extravasation and thrombophlebitis in paediatric patients[1]. Symptoms include discomfort, pain, erythema, and swelling at the catheter insertion site. If untreated, phlebitis may develop into advanced infections or even systemic complications. Early diagnosis and treatment are necessary to avoid such outcomes.

Phlebitis in paediatric patients presents unique challenges. Due to the fragility of puny veins, immature immune systems, and failure of children to accurately communicate pain or discomfort, the diagnosis of phlebitis becomes complicated.

The basis of phlebitis is pathophysiological, where an inflammatory response occurs following injury to endothelial cells. There are multiple causes of endothelial engagement: the catheter may produce mechanical trauma, infusion may lead to chemical irritation, or the patient may have a microbial infection. An inflammatory process follows and produces the classic signs of pain, swelling, and redness.

Risk factors for paediatric phlebitis are related to catheter characteristics, such as size, material, or duration of placement, and patient factors, such as age, comorbidities, and vein fragility. Specific medications, especially hyperosmolar or irritant drugs, increase this risk. Other factors, such as poor catheter management, lack of hygiene, and infrequent inspection of the filament, lengthen exposure to phlebitis.

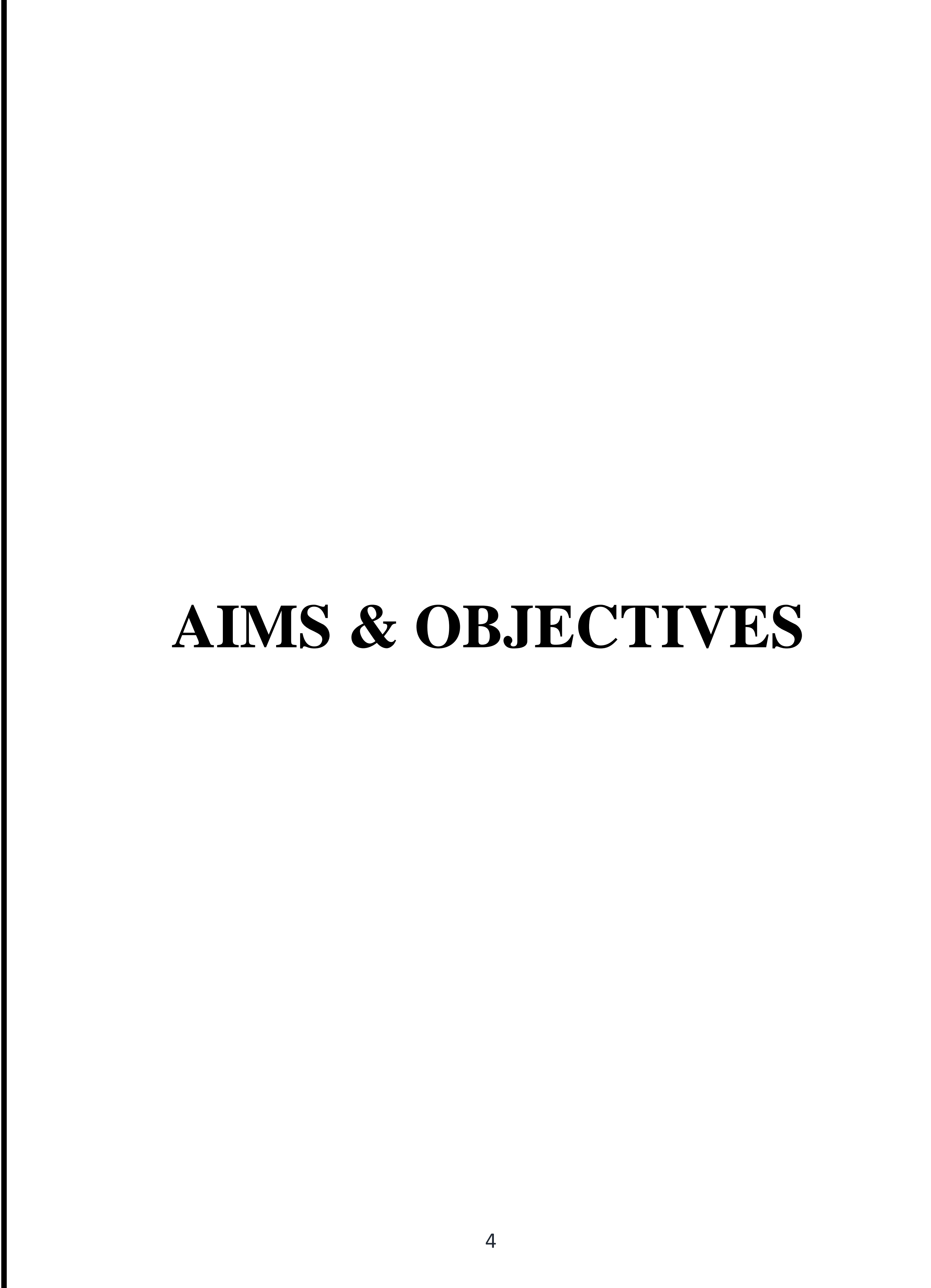
Regular physician examination is an important intervention for the identification and management of phlebitis. Although the nursing team undertakes regular observations, physicians provide a broader perspective. By utilizing routine inspections, the early signs of phlebitis can be recognized and treated swiftly, which helps to prevent complications.

Children are significantly more likely to be affected by complications resulting from phlebitis. While there have been some limited studies exploring peripheral venous cannulation adverse events (PVCAE), there are sparse data available for the exclusively

paediatric group [2,3] .PVACEs are routinely recorded on nursing observations using the Visual Infusion Phlebitis (VIP) score.[4,5]

By using the VIP score tool to assess early signs of phlebitis and removal of PIVCs, the rate has been effectively lowered below the acceptable benchmark of five percent[6].

This study aims to evaluate the impact of routine physician inspection on the detection rates of phlebitis in paediatric patients.



AIMS & OBJECTIVES

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AIMS:

To evaluate the effectiveness of routine physician inspection in enhancing the detection of phlebitis in paediatric patients.

OBJECTIVES:

Identify phlebitis in children aged 1 month to 12 years who required IV cannulation by using VIP Scores.

- To determine phlebitis in children aged between 1 month and 12 years of age requiring IV cannulation by applying VIP scores by doctors.
- To compare rates of phlebitis between the observations by nurses and doctors.
- To determine the factors associated with phlebitis

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Definition:

Phlebitis is defined as the inflammation of a vein, typically occurring in response to mechanical, chemical, or infectious irritation. It is a common complication in paediatric patients undergoing IV therapy, leading to pain, erythema, warmth, and swelling at the site of catheter insertion. Phlebitis can significantly impact patient comfort and may increase the risk of bloodstream infections and systemic complications if not promptly managed.

As stated by the Infusion Nurses Society (INS), the acceptable rate of phlebitis should be 5% or lower[7,8]. In 1998, the first INS phlebitis scale was created, categorizing phlebitis according to the severity of symptoms through a standardized grading system[9]. Early detection and intervention are essential in preventing the progression to more severe forms.

Classification of Phlebitis:

Phlebitis can be classified into different types based on its underlying cause. Understanding these classifications aids in early identification, appropriate management, and prevention of complications. The four main types of phlebitis are Mechanical Phlebitis, Chemical Phlebitis, Infectious/Bacterial Phlebitis, and Post-Infusion Phlebitis[10].

Mechanical Phlebitis:

Mechanical phlebitis occurs in response to physical trauma and irritation of the vein wall. This is most often associated with the movement or misplacement of IV catheters.

Causes:

- Poor catheter placement
- Large or stiff catheters
- Catheter insertion at a flexion site (e.g., elbow, wrist)

- Frequent movement of the catheter
- Prolonged use of the catheter
- Poor vein selection

Clinical Features:

- Localized pain and tenderness
- Erythema along the vein path
- Swelling at the insertion site
- Palpable venous cord in severe cases

Chemical Phlebitis:

Chemical phlebitis is caused by the infusion of medications or fluids that irritate the vein wall. Hyperosmolar, acidic or alkaline substances can lead to damage of the endothelial lining of the vein that can precipitate inflammation

Causes:

- Administration of hypertonic solutions (e.g., total parenteral nutrition).
- Chemotherapy drugs.
- Potassium chloride, calcium gluconate or antibiotics
- Rapid infusion rates
- Insufficient dilution of medications

Clinical Features:

- Pain and burning sensation during infusion
- Redness and warmth around the catheter site
- Swelling and localized discomfort
- No systemic signs of infection initially

Infectious Phlebitis:

Infectious phlebitis, or septic phlebitis, occurs when the IV catheter or infusion site has been contaminated with bacteria. Infectious phlebitis can lead to serious complications such as bloodstream infections and sepsis.

Causes:

- Poor aseptic technique during catheter insertion
- Prolonged catheter dwell time
- Contaminated IV fluids or medications
- Immunocompromised state in paediatric patients

Clinical Features:

- Pain and erythema with purulent discharge at the insertion site
- Swelling and warmth over the vein
- Fever, chills, and tachycardia
- Systemic signs of infection in severe cases

Post-Infusion Phlebitis:

Post-infusion phlebitis typically occurs 48 to 96 hours after the removal of the catheter. It occurs from a delayed response to irritation or inflammation from the IV therapy

Causes:

- Residual irritation from infused medications
- Inflammatory response to catheter materials
- Minor vein wall trauma during catheter removal
- Inadequate vein rest or care post-removal

Clinical Features:

- Persistent redness and tenderness along the vein
- Mild swelling at the former catheter site
- No systemic signs of infection
- Symptoms gradually subside without intervention

Pathophysiology of Phlebitis:

Phlebitis relates to the inflammation of the wall of the vein, mainly the endothelium layer. It is brought on by bacterial infections, chemical irritation from infused solutions, or mechanical trauma from catheters[11]. Histamine, prostaglandins, and cytokines are among the inflammatory mediators released as a result of the initial endothelial damage. This causes vasodilation, increases vascular permeability, and attracts neutrophils and macrophages. This inflammatory reaction results in warmth, erythema, swelling, and localized pain. The coagulation cascade is triggered, and fibrin deposits are formed when platelets attach to the injured endothelium. This may occasionally result in thrombophlebitis. If infectious phlebitis is not treated right away, it could develop into a systemic infection. The length of catheter use, the kind of medication infused, and the patient's immune response are some of the variables that affect the degree of inflammation and the emergence of complications.

INCIDENCE OF PHELBITIS:

In a study conducted by Bitencourt et al[12], the prevalence of phlebitis among children aged 0 to 2 years was 34%. In this regard, there is a great deal of variation in the literature; some studies report phlebitis rates of 1.5%[13], 2.75%[14], and 71.25%[15].

According to a study by Kumar et al[16], all 86 cases had phlebitis on the second day of catheter insertion, 64% of them had Grade 2 phlebitis, and 19% had Grade 3 phlebitis.

A study in Eastern India observed a higher incidence of phlebitis in children younger than 1 year (44.64%) and those older than 5 years (41.08%), compared to children aged 1–5 years (14.28%). In the same study, phlebitis occurred in 62.5% of male and 37.5% of female patients, though this difference was not statistically significant[17].

Another study in Puducherry, India, reported that 55% of phlebitis cases occurred in female patients, while 45% occurred in males[18].

RISK FACTORS OF PHLEBITIS:

There are three main categories of risk factors for phlebitis in children: those related to the patient, those related to the catheter, and those related to the infusion. It is crucial to comprehend these elements in order to prevent and treat paediatric phlebitis.

Patient-Related Factors:

- Age: Infants and young children are more susceptible to phlebitis due to their smaller, fragile veins and delicate skin. Neonates and infants (<2 years) are particularly vulnerable.
- Gender: Some studies suggest a slightly higher incidence of phlebitis in female children, though findings are inconsistent[19].
- Nutritional Status: Malnourished children may have compromised skin and vein integrity, increasing the risk of vein injury.

Catheter-Related Factors:

- Catheter size: Larger gauge catheters are more traumatic to the vein and increase phlebitis risk[20].

- Material of the catheter: Some materials, like Teflon, are more irritating to the vein lining compared to softer materials like polyurethane or silicone.
- Duration of catheter placement: The longer a catheter remains in place (beyond 72–96 hours), the higher the risk of inflammation and infection.
- Site of insertion: Catheters inserted in areas with more movement (like the wrist or antecubital fossa) are more prone to mechanical irritation.
- Multiple insertion attempts: Repeated attempts can damage the vein and surrounding tissue, increasing the risk of inflammation.
- Improper flushing technique: Inadequate flushing or use of excessive force can irritate the vessel wall.
- Catheter contamination: Failure to maintain aseptic technique during insertion or handling increases infection risk and related phlebitis.
- Infusion of irritant drugs: Even if catheter-related, certain drugs (like potassium chloride, some antibiotics) when infused through a peripheral catheter can increase phlebitis risk.

Infusion Related Factors:

- Type of medication or fluid: Some medications are known to irritate the vein lining, including potassium chloride, vancomycin, and some chemotherapy agents[20].
- pH of the Solution: The risk of phlebitis is increased by solutions that are either too acidic or too alkaline, as these can irritate the endothelium.
- Osmolarity: Vascular wall damage can result from hyperosmolar fluids, such as concentrated dextrose or TPN, particularly when administered via peripheral lines.
- Infusion Rate: Rapid infusion rates have the potential to cause mechanical irritation and raise the risk of inflammation.
- Contaminated Infusate: Chemical or infectious phlebitis may be directly caused by an unsterile or microbiologically contaminated solution.

- Repeated or prolonged Infusions: It is possible for cumulative irritation to result from repeated or frequent infusions administered over time through the same vein.
- The temperature of the Infusate: Phlebitis can result from thermal irritation of the vein wall caused by cold or boiling fluids.

Types of Cannulas and Catheters Used in Children:

The right cannulas and catheters are critical in paediatric patients to achieve safe and effective intravenous therapy. PIVCs, peripherally inserted central catheters (PICCs), and central venous catheters (CVCs) each have their own risk profile. Peripheral cannulas are more subject to mechanical irritation, while CVCs and PICCs, although a better choice for longer-term intravenous therapy, generally contain a higher risk for infection[21]. Choosing the right device is important for reducing complications based on the specific child's condition and duration of treatment.

Duration of Cannula Placement in Children:

The duration of cannula placement in pediatric patients is pertinent in causing complications, including but not limited to phlebitis, infiltration, and infection. When used for peripheral intravenous use, it's suggested that cannulas should remain in place for short intervals of time, and the recommended frequency is usually 48 hours to 5 days[22]. The tissue composition of veins in children is more fragile, which means that the more prolonged the placement, the risk of irritation and inflammation goes for the vein. While prolonged duration is most often over 72 hours, the likeliness of penis irritation does increase, as well as inflammation, and chances of infection. In children, variables like the actual insertion site, placement location, pre-existing conditions, and other factors contribute to the risk.

Influence of Underlying Medical Conditions on Phlebitis in Children:

Underlying medical conditions are a key factor in phlebitis risk in children requiring IV therapy. Children with chronic conditions such as renal failure[23] and congenital heart disease typically require IV lines for longer periods of time, and these conditions expose children to a greater risk of vein irritation and inflammation. Immunocompromised patients, which also includes those patients on chemotherapy and those on immunosuppressive therapy, also face a greater risk of infective phlebitis due to their limited defense. Conditions that result in poor peripheral circulation or dehydration could also render veins compromised due to low volume, which increases the potential risk and injury during catheterization. Nutritional deficiencies and infants/children born premature also cause weakened walls to veins, and increase the likelihood of incident mechanical and chemical phlebitis due to vulnerable veins. Targeting the existing conditions to the best of our ability, the type of catheter utilized, and strict monitoring protocols, children with multifactorial conditions can mitigate the risks involved with phlebitis.

INTRAVENOUS DELIVERY DEVICES:

Intravenous (IV) delivery devices allow fluids, medications, nutrients, and blood products to deliver substances directly into the child's bloodstream. For pediatric patients, the IV devices used will depend on the type of therapy, duration of therapy, and the condition of the child’s veins[24].

TYPES OF CANNULAS FOR CHILDREN FOR PHLEBITIS MANAGEMENT:

Choosing the right cannula is an important decision in a pediatric population when it comes to IV therapy, as it relates to regulating and preventing phlebitis (inflammation of a vein). Children are born with small, fragile veins and are at highest risk for many complications such as phlebitis, infiltration, or infection. When choosing a cannula, the provider must consider the child's age, size of vein, medical condition, and the solution and/or medication being administered[25].

1. Peripheral Intravenous Cannula (PIVC):

The PIVC is the most common cannula chosen for short-term IV therapy in children. A PIVC is inserted into a peripheral vein, which will be in the child's hands, arms, or feet. PIVCs come in a wide variety of sizes, with smaller sizes (22G or 24G) more appropriate as children's veins are small and to cause any longer vein trauma or risk of phlebitis.

24G yellow cannulas are generally used for infants and neonates because they can be easier to place due to size and are less invasive. Older children seem to be safe with 22G blue cannula options. PIVCs are considered a safe option when it comes to administering oral fluids, medications, and/or antibiotics. However, it is recommended to monitor frequently so that if phlebitis is observed, which includes redness, swelling, and/or tenderness at the insertion site, action can be taken immediately. Recently, it has been estimated that there are approximately 150 million PIV catheters placed each year in the US alone [3]. An incidence benchmark of 5% was considered acceptable for phlebitis. Clinical evidence would support the Centers for Disease Control and Prevention's (CDC) 2002 recommendation that all PIV sites and administration sets be changed at least every 96 hours, which would mean that at least 25% of PIV catheters would exist at least after 96 hours without showing any symptoms of phlebitis [5].

2. Midline Cannula

A Midline Cannula is considered a longer peripheral cannula, which is inserted into a larger peripheral vein and goes further up the arm than a standard peripheral cannula. Midline cannulas are mainly used in children who need intermediate-term IV therapy lasting up to four weeks. Midlines are not as irritating to veins as PIVCs, and they are a good alternative when there is a higher risk of developing phlebitis in a standard PIVC.

Midlines are also a good intervention when you need to do several blood draws or infuse medications that potentially carry a moderate risk of irritation to the vein. They allow stable access with a low risk of infiltration, but always monitor carefully for phlebitis.

3. Central Venous Cannula (CVC)

When there is a need for long-term intravenous therapy and the potential for irritating medications such as chemotherapeutic agents or parenteral nutrition, are being used, a CVC will be preferred. With CVCs, the cannula is inserted into a large vein, such as a subclavian or jugular vein, providing more stable and reliable access.

Although CVCs reduce the risk of developing phlebitis by bypassing smaller peripheral veins, they require attentive maintenance to avoid complications and infections. In critically ill children, PICCs are a common choice as they are safer for long-term use with a reduced likelihood of phlebitis.

4. Butterfly Cannula (Winged Infusion Set)

A butterfly cannula is a little needle with flexible plastic wings that can be used for short-term, usually blood draws, single-dose medications, or IV infusions that last less than 24 hours. Due to the ease of insertion and minimal discomfort, butterfly cannulas are utilized in neonates and infants.

However, they are not recommended for continuous infusions due to the increasing risk of phlebitis and infiltration over time, and caregivers must monitor for any sign of inflammation or leakage at the site.

5. Scalp Vein Cannula

When there is limited venous access for neonates and infants, a scalp vein cannula may be used. Scalp vein cannulas are inserted into the veins of the scalp, where the veins can be more pronounced and easier to access in young children. The incidence of phlebitis may be lower because the scalp vein cannula is anchored better than fortune of the usual distance and movement at the site of attachment.

Scalp vein cannulas provide a practical solution for neonates, but are typically avoided in older children due to pain, discomfort, and aesthetics. Caring for the site properly and viewing it regularly can help avoid complications.

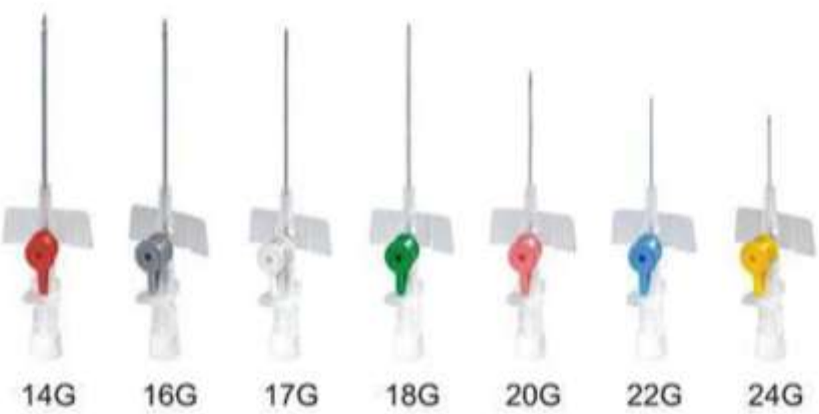
Cannula Colour Codes and Their Uses:

Cannulas come in different sizes, with standardized colour codes to aid health care providers in a quick and efficient identification of the appropriate size for a clinical situation. The standardized colour code system is represented in Table 1 and Figure 1, with the colour code associated with the gauge (G) of a cannula having a larger diameter for a lower gauge number. The cannula size determines the flow rate of the fluid and could also affect the type of therapy to utilize. Smaller size cannulas are normally used in the paediatric population to minimize vein trauma and to reduce complications such as phlebitis.

Table 1: Cannula colour Codes and Specifications

colour	Gauge(G)	Outer Diameter (mm)	Flowrate (ml/ min)	Common Uses
Orange	14 G	2.1mm	240 ml/min	Emergency fluid resuscitation, in trauma, and shock management. Suitable for adults and older children.
Grey	16 G	1.8mm	180 ml/min	Major surgeries, massive transfusions, or fluid resuscitation. Limited use in paediatrics.
Green	18 G	1.3mm	90-110 ml/min	Blood Product transfusions, large-volume fluid replacement. Suitable for older children.
Pink	20 G	1.1mm	60-80 ml / min	General IV fluids, medications, and blood transfusions. Commonly used in older children and adults.
Blue	22 G	0.9 mm	36 ml/min	IV medication administration, fluids, and blood products in young children and adults with fragile veins.
Yellow	24 G	0.7 mm	20 ml/min	Neonatal, infant, and paediatric use. Ideal for small veins and patients prone to phlebitis.
Purple	26 G	0.6 mm	13 ml/min	Suitable for neonates, premature infants, or when veins are difficult to access. Used for low-volume infusions.

Figure 1: colour coding for IV Cannula



Choosing the Right Cannula for Paediatric Patients:

- Neonates and Infants (0–1 Year): 24G (Yellow) or 26G (Purple) cannulas are preferred due to their small diameter and reduced risk of vein injury. They are ideal for administering medications, fluids, or antibiotics[22].
- Toddlers and Young Children (1–6 Years): 22G (Blue) cannulas are commonly used for hydration, medication delivery, and minor blood transfusions. They provide a balance between flow rate and vein protection [22].
- Older Children (6–12 Years): 20G (Pink) or 22G (Blue) cannulas may be appropriate for children requiring moderate fluid replacement or blood transfusions[22].
- Emergencies or Severe Fluid Loss: In paediatric emergencies requiring rapid fluid resuscitation, an 18-G (Green) cannula may be used under careful supervision.

PROGRESSION OF PHLEBITIS IN CHILDREN:

Phlebitis in children typically follows a progressive course if not promptly managed. The condition begins with mild irritation and can escalate to severe inflammation, potentially leading to complications. The progression can be categorized into several stages:

Stage 1: Initial Irritation and Inflammation

- In the early phase, children may experience mild redness, tenderness, and warmth around the intravenous catheter site.
- The vein wall becomes irritated due to mechanical trauma, chemical irritation from medications, or infection.

Stage 2: Moderate Inflammation

- As the inflammation progresses, the redness may extend along the vein, often presenting as a palpable, hardened cord.
- Swelling increases, and the child may complain of localized pain or discomfort.
- There may be mild leakage from the insertion site, indicating worsening venous irritation.

Stage 3:

- At this stage, the inflammation increases, resulting in significant redness, swelling, and warmth around the vein.
- The vein may be visibly hardened above, and pain will be more severe.
- Fever and potentially other systemic symptoms may also arise if this becomes infective phlebitis.

Stage 4 :

- Potentially led to thrombophlebitis if phlebitis is present in untreated swollen areas, so a clot is indicated to form in the inflamed vein.
- If severe enough and if the infection has spread into the blood, it may be in a state of sepsis or embolism if the source of the infection is ignored.

EARLY SIGNS AND SYMPTOMS[17,26]:

- Redness around the IV site
- Warmth to touch over the vein
- Swelling or localized puffiness
- Pain or tenderness at the insertion site
- Hardness or a palpable cord-like vein
- Skin discoloration or bruising near the IV site
- Irritability or inconsolable crying in infants
- Cool skin around the IV site (indicating possible infiltration)
- Slowed or blocked infusion despite proper settings
- Low-grade fever or mild systemic symptoms in severe cases.

DIAGNOSTIC CRITERIA OF PHLEBITIS IN CHILDREN:

The diagnosis of phlebitis in children is primarily clinical, based on the observation of signs and symptoms at the IV catheter site.

Visual and Physical Examination:

The dominant diagnostic method for identifying phlebitis in children is through visual and physical examination. The examination includes a thorough examination of the IV catheter site along with an evaluation of localized and systemic symptoms. Children are

more likely to experience phlebitis because of their delicate skin and smaller veins; therefore, frequent assessments are paramount.

1. Visual Inspection:

Redness (Erythema):

- Maybe the very first sign of phlebitis tracing children.
- May be visible as a defined area of redness surrounding the IV site.
- Redness may extend along the vein suggesting the progression of inflammation.

Swelling (Edema):

- The presence of localized swelling surrounding the area on the catheter site.
- May be related to the infractions of the protrusion causing fluid to leak because of irritation of the vein or along with the skin.

Skin Discoloration:

    - May represent bruising or darkening of the skin nearby the IV site.
    - More extreme forms of phlebitis may include taut, shiny skin.

Drainage or Pus:

- Phlebitis that leads to infection may include pus or some form of visible drainage.
- This is often associated with skin breakdown and greater involved redness.

2. Physical Examination:

- Temperature:
    - The skin around the IV site may feel warm to the touch, suggesting inflammation.
    - Warmth extending along the vein indicates more severe inflammation.
- Pain and Tenderness:
    - Gentle palpation may elicit pain or discomfort at the IV site.

    - Pain may be mild in early stages and worsen with progression.
    - Younger children may express discomfort through irritability, crying, or refusing to use the affected limb.
- Vein Hardening (Cord-like Vein):
    - In advanced stages, the inflamed vein may become palpable as a firm, cord-like structure.
    - This indicates severe phlebitis, often associated with thrombosis.
- Mobility and Function:
    - Reduced movement of the affected limb due to pain.
    - Guarding behaviors or withdrawal of the limb when touched.

Pain and Tenderness Assessment:

Pain and tenderness are chief signs of phlebitis in children that may provide the earliest warning signs of venous inflammation. Pain assessment in pediatric patients is often based on objective observation in combination with subjective reporting as younger children will often not report their pain well.

1. Assessing Pain in Different Age Groups

Infants and Toddlers (0–3 years)

- May exhibit nonverbal indicators such as excessive crying, irritability, and refusal to use the limb that may be affected.
- Facial expressions such as grimacing or frowning may also indicate they are in discomfort.
- They may also have difficulty sleeping or feeding.

Preschoolers and Young Children (3–7 years)

- May be able to localize pain and point to where the pain is occurring and demonstrate it with their body.
- May express or describe pain with words "hurt" or "ouch."

- May exhibit behavioral changes such as withdrawal, clinging, reluctance to use the limb, etc.

2. Evaluating Tenderness

- Palpation Method:
    - Gently palpate the area around the IV site to assess for tenderness.
    - Increased sensitivity upon touch or pressure is indicative of localized inflammation.
    - Severe tenderness may suggest progression to more advanced stages of phlebitis.
- Extension of Tenderness:
    - In some cases, tenderness may extend along the vein's path.
    - The presence of a palpable cord-like structure upon examination indicates significant vein irritation or thrombophlebitis.

3. Pain Scoring Tools for Children

- FLACC Scale (Face, Legs, Activity, Cry, Consolability) – For infants and non-verbal children.
- Wong-Baker FACES Pain Rating Scale – Suitable for younger children aged 3-7 years.
- Numeric Rating Scale (0-10) – Commonly used for older children and adolescents.

<u>FLACC SCALE:</u>

The FLACC scale is a behavioral pain assessment tool for children aged 2 months to 7 years and for patients who cannot communicate. It was developed in 1997 and remains in use today[27]. It consists of five categories: Face, Legs, Activity, Cry, and Consolability. Each category is scored from 0-2, with a total score between 0-10. Here's how the scoring works:

Scoring:

- Each of the five categories is scored 0, 1, or 2.
- The total FLACC score is the sum of all five categories, resulting in a total between 0 (no pain) and 10 (severe pain)

Interpretation:

- 0: Relaxed and comfortable
- 1–3: Mild discomfort
- 4–6: Moderate pain
- 7–10: Severe discomfort or pain

WONG BAKER FACES PAIN SCALE:

The Wong-Baker FACES Pain Rating Scale (created in 1998) is a self-assessment tool that allows people, especially children as young as age 3, to communicate the intensity of their pain using six faces representing different levels of pain intensity. The faces are a smiling face to indicate "no hurt" (0) to a crying face for "hurts worst" (10), as well as faces in between representing increasing levels of pain[28].

SCORING:

The scale includes six faces, each associated with a numerical value increasing in intervals of two: 0, 2, 4, 6, 8, and 10. Each face is accompanied by a brief descriptive phrase:

- 0: No hurt
- 2: Hurts a little bit
- 4: Hurts a little more
- 6: Hurts even more
- 8: Hurts a whole lot
- 10: Hurts worst

The faces visually depict the pain levels, making it easier for children and others who may have difficulty with numeric scales to express their pain.

Laboratory and Imaging Investigations:

When phlebitis is suspected in children, laboratory and imaging investigations may be required to confirm the diagnosis, evaluate the severity, and rule out complications such as infection or thrombosis. While most cases of phlebitis are diagnosed clinically, additional tests can provide valuable insights in more severe or uncertain cases.

Laboratory Investigations:

Complete Blood Count (CBC)

- Assesses the white blood cell (WBC) count, which may be increased in instances of infectious phlebitis. Provides information about possible systemic infection or inflammation.

C-Reactive Protein (CRP) and Erythrocyte Sedimentation Rate (ESR)

- Both serve as indicators of inflammation.
- Increased levels indicate the presence of ongoing inflammation or infection..

Blood Culture

- Recommended if signs of systemic infection, such as fever, chills, or malaise, are present.
- Helps identify the causative organism in cases of suspected septic thrombophlebitis.

Prothrombin Time (PT), Activated Partial Thromboplastin Time (aPTT), and D-Dimer

- Useful in cases of suspected thrombophlebitis or deep vein thrombosis (DVT).
- Elevated D-dimer levels may indicate the presence of a thrombus.

Imaging Investigations

Ultrasonography(USG) with Doppler :

- First-line imaging modality for evaluating suspected thrombophlebitis.
- Detects vein inflammation, venous thrombosis, or impaired blood flow.
- Non-invasive and child-friendly, with no radiation exposure.

Magnetic Resonance Imaging (MRI):

- Used in complex or recurrent cases where thrombophlebitis is suspected to extend to deeper veins.
- Provides detailed visualization of soft tissues and blood vessels.

Contrast-Enhanced Computed Tomography (CECT):

- Performed in severe cases with suspected complications like septic emboli or deep vein involvement.
- Useful for diagnosing systemic infection spread.

Venography:

- An invasive imaging technique using contrast dye to visualize veins.
- Reserved for cases where non-invasive imaging is inconclusive.

PHLEBITIS SCORING SYSTEM:

Phlebitis scoring systems refer to standardized assessment tools used to assess and document the presence and severity of phlebitis. Utilizing a scoring system to assess phlebitis provides a standardized process to assess the condition of an IV site, while using it to provide early identification and timely intervention as well as regular monitoring. In pediatrics, it is important to assess phlebitis since children often are at a higher risk for complications due to their delicate veins; therefore, scoring IV phlebitis

accurately is important. Examples of standardized scoring systems used to measure phlebitis assessments and diagnosis:

1) Visual Infusion Phlebitis (VIP) Scoring System

2) Infusion Nurses Society (INS) Phlebitis Scoring System

3) Maddox Scale.

Purpose of Phlebitis Scoring:

- Early identification of phlebitis to prevent complications
- Standardized documentation for monitoring and comparison
- Decision-making for treatment interventions
- Evaluation of the effectiveness of interventions

VISUAL INFUSION PHLEBITIS (VIP) SCORING SYSTEM

The VIP Score is a standardized metric for determining the severity of phlebitis in children. Phlebitis is the inflammation of a vein that can develop from IV catheters. The VIP score allows staff to detect and monitor IV-related incidence, effect pace of treatment can be changed if severity increases, and prevents further complications by not delaying treatment. The VIP score measuring points are 0 through 5, and a higher number correlates to a more severe score.

The use of the VIP score is especially important with children as they have fragile veins and are prone to complications. In addition, paediatric age patients have difficulty quantifying discomfort or pain, therefore, visual assessment from the outside is a predominant way to assess. The score assesses the redness, pain, swelling, and cord, whether it is palpable or has purulent drainage from the IV insertion site. Using the VIP score gives healthcare providers a structured way to identify early signs of phlebitis and decide an appropriate response to minimize damage. Figure 2 depicts the VIP Scoring System, which was conceived by Jackson in 1998[29].

A score of 0 means no evidence of phlebitis – indicates a healthy IV site with no redness, tenderness, or swelling and you would provide ongoing care and observation. A score of 1 indicates the very early stage of phlebitis, but there is minimal redness, and tenderness is mild in nature. If you are at this stage, you could apply a warm compress and elevate the limb to maintain a minimal condition and prevent progression. If tenderness, swelling, or redness progresses in extent, you would note this so a similar experience can be avoided on future infusions.

A score of 2 indicates moderate phlebitis. Pain, redness, and swelling will now be manifest. The IV catheter should be removed immediately, and the application of a warm compress should be applied to reduce inflammation. You may have to consider anti-inflammatories also, in some situations. A score of 3 indicates that phlebitis has progressed to severe. It also signifies that a venous cord and palpable thrombus are present. This condition will require further examination to rule out thrombophlebitis, and systemic treatment may also be warranted.

In these higher levels, a score of 4 or 5 indicates pronounced inflammation, with agonizing pain, and may indicate an infectious process as well, in purulent drainage from the IV site. These cases will require systemic antibiotics, advanced medical treatments aimed at preventing sepsis, or any other serious medical disorder. These cases often require hospitalization with constant medical observation and care.

As implemented in clinical practice, VIP Score acts not only as a diagnostic tool but a potentially beneficial mechanism for health care providers making treatment decisions. Take note that when nurses regularly use a scoring system routinely with patients, it encourages shared language, shared measurement, standardization of care, and reduced variability. Taking the VIP Score to document assessment in routine assessment helps support quality improvement initiatives and improved patient safety.

In summary, the VIP score is an important step in the care for children receiving IV therapy as it assesses the safety and well-being of the child while following the premise of the systematic, evidence-based approach that health professionals should adhere to. Using systematic, evidence-based approach, health professionals can deliver

timely, appropriate interventions to patients at high risk for developing phlebitis, and decreasing the incidence and severity of phlebitis in pediatric patients.

Figure 2: The VIP Scoring System

Visual Infusion Phlebitis Score		
IV site appears healthy	0	No signs of phlebitis OBSERVE CANNULA
One of the following is evident: • Slight pain at IV site • Redness near IV site	1	Possible first sign of phlebitis OBSERVE CANNULA
Two of the following are evident: • Pain • Erythema • Swelling	2	Early stage of phlebitis RESITE THE CANNULA
All of the following signs are evident: • Pain along the path of the cannula • Erythema • Induration	3	Medium stage of phlebitis RESITE THE CANNULA CONSIDER TREATMENT
All of the following signs evident and extensive: • Pain along the path of the cannula • Erythema • Induration • Palpable venous cord	4	Advanced stage of phlebitis or start of thrombophlebitis RESITE THE CANNULA CONSIDER TREATMENT
All of the following signs are evident and extensive: • Pain along the path of the cannula • Erythema • Induration • Palpable venous cord • Pyrexia	5	Advanced stage of thrombophlebitis INITIATE TREATMENT RESITE THE CANNULA

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INFUSION NURSES SOCIETY (INS) PHLEBITIS SCORING SYSTEM:

The INS Phlebitis Scale is a standardized assessment tool that health care workers can use to objectively rate and characterize the severity of phlebitis associated with intravenous therapy. The utilization of this tool by health care professionals provides a clear, objective measure for assessing phlebitis severity, which will lead to timely intervention while minimizing complications. The INS Phlebitis Scale can be utilized for adults and pediatric patients alike, even young children. Pediatric patients may experience IV-related complications more frequently than adult patients due to their smaller veins and sensitive skin[30].

Purpose of the INS Phlebitis Scale

- To provide a consistent method for evaluating the severity of phlebitis.

- To guide appropriate medical interventions based on severity.
- To monitor trends and ensure the quality of IV therapy.
- To support accurate documentation and communication among healthcare providers.

INS Phlebitis Scale Grading:

The INS Phlebitis Scale uses a 0 to 4 grading system, with each grade representing a progressively severe stage of phlebitis:

- Grade 0 (No Phlebitis)
  - No symptoms of phlebitis.
  - IV site appears healthy without redness, pain, or swelling.
- Grade 1 (Mild Phlebitis)
  - Slight redness at the IV insertion site.
  - Possible pain or tenderness on palpation.
  - No palpable venous cord.
  - Management: Apply a warm compress and monitor closely.
- Grade 2 (Moderate Phlebitis)
  - Pain, redness, and swelling at the IV site.
  - Palpable venous cord may be present.
  - Management: Remove the IV catheter and consider anti-inflammatory treatment.
- Grade 3 (Severe Phlebitis)
  - Extensive redness and swelling.
  - Pain is moderate to severe.
  - A palpable venous cord is evident.
  - Management: Remove the catheter, apply a warm compress, and consider medical treatment.
- Grade 4 (Thrombophlebitis)
  - Severe pain and redness extending beyond the IV site.
  - Swelling may involve the entire limb.

- Purulent drainage or signs of infection.
- Management: Immediate medical evaluation, antibiotic therapy, and potential vascular imaging.

Application in Pediatric Patients:

The INS Phlebitis Scale is especially helpful in children, as they may not verbalize pain accurately. Visual inspection/observation and palpation are very important to determine phlebitis. Pediatric nurses are specifically taught to recognize early signs and symptoms through the scale so interventions can take place quickly to avoid additional complications. A frequent assessment interval every 4-8 hours is recommended to monitor for phlebitis, especially for children receiving extended IV therapy. The INS Phlebitis Scale is illustrated in Figure 3 and was developed in 2006 by the Infusion Nurses Society (INS).

Figure 3: INS Phlebitis Scale

Phlebitis Grade	Phlebitis Symptoms
Grade 0	• No symptoms
Grade 1	• Erythema at access site with or without pain
Grade 2	• Pain at access site with erythema and/or edema
Grade 3	• Pain at access site with erythema and/or edema, streak formation, palpable venous cord
Grade 4	• Pain at access site with erythema and/or edema, streak formation, palpable venous cord greater than one inch in length and purulent drainage

*Source: Infusion Nurses Society, 2006.

MADDOX SCALE:

The Maddox Scale is a clinical rating tool that evaluates the severity of phlebitis caused by intravenous catheterization. It is one of the original grading systems, and while it may not be in common use in modern healthcare environments, it is mentioned in literature and still used for monitoring IV-related complications in some organizations. The assessment is based on observational and physical exam findings, such as redness, pain, swelling, and the presence of a palpable vein. The scale provides a simple and systematic way to classify the severity of phlebitis and to inform clinical decisions[31].

Grading:

Grade 0 :

- No clinical signs of Phlebitis.
- The IV site appears to be healthy with no redness, pain, or swelling.
- Continue routine care and monitoring

Grade 1 (Early Phlebitis):

- Slight pain and redness at the IV insertion site.
- No palpable venous cord.

Grade 2 (Mild Phlebitis):

- Pain, redness, and swelling are present.
- No palpable venous cord.

Grade 3 (Moderate Phlebitis):

- Increased pain, redness, and swelling.
- A palpable venous cord may be present, indicating irritation or inflammation along the vein.

Grade 4 (Severe Phlebitis/Thrombophlebitis):

- Severe pain, significant redness, and extensive swelling.
- A palpable venous cord is present, and purulent drainage or signs of infection may be observed.

Clinical Application:

- The Maddox Scale is useful in identifying the progression of phlebitis and providing clear guidelines for treatment.
- In pediatric patients, careful assessment is essential as children may not verbalize discomfort effectively. Visual cues like redness or swelling and behavioral changes like increased fussiness may indicate phlebitis.
- Routine assessment using the Maddox Scale, particularly in patients requiring long-term IV therapy, helps prevent complications such as thrombophlebitis and catheter-related bloodstream infections (CRBSIs).

BENEFITS OF ROUTINE PHYSICIAN INVOLVEMENT:

- Enhances early detection of phlebitis, reducing the threat of serious complications like CRBSIs or tissue damage.
- Enables timely catheter replacement or removal, decreasing catheter dwell time and associated risks.
- Improves coherence in patient care through normalized protocols and evidence-based practices.
- Supports cost-effective healthcare delivery by reducing needless hospital stays and minimizing the demand for intensive interventions.
- Ultimately results in higher patient safety, better comfort for pediatric patients, and improved clinical outcomes.

ROLE OF THE PHYSICIAN EARLY DETECTION OF PHLEBITIS:

The physician's role is crucial to the early diagnosis and management of phlebitis, especially in children receiving intravenous (IV) therapy. In recognizing phlebitis, the

ability of the physician to use their clinical reasoning, decision-making, and working relationship with nursing staff is important to early treatment of complications of phlebitis involving thrombophlebitis, infection, and catheter-related bloodstream infections (CRBSI).

Clinical Assessment and Initial Diagnosis:

- The physician's assistant completes scheduled clinical examinations of IV sites and recognizes that phlebitis is present at an early stage, exhibiting signs of phlebitis like redness, swelling, tenderness, warmth, and cord-like induration.
- Standardized clinical tools, such as the VIP Score and the INS Phlebitis Scale, provide objective measures to assess the severity of phlebitis.
- For children, behavioural signals, like irritability and increased crying or avoidance of the limb, may indicate preceding symptoms of pain and inflammation..
- The regularity of a physician's evaluations leads to identification of phlebitis, allowing for timely interventions and reduced risk of further progression of phlebitis into more complicated forms.

Collaboration and Team-Based Care

- Physicians work hand-in-hand with nursing staff, since they usually watch for changes at IV sites first, and this prompt communication allows regular assessment and evaluation of IV sites for timely action.
- Training and support for nurses on scoring systems and protocols fosters the best detection accuracy and consistency in their responses to patients.
- Interprofessional collaboration enhances clinical reasoning collectively, particularly when determining cessation of use of the IV, removing the IV, or simply changing IV sites.

Diagnostic and Therapeutic Decisions

- Physicians assess whether there is a need for continued IV therapy or whether they should start to facilitate from IV to other routes (oral or subcutaneous) based on clinical assessments.
- In extreme situations, further diagnostics may be needed, such as ordering an ultrasound, blood cultures, and inflammatory markers (CRP, WBC) to rule out deeper infections or complexities.
- Early and appropriate action, like removing the catheter or starting them on antibiotic therapy, is helping reduce the progression of symptoms and ensure patients can have improved outcomes.

COMPLICATIONS OF UNDETECTED PHLEBITIS IN CHILDREN:

When phlebitis goes undetected or untreated in children, it can lead to serious complications ranging from localized vascular inflammation to systemic infection. Phlebitis in children can progress rapidly, given the delicate vasculature and more fragile skin[32]

. Recognizing these potential complications is important for proper management and for preventing long-term consequences for the child..

1. Thrombophlebitis:

- Thrombophlebitis occurs when the inflammation of the vein triggers the occurrence of blood clot (thrombus) at the site of catheterization.
- The thrombus can completely or partially occlude the vein, which results in pain, swelling, and compromised blood flow.
- In severe cases, the clot can propagate further, increasing the risk of more severe vascular issues.
- Pediatric patients with compromised immunity or underlying medical conditions are particularly susceptible to thrombophlebitis.

2. Catheter-Related Bloodstream Infection (CRBSI)

- Prolonged undetected phlebitis increases the risk of CRBSI, where bacteria or fungi invade the bloodstream through the compromised IV site.
- This can lead to bacteremia or septicemia, resulting in life-threatening systemic infections.
- Symptoms may include fever, chills, tachycardia, and hypotension, requiring aggressive antimicrobial therapy.
- CRBSI remains a major concern in paediatric intensive care units (PICUs) due to the increased use of central and peripheral lines.

3. Tissue Necrosis and Ulceration:

- Persistent inflammation can cause the breakdown of surrounding tissues, leading to necrosis and skin ulceration.
- The compromised blood supply and poor tissue perfusion at the affected site can delay healing and increase the risk of secondary infections.
- Severe tissue damage may necessitate surgical intervention, including debridement or skin grafting in rare cases.

4. Deep Vein Thrombosis (DVT):

- In cases where thrombophlebitis extends to deeper veins, it can result in DVT.
- Although rare in pediatric patients, DVT can occur in children with immobility, malignancies, or those receiving chemotherapy.
- The ailment is marked by the presence of swelling, warmth, and pain in the affected area.
- Deep vein thrombosis (DVT) carries the risk of pulmonary embolism if the blood clot breaks loose and moves to the lungs, necessitating prompt medical attention.

5. Septic Thrombophlebitis:

- When phlebitis becomes infected and a thrombus forms, it can lead to septic thrombophlebitis.

- This condition is characterized by systemic symptoms such as fever, rigors, and leukocytosis.
- Septic emboli may disseminate to distant organs, causing complications like lung abscesses or endocarditis.
- Management involves a combination of anticoagulation therapy and targeted antibiotic treatment.

6. Persistent Pain and Reduced Limb Function:

- Chronic inflammation leads to prolonged pain and discomfort in children, limiting limb movement and impacting their daily activities.
- In some cases, residual damage to veins may result in post-phlebitic syndrome, characterized by swelling, discoloration, and venous insufficiency.
- Physiotherapy and pain management may be required for long-term rehabilitation.

7. Psychological Impact:

- Repeated cannulation, infection management, and prolonged hospital stays can be distressing for children and their caregivers.
- Pediatric patients may develop needle phobia or anxiety related to IV therapy, requiring psychological support and reassurance.

8. Extravasation:

Extravasation refers to the accidental leakage of IV fluids, medications, or vesicant drugs into the surrounding tissues during infusion, which can occur as a complication of phlebitis. It is an issue of concern, especially in children, because they have finer veins and blood vessels and are at greater risk. Extravasation is always possible, especially when the effect of phlebitis relaxes the wall structure of a vein, as it can allow for leakage, especially when a catheter is not correctly placed, or with multiple impacts on a vein wall. The effects of phlebitis can also have an inflammatory response that adversely affects vascular integrity, causing infiltration into tissue. Extravasation

may present itself with local swelling, erythema, as well as pain, and may be indistinguishable from worsening phlebitis. On rarer occasions, extreme cases of extravasation can lead to tissue necrosis, ulceration and chronic scarring with possible long-term implications.

TREATMENT:

Treatment of phlebitis in children involves ample and individualized management to alleviate signs and symptoms, minimize risk factors, and promote quick recovery. Management of treatment pathways will vary based on the severity of the signs and symptoms being witnessed, the underlying risk factors present, and whether or not there is a concurrent infection or thrombosis

Discontinuation of the Intravenous Catheter:

The first and foremost step of treating phlebitis is the removal of the IV catheter. Maintaining catheter placement in an already inflamed or infected vein can worsen symptoms, and complications can arise, for example, thrombophlebitis or seeding an infection into the bloodstream. Once the catheter is removed, the affected site should be assessed for severity using one of many grading scales (Visual Infusion Phlebitis Score, Infusion Nurses Society Phlebitis Scale). Once the site has been assessed, the physician or advanced practice clinician must determine whether or not to reinstate the catheter, depending on the child's clinical needs, ideally at a different site or vein [33]

Symptomatic Management

Using warm compresses to the affected area is a simple method of decreasing inflammation and increasing blood flow. Warmth causes blood vessels to dilate, providing increased blood flow and faster clearance of inflammatory mediators. Warmth provides pain relief and decreases swelling. Warm compresses are administered for usually 15 to 20 minutes by application of appropriate pressure three to four times daily under supervised conditions of use to prevent burns or skin damage in children[34].

Pain Management

Phlebitis typically comes with pain and tenderness, and adequate pain management is an important component of patient comfort. Non-tylenol or ibuprofen (nonsteroidal anti-inflammatory) agents for pain should be used liberally for discomfort/professional pain as well as phlebitis inflammation. If there is significant discomfort, stronger pain relief medications may be provided. Topical anti-inflammatory agents such as diclofenac gel can be applied locally (feel free to provide samples). Care must be taken to use medications as appropriate with children, as we do not want to cause to any additional adverse events.

Topical and Systemic Medications

- Anti-inflammatory Agents:
  - Topical application of nonsteroidal anti-inflammatory drugs (NSAIDs) like diclofenac gel can alleviate local inflammation.
  - For severe inflammation, oral NSAIDs may be recommended.
- Antibiotics:
  - If there are signs of infection, empirical antibiotic therapy may be initiated based on culture results.
  - Antibiotics such as cefazolin or vancomycin are commonly used for suspected catheter-related bloodstream infections.
- Anticoagulants:
  - In cases of thrombophlebitis, especially with deep vein involvement, low-molecular-weight heparin (LMWH) or warfarin may be prescribed to prevent further clot formation.

Management of Complications:

In cases where phlebitis progresses to thrombophlebitis or infection, more aggressive management may be necessary. Systemic anticoagulation may be considered if there is evidence of thrombus formation. Additionally, blood cultures and imaging

studies may be performed to rule out CRBSIs. Close monitoring in a PICU may be required for children with severe or complicated cases.

Prevention of Recurrence:

To prevent phlebitis from redeveloping, best practices for IV catheter care must be performed. After all, along with selecting the catheter size and using the appropriate aseptic technique during insertion, the catheter should have securement applied easily and in such a manner as to minimize the movement of the catheter in the vein. IV sites should be rotated as needed, clean and dry dressing maintained, and transparent dressings will allow for dressing monitoring to some degree without having to remove the dressing. Teaching healthcare providers, caregivers, and parents how to recognize early signs of phlebitis is also an important preventive measure in allowing for earlier identification and intervention, resulting in better outcomes.

LITERATURE

Robert et al.in a study titled "Impact of Physician Inspection in Detection of Phlebitis and Factors Contributing to it in Admitted Children of a Tertiary Care Hospital" reported an overall incidence of thrombophlebitis of 10.3%. Remarkably, 45% of the cases were detected through physician inspection. The study identified several statistically significant risk factors, including maternal education less than 12 years, central line insertion site, use of larger and non-spherical cannulas, administration of potassium-containing IV fluids, and high-concentration infusions like aminophylline and magnesium sulphate [1].

In their study titled “Evaluation of a Visual Infusion Phlebitis Scale for determining appropriate discontinuation of peripheral intravenous catheters,” Schultz assessed the effectiveness of the VIP scale in determining the appropriate timing for PIV catheter removal. Monitoring 850 PIV catheters, they found that approximately 25% remained clinically unproblematic even after the CDC-recommended 96-hour period. Their results demonstrated that the VIP scale allowed for more precise, individualized decisions regarding catheter removal, reducing unnecessary replacements while

maintaining patient safety. This supports a shift from routine, time-based protocols to evidence-based clinical assessment [5].

Tzolos and Salawu, in their study "Improving the Frequency of Visual Infusion Phlebitis (VIP) Scoring on an Oncology Ward," demonstrated the effectiveness of targeted interventions in enhancing compliance with phlebitis monitoring. Initially, the proper documentation and assessment of cannulas using the VIP scale were below 30%. However, through three Plan-Do-Study-Act (PDSA) cycles—featuring interventions such as educational sessions for junior doctors and placing VIP charts at patient bedsides—compliance improved to approximately 80% after the second cycle and reached 100% by the third. The results highlight that simple, well-structured measures can significantly improve adherence to phlebitis surveillance practices [6].

In a retrospective cohort study on "Phlebitis associated with peripheral intravenous catheters in children," Jacinto et al. reported a phlebitis incidence of 2.7%. While demographic characteristics showed no significant association with phlebitis development, several therapy-related factors were found to be statistically significant. These included intermittent maintenance ($p = 0.001$), extended catheter dwell time ($p = 0.006$), and catheter use exceeding five days ($p = 0.001$). Additional high-risk factors identified were the administration of medications or solutions with extreme pH or osmolarity ($p = 0.004$, OR = 7.700), previous complications ($p < 0.001$, OR = 40.666), and conditions predisposing to puncture failure ($p = 0.041$, OR = 4.645). The study concluded that therapy-related factors play a critical role in the onset of phlebitis in pediatric patients.

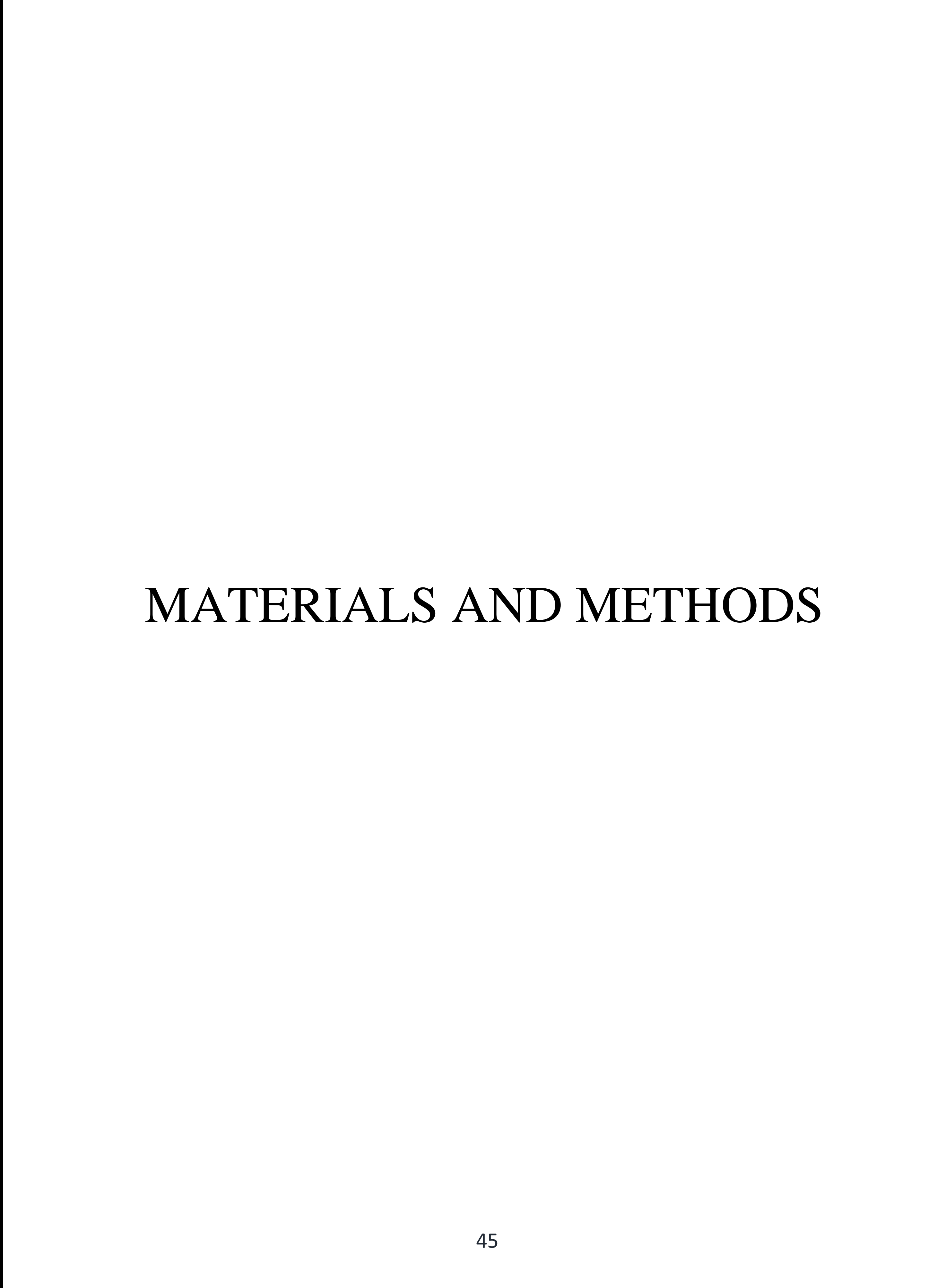
As part of a quality improvement initiative in the pediatric critical care unit of a tertiary care hospital, Diwakar et al., in their study "Reduction in the Incidence of Infusion-Related Phlebitis in a Pediatric Critical Care Unit," focused on lowering phlebitis rates among hospitalized children in Eastern India. Over six months, five evidence-based interventions were introduced sequentially: strict hand hygiene, application of transparent dressings, use of extension lines with peripheral venous catheters (PVCs), joint immobilization using hard cardboard splints, and administration

of heparinized flushes after medications. Among 284 patients with 718 PVCs, 56 phlebitis cases were observed. The baseline phlebitis rate of 48% showed a steady decline with each intervention, dropping to below 5% and maintaining this low rate over the subsequent 18 weeks. The findings emphasize that a structured and straightforward intervention strategy can significantly reduce the incidence of phlebitis in pediatric critical care settings [17].

In the study "A Study to Assess the Risk Factors of Developing Thrombophlebitis Among Children Admitted in Pediatric Ward," Sumathy and Finny investigated the incidence and associated risk factors of thrombophlebitis in children with IV cannulas. Using purposive sampling, 40 pediatric patients were assessed using the VIP scale alongside clinical and demographic data. The results showed that 9 out of 40 children developed Grade 1 phlebitis. Among the variables analyzed, only the type of medication administered was significantly associated with phlebitis ($P<0.01$), with antibiotics posing a higher risk compared to multivitamins. No significant correlations were found with other factors such as cannula size, insertion site, infusion duration, or use of restraints. The study concluded that vigilant monitoring and appropriate nursing interventions can improve pediatric care and reduce phlebitis-related complications [18.]

In the study "The Incidence of Peripheral Intravenous Catheter Phlebitis and Risk Factors Among Pediatric Patients," Suliman et al. investigated the prevalence and contributing factors of PIVC-related phlebitis among children in five hospitals across Jordan. A total of 307 pediatric patients under 12 years of age were monitored using the Visual Infusion Phlebitis (VIP) scale at 12-hour intervals over six months. The study revealed a high phlebitis incidence rate of 53.4%, along with other complications such as leakage (12.1%) and extravasation (34.9%). Key risk factors included infection at the catheter dressing site, lower limb insertion, procedures performed by less experienced nurses, and hospital admissions to general wards. The findings underscore the importance of skilled catheter insertion and vigilant site monitoring to minimize complications, discomfort, and healthcare costs in pediatric settings[21].

In the study "Predicting Factors for Complications in Peripheral Intravenous Catheters in the Pediatric Population," Resnick et al.examined the impact of catheter gauge, patient age, and insertion site on the occurrence of PIVC-related complications in children. Conducted at Hadassah Medical Center in Israel, the study evaluated 132 PIVCs in 113 pediatric patients, revealing a complication rate of 40.9%, with dislodgement being the most common issue. Higher complication rates were significantly associated with insertions in the external jugular vein (100%) and lower limbs (60%) ($p = 0.002$), as well as the presence of comorbidities ($p = 0.003$). Children aged 1–6 years experienced more complications with PIVCs smaller than 24G ($p = 0.004$), while infants under 12 months had higher complication rates with 22G or larger catheters. The study concluded that selecting the appropriate catheter gauge and insertion site based on patient age and clinical condition is essential for minimizing complications [32].



MATERIALS AND METHODS

MATERIALS AND METHODS

STUDY PLACE: R.L JALAPPA HOSPITAL & RESEARCH CENTRE (RLJH&RC).

STUDY AGE: All paediatric patients aged between 1 month and 12 years of age admitted at RLJH&RC (PICU and Paediatric wards) who needed IV cannulation during the period of study and who consented to be a part of the study.

STUDY DESIGN: A Prospective Observational Study.

STUDY PERIOD: 1 year and 6 months (May 2023- October 2024)

METHOD OF COLLECTION OF DATA:

This research commenced after securing approval from the institutional ethics committee and obtaining consent from the parents.

INCLUSION CRITERIA:

- All pediatric patients aged between 1 month and 12 years of age admitted to the PICU and paediatric wards at RLJH&RC who were on IV therapy.

EXCLUSION CRITERIA:

1. Children with a central venous catheter.
2. Children with scalp vein cannulation.
3. Children with dermatological disorders.
4. Children diagnosed with a primary vasculitis.
5. Children receiving chemotherapeutic agents.
6. Children on mechanical ventilator support.

ETHICAL CONSIDERATIONS:

The study was approved by the institutional ethics committee.

Written consent was obtained from all parents or guardians of the study participants. Only those participants whose parents or guardians agreed to sign the informed consent were included in the study. The parents or guardians of the participants were informed about the risks and benefits associated with the study, as well as the fact that participation is voluntary, prior to securing consent. The privacy of the study participants was safeguarded.

SAMPLE SIZE:

The sample size was calculated based on a reported phlebitis incidence of 19% in patients who underwent IV cannulation, as noted in the study by Sengupta M[35]. The following formula was used for the calculation:

Sample Size = $(Z_{1}\text{-}\alpha/2)^2 \times P \times (1 - P) / d^2$

Where:

- $Z_{1}\text{-}\alpha/2$ is the standard normal deviate. For a 5% type I error ($P < 0.05$), the value is 1.96, which is commonly used in similar studies.
- P represents the expected proportion in the population, taken as 0.19 (19%) based on previous findings.
- q is 1 – P, or 0.81 (81%).
- d is the absolute precision, set at 0.05 (5%).

Using these values and assuming a 95% confidence level, the required sample size was calculated to be 237 participants.

METHODOLOGY:

This study was conducted at RLJH&RC, affiliated to Sri Devaraj Urs Medical College, a constituent of Sri Devaraj Urs Academy of Higher Education and Research. VIP score was applied to the included patients, and they were graded from 0 to 5 as follows[29] :

Table 2: The Visual Infusion Phlebitis score

APPEARANCE	RATING	PHASE
IV site looks to be in a good condition Action: Monitor the cannula	0	No indications of phlebitis
An obvious indication was present from the options provided ● Mild discomfort at the IV location or ● Mild redness surrounding the IV insertion site Action: To Monitor IV cannula	1	Possibly first Indication of phlebitis
Any two of the following were noticeable. ● Discomfort at the IV site ● Inflammation ● Enlargement Action: To recite the cannula	2	Early stage of phlebitis
All of the subsequent signs were apparent. ● Discomfort along the path of the cannula ● Inflammation surrounding the area ● Enlargement Action: recited the cannula and consider treatment	3	Medium stage of phlebitis

All of the following signs were evident and extensive ● Discomfort along the route of the cannula ● Discoloration of the surrounding area ● Swelling ● Palpable venous cord Action: To recite the cannula and consider treatment	4	Advanced stage of phlebitis or start of thrombophlebitis
All of the following signs were evident and extensive • Discomfort in the area where the cannula is placed. • Inflammation and swelling around the area. • Noticeable vein-like structure • Fever Action: initiated treatment/ recited cannula	5	Advanced stage thrombophlebitis

- Information such as the patient's age, gender, size of the cannula, insertion location, duration of indwelling, specifics of intravenous fluids, medications given, and any blood products used were recorded.
- All patients fulfilling the inclusion criteria were visited daily, and the cannula insertion site was examined for signs of phlebitis using VIP scoring by staff nurses thrice a day, at 8 am, at 2 pm, and at 8 pm. If the site looked healthy, then a saline flush with 2ml normal saline was given.

- Pain at the IV site and along the path of the cannula was assessed using the FLACC Scale [27] in infants 3 years and below and the Wong Baker Faces pain scale was used for children 3 years and above [28].
- On the same day, the patient was examined by the physician using VIP scoring twice a day, at 9 am and at 4 pm. Altogether, a total of 5 observations were done in a day.
- VIP score more than or equal to 2 was considered phlebitis and warranted a change of cannula.
- The monitoring was carried out on a daily basis until the patient was discharged or the cannula was removed because of thrombophlebitis.
- Thrombophlebitis cases noted by doctors and nurses were analyzed to determine if there was a statistically significant difference in the rates of detection. Based on the grades, suitable measures were implemented.

STATISTICAL ANALYSIS:

Information was recorded in a Microsoft Excel spreadsheet. Categorical data were displayed as frequencies and proportions. The Chi-square test was utilized to determine statistical significance. Continuous data were expressed as the average and standard deviation. All statistical analyses were conducted using SPSS Statistics 19 for Windows (version 22, IBM Corp., Armonk, NY, USA). Samples were analyzed and assessed using a Paired T-test. A P-value of <0.05 was considered statistically significant. The confidence interval was set at 95%.

GRAPHICAL REPRESENTATION OF DATA: MS Excel and MS Word were used to obtain various types of graphs, such as bar diagrams and pie diagrams.

CONSORT DIAGRAM:

Enrollment

Assessed for eligibility

Allocation

- All patients who were admitted underwent daily check-up to monitor the presence of phlebitis by using the VIP Scoring system by Doctors and Nurse
- FLACC and Wong Baker Scales were used to identify phlebitis

Follow up

- All 237 children were monitored until discharge or cannula removal.
- Each patient was assessed 5 times per day: 3 times by nurses (8AM, 2 PM, 8 PM) and 2 times by Doctors (9 AM, 4 PM)

Analysis

Data was analyzed using SPSS v22.

- Chi-square test was done for categorical variables.

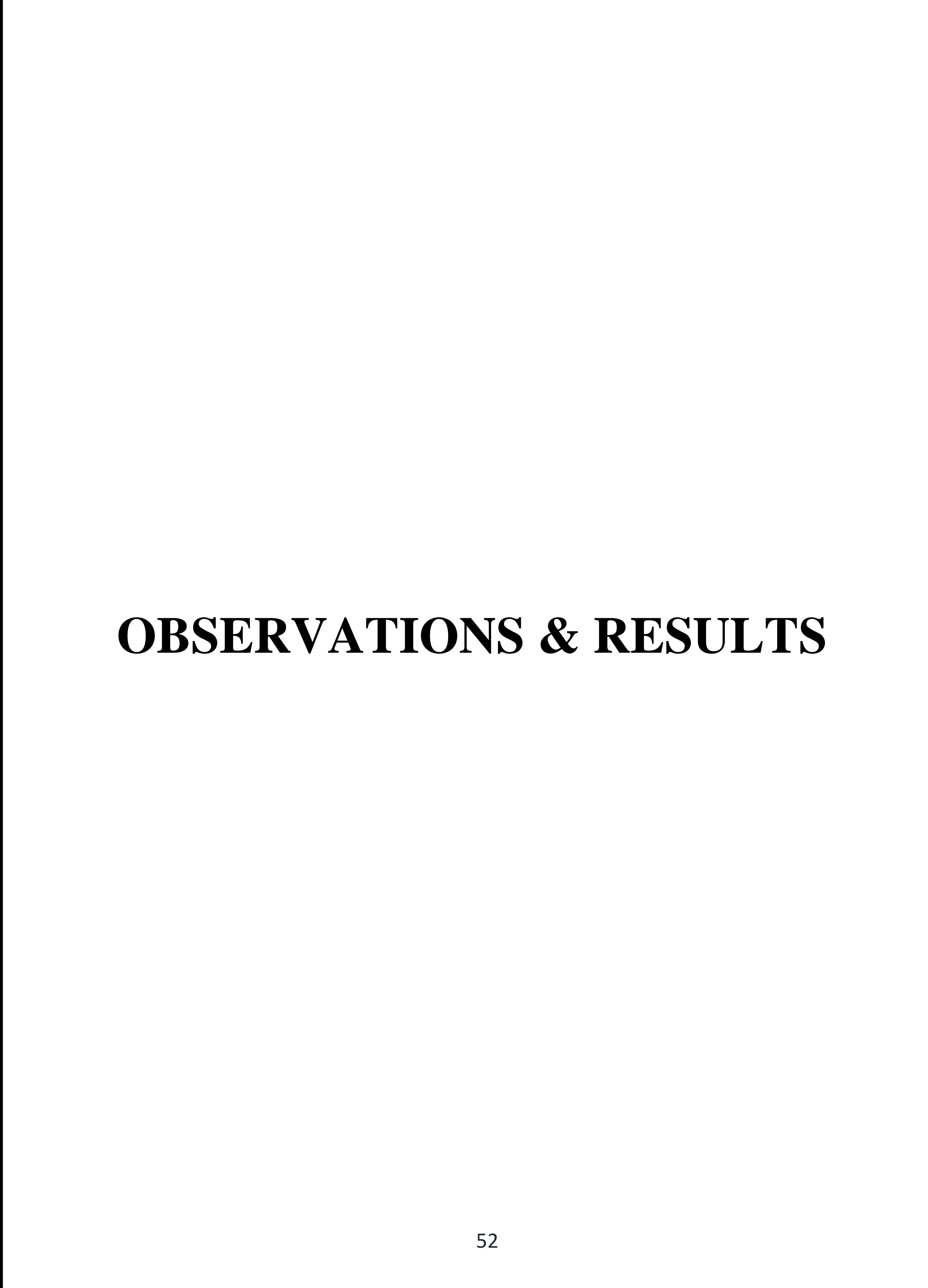
- Paired t-test was done for comparison.

- Significance threshold of $p < 0.05$ was set

- 33 cases (13.92%) out of 237 patients were detected for phlebitis.

  • 14 cases by nurses (5.9%)

  • 19 cases by physicians (8.02%)



OBSERVATIONS & RESULTS

OBSERVATIONS & RESULTS

A total of 237 patients were included in the study.

Table 3: Distribution of subjects based on age (n=237)

Age Group	No. of Patients	Percentage
1 month to 3 years	71	29.95%
>3 to 6 years	74	31.22%
>6 to 9 years	63	26.58%
>9 to 12 years	29	12.23%

Figure 4: Distribution of age among the study population

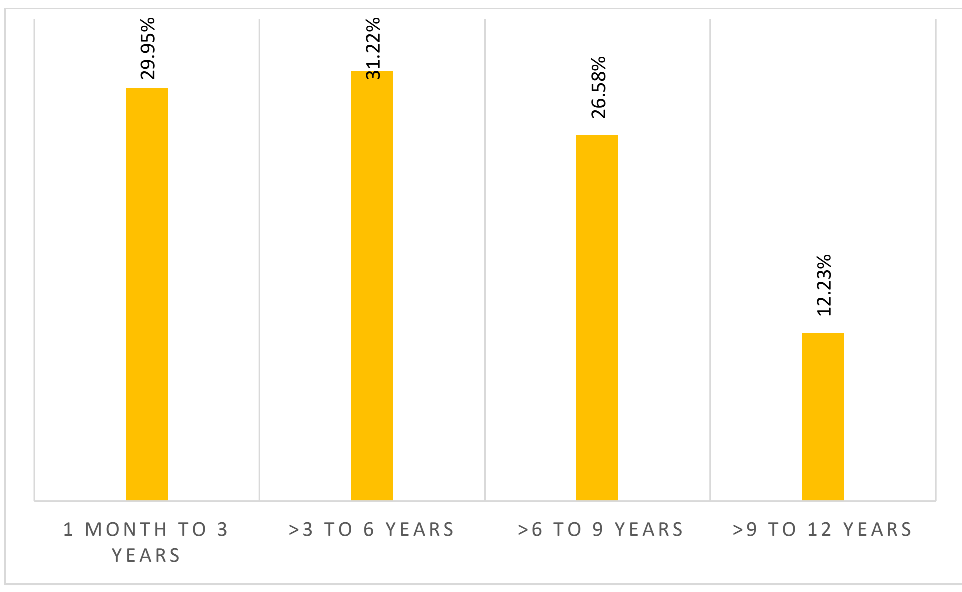


Table 3 and Figure 4 depict that the distribution of age is almost equal in the groups aged below 3 years, 3 to 6 years, and 6 to 9 years. The fourth division of the age

group (9 to 12 years) was found to be the lowest. The highest percentage of admitted children belonged to the age group of 3 to 6 years was 31.22%.

Table 4: Distribution of subjects based on gender (n=237)

Gender	No of Patients	Percentage
Male	108	45.56%
Female	129	54.44%

Figure 5: Gender distribution among the study population

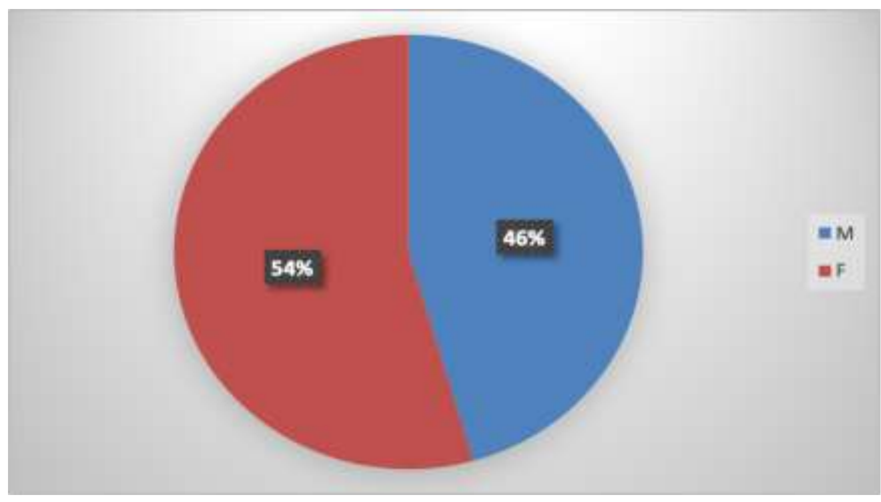


Table 4 and Figure 5 depict that the gender distribution shows a slight predominance of female children. Out of the 237 children admitted, 54.44% were female and 45.56% were male.

Table 5: Distribution of subjects based on site of cannula (n=237)

Initial Site of Cannula	No of Patients	Percentage
Cephalic Vein	57	24.05%
Basilic Vein	45	18.98%
Median Cubital Vein	31	13.08%
Great Saphenous Vein	32	13.50%
Dorsal Venous Network Hand	53	22.36%
Dorsal Venous Network Foot	19	8.01%

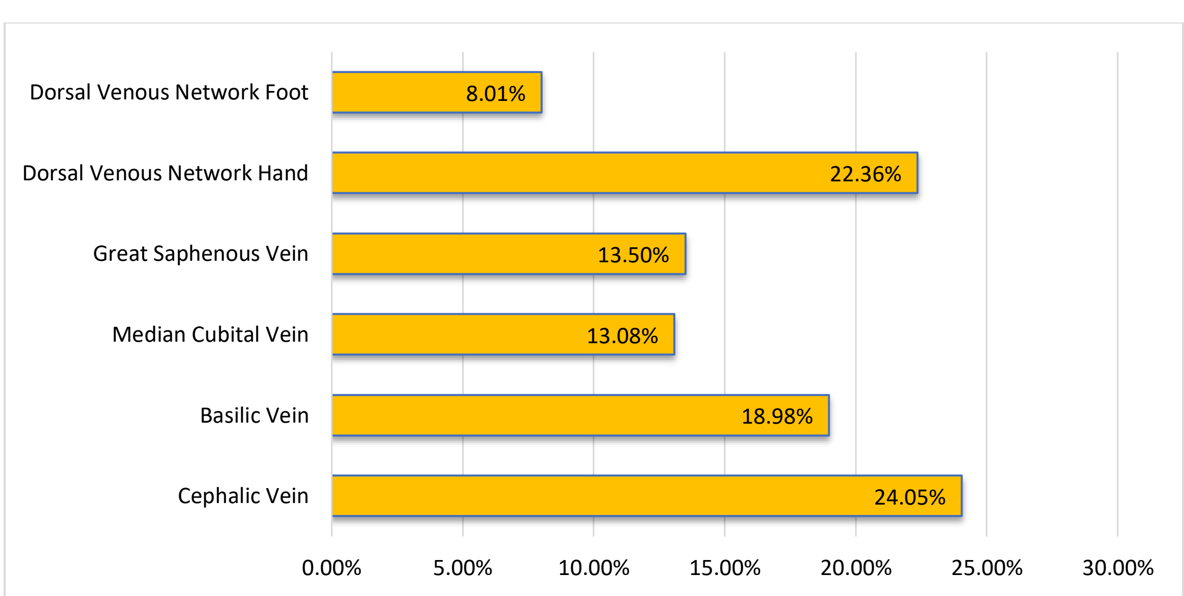


Figure 6: Distribution based on site of cannula

Table 5 and Figure 6 depict that the initial site of cannula varied among the study population, with the cephalic vein being the most commonly used insertion site (24.05%). This was followed by the dorsal venous network of the hand (22.36%). The great saphenous vein and the median cubital vein were used in 13.50% and 13.30% of children, respectively, and the basilic vein was used in 18.98% of children. The dorsal vein of the foot was the least used site, which accounted for 8.01%.

Table 6: Distribution of subjects based on indwelling time of cannula (n=237)

Duration of Cannula	No of Patients	Percentage
≤3 days	113	47.67%
>3 days	124	52.32%

Figure 7: Distribution based on the indwelling time of the cannula

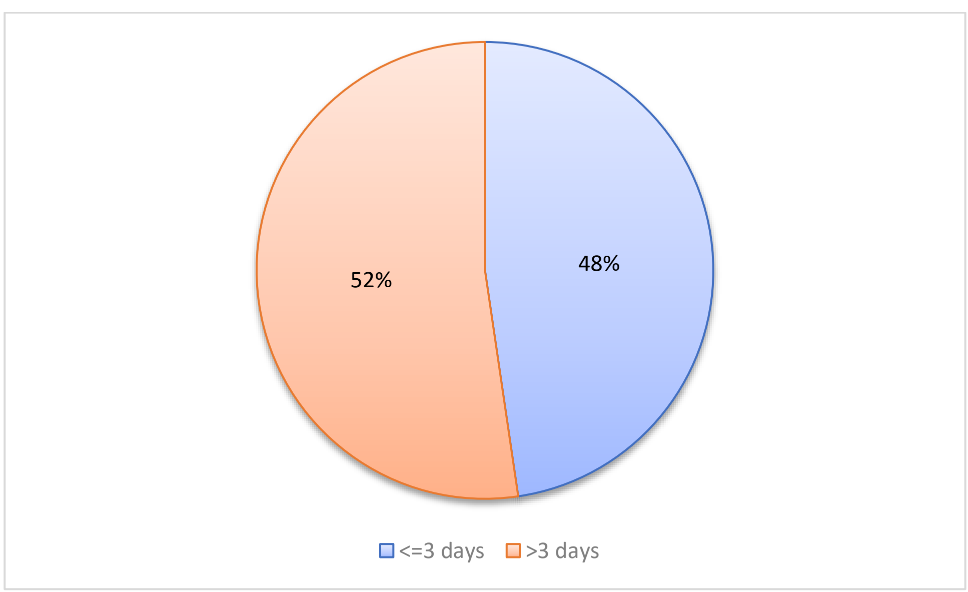


Table 6 & Figure 7 depict that 124 children (52.32%) had cannulas in place for more than 3 days, whereas 113 children (47.67%) had cannulas inserted for 3 days or less.

Table 7: Distribution of subjects based on size of cannula (n=237)

Size of Cannula	No of Patients	Percentage
22 G	99	41.77%
24G	138	58.22%

Figure 8: Distribution based on the size of the cannula

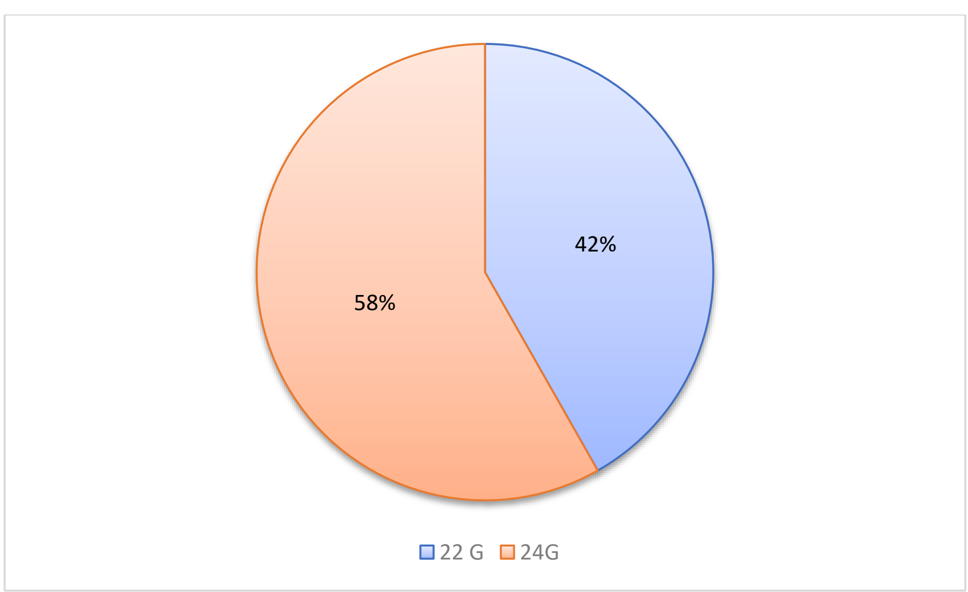


Table 7 & Figure 8 depict that a 24-G cannula was used in most children (58.22%), while a smaller proportion (41.77%) had a 22-G cannula.

Table 8: Distribution of subjects based on intravenous (IV) fluids and medication administered

IV Fluids and Medication Administered	No. of Patients	Percentage
Maintenance IV Fluids (with potassium)	65	27.42%
Antibiotics	61	25.72%
Blood Products	26	10.97%
3% NS	15	6.32%
Mannitol	11	4.64%
Saline Bolus Infusion	23	9.70%
Antiepileptics	17	7.17%
Calcium Infusion	19	8.01%

Figure 9: Distribution based on the IV fluids given and medications administered

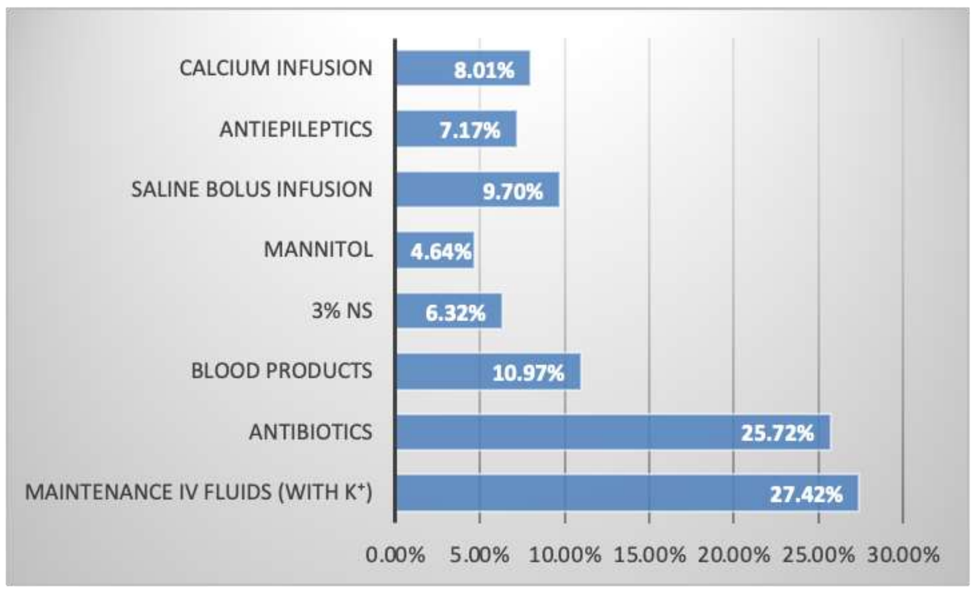


Table 8 and Figure 9 depict that the most used fluid was maintenance IV fluids with potassium (27.4%). This was followed by antibiotics (25.72%) and blood products (10.9%). Saline bolus infusion was used in 9.70% of the cases followed by 3% normal saline (6.32%) and mannitol (4.64%). Antiepileptics were used in 7.17% of cases and calcium infusion was administered in 8.01% of the patients.

Table 9: Distribution of occurrence of phlebitis (VIP Score ≥ 2) detected by nurses & physician (n=237)

No of cannulas assessed	No of Phlebitis cases detected by Nurses	No of phlebitis cases detected by the Physician	Total phlebitis detected	p-value
237	14 (5.90%)	19 (8.02%)	33 (13.92%)	<0.05

Table 9 depicts that out of 273 cannulations, 33 (13.92%) had phlebitis. Nurses identified 14 cases (5.90%), and physicians identified a further 5 cases above what the nurses had identified, totaling up to 19 instances (8.02%). Statistical Significance was observed in phlebitis detection rates between nurses (5.9%) and doctors (8.02%) ($p < 0.05$).

Table 10: Comparison of age groups in Phlebitis and Non-Phlebitis Groups

Age Group	With Phlebitis (N = 33)	Without Phlebitis (N = 204)	P-value
1 month to 3 years	12 (36.66%)	59 (28.92%)	<0.05
>3 to 6 years	9 (27.27%)	65 (31.86%)	
>6 to 9 years	7 (21.21%)	56 (27.45%)	
>9 to 12 years	5 (15.15%)	24 (11.76%)	

Table 10 depicts that the incidence of phlebitis was found to be significantly higher in younger age groups, particularly among infants between the age of 1 month to 3 years (36.66%) and children between the ages of 3 to 6 years (27.27%). In contrast, children between the ages of 6 to 9 years (21.21%) and 9 to 12 years (15.15%) showed a lower occurrence of phlebitis. This shows that infants between the ages of 1 month to 3 years had a much higher incidence of phlebitis as compared to all other children, evidenced by a p-value of <0.05.

Table 11: Comparison of gender in Phlebitis and Non-Phlebitis Groups

Gender	With Phlebitis (N = 33)	Without Phlebitis (N = 204)	P-value
Male	13 (39.39%)	95 (46.56%)	0.68
Female	20 (60.60%)	109 (53.43%)	

Table 11 depicts that there was no significant association between gender and phlebitis incidence, with a p-value > 0.05. Out of the 33 phlebitis cases, males accounted for 39.33% and females accounted for 60.66% of all cases of phlebitis

Table 12: Comparison of cannula sites in Phlebitis and Non-Phlebitis Groups

Site of Cannula	With Phlebitis (N = 33)	Without Phlebitis (N = 204)	P-value
Cephalic Vein	4 (12.12%)	53 (25.98%)	<0.05
Basilic Vein	7 (21.21%)	38 (18.62%)	
Median Cubital Vein	5 (15.15%)	26 (12.74%)	
Great Saphenous Vein	6 (18.18%)	26 (12.74%)	
Dorsal Venous Network (Hand)	9 (27.27%)	44 (21.56%)	
Dorsal Venous Network (Foot)	2 (6.06%)	17 (8.35%)	

Table 12 depicts that incidence of phlebitis was higher in the Dorsal Venous Network of the hand (27.27%). The Dorsal Venous network of foot had a much lower phlebitis rate (6.06%). Great saphenous vein showed a moderate association with phlebitis (18.18%) followed by the Basilic Vein (21.21%), the Median cubital vein (15.15%) and Cephalic vein (12.12%). The association between the cannula site and phlebitis showed a highly significant p value of <0.05

Table 13: Comparison of cannula size in Phlebitis and Non-Phlebitis Groups

Cannula Size	With Phlebitis (N = 33)	Without Phlebitis (N = 204)	P-value
22 G	11 (33.33%)	88 (43.13%)	<0.05
24 G	22 (66.66%)	116 (56.86%)	

Table 14: Comparison of indwelling time of cannula in Phlebitis and Non-Phlebitis Groups

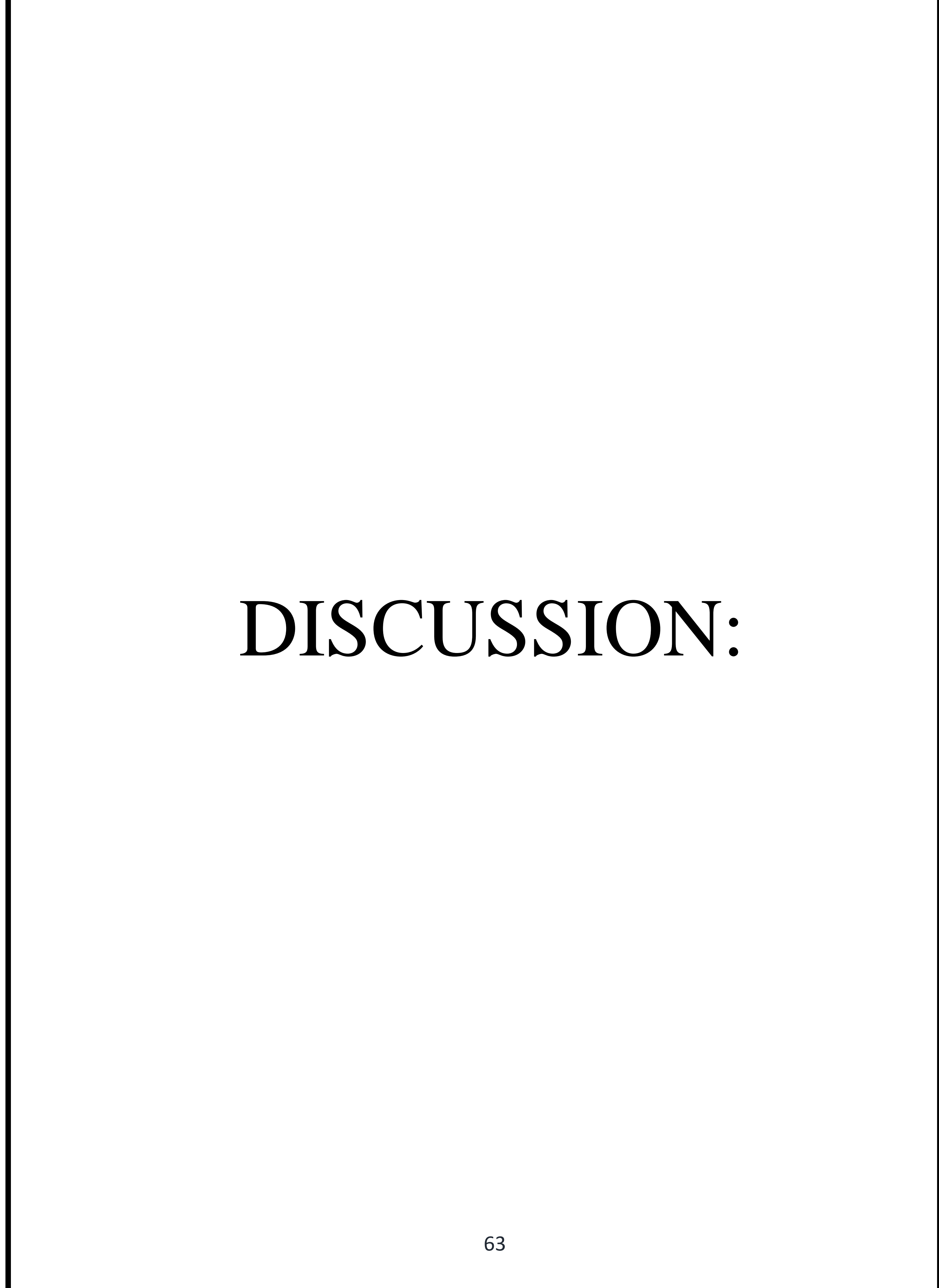
Duration of Cannula	With Phlebitis (N = 33)	Without Phlebitis (N = 204)	P-value
≤3 days	12 (36.36%)	92 (45.09%)	<0.05
>3 days	21 (63.63%)	112 (54.90%)	

Table 14 depicts that among the total number of phlebitis cases, phlebitis was seen more frequently in children with cannula duration >3 days (63.63%) compared to those with a duration of ≤ 3 days (36.36%). The association between duration of cannula and phlebitis was found to be highly significant, with a p-value of < 0.05

Table 15: Comparison of IV fluids and medications administered in Phlebitis and Non-Phlebitis Groups

IV Fluids/Medication	With Phlebitis (N = 33)	Without Phlebitis (N = 204)	P-value
Maintenance IVF (with potassium)	15 (45.45%)	50 (24.50%)	0.02
Antibiotics	10 (30.30%)	51 (25.00%)	0.01
Blood Products	6 (18.18%)	20 (9.80%)	0.03
3% NS	1 (3.03%)	14 (6.86%)	1.00 (NS)
Mannitol	0 (0%)	11 (5.39%)	0.5 (NS)
Saline Bolus Infusion	1(3.03%)	22 (10.78%)	1.0 (NS)
Antiepileptics	0 (0%)	17 (8.33%)	1.0 (NS)
Calcium Infusion	0 (0%)	19 (9.31%)	1.0 (NS)

Table 15 depicts the comparison of phlebitis with the type of IV fluids and medications administered. Among patients who developed phlebitis, 45.45% received maintenance IV fluids with potassium, 30.30% received antibiotics, and 18.18% received blood products. In contrast, only 3.03% each were administered 3% NS and saline bolus infusion. Maintenance IV fluids with potassium, antibiotics, and blood products were shown to be statistically significant among patients with phlebitis, with a p-value less than 0.05.



DISCUSSION:

DISCUSSION:

This prospective observational study conducted in a tertiary care Hospital focused on improving the early detection of phlebitis in pediatric patients through routine physician assessments. This study evaluated the impact of clinical assessments to identify phlebitis in children with an IV cannula. This resulted in the detection of more phlebitis cases by doctors than Nurses, improving early intervention opportunities. Risk-associated factors such as cannula size, type of IV fluids given, duration of cannula, medicine administered, and the cannula site were also identified. Routine physician inspections led to better VIP scoring accuracy.

Occurrence of phlebitis (VIP Score ≥ 2) detected by nurses and physicians

The present study showed that out of 237 cannulas assessed, an overall phlebitis rate of 13.92% was detected. Nurses identified 14 cases of phlebitis (5.90%), while doctors detected 19 cases (8.02%). Nurses reported a mean score of 0.36 ± 0.28, whereas doctors reported a higher mean score of 0.51 ± 0.47. The difference between the two groups is statistically significant, indicating that doctors tend to rate the severity of phlebitis higher than nurses.

Robert et al. [1] revealed that nearly 45% of total phlebitis cases were detected through additional physician observation beyond routine nursing assessment, which aligns well with our study.

In a study by Gallant et al. [5] demonstrated about trend of phlebitis using Visual Infusion Phlebitis (VIP) scores ≥ 2. At 24 hours, 1.0% of the 789 catheters had significant phlebitis scores, slightly increasing to 1.8% and 1.9% at 48 and 72 hours, respectively. The incidence of phlebitis then fluctuated, with 1.1% at 96 hours and a peak of 2.8% at 120 hours. By 144 and 170 hours, the rates dropped to 0.9% and 0%, respectively.

Phlebitis of subjects based on Age and Gender:

Phlebitis was commonly seen in children aged 1 month and 3 years (36.66%) and in children between 3 and 6 years (27.27%), with a highly significant value of $p<0.05$. Children age above 6 years had fewer cases of phlebitis with statistically significantly lower rates.

Andriyani R et al [36], found that the median age of the participants in the case group (with phlebitis) was 1 year and 6 months, and in the control group, it was slightly higher (1 year and 9 months). The age range in both groups was comparable, with the case group ranging from 2 months to 16 years and the control group from 1 month to 16 years.

In regard to gender distribution, a slightly higher proportion of female subjects were observed in the present study (54.44% vs. 45.56%). There was no statistically significant difference in the occurrence of phlebitis between males and females ($p>0.05$). Similar observations were made by Sumathy et al [18], where the majority of the patients belonged to the female category (55%), and 45% belonged to the male category out of 40 pediatric patients.

Phlebitis of subjects based on the Site of the Cannula:

In the present study, Phlebitis was significantly higher in children with cannulas inserted into the dorsal venous network of the hand (27.27%), basilic vein (21.21%), and great saphenous vein (8.18%) with a highly significant value of $p < 0.05$. The median cubital vein accounted for 15.15% of the phlebitis cases. The dorsal venous network of the foot had a lower incidence, with only 2 out of 33 patients developing phlebitis (6.06%).

Similar to our findings, Nikhila et al [37]Their study revealed a preference of cannulation site in the upper extremity (Metacarpal vein, Cubital fossa, and wrist). However, our study observed higher use of the dorsal hand vein and the basilic vein.

Resnick et al [32] In his study, he revealed that the dorsal hand was the most common site (46.2%), especially in younger children (used in 75% of infants aged 0–3 months), which aligns well with our study.

Distribution of subjects based on size of cannula:

Our study revealed that 24G cannulas were more commonly used (58.22%) compared to 22G cannulas (41.77%). Among patients who developed phlebitis, 66.66% had 24G cannulas, while 33.33% had 22G cannulas with a significant value of $p<0.05$. In the non-phlebitis group, 56.86% had 24G and 43.13% had 22G cannulas.

Nikhila et al[37], showed the large bore cannulas was less frequently used (18G-11% and 16G - 0.7%), and the most commonly used IV Cannula gauge was 20G(64.4%) and 22G (24%), which is similar to our study.

In a study conducted by Kumar P et al [16] found a significant variation in the use of the size of the cannula, with the 24-gauge cannula being the predominant option. A total of 72 patients (83.7%) used a 24G cannula, and the 22G cannula was used in 14 patients (16.3%), which aligns well with our study.

In contrast, Mandal et al [38] in their study observed that phlebitis was seen more commonly with large-bore catheters. The incidence was found to be 37.97% with 18G catheters and 23.94% with 20 G catheters.

Phlebitis of subjects based on the duration of the cannula:

The present study revealed that out of 237 patients, 52.32% of cannulas were in place for more than 3 days, while 47.67% were used for less than 3 days. Among patients who developed phlebitis, 63.63% had cannulas inserted for more than 3 days, compared to 36.36% of the pateints who had cannulas for less than 3 days. In the non-phlebitis group, the distribution was more balanced, with 54.90% having cannulas for more than 3 days and 45.09% for less than 3 days. The association between longer cannula duration and phlebitis was found to be statistically significant ($p < 0.05$).

In a study conducted by Rita Andriyani [36]The duration of the cannula was categorized as <72 hours or ≥72 hours. The mean duration of the cannula was found to be 66 hours (2 days and 18 hours). In their study

In a study by Sumathy [18], revealed that 37.5% of the participants received infusions for less than 2 hours daily, whereas a smaller proportion of participants received infusions for longer durations (2.5% for both 5–6 hours and >6 hours). The majority of the participants (60%) received infusions for 2 to 4 hours a day.

The study by Kaphan et al [10], revealed that 95.4% of the cases had a catheter dwell time of less than 4 days. Only 3.2% of the cases had a catheter in place for more than 4 days, while 1.4% had an unknown catheter dwell time.

Phlebitis of subjects based on the IV Fluids and Medications Administered:

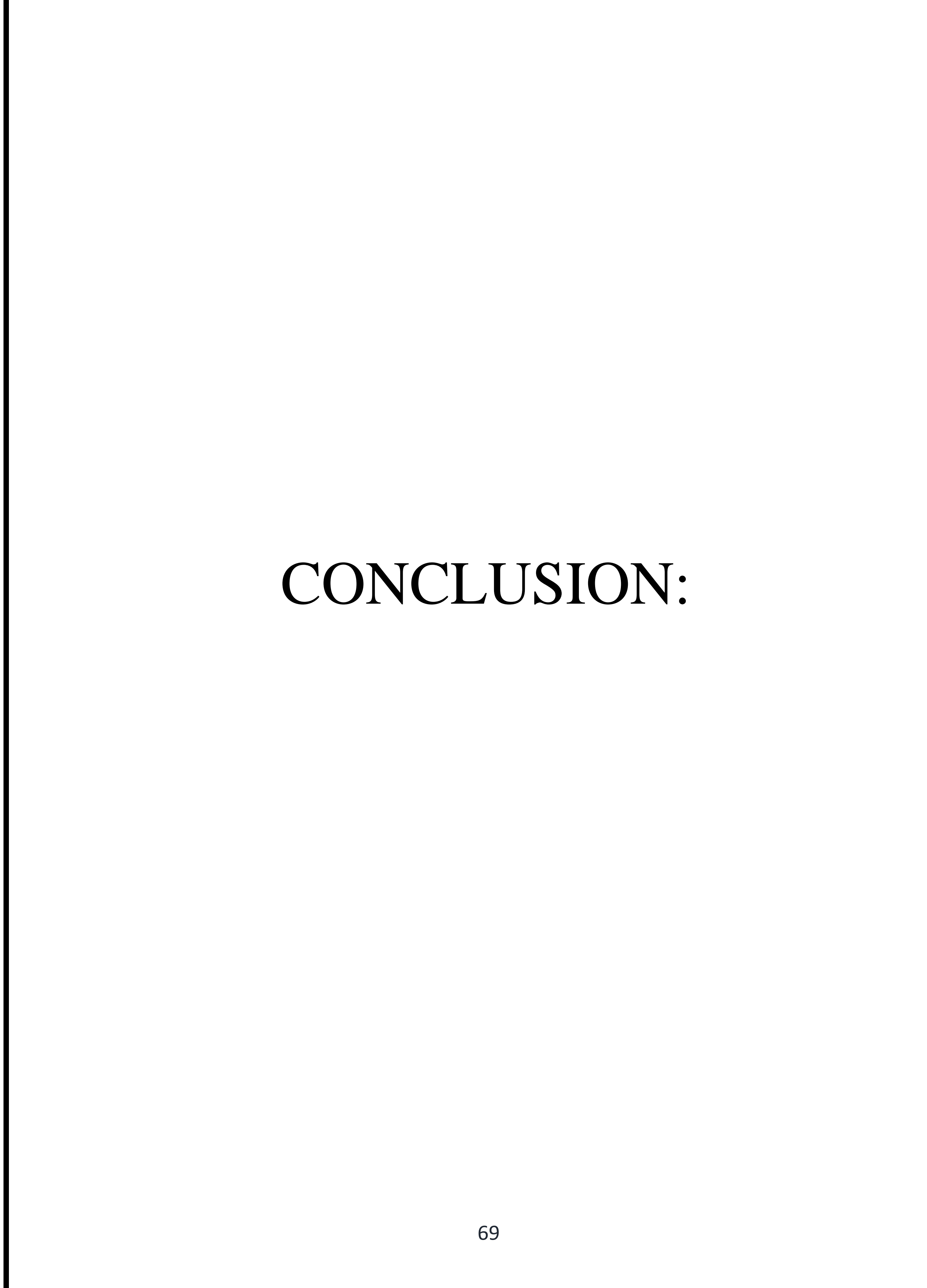
The present study revealed that the most commonly administered drugs were the maintenance IV fluids containing potassium (27.42%) and antibiotics (25.72%). A significant association was observed between potassium-containing fluids and phlebitis, with 45.45% of phlebitis cases receiving maintenance IV fluids containing potassium compared to 24.50% in the non-phlebitis group ($p < 0.05$). 30.30% had received antibiotics, and 18.18% of patients received blood products, while 3% NS and saline bolus were less frequently used (3.03%). No phlebitis cases were identified among patients who received mannitol, antiepileptics, or calcium infusion.

Similar to our study, Robert et al [1], found that the administration of IV Fluids containing potassium was significantly associated with phlebitis rate (31 out of 35 cases). High-risk Medication (HRM) and fluid boluses were also significant.

In a study conducted by Shinzato et al [39]The most common administered drugs included fentanyl (16.6%), followed by lipid emulsion (9.8%) and heparin (9.4%), with significant associations observed in phlebitis incidence. Dexmedetomidine and ampicillin were also frequently used in their study.

Mandal et al[38], showed that the use of antibiotics was associated with a higher incidence of phlebitis compared to those who did not receive Antibiotics. Administration of Blood Products also resulted in the incidence of phlebitis, with no significance.

According to Kaur's findings, [40] 46% of children were given free water solution (Dextrose Normal Saline). Additionally, 87% of the children in their study received antibiotics, indicating a higher prevalence or wider use of intravenous antibiotic therapy in that context.

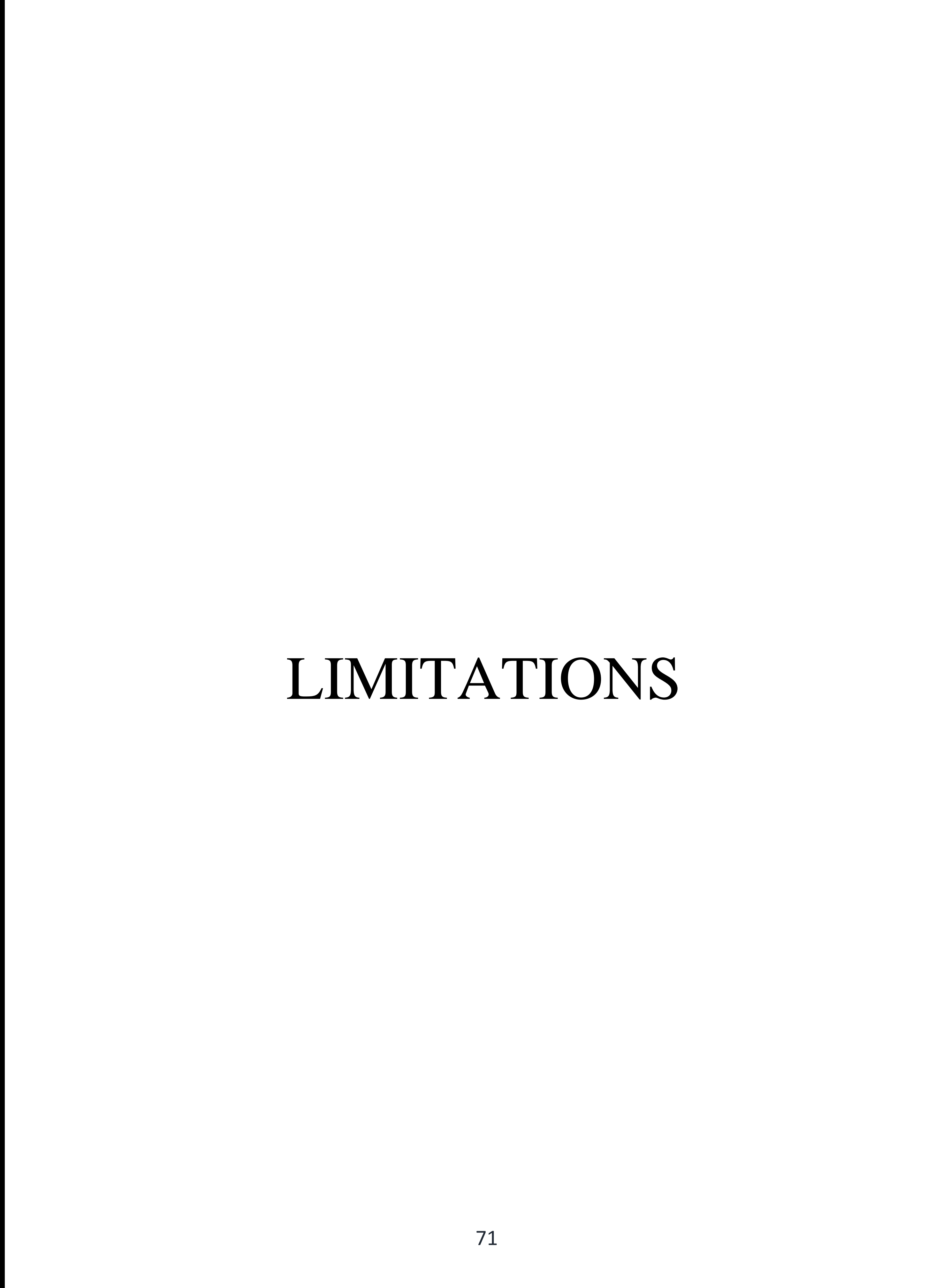


CONCLUSION:

CONCLUSION:

- Routine physician inspections significantly enhanced early phlebitis detection, showing higher VIP scores and identifying more cases than nurses.
- The occurrence of phlebitis was significantly influenced by the cannula insertion site, gauge size, duration of use, and the administration of IV Fluids with potassium maintenance, Antibiotics, and blood products.

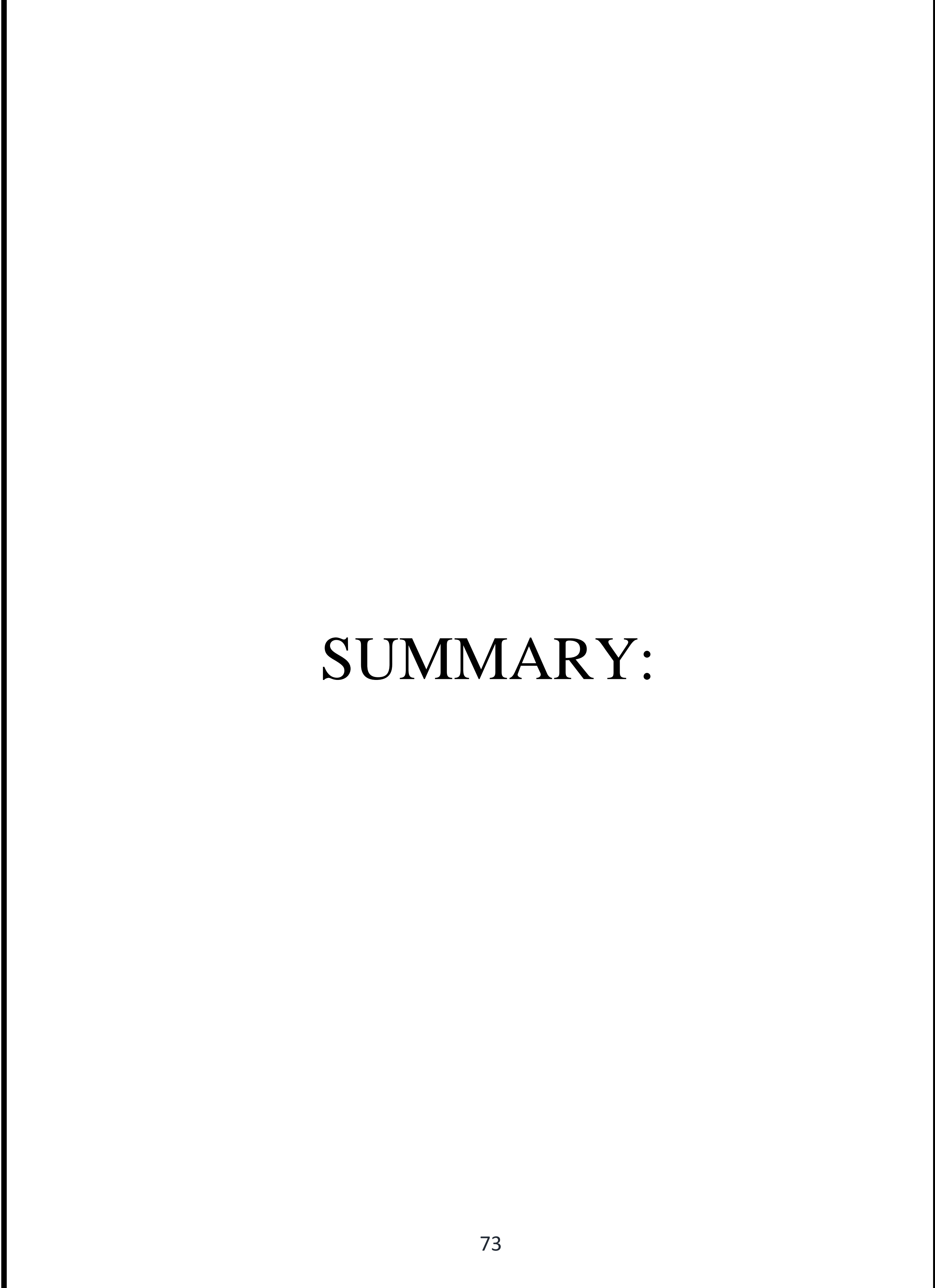
Younger pediatric patients (especially under 6 years) are more vulnerable to phlebitis, reinforcing the need for regular and vigilant observations by physicians in this age group



LIMITATIONS

LIMITATIONS

1. In this study, a detailed comparison between Nurses and doctors' detection of Phlebitis was not done by having case and control groups. This can be incorporated in future studies.
2. The knowledge and practice with regard to the management of Phlebitis of Nurses and Doctors is not documented, which can be done in future studies.
3. The experience of Doctors and Nurses can also be taken into consideration in future studies to assess who picks up phlebitis quicker based on their exposure of being in various Hospital setups.



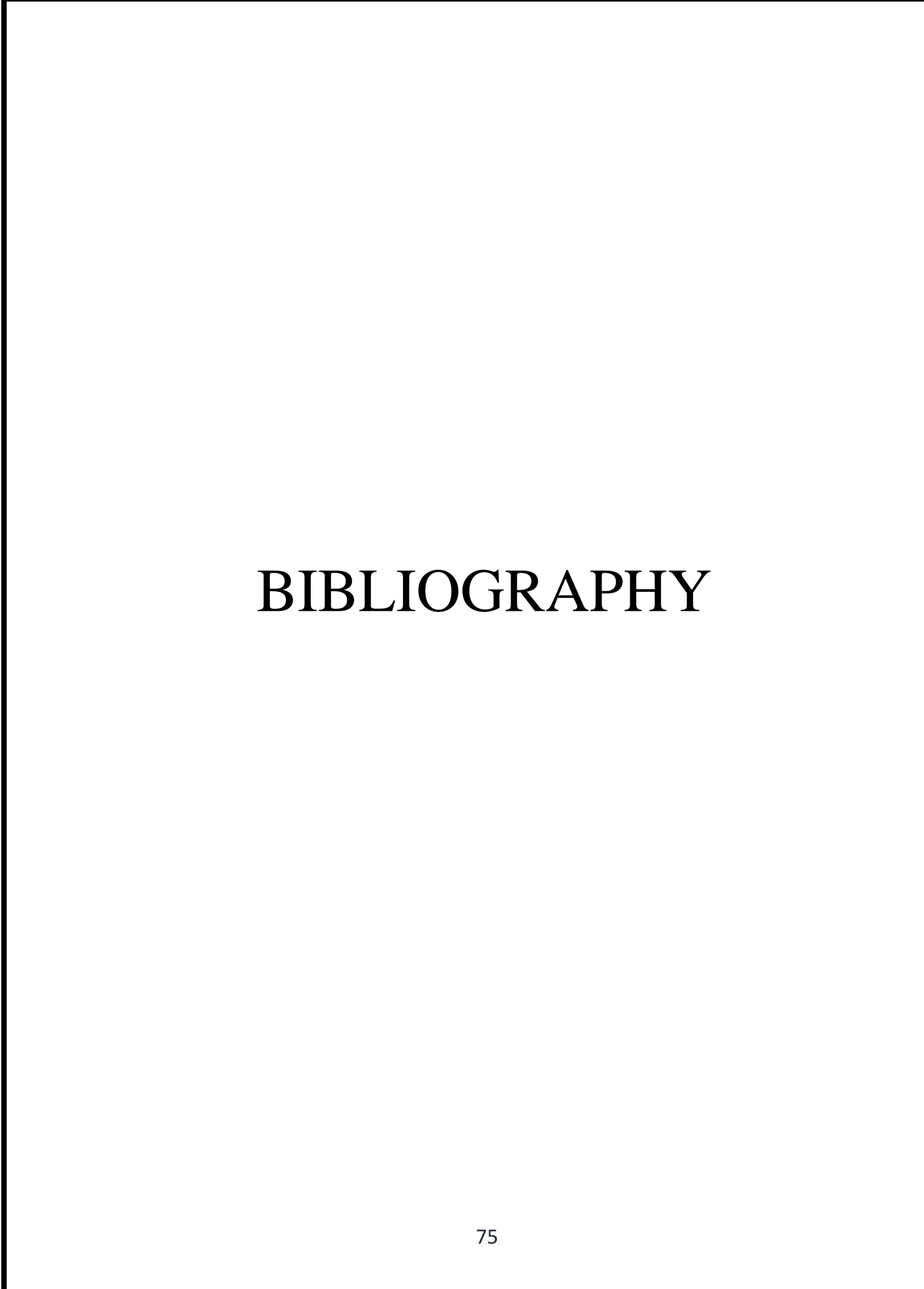
SUMMARY:

SUMMARY:

This prospective observational study, conducted in a tertiary care hospital, assessed the impact of routine physician inspection on the early detection of phlebitis in pediatric patients with IV cannulas. A total of 237 children aged 1 month to 12 years were included. Age-wise analysis indicated a higher prevalence of phlebitis in the 1-month to 3-year (36.66%) and 3–6 years (27.27%) age groups, with statistical significance ($p<0.05$). The gender distribution revealed a slight female predominance (54.44%); however, gender was not significantly associated with phlebitis.

The cannula site significantly influenced the incidence of phlebitis, with higher rates observed in the dorsal venous network of the hand, the basilic vein, and the great saphenous vein. The cephalic vein served as the most commonly used site. The size of the cannula gauge also played a role—24 G cannulas were used most frequently (58.22%) and were associated with a greater number of phlebitis cases than 22 G ($p<0.05$).

Longer cannula duration (>3 days) significantly correlated with increased phlebitis incidence. Additionally, IV fluids containing potassium and antibiotic administration, and blood products were strongly associated with phlebitis. The mean Visual Infusion Phlebitis (VIP) scores were higher among doctors (0.51 ± 0.47) compared to nurses (0.36 ± 0.28), further emphasizing physicians' more vigilant detection. A key finding was that routine physician assessments resulted in the identification of more phlebitis cases (19 vs. 14 by nurses), highlighting the importance of physician involvement.



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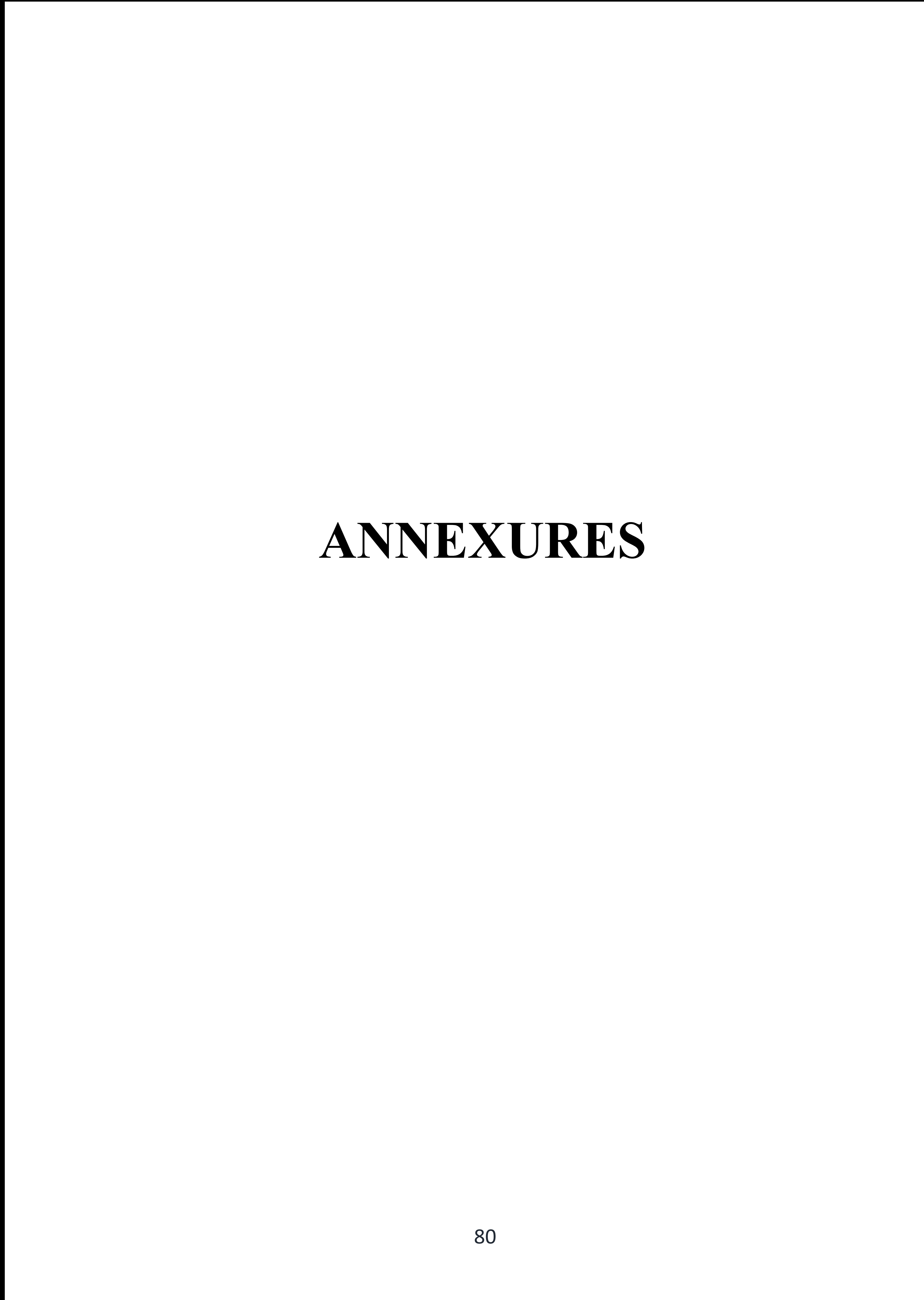

ANNEXURES

PATIENT INFORMATION SHEET

IMPACT OF PHYSICIAN INSPECTION IN THE DETECTION OF PHLEBITIS AND FACTORS CONTRIBUTING TO IN ADMITTED CHILDREN OF TERITARY CARE HOSPITAL -A PROSPECTIVE OBSERVATIONAL STUDY

Principal Investigator: DR MALRAJ SAI ROHIT

I Dr. MALRAJ SAI ROHIT Post graduate student in Department at Sri Devraj Urs Medical College will be conducting a study titled "IMPACT OF PHYSICIAN INSPECTION IN THE DETECTION OF PHLEBITIS AND FACTORS CONTRIBUTING TO IT IN ADMITTED CHILDREN OF TERITARY CARE HOSPITAL - A PROSPECTIVE OBSERVATIONAL STUDY for my dissertation under the guidance of Dr. SUDHA REDDY V.R., Professor of Department of Paediatrics.

This study will be conducted at R.L.Jalappa Hospital & Research Centre, affiliated to Sri Devaraj Urs Medical College, a constituent of Sri Devaraj Urs Academy of Higher Education and Research.

PURPOSE OF THE STUDY: In this study we will observe the site of the cannula at regular intervals for inflammation (phlebitis), by which we can reduce the incidence of phlebitis and its complications.

BENEFITS OF TAKING PART IN THE STUDY:

There are direct benefits to the patient and knowledge gained by the observer could provide a new information regarding the management and may benefit future patients.

VIP score will be applied to the included patients and they will be graded from 0 to 5 as follows:

APPEARANCE	SCORE	STAGE
IV site appears healthy Action: observe cannula	0	No signs of phlebitis
One of the following signs is evident ● Slight pain near IV site or ● Slight redness near IV site Action: observe cannula	1	Possibly first Signs of phlebitis
Two of the following are evident ● Pain at IV site ● Redness	2	Early stage of phlebitis

● Swelling Action: resite cannula		
All of the following signs are evident ● Pain along path of cannula ● Redness around site ● Swelling Action: resite cannula and consider treatment	3	Medium stage of phlebitis
All of the following signs are evident and extensive ● Pain along path of cannula ● Redness around site ● Swelling ● Palpable venous cord Action: resite cannula and consider treatment	4	Advanced stage of phlebitis or start of thrombophlebitis
All of the following signs are evident and extensive ● Pain along path of cannula ● Redness around site and swelling ● Palpable venous cord ● Pyrexia Action: initiate treatment/ resite cannula	5	Advanced stage thrombophlebitis

- You will not be paid any financial compensation for the participation of your child in this research project. All the expenses needed for the study will be borne by principal investigator.
- All the data will be kept confidential and will be used only for research purpose by this institution. You are free to provide consent for the participation of your child in this study. You can also withdraw your child from the study at any point of time without giving any reasons whatsoever. Your refusal to participate will not prejudice you to any present or future care at this institution.

Name of the Principal Investigator
Contact number :8297112116
Date-

ರೋಗಿಯ ಮಾಹಿತಿ ಹಾಳ

ಟೆರಿಟರಿ ಕೇರ್ ಆಸ್ಪತ್ರೆಯ ಪ್ರವೇಶ ಪಡೆದ ಮಕ್ಕಳಲ್ಲಿ ಫ್ಲೆಬಿಟಿಸ್ ಮತ್ತು ಅಂಶಗಳ ಪತ್ತೆಯಲ್ಲಿ ವೈದ್ಯರ ತಪಾಸಣೆಯ ಪರಿಣಾಮ -ಒಂದು ನಿರೀಕ್ಷಿತ ವೀಕ್ಷಣಾ ಅಧ್ಯಯನ

ಪ್ರಧಾನ ತನಿಖಾಧಿಕಾರಿ: ಡಾ. ಮಲ್ರಾಜ್ ಸಾಯಿ ರೋಹಿತ್

ನಾನು ಡಾ. ಮಲ್ರಾಜ್ ಸಾಯಿ ರೋಹಿತ್ ಅವರು ಶ್ರೀ ದೇವರಾಜ್ ಅರ್ಸ್ ಮೆಡಿಕಲ್ ಕಾಲೇಜಿನಲ್ಲಿ ವಿಭಾಗದಲ್ಲಿ ಸ್ನಾತಕೋತ್ತರ ವಿದ್ಯಾರ್ಥಿಯಾಗಿದ್ದು, "ಫ್ಲೇಬಿಟಿಸ್ ಪತ್ತೆಯಲ್ಲಿ ವೈದ್ಯರ ತಪಾಸಣೆಯ ಪರಿಣಾಮ ಮತ್ತು ಪ್ರವೇಶ ಪಡೆದ ಮಕ್ಕಳ ಚಟುವಟಿಕೆಯಲ್ಲಿ ಅದಕ್ಕೆ ಕಾರಣವಾಗುವ ಅಂಶಗಳು" ಎಂಬ ಅಧ್ಯಯನವನ್ನು ನಡೆಸುತ್ತಿದ್ದಾರೆ. ಸ್ಟಡಿ ಮಕ್ಕಳ ವಿಭಾಗದ ಪ್ರಾಧ್ಯಾಪಕರಾದ ಡಾ. ಸುಧಾ ರೆಡ್ಡಿ ವಿ.ಆರ್. ಅವರ ಮಾರ್ಗದರ್ಶನದಲ್ಲಿ ನನ್ನ ಪ್ರಬಂಧ.

• ಈ ಸಂಶೋಧನಾ ಯೋಜನೆಯಲ್ಲಿ ನಿಮ್ಮ ಮಗುವಿನ ಭಾಗವಹಿಸುವಿಕೆಗಾಗಿ ನಿಮಗೆ ಯಾವುದೇ ಹಣಕಾಸಿನ ಪರಿಹಾರವನ್ನು ಪಾವತಿಸಲಾಗುವುದಿಲ್ಲ. ಅಧ್ಯಯನಕ್ಕೆ ಅಗತ್ಯವಿರುವ ಎಲ್ಲಾ ವೆಚ್ಚಗಳು ಪ್ರಧಾನ ತನಿಖಾಧಿಕಾರಿಯಿಂದ ಬೇಸರಗೊಳ್ಳುತ್ತವೆ.

• ಎಲ್ಲಾ ಡೇಟಾವನ್ನು ಗೌಪ್ಯವಾಗಿ ಇರಿಸಲಾಗುತ್ತದೆ ಮತ್ತು ಈ ಸಂಸ್ಥೆಯಿಂದ ಸಂಶೋಧನಾ ಉದ್ದೇಶಕ್ಕಾಗಿ ಮಾತ್ರ ಬಳಸಲಾಗುತ್ತದೆ. ಈ ಅಧ್ಯಯನದಲ್ಲಿ ನಿಮ್ಮ ಮಗುವಿನ ಭಾಗವಹಿಸುವಿಕೆಗೆ ಒಪ್ಪಿಗೆ ನೀಡಲು ನೀವು ಸ್ವತಂತ್ರರಾಗಿದ್ದೀರಿ. ಯಾವುದೇ ಕಾರಣಗಳನ್ನು ನೀಡದೆ ನೀವು ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ನಿಮ್ಮ ಮಗುವನ್ನು ಅಧ್ಯಯನದಿಂದ ಹಿಂಪಡೆಯಬಹುದು. ಭಾಗವಹಿಸಲು ನಿಮ್ಮ ನಿರಾಕರಣೆಯು ಈ ಸಂಸ್ಥೆಯಲ್ಲಿ ಯಾವುದೇ ಪ್ರಸ್ತುತ ಅಥವಾ ಭವಿಷ್ಯದ ಕಾಳಜಿಗೆ ನಿಮ್ಮನ್ನು ಪೂರ್ವಾಗ್ರಹ ಮಾಡುವುದಿಲ್ಲ.

• ಅಧ್ಯಯನದ ಉದ್ದೇಶ: ಈ ಅಧ್ಯಯನದಲ್ಲಿ ನಾವು ನಿಯಮಿತ ಮಧ್ಯಂತರದಲ್ಲಿ ಇರಿಸಲಾದ ತೂರುನಳಿಗೆಯ ಸ್ಥಳವನ್ನು ಗಮನಿಸುತ್ತೇವೆ, ಇದರ ಮೂಲಕ ನಾವು ಫೆಲೆಬಿಟಿಸ್ ಅನ್ನು ಕಡಿಮೆ ಮಾಡಬಹುದು ಮತ್ತು ಯಾವುದೇ ಚಿಕಿತ್ಸೆಯ ಅಗತ್ಯತೆ ಮತ್ತು ಫ್ಲೆಬಿಟಿಸ್‌ನೊಂದಿಗೆ ತೊಡಕುಗಳು ಸಂಭವಿಸುವ ಮೊದಲು ಅದನ್ನು ತಡೆಯಬಹುದು.

• ಅಧ್ಯಯನದ ಭಾಗದಲ್ಲಿ ಯಾವುದೇ ನಿರ್ಬಂಧವನ್ನು ಅನುಸರಿಸಬಾರದು.

• ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸುವ ಪ್ರಯೋಜನಗಳು:

• ರೋಗಿಗೆ ನೇರ ಪ್ರಯೋಜನಗಳಿವೆ ಮತ್ತು ಆದಾಗ್ಯೂ ವೀಕ್ಷಕರಿಂದ ಪಡೆದ ಜ್ಞಾನವು ನಿರ್ವಹಣೆಗೆ ಸಂಬಂಧಿಸಿದಂತೆ ಹೊಸ ಮಾಹಿತಿಯನ್ನು ಒದಗಿಸಬಹುದು ಮತ್ತು ಭವಿಷ್ಯದ ರೋಗಿಗಳಿಗೆ ಪ್ರಯೋಜನವಾಗಬಹುದು

ಈ ಅಧ್ಯಯನವನ್ನು ಶ್ರೀ ದೇವರಾಜ್ ಅರಸ್ ಮೆಡಿಕಲ್ ಕಾಲೇಜಿಗೆ ಸಂಯೋಜಿತವಾಗಿರುವ ಆರ್.ಎಲ್.ಜಾಲಪ್ಪ ಆಸ್ಪತ್ರೆ ಮತ್ತು ಸಂಶೋಧನಾ ಕೇಂದ್ರದಲ್ಲಿ ನಡೆಸಲಾಗುವುದು, ಇದು ಶ್ರೀ ದೇವರಾಜ್ ಅರ್ಸ್ ಅಕಾಡೆಮಿ ಆಫ್ ಹೈಯರ್ ಎಜುಕೇಶನ್ ಅಂಡ್ ರಿಸರ್ಚ್‌ನ ಘಟಕವಾಗಿದೆ.

• ಒಳಗೊಂಡಿರುವ ರೋಗಿಗಳಿಗೆ VIP ಸ್ಕೋರ್ ಅನ್ನು ಅನ್ವಯಿಸಲಾಗುತ್ತದೆ ಮತ್ತು ಅವರನ್ನು 0 ರಿಂದ 5 ರವರೆಗೆ ಈ ಕೆಳಗಿನಂತೆ ಶ್ರೇಣೀಕರಿಸಲಾಗುತ್ತದೆ

ಪ್ರಧಾನ ತನಿಖಾಧಿಕಾರಿಯ ಹೆಸರು
ಸಂಪರ್ಕ ಸಂಖ್ಯೆ :8297112116
ದಿನಾಂಕ-

INFORMED CONSENT FORM

Date:

I, Mr/Mrs…………………………

, have been explained in my own vernacular language that my child will be included in "IMPACT OF PHYSICIAN INSPECTION IN THE DETECTION OF PHLEBITIS AND FACTORS CONTRIBUTING TO IT IN ADMITTED CHILDREN OF TERITARY CARE HOSPITAL-A PROSPECTIVE OBSERVATIONAL STUDY" hereby I give my valid written informed consent without any force or prejudice for recording the observations of clinical parameters. The nature and risks involved have been explained to me, to my satisfaction. I have been explained in detail about the study being conducted. I have read the patient information sheet and I have had the opportunity to ask any question. Any question that I have asked, have been answered to my satisfaction. I provide consent voluntarily to allow my child as a participant in this research. I hereby give consent to provide history, undergo physical examination, undergo the procedure, undergo investigations, and provide its results and documents etc to the doctor / institute etc. For academic and scientific purpose, the operation / procedure, etc may be video graphed or photographed. All the expenses needed for the study will be bored by principal investigator. All the data may be published or used for any academic purpose. I will not hold the doctors / institute etc responsible for any untoward consequences during the procedure / study.

(Signature & Name of Patient/ Attendant/ Mother)

(Signature & Name of Primary Investigator)

(Relation with patient)

Witness:

ಮಾಹಿತಿ ನೀಡಿದ ಒಪ್ಪಿಗೆ ನಮೂನೆ

ದಿನಾಂಕ:

ನಾನು, ಶ್ರೀ/ಶ್ರೀಮತಿ ___________________________________,

ನನ್ನ ಸ್ವಂತ ಸ್ಥಳೀಯ ಭಾಷೆಯಲ್ಲಿ ನನ್ನ ಮಗುವನ್ನು "ವೈದ್ಯಕೀಯ ತಪಾಸಣೆಯ ಪರಿಣಾಮದಲ್ಲಿ ಫ್ಲೆಬಿಟಿಸ್ ಪತ್ತೆಯಲ್ಲಿ ಸೇರಿಸಲಾಗುವುದು ಮತ್ತು ಆಸ್ಪತ್ರೆಯ ಆಸ್ಪತ್ರೆಯ ಆಸ್ಪತ್ರೆಯ ದಾಖಲಾತಿ ಮಕ್ಕಳಲ್ಲಿ ಅದಕ್ಕೆ ಕೊಡುಗೆ ನೀಡುವ ಅಂಶಗಳನ್ನು ಮಾನ್ಯವಾಗಿ ನೀಡಲಾಗಿದೆ" ಎಂದು ವಿವರಿಸಲಾಗಿದೆ. ಕ್ಲಿನಿಕಲ್ ನಿಯತಾಂಕಗಳ ಅವಲೋಕನಗಳನ್ನು ದಾಖಲಿಸಲು ಯಾವುದೇ ಬಲ ಅಥವಾ ಪೂರ್ವಾಗ್ರಹವಿಲ್ಲದೆ ಒಪ್ಪಿಗೆ. ಒಳಗೊಂಡಿರುವ ಸ್ವಭಾವ ಮತ್ತು ಅಪಾಯಗಳನ್ನು ನನಗೆ ವಿವರಿಸಲಾಗಿದೆ, ನನ್ನ ತೃಪ್ತಿ. ನಡೆಸುತ್ತಿರುವ ಅಧ್ಯಯನದ ಬಗ್ಗೆ ನನಗೆ ವಿವರವಾಗಿ ವಿವರಿಸಲಾಗಿದೆ. ನಾನು ರೋಗಿಯ ಮಾಹಿತಿ ಹಾಳೆಯನ್ನು ಓದಿದ್ದೇನೆ ಮತ್ತು ಯಾವುದೇ ಪ್ರಶ್ನೆಯನ್ನು ಕೇಳಲು ನನಗೆ ಅವಕಾಶವಿದೆ. ನಾನು ಕೇಳಿದ ಯಾವುದೇ ಪ್ರಶ್ನೆಗೆ ನನ್ನ ತೃಪ್ತಿಗೆ ಉತ್ತರಿಸಲಾಗಿದೆ. ನನ್ನ ಮಗುವನ್ನು ಈ ಸಂಶೋಧನೆಯಲ್ಲಿ ಪಾಲ್ಗೊಳ್ಳುವಂತೆ ಅನುಮತಿಸಲು ನಾನು ಸ್ವಯಂಪ್ರೇರಣೆಯಿಂದ ಒಪ್ಪಿಗೆಯನ್ನು ನೀಡುತ್ತೇನೆ. ಇತಿಹಾಸವನ್ನು ಒದಗಿಸಲು, ದೈಹಿಕ ಪರೀಕ್ಷೆಗೆ ಒಳಗಾಗಲು, ಕಾರ್ಯವಿಧಾನಕ್ಕೆ ಒಳಗಾಗಲು, ತನಿಖೆಗೆ ಒಳಗಾಗಲು ಮತ್ತು ಅದರ ಫಲಿತಾಂಶಗಳು ಮತ್ತು ದಾಖಲೆಗಳನ್ನು ಇತ್ಯಾದಿಗಳನ್ನು ವೈದ್ಯರು / ಸಂಸ್ಥೆ ಇತ್ಯಾದಿಗಳಿಗೆ ಒದಗಿಸಲು ನಾನು ಈ ಮೂಲಕ ಒಪ್ಪಿಗೆ ನೀಡುತ್ತೇನೆ. ಶೈಕ್ಷಣಿಕ ಮತ್ತು ವೈಜ್ಞಾನಿಕ ಉದ್ದೇಶಕ್ಕಾಗಿ, ಕಾರ್ಯಾಚರಣೆ / ಕಾರ್ಯವಿಧಾನ, ಇತ್ಯಾದಿಗಳನ್ನು ವೀಡಿಯೊ ಗ್ರಾಫ್ ಮಾಡಬಹುದು ಅಥವಾ ಛಾಯಾಚಿತ್ರ. ಅಧ್ಯಯನಕ್ಕೆ ಅಗತ್ಯವಿರುವ ಎಲ್ಲಾ ವೆಚ್ಚಗಳು ಪ್ರಧಾನ ತನಿಖಾಧಿಕಾರಿಯಿಂದ ಬೇಸರಗೊಳ್ಳುತ್ತವೆ. ಎಲ್ಲಾ ಡೇಟಾವನ್ನು ಪ್ರಕಟಿಸಬಹುದು ಅಥವಾ ಯಾವುದೇ ಶೈಕ್ಷಣಿಕ ಉದ್ದೇಶಕ್ಕಾಗಿ ಬಳಸಬಹುದು. ಕಾರ್ಯವಿಧಾನ / ಅಧ್ಯಯನದ ಸಮಯದಲ್ಲಿ ಯಾವುದೇ ಅಹಿತಕರ ಪರಿಣಾಮಗಳಿಗೆ ನಾನು ವೈದ್ಯರು / ಸಂಸ್ಥೆ ಇತ್ಯಾದಿಗಳನ್ನು ಹೊಣೆಗಾರರನ್ನಾಗಿ ಮಾಡುವುದಿಲ್ಲ.

(ರೋಗಿಯ ಸಹಿ ಮತ್ತು ಹೆಸರು

(ಸಂಶೋಧಕರ ಸಹಿ ಮತ್ತು ಹೆಸರ

ವ್ಯಕ್ತಿ/ವೈದ್ಯ)

ಪರಿಚಾರಕ/ತಾಯಿ)

ರೋಗಿಯೊಂದಿಗಿನ ಸಂಬಂಧ)
ಸಾಕ್ಷಿ:

PROFORMA FOR DOCTORS

Sl No:

Date of admission:

Date of discharge:

Name of Patient: ……………………………… UHID No……………………

Age of Patient: ……………………………

Gender: ……………………………...

Address:

……………………………………………………………………………………………….
……

Diagnosis: ………………………………………………………………………….……...

- Patient admitted in: PICU/PAEDIATRIC WARD
- Cannula secured by: Nurse/ Doctor
- Years of experience of Nurse/ Doctor: ………………………..
- Date & Time of insertion of cannula………………….
- Date & Time of removal of cannula…………….
- Size of the cannula used: ……………………………………….
- Site of insertion of the cannula:
- 1)Hands 2) Wrists 3) Forearm 4) Feet and 5) Ante cubital fossae
- Patency checked after securing cannula: {YES/NO}

Type of Intravenous Fluid used:

- 5%Dextrose
- 10% Dextrose
- 0.9% NS
- 0.45% NS

- 3% NS
- DNS
- Isolyte- P

Type of medication used:

- IV Antibiotics (Specify)
- IV Calcium
- IV Antiepileptics (Specify)
- IV Blood Products (Specify)
- IV Mannitol
- Other medications (specify): …………………………………………………

Saline Flush given after medication YES/NO

Date of application of VIP score	Time	APPEARANCE	VIP SCORE	ACTION	Primary observer signature
	9AM 4PM				
	9AM 4PM				
	9AM 4PM				
	9AM 4PM				
	9AM 4PM				

	9AM 4PM				

Visual Infusion Phlebitis Score IV site appears healthy	0	No signs of phlebitis **OBSERVE CANNULA**
One of the following is evident: • Slight pain at IV site • Redness near IV site	1	Possible first sign of phlebitis **OBSERVE CANNULA**
Two of the following are evident: • Pain • Erythema • Swelling	2	Early stage of phlebitis **RESITE THE CANNULA**
All of the following signs are evident: • Pain along the path of the cannula • Erythema • Induration	3	Medium stage of phlebitis **RESITE THE CANNULA** **CONSIDER TREATMENT**
All of the following signs evident and extensive: • Pain along the path of the cannula • Erythema • Induration • Palpable venous cord	4	Advanced stage of phlebitis or start of thrombophlebitis **RESITE THE CANNULA** **CONSIDER TREATMENT**
All of the following signs are evident and extensive: • Pain along the path of the cannula • Erythema • Induration • Palpable venous cord • Pyrexia	5	Advanced stage of thrombophlebitis **INITIATE TREATMENT** **RESITE THE CANNULA**

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SIGNATURE OF PRIMARY INVESTIGATOR:

PROFORMA FOR NURSES

Sl No:

Date of admission:

Date of discharge:

Name of Patient: ……………………………… UHID No……………………

Age of Patient: ……………………………

Gender: ……………………………...

Address:

…………………………………………………………………………………………….

……

Diagnosis: ………………………………………………………………………….……...

- Patient admitted in: PICU/PAEDIATRIC WARD
- Cannula secured by: Nurse/ Doctor
- Years of experience of Nurse/ Doctor: ………………………..
- Date & Time of insertion of cannula………………….
- Date & Time of removal of cannula…………….
- Size of the cannula used: ……………………………………….
- Site of insertion of the cannula:
- 1)Hands 2) Wrists 3) Forearm 4) Feet and 5) Ante cubital fossae
- Patency checked after securing cannula: {YES/NO}

Type of Intravenous Fluid used:

- 5%Dextrose
- 10% Dextrose
- 0.9% NS

- 0.45% NS
- 3% NS
- DNS
- Isolyte- P

Type of medication used:

- IV Antibiotics (Specify)
- IV Calcium
- IV Antiepileptics (Specify)
- IV Blood Products (Specify)
- IV Mannitol
- Other medications (specify): ………………………………………………………

Saline Flush given after medication YES/NO

-

Date of application of VIP score	Time	APPEARANCE	VIP SCORE	ACTION	Staff nurse signature:
	8AM 2PM 8PM				
	8AM 2PM 8PM				
	8AM 2PM 8PM				

	8AM 2PM 8PM				
	8AM 2PM 8PM				
	8AM 2PM 8PM				

Visual Infusion Phlebitis Score

Signs	Score	Stage / Action
IV site appears healthy	0	No signs of phlebitis **OBSERVE CANNULA**
One of the following is evident: • Slight pain at IV site • Redness near IV site	1	Possible first sign of phlebitis **OBSERVE CANNULA**
Two of the following are evident: • Pain • Erythema • Swelling	2	Early stage of phlebitis **RESITE THE CANNULA**
All of the following signs are evident: • Pain along the path of the cannula • Erythema • Induration	3	Medium stage of phlebitis **RESITE THE CANNULA** **CONSIDER TREATMENT**
All of the following signs evident and extensive: • Pain along the path of the cannula • Erythema • Induration • Palpable venous cord	4	Advanced stage of phlebitis or start of thrombophlebitis **RESITE THE CANNULA** **CONSIDER TREATMENT**
All of the following signs are evident and extensive: • Pain along the path of the cannula • Erythema • Induration • Palpable venous cord • Pyrexia	5	Advanced stage of thrombophlebitis **INITIATE TREATMENT** **RESITE THE CANNULA**

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