A STUDY TO ASSESS KNOWLEDGE ABOUT INFUSION THERAPY AMONG NEURO NURSES

PROJECT REPORT

Submitted as a partial fulfillment of the requirements for the

DIPLOMA IN NEURO NURSING

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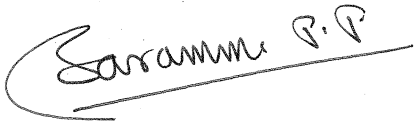
CODE NO: 5893

SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES AND TECHNOLOGY, TRIVANDRUM

2009

CERTIFICATE FROM SUPERVISORY GUIDE

This is to certify that **Miss VIJI.V.FERNANDEZ** has completed the project work on 'A STUDY TO ASSESS THE KNOWLEDGE ABOUT INFUSION THERAPY AMONG NEURO NURSES' in NSICU, NMICU, NMWRD, NSWRD at SCTIMST, Trivandrum under my direct supervision for the partial fulfilment for the Diploma in Neuro Nursing in the University of Sree Chitra Tirunal Institute for Medical Sciences and Technology. It is also certified that no part of this report has been included in any other thesis for processing any other degree by the candidate.



Dr. Saramma. P. P
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Trivandrum
November 2009

CERTIFICATE FROM THE CANDIDATE

This is to certify that the project on ***'A STUDY TO ASSESS THE KNOWLEDGE ABOUT INFUSION THERAPY AMONG NEURO NURSES'*** in NSICU, NMICU, NMWRD, NSWRD at SCTIMST, Trivandrum is a genuine work by me, under the guidance of Dr. Saramma.P.P, PhD, Senior Lecturer in Nursing, SCTIMST, Trivandrum. It is also certified that this work has not been presented previously to any other University for award of degree, diploma or other recognition.

Miss.VIJI.V.FERNANDEZ.
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Thiruvananthapuram,
November 2009.

APPROVAL SHEET

This is to certify that ***Miss.Viji.V.Fernandez*** bearing code no: 5893, has been admitted to the Diploma in Neuro Nursing, in January 2009 and she has undertaken the project entitled, '**A STUDY TO ASSESS THE KNOWLEDGE ABOUT INFUSION THERAPY AMONG NEURO NURSES'** in NSICU, NMICU, NMWRD, NSWRD of SCTIMST, Trivandrum, which is approved for the Diploma in Neuro Nursing, awarded by the Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram and it is found satisfactory.

EXAMINERS

(1).....

(2).....

GUIDE

(1).....

(2).....

Thiruvananthapuram
November 2009

ACKNOWLEDGEMENT

Acknowledgement is to give free confession and to show appreciation and to give thanks for these who generally guided helped and uplifted up to the completion of my study.

First of all let me thank God almighty for unending love, care and blessing especially during the tenure of this study.

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VIJI. V. FERNANDEZ

ABSTRACT

Topic: ***A study to assess knowledge about infusion therapy among Neuro-nurses***

Intravenous therapy presents a potential risk to patient safety, with associated risks varying from minor complications to death. The number of patients who require IV therapy is increasing, because more patients are acutely ill and also because of changes in prescribing patterns. **OBJECTIVES: (1) To** identify knowledge about infusion therapy among Neuro- nurses,(2) To find out knowledge about infusion therapy and to prepare a protocol for infusion therapy .(3) To find out association between knowledge about infusion therapy and selected variables. **METHODS:** 38 Neuro nurses were purposely selected from NSICU, NMICU, NMWRD and NSWRD of Sree Chitra Tirunal Institute for Medical Science and Technology, Trivandrum. Consecutive sampling technique was used for selecting the sample. Total period of the study was September 2009 to October 2009.A validated questionnaire was used, mostly in the form of multiple choices. **RESULTS:** Studies showed that neuro nurses knowledge about infusion therapy is above average (11.24 / 15). There was no statistically significant difference between the mean knowledge score and age, experience and the areas of work. **CONCLUSION:** Based on the findings of the study Neuro nurses have above average knowledge about infusion therapy and below average in calculation.

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LIST OF ABBREVATIONS

CI	-	Confidence Interval
D5W	-	5% Dextrose
IV	-	Intra Venous.
LUDH	-	Lothian- University Hospital Division.
NaCl	-	Sodium Chloride
NMC	-	Nursing and Midwifery Council.
NMICU	-	Neuro Medical Intensive care Unit
NMWRD	-	Neuro Medical Ward
NS	-	Normal Saline
NSICU	-	Neuro surgical Intensive care Unit
NSWRD	-	Neuro Surgical Ward
RCN	-	Royal College of Nursing.
SCTIMST	-	Sree Chitra Tirunal Institute for Medical Sciences and Technology

CHAPTER - 1

INTRODUCTION

1.1 INTRODUCTION:

The nurse practicing in today's world is faced with a myriad of duties and responsibilities involving specialized skills and techniques .She is answerable for all decisions and performances associated with the delivery of a safe level of care (Josephson, *2003).* Core clinical skills; include the preparation and administration of intravenous drugs, peripheral venous access, acute and long term central venous access and pediatric intravenous therapy (Dougherty et al, 1999). Staff must be competent in the use of devices and update their knowledge and skills through regular review and assessment of competence (Carlisle et al 1996, NMC 2004a). The infusion nurse specialist needs to have the knowledge and skills necessary to recognize and respond appropriately when anaphylaxis occurs (Scarlet, 2006).

Safe administration of intravenous fluid requires the nurse to understand the role of electrolytes and water in the body, the mechanism for movements between different body compartments and how the fluid balance is maintained (Hand, 2001) .The metabolic process of the body depend on adequate supplies of water and electrolytes. In adults,water account for about 60%of the body weight ,divided into two main compartments:the intracellular and

extracellular spaces.The intracellular wateris about 40%of the body weight , the extracellular fluid acounts for about 20%.(Kelly J).

Infusion therapy is one of the major responsibility the nurse faces in her day-to-day practice of nursing and is an area that is continually expanding "*Infusion nursing should be defined as the utilization of the nursing process as it relates to the following: technology and clinical application, fluid and electrolyte balance, pharmacology, infection control, pediatrics, transfusion therapy, anti neoplastic therapy, parenteral nutrition, and quality assurance/ performance improvement"* (Josephson , 2003).The goal of the fluid therapy is to maintain tissue perfusion (Hickey,2007)

Barsoum and Kleeman (2002) reviewed the evolution of parenteral fluid and transfusion therapy. Some of the salient landmarks from this review are shown in Table –1.1.

TABLE: -1.1 The history of intravenous therapy excluding blood transfusion.

1656	First intravenous injection in an animal.	Sir Christopher Wren, London architect of Saint Paul's cathedral describes 'a way to convey liquid poison into the mass of blood'.
1662	First intravenous injection in humans	Johann D. Major, a German graduate of Padua University injected an un purified compound into a man's vein.
1830	First intravenous use of water	Herman and Jaehnichen, Russians physicians desperate in the face of cholera.
1833	First successful saline infusion	Dr Thomas Latta's in 25 patients.
1834	First use of intravenous albumin	John Mackintosh, Scottish physician and student of Latta.
1876	Ringer's solution introduced	Sydney Ringer, one of the clinical pharmacologists was the first to observe the different physiological effects of various electrolytes.
1969	TPN	Stanley Dudrick, experiments with IV hyperalimenation.

1.2 BACK GROUND OF THE STUDY: -

1.2.1 INTRAVENOUS THERAPY: -

Intravenous therapy or IV therapy is the giving of liquid substances directly into a vein. It can be intermittent or continuous; continuous administration is called an **intravenous drip**. Therapies administered intravenously are often called **specialty pharmaceuticals**. Compared with other routs of administration, the intravenous route is the fastest ways to deliver fluids and medications throughout the body. Continuos infusion may be to correct dehydration or an electrolyte imbalance, to deliver medications or for blood transfusions.The commonly used crystalloid fluid is normal saline, Ringers lactate or Ringers acetate is another isotonic solution often used for large – volume fluid replacement. 5% Dextrose solution is used instead if the patient is at risk for having low blood suger or high sodium (Martin,external links).NS is typically the first fluid used when hypovolemia is severe enough to threaten the adequacy of blood circulation and has long been belived to be the safest fluid to give quickly in the large volumes.Rapid infusion of NS can cause metabolic acidosis (Bidani and Prough ,1999).

The choice of fluids may also depend on the chemical properties of the medications being given.Most commonly used crystalloid solutions and its composition are shown on Table 1.2.

TABLE 1.2 Composition of common crystalloid solutions

Solution	Other Name	$[Na^+]$(mmol/L)	$[Cl^-]$(mmol/L)	[Glucose](mmol/L)	[Glucose](mg/dl)
D5W	5% Dextrose	0	0	278	5000
Half Normal Saline	0.45%NaCl	77	77	0	0
NS	0.9%NaCl	154	154	0	0
RL	Lactated Ringer	130	109	0	0

1.2.2 NURSES RESPONSIBILITIES:-

Safe successful fluid therapy depends not only upon the knowledge and skill of the intravenous nurse, but also upon the role the staff nurse plays in maintaining the infusion. In dealing with intravenous infusion s the nurse is accountable for knowing what is ordered ,why is it indicated, its intendend impact on the patient ,and any possible side effects or adverse reactions that may occur. She is expected to prepare the patient physically and psychologically, to administer the infusion correctly , to maintain it to monitor the patient and support him emotionally ,and to documentation and reporting associated with the infusion therapy is her responsibility (Pandya, 2007). Continuous observation of measures that reflect fluid and electrolyte balances is crucial for neurological patients. The nursing implications involve

assessment of the IV insertion site for signs and symptoms of infiltration, signs and symptoms of phlebitis, carefully monitoring the IV to ensure accurate delivery of the intravenous fluid, and documentation of the IV fluid and also ensure that the IV tubing and the IV site are changed according to hospital policy. As the nurse, need to follow the recommended standards of practice associated with medication administration (six rights of medication administration) and know the drug classification, usual dosage ,routes of administration, side effects ,and adverse effects. IV sites should be monitored q2h to ensure patency. Nurses in general learnt how to prepare and administer IV medication from each other on the wards (Taxis, Barber 2003).

The nursing assessment data also help the physician institute early therapy for imbalances. Maintenance of vigilant attitude is necessary when caring for patients who are at high risk for fluid and electrolyte imbalances. Such patients include, (Pandya, 2007)

- Confused or unconscious patients who are unable to react to normal stimuli for replenishing water and electrolyte losses.
- Patients with conditions that increase insensible water loss, such as fever, hyperventilation ,incontinence and diarrhoea, and those on mechanical ventilation which also increases insensible water loss.
- Patients with damage to the area surrounding the hypothalamus, which can result in abnormal secretion of ADH.

- ❖ Patients undergoing therapy with such drugs as hyperosmolar solutions,diurectics,and steroids and those receiving hyperosmolar tube feedings.

Intravenous infusion technique enables the calculations for determining the delivery rate of IV fluid for the individual patient and the necessary spiking of the container and priming of the tubing before venupuncture and administration of the fluid (Mosby, 3rd Ed).

Risk management and examining ways to learn from adverse incidents have increased. This can be attributed in part of the Department of Health's (DH) publication An Organization with a Memory (DH 2000) and, more recently, in England and Wales, to the National Patient Safety Agency (NPSA), which was established in 2001.Risk of intravenous therapy are infection, speed shock / fluid overload (Dougherty and Lamp 1999,Plumer and Weinstein 2001), phlebitis (Jackson 1998, Panadero et al 2002), infiltration (Dougherty and Lamp 1999,Plumer and Weinstein 2001), electrolyte imbalance, embolism and extravasation (Jones and Stanley 1997 ,Moreno de Vega et al 2002). Infiltration refers to the inadvertent administration of a non-vesicant drug into the surrounding tissues (Dougherty and Lamb 1999, Plumer and Weinstein 2001). Extravasation is the leakage of IV drugs from the vein into the surrounding tissues (Jones and Stanley 1997). One of the risks associated with the peripheral IV route, as with other routes, is calculation of medicine doses. This requires educational support to enable staff competence (Hutton 1998, LUHD 2003a). NMC (2004b) guidance on the administration of

medicines specifies that two staff members are required where there are complex calculations, and that both practitioners need to calculate independently. One key risk related to IV therapy management is anaphylaxis (Henderson 1998, Drain and Volcheck 2001, LUHD 2004). It can have life – threatening consequences. A lager amount of air, if delivered all at once, can cause life-threatening damage to pulmonary circulation, or, if extremely large (3-8mm/kg of body weight) can stop the heart (Martin, external links).

There is a great risk of infection if sterile technique is not observed. Solutions, once opened, must be used within 24hrs or discarded. Glucose is a culture medium and when exposed to air for an extended length of time becomes a potential vehicle for bacteria.

Prolonged intravenous therapy presents a hazard .To minimize the risk of deep phlebitis during a constant infusion, the tubing should be changed every 24 to 48 hours, using rigid sterile technique and making sure all air is expelled from the tubing before it is attached to the in lying needle (Martin, external links).

However intravenous drug administration errors are most common during bolus administration and when making up medicines, that required multiple step preparation (Taxis and Barber 2003). Recommendations for practice:

- Support for staff is crucial; staff should be appropriately trained and knowledgeable of their practice area and medicines.

- Robust policies and procedures should be in place to help support and assess staff in clinical practice.
- Staff must complete an approved competency – based training programme relating to their field of practice and be familiar with associated medicines and polices (RCN 2003).
- Up-to –date information should be readily available to support good practice (LUHD 2003b), as well as expert resources, for example, a 24-hour pharmacy help line.

1.2.3 INFUSION THERAPY IN NEURO SURGERY:-

The management of fluid in the neurosurgical patients (Pandya, 2007) is a clinical challenge, because:-

- Blood los is difficult to measure .
- Inadequate fluid replasement to avoid increased ICP will lead to dehydration and cardiovascular instability.
- Overhydration with hypoosmotic solutions will increase cerebral oedema.
- Diuretics used to reduce brain bulk can cause intravascular volume shiftand electrolyte disturbances.

Ringer's lactate and 5%Dextrose are hypotonioc in nature, they can increase ICP and cerebral oedema. So these fluid should be used judiciously. Mannitol is most effective in oedematus brain tissue with a defective blood brain barrier

,in the acute phase. Prolonged administration of mannitol should be avoided as equilibrium is rapidly established in the brain and it becomes less effective. If the ICP is markedly raised , restrict fluids give IV mannitol but be careful to avoid dehydration , electrolyte imbalance, renel disfunction and hypertension (Pandya, 2007). Administration of hypertonic (3%) sodium chloride in midly hyponatremic patients (Suarez et al, 1999). Rapid correction of severe hyponatremia can produce Central Pontine Myelinosis or Osmotic Demyelination Syndrome(O.D.S) , which can cause substantial morbidity and mortality (Pandya, 2007).

1.3 NEED AND SIGNIFICANCE OF THE STUDY:-

Intravenous therapy presents a potential risk to patient safety, with associated risks varying from minor complications to death. The number of patients who require IV therapy is increasing, because more patients are acutely ill and also because of changes in prescribing patterns (Ingram and Lavery, 2005). Electrolyte solutions may cause peripheral circulatory collapse and anuria in patients. With Na deficiency; may aggravate hypokalemia. Do not give with blood. Electrolyte fee solutions increase body fluid loss (Stone, dead link). Hypertonic saline is used in treating hyponatremia and cerebral edema. Due to hypertonicity , administration may result in phlebitis and tissue necrosis. It should be administered via a central venous catheter (Prough and Bidani, 1999).

Fluid and electrolyte management is one of the corner stones of patient care. Most disease process, tissue injuries and surgical procedures greatly influence the physiologic status of fluids and electrolytes in the body (Martin, external links). Once the flow of body fluids among fluid compartments is understood, it is easy to follow the intended path of IV fluids are categorized prior to infusion (isotonic, hypotonic and hypertonic) because these are not always consistent with how they react in the body (Cook, 2003).

In this case infusion therapy is given to replace fluids and electrolytes, to treat cerebral oedema, to provide energy and to correct electrolytes. A nurse working in the Intensive Care Unit should have enough knowledge regarding calculation (ionotopic drugs), electrolyte deficit calculation (Na deficit). Hence this study is undertaken.

1.4 STATEMENT OF THE PROBLEM:-

"A study to assess knowledge about infusion therapy among Neuro-nurses".

1.5 OBJECTIVES: -

The objectives of this study are: -

1. To identify knowledge about infusion therapy among Neuro- nurses.

2. To find out knowledge about infusion therapy and to prepare a protocol for infusion therapy.
3. Find out association between knowledge about infusion therapy and selected variables.

1.6 OPERATIONAL DEFINITIONS: -

Knowledge: -About technology and clinical application, fluid and electrolyte balance, pharmacology, infection control, infusion therapy, parenteral nutrition, and quality assurance / performance improvement.

Infusion therapy: - Intravenous fluid administration except antibiotics and blood transfusions.

Neuro nurses: - Nurses were working in NSICU, NMICU, NMWRD, and NSWRD in SCTIMST, except student nurses.

1.7 METHODOLOGY: -

This is a descriptive survey of nursing staff. The investigator first assesses the knowledge about infusion therapy among Neuro nurses with a standardized questionnaire .The total duration of assessment is 10 minutes. Fifty nursing staff will be selected for the study. The duration of the study is from August - October.

1.8 DELIMITATIONS: -

The study is delimited to Neuro- nursing staff working in Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum.

1.9 ORGANISATION OF THE REPORT: -

The report is divided into V chapters .The first chapter is introduction. In this chapter the background of the study is outlined, the subject-assessing nurses knowledge about infusion therapy and the staff nurses responsibility in maintenance of infusion is briefed, the need and significance of the research problem is stressed, and the problem and objectives are stated .An attempt is made to operationally define the terms so as to clarify the problem and a brief discussion on methodology adopted for the study .The delimitations are specified. A summary of related studies pertaining to relevant areas of the present study is reviewed in chapter II, chapter III deals with the materials and methods of the study and chapter IV analyses and interprets the findings, chapter V presents a summary of the study including major findings, conclusions, implications, limitations of the present study together with certain recommendations for further research. The report also includes selected references and appendices.

CHAPTER – 2

REVIEW OF LITERATURE

2.1 INTRODUCTION: -

In this study data are mostly limited to published studies and unpublished theses. Online search of electronic database, online journals, hand searches of printed journals and theses, backward searches from literature review summaries and citation lists of studies and link articles were conducted Key words for online search included dependent and independent variables as well as related terms. The effective evaluation of these documents in relation to the research being proposed enabled the researcher to gain deeper insight into the research problem. It also threw light on the different dimensions of the selected problem and served as a frame of reference for the study.

The main purpose of this study was to assess the nurse's knowledge about infusion therapy .In order to facilitate this; the literature review was focused on the following aspects.

2.2 INTRAVENOUS MEDICATION ERRORS: -

Intravenous medication errors are frequent events. They are associated with considerable harm, but little is known about their cause's .The common errors in drug administration include poor handwriting of prescriptions, staff failing to

follow policy and poor communication (Cooper 1995, Williams 1996, Upton 2001).

Coombes et al (2005), performed a study about the prevalence of medication administration errors for continuous IV infusions and identify the variables that caused them and to quantify the probability of errors by fitting a logistic regression model to the data. The study was conducted on three surgical wards in Australia. Using a direct observational approach, six hundred and eighty seven observations were made, in which 124 (18.0%) have at least one medication administration error. The most common error observed was wrong administration rate. The median deviation from the prescribed rate was -4ml/hr (interquartile range – 75 to +33.8ml/hr). Errors were more likely to occur if an IV infusion control device was not used and as the duration of the infusion increased.

Cousins et al (2005), compare the preparation and administration of intravenous therapy in hospitals in three European countries for to observe medication errors and to gain a better understanding of these risks and the methods used in each country to manage them. By a single observer, the preparation and the administration of intravenous drugs were noticed in each country.824 doses were prepared and 798 doses administered .The product was either not labeled or incorrectly labeled in 43%, 99% and 20% of doses administered in the UK, German and French hospitals, respectively. The wrong diluent was used in 15, 49% and 18% of cases, respectively. At least one deviation from aseptic technique was observed among 100%, 58% and

19% of cases in the three countries. And concluded that uncontrolled risks in the intravenous systems were observed in these countries. Intravenous therapy must be regarded as a high-risk activity where the use of risk management procedures to minimize risk to patients is seen as high priority by all those involved with these duties.

Hoefel and Lautert (2006), aimed to analyze errors in nursing procedures in the use of cefepime. A direct observational survey was performed. 33 nursing assistants were observed and interviewed as they prepared and administered cefepime on 99 occasions. From that sample, 20 (20%) applications were performed correctly but 126 errors were observed in 79 cases (80%). The majority (62%) of errors detected were time (scheduled and rate) related. Trained personnel executed the procedure for diluting the solution better than non-trained personnel, but no other statistically significant effect related to the knowledge level of the personnel was detected. This study concluded that errors occurred during care of patients because lack of specific procedures, such as adequate planned rate of infusion and schedule time.

Fahimi et al (2008), contribute a study to determine the frequency of medication errors that occurred during the preparation and administration of IV drugs in an intensive care unit. The study was conducted in a 12-bed intensive care unit of one of the largest teaching hospitals in Tehran. Data were collected over 16 randomly selected days at different medication round times, between July and September 2006. A trained observer accompanied nurses during intravenous (IV) drug rounds. Medication errors were recorded

during the observation times of IV drug administration and preparation. Drugs with the highest rate of use in the intensive care unit (ICU) were selected. Details of the process of preparation and administration of the selected drugs were compared to an informed checklist, which was prepared using reference books and manufacturers' instructions. They observed a total of 524 preparations and administrations. The calculated number of opportunities for error was 4040. The numbers of errors identified were 380/4040 (9.4%). Of those, 33.6% were related to the preparation process and 66.4% to the administration process. The most common type of error (43.4%) was the injection of bolus doses faster than the recommended rate. Amikacin was involved in the highest rate of error (11%) among all the selected medications. It was found that the IV rounds conducted at 9:a.m. had the highest rate of error (19.8%). No significant correlation was found between the rate of error and the nurses' age, sex, qualification, work experience, marital status, and type of working contract (permanent or temporary). Since the investigator reported that errors are not detected and consequently not prevented. Administrators need to take the initiative of developing systems that guarantee safe medication administration.

Taxis and Barber (2003), determined the incidence and clinical importance of errors in the preparation and administration of intravenous drugs and the stages of the process in which errors occur. Study was performed in 10 wards in a teaching and non-teaching hospital. 249 errors were identified. At least one error occurred in 212 out of 430 intravenous drug doses (49%, 95% confidence interval 45% to 54%). Three doses (1%) had potentially severe

errors, 126 (29%) potentially moderate errors, and 83 (19%) potentially minor errors. Most errors occurred when giving bolus doses or making up drugs that required multiple step preparation .The rate of intravenous drug errors was high. Although most errors would cause only short-term adverse effects, a few could have been serious. A combination of reducing the amount of preparation on the ward, training, and technology to administer slow bolus doses would probably have the greatest effect on error rates.

Bruce and Wong (2001), made a study to determine the error rate during preparation and administration of parenteral medications by nursing staff and to propose strategies to reduce the error rate during parenteral administration. A direct observation technique was used. The investigator Bruce observed and recorded errors that occurred during the preparation and administration of parenteral medications on an admissions ward between 8.00am and 4.30pm from Monday to Friday for a 4-week period during December 1998. The staffs were told that the observer was timing the administration; therefore they were not aware of the true nature of the study. Drug administration was witnessed for a 4-week period providing 107 opportunities for error. 27 errors were observed which equated to an error rate of 25.2% [95% confidence interval (CI) 17.0 to 33.5%] including wrong time errors. Excluding wrong time errors, the most frequently occurring type of error, reduced the error rate to 10.3% (95% CI 3.8 to 14.9%). In the observed hospital, only nursing staffs were completed a training package is allowed to administer parenteral medications. And concluded that parenteral medication administration errors are common in the UK.

2.5 CONCLUSION: -

Infusion therapy is know an integral part of the majority of nurses professional practice (RCN, 2006). As nurses, we are responsible for maintaining our skills and knowledge in relation to all aspects of patient care (RCN, 2006). Although there are many complications associated with vascular assess devices (Docherty, 2006). Infection is one of the most serious complications that can result from the presence and use of a central venous catheter (Humar et al, 2000), however careful management of these devices can minimize the complications associated with infusion therapy. It is a complex process usually requiring the preparation of the medicine in the clinical areas before administration to the patient. Administration errors involving continuous IV infusions occur frequently. They could be reduced by more common use of infusion control devices and regular checking of administration rates.

Table 2.1 KEY TERMS USED FOR SEARCHING ARTICLES

Parenteral drug administration	4
Intravenous therapy	24
Medication errors	100
Medication safety education program	659
Errors commited by nursing technicians and assistants	99
A study to assess nurses knowledge about medication errors.	564
A study to assess nurses knowledge about infusion therapy	2
Reporting medication errors to improve patient safety	516

CHAPTER - 3

METHODOLOGY

3.1 INTRODUCTION: -

This chapter deals with the research approach, setting the sample and sampling techniques, development of tool, description of tool, pilot study, data collection procedure and plan for analysis.

3.2 RESEARCH APPROACH: -

The present study was an interventional study.

The objectives of the study are: -

- To identify knowledge about infusion therapy among Neuro- nurses.
- To find out knowledge about infusion therapy and to prepare a protocol for infusion therapy.
- Find out association between knowledge about infusion therapy and selected variables.

A descriptive survey approach was used.

3.3 SETTINGS: -

The study was conducted in the Sree Chitra Tirunal Institute for Medical Science and Technology, Thiruvananthapuram; an Institute of National Importance established by an Act of the Indian Parlament. It is an autonomous Institute under the administrative control of the Department of Science and Technology, Government of India. The study center was Tertiary level referral b specialty government hospitals. In Sree Chitra Tirunal Institute for Medical Science and Technology, Thiruvananthapuram, nursing staffs are selected on the basis of written exam and interview. The selection ensures intellectually bright nurses only to be selected as nursing staff of the institute.

3.4 SAMPLE AND SAMPLING TECHNIQUES: -

The sample was selected from the nursing staff working in Sree Chitra Tirunal Institute for Medical Science and Technology; Trivandrum. The size of the sample was fifty.

Sampling technique refers to process of selecting portion of nursing staff. In order to get a representation sample, purposive sampling technique was used for the present study. First prepared the master checklist of the nursing staff in order of duty roster Samples were taken from Neuro Surgical Intensive care Unit, Neuro Surgical Ward, Neuro Medical Intensive Care Unit and Neuro Medical Ward.

3.5 INCLUSION CRITERIA: -

Nursing staff working in Intensive Care Units and Wards of Sree Chitra Tirunal Institute for Medical Science and Technology, Trivandrum.

3.6 EXCLUSION CRITERIA: -

Nursing staff's working in Operation Theater, other departments, Central sterile supply departments.

3.7 DEVELOPMENT OF DATA COLLECTION TOOL: -

Data collection tool refers to instruments, which was constructed to obtain relevant data. An extensive review and study of literature and journal articles helped in preparing items for the tool. The investigator used Questionnaire as tool for the study Experts in Sree Chitra Tirunal Institute for Medical Science and Technology, Trivandrum, approved the tool. (See Appendix)

3.8 DESCRIPTION OF TOOL: -

The tool used in the present study consisted of the following parts.

Part-1

The part is socio Demographic data, which consist of age, sex, qualification, place of work, total year of experience.

Part-2

Using a questionnaire assessed knowledge. It consist of 15 questions on infusion therapy, it covers knowledge about infusion therapy, risk and complications, inotropes drugs, actions, calculations. The possible responses are Yes or No. Actual duration for completing the questionnaire was about 10 minutes.

3.9 PILOT STUDY: -

After obtaining permission from the authorities pilot study was conducted among the nursing students of Sree Chitra Tirunal Institute for Medical Science and Technology, Trivandrum. Pilot study was done in Aug 2009.The purpose of the study was to test feasibility of original tool.

3.10 DATA COLLECTION: -

For data collection formal permission was obtained from the authorities. The total period of data collection was from August to October 2009. The investigator first introduced her-self and explained the need and purpose of the study. Confidentiality of their responses was assured and consent was obtained from each nursing staff. The nursing staffs were given the structured tool to complete. The time taken for the completion was about 10 minutes.

3.11 PLAN OF ANALYSIS: -

The data were coded, entered in excel sheet for analysis. Descriptive statistics and present them in the form of tables and bar diagram.

3.12 SUMMARY: -

This chapter presented the research approach used for the study, design of the study, setting of the study, sample and sampling techniques, development of data collection tool, description of tool, pilot study, data collection procedure and plan for data analysis.

CHAPTER - 4

ANALYSIS AND INTERPRETATION OF DATA

This chapter presents the analysis and interpretation of the data collected from thirty-eight Neuro-nursing staff working at Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum. Fifty nurses were randomly selected for assessing the knowledge about infusion therapy among nurses. Questions were handed over to each of them individually. But only thirty-eight nurses completed the questionnaires and returned. Ten of them returned the questionnaires without answering. Remaining two nurses missed the questionnaires and didn't return it. Hence there were data from only thirty-eight questionnaires to be analyzed.

Analysis is a process of organizing and synthesizing data in such a way that project questions can be answered .The over all objective of analysis is to be organize, structure and to elicit answers from the assessment.

Interpretation is the process of making sense of the result and examining the implication of findings with in the broader content.

The findings of the study were analyzed and arranged under the following sections.

4.1 - Distribution of samples according to socio economic data

4.2 - Distribution of samples according to knowledge score.

4.3 – Comparison of mean, standard deviation and p value.

4.1 Distribution of samples according to socio- demographic data.

I –Distribution of samples according to age: -

The age of samples ranges from 21 to 50 with a mean age of 37.58, standard deviation of 7.92, median age of 38.5 and mode of 29.

Table 4.1 Distribution of samples according to age category.

N=38

AGE CATEGORY	FREQUENCY	PERCENTAGE
21-30 years	11	28.94%
31-40 years	13	34.21%
41-50 years	14	36.84%
Total	**38**	**99.99%**

Age categories were made based on the age distribution of samples so as to have a minimum number under each class .The data given in Table 4.1 shows that majority of samples belong the elder age category (41 -50 years).

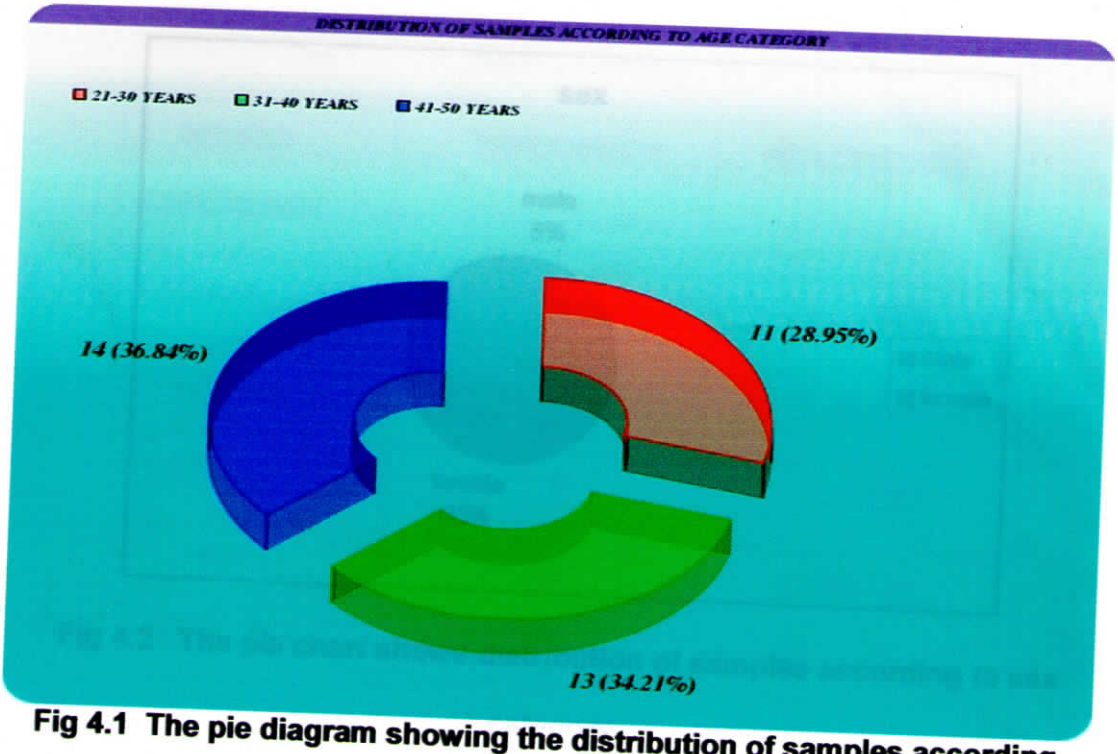

Fig 4.1 The pie diagram showing the distribution of samples according to age category.

II- Distribution of samples according to sex: -

The sex of samples categorized as male and female from 38 samples, out of which 36 females and 2 males were distributed.

Table 4.2. Distribution of samples according to sex category.

SEX	FREQUENCY	PERCENTAGE
FEMALE	36	94.74%
MALE	2	5.26%
TOTAL	**38**	**100%**

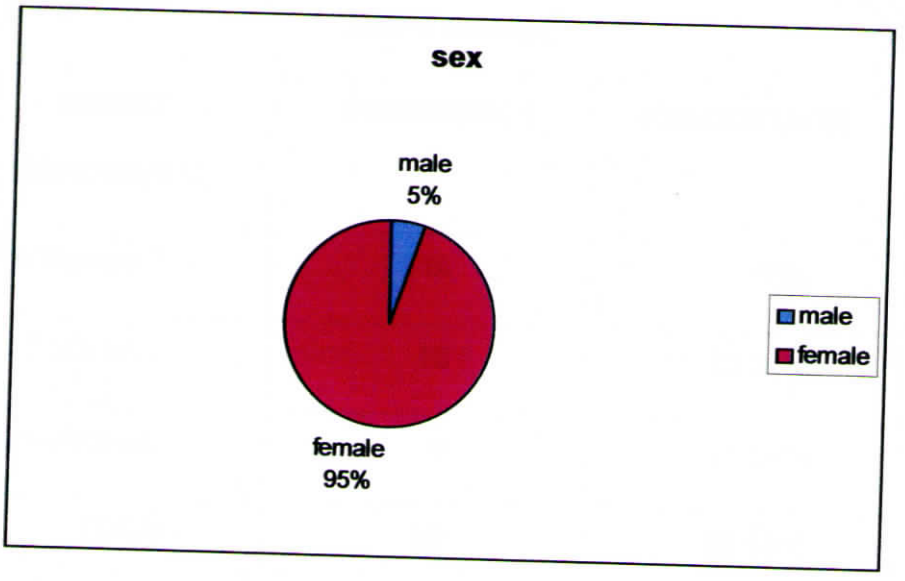

Fig 4.2 The pie chart shows distribution of samples according to sex category.

III - Distribution of samples according to years of experience in Neuro –nursing: -

Data collected from Neuro- staff with their Neuro-experience, which ranges from 1-30 years.

Table 4.3 Distribution of samples according to years of experience in Neuro nursing.

NEURO-EXPERIENCE	FREQUENCY	PERCENTAGE
1-10years	19	50%
11-20years	10	26.31%
21-30years	9	23.68%
TOTAL	**38**	**99.99%**

Data given in Table 4.3 shows that nineteen of them has 1-10 years of experience, ten of them have 11-20 experience and nine of them had 21-30 experience in Neuro nursing.

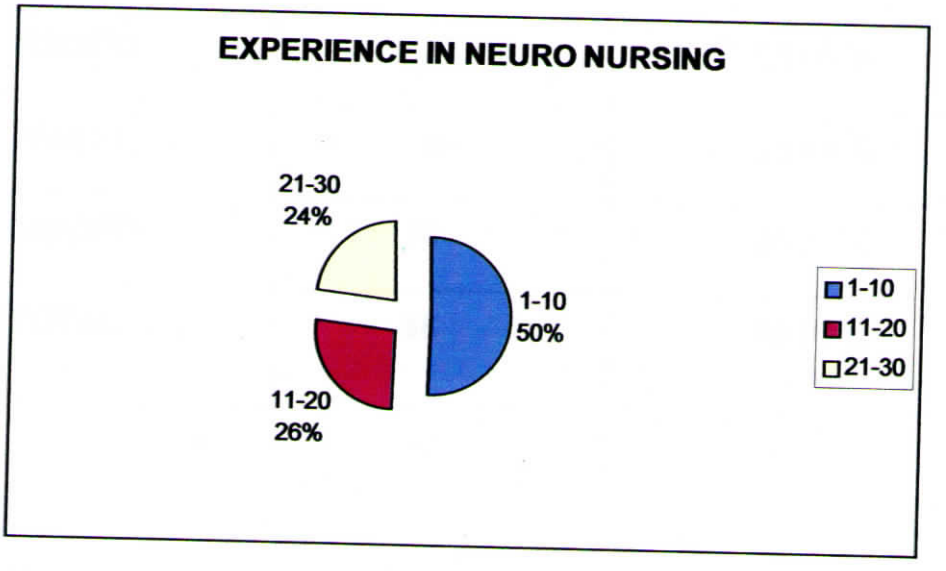

Fig 4.3 The pie diagram showing the distribution of samples according to experience in Neuro nursing.

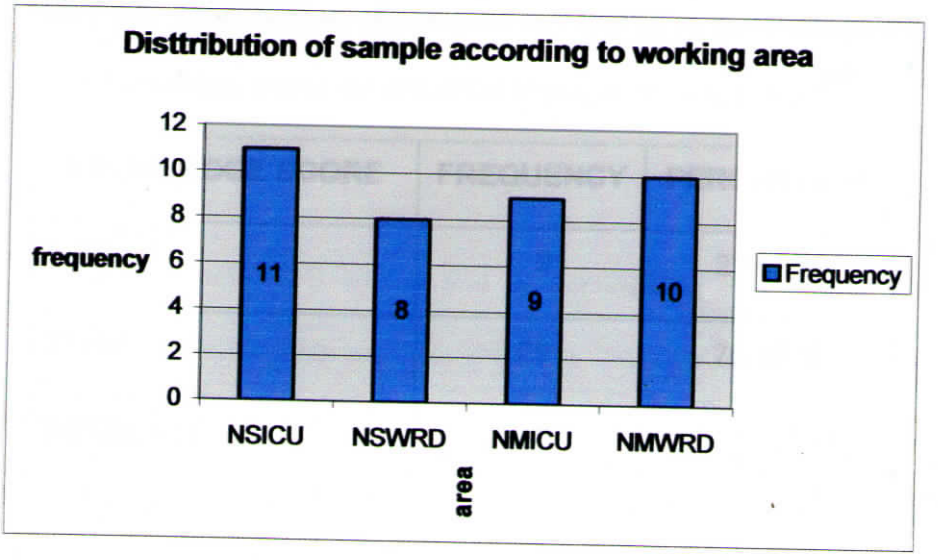

Fig 4.4 The bar diagram showing the distribution of samples according to working area.

4.2 Distribution of samples according to knowledge score: -

I - Distribution of samples according to percentage of knowledge score in an infusion therapy among nurses

There were fifteen questions in the knowledge test related to infusion therapy with the maximum score of fifteen. Total knowledge score obtained ranged from 5 –14 with a mean of 11.24, standard deviation of 1.97, median 11 and mode 11.This shows that the nurse have above average knowledge about infusion therapy .

knowledge score on infusion therapy among nurses.

KNOWLEDGE SCORE	FREQUENCY	PERCENTAGE
5 -10	9	23.68 %
11 -14	29	76.32 %
TOTAL -15	**38**	**100 %**

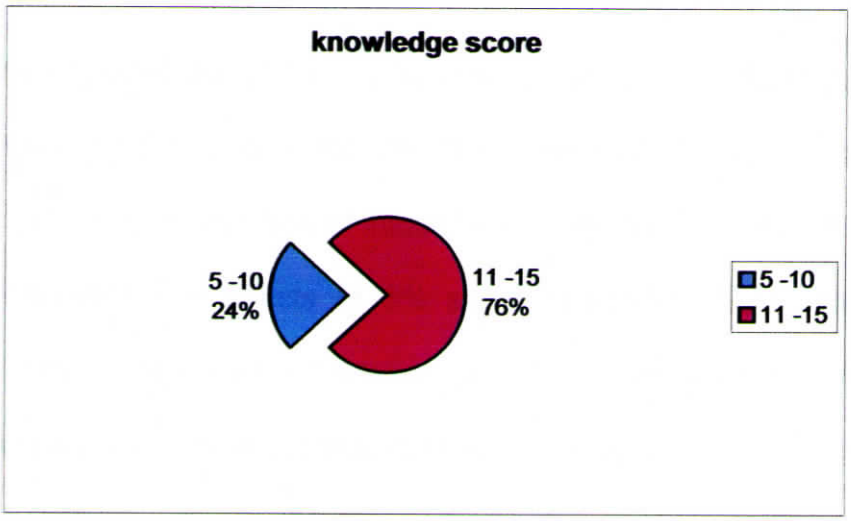

Fig 4.5 The pie charts shows the knowledge score of Neuro- nurses about infusion therapy.

IV -Distribution of samples according to working area: -

The samples were distributed among the NSICU, NSWRD, NMICU, and NMWRD. 28.94% of them working in Neurosurgical Intensive Care Unit, 21.05% of them were working in Neuro surgical Ward, 23.68% of them were working in Neuro Medical Intensive Care Unit, 26.31% of them were working in Neuro Medical Ward.

Table 4.4 Distribution of samples according to working area.

WORKING AREA	FREQUENCY	PERCENTAGE
NSICU	11	28.94 %
NSWRD	8	21.05 %
NMICU	9	23.68 %
NMWRD	10	26.31 %
TOTAL	**38**	**99.98 %**

II - Percentage of score in an area of knowledge about infusion therapy.

The data given in Table 4.6 shows the percentage of samples obtained in each item of the knowledge test on infusion therapy. Results shows that infusion therapy having potassium concentration in 10ml (86.84%), frequency of changing IV set (86.84%), effect of injection Phentolamine (92.11%), meaning of isotonic (94.74%), effect of Mannitol in head injury (92.11%); false statements- nitroprusside (92.11%), its average dose (84.21%); calculation of infusion rate in macro drip set (89.47%), calculation of infusion rate – inotropes (92.11%), calculation of infusion rate - mannitol (73.68%). They had average knowledge in effects of 3% saline (65.79%), most safe IV fluid (60.53%) and in flow rate calculation (57.89%). The samples had below average knowledge in physiological IV fluid (36.84%), precautions when client receiving dopamine infusion (21.05%).

Table 4.6 Percentage of knowledge about infusion therapy in each item of the knowledge test among Neuro nurses.

N =38

AREA OF KNOWLEDGE	FREQUENCY	PERCENTAGE
Meaning of isotonic.	36	94.74%
Effect of phentolamine.	35	92.11%
Effect of Mannitol in head injury.	35	92.11%
False statements -nitroprusside.	35	92.11%
Calculation of infusion rate -inotropes.	35	92.11%
Calculation of infusion rate in macro drip set.	34	89.47%
MEq Potassium concentration in 10ml of 15% KCl.	33	86.84%
Frequency of changing IV set.	33	86.84%
Average dose of nitroprusside.	32	84.21%
Calculation of infusion rate -mannitol.	28	73.68%
Effects of 3% saline.	25	65.79%
Most safe iv fluid in hyponatremia.	23	60.53%
Flow rate calculation.	22	57.89%
Physiological IV fluid.	14	36.84%
Precautions, when client receiving dopamine infusion.	8	21.05%

4.5 – Comparison of mean, standard deviation and p value: -

I- According to age: -

Table 4.7 Mean knowledge score according to age group.

AGE	MEAN	STANDARD DEVIATION	p -VALUE
21- 30 years	11.33	1.92	0.90
31- 40 years	11.4	1.43	
41- 50 years	11.06	2.35	

From age 21 - 30 years, knowledge score ranges from 6 - 13 with a mean of 1.33 ± 1.92. Age 31 - 40 years – knowledge score ranges from 9 - 14 with a mean of 1.4 ± 1.43. Age 41 - 50 years, knowledge score ranges from 5 - 14 with a mean of 11.06 ± 2.35. There is no statistically significant difference, all are at same range.

II – According to years of experience: -

Table 4.8 Mean knowledge score according to years of experience

YEARS OF EXPERIENCE	MEAN	STANDARD DEVIATION	p- VALUE
1- 10YEARS	11.37	1.61	0.58
11- 20YEARS	10.73	2.69	
21- 30YEARS	11.63	1.69	

From 1-10 years, knowledge score ranges from 6 - 13 with a mean of 11.37 ± 1.61. From 11- 20 years, knowledge score ranges from 5 - 14 with a mean of 10.73 ± 2.69. From 21 - 30 years, knowledge score ranges from 9- 14 with a mean of 11.63 ± 1.69`. The mean range is almost same.

III – According to areas: -

Table 4.9 Mean knowledge score according areas.

AREAS	MEAN	STANDARD DEVIATION	p - VALUE
NSICU	10.36	2.94	0.41
NSWRD	11.63	1.30	
NMICU	11.56	1.42	
NMWRD	11.60	1.35	

In NSICU, knowledge score ranges from 5 - 14 with a mean of 10.36 ± 2.94. From NSWRD, knowledge score ranges from10 - 13 with a mean of 11.63 ± 1.30. From NMICU, knowledge score ranges from 9 - 14 with a mean of 11.56 ± 1.42 and in NMWRD, knowledge score ranges from 10 - 14 with a mean of 11.60 ±1.35.The probability of this result is 0.41 (P= 0.41).Most of them at same range of mean.

CHAPTER – 5

SUMMARY, CONCLUSION, LIMITATION, DISCUSSION AND RECOMMENDATION

This chapter gives a brief account of the present study including conclusions drawn from findings and possible application of the results. Recommendations for further research and suggestion for improving the present study are also presented.

SUMMARY: -

This study was undertaken to assess the knowledge about infusion therapy among Neuro nurses, working in Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum.

The specific objectives of the study: -

1. To identify knowledge about infusion therapy among Neuro- nurses.
2. To find out knowledge about infusion therapy and to prepare a protocol for infusion therapy.
3. Find out association between knowledge about infusion therapy and selected variables.

Need for the study was that few studies done abroad reveal lack of knowledge among nurses about infusion therapy. Nurses face a lot of problems especially in Neuro Surgical intensive Care Unit about the calculation of flow

rate when giving 3% saline and ionotropic support. This study was an attempt to find out whether the nursing staff have adequate knowledge about infusion therapy.

A validated questionnaire was used for assessing the knowledge level of nursing staff. After the assessment the investigator explained and cleared doubts regarding infusion therapy.

The study was conducted in Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum, Kerala, during the period of August to October 2009. Neuro nurses were selected by purposive sampling. Among fifty samples, thirty-eight completely filled and returned the questionnaire and the remaining ten returned the questionnaire with out answering and two of them lost the questionnaire.

Major findings of the study: -

This study showed that Neuro nurses knowledge about infusion therapy is above average (11.24 / 15). There was no statistically significant difference between the mean knowledge score and age, experience and area of work.

DISCUSSION: -

In this study 15 items survey includes specific questions from intravenous infusions. A total 38 Neuro nursing staff responded to the survey. The data

given in Table 4.6 shows the samples had above average knowledge about infusion therapy. Study showed that Neuro nurses knowledge about infusion therapy is about 75% that is 11.25 / 15. Kazeem et al (2008), determined adequacy of knowledge and skills of drug dose calculations in children by medical students during their clinical attachment in paediatrics'. The investigator concluded that medical students lacked the basic knowledge of paediatric drug dose calculations. Studies have shown however that nurse's donot always have the necessary skills to calculate accurate drug dosages and are potentially administering incorrect dosages of drug to their patients (Hutton, 1998)

LIMITATION: -

The study was limited to Neuro nurses working in Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum.

CONCLUSION: -

Based on the findings of the study the following conclusions were drawn. Experiences in NSICU staff nurses have adequate knowledge about infusion therapy. The nursing staff has below average knowledge in flow rate calculations.

RECOMMENDATIONS: -

Staff nurses require additional knowledge about infusion therapy, but they have inadequate knowledge in flow rate calculations. Through a regular practice or protocol made the calculations easy. Regular in-service education program to the nursing staff on various aspects, techniques and skills of infusion therapy.

REFERENCES

Campbell, J. (1996). Intravenous Drug Therapy. *Professional Nurse*.11 (7), 437-42.

Weinstein, S. M. (1997). Plumers Principles and Practices of Intravenous Therapy 6th edition. J B Lippincott, Philadelphia.

Daniels, L.E. (1995). The Physical and Psychosocial Implications of Central Venous_Access Devices in Cancer Patients: a view of literature. *Journal of Cancer Care*, 4 , 141-5.

Hockey, J. et al (1995). Audit to Pinpoint I.V. Drug Administration Pitfalls. Nursing Times. 91(51), 33-4.

Kelly, L.J. (2008). The care of vascular access devices in community care. British journal of community nursing. 13(5). 98, 200,202.

Gabriel, J. (2008). Infusion therapy part one: minimizing the risk. *Nursing standard* (Royal College of Nursing (Great Britain). 22(31), 51-6.

Dennison, R.D. (2007). A medication safety education program to reduce the risk of harm caused by medication errors. *Journal of Continuing Education in Nursing*. 38(4), 176 –84.

Hoefel, H.H., Lautert. L. (2006). Errors committed by nursing technicians and assistants in administering antibiotics. *American Journal of Infection Control.* 34(7), 437- 42 .

Scarlet, C. (2006). Anaphylaxis. *Journal of Infusion Nursing.* 29(1), 39-44.

Santell, J. P., Cousins, D.D. (2005). Medication errors involving wrong administration technique. *Joint Commission journal on quality and patient safety / Joint Commission Resources.* 31(9), 528- 32.

Hicks, R. W., Becker, S. C. (2006). An overview of intravenous –related medication administration errors as reported to MEDMARX, a national medication error –reporting program. *Journal of infusion nursing.* 29(1), 20- 7.

Fahimi, F et al (2008). Errors in preparation and administration of intravenous medications in the intensive care unit of a teaching hospital: an observational study; *Australian Critical care: official journal of the confederation of Australian Critical Care Nurses.* 21(2), 110- 6.

Taxis, K., Barber .N. (2003). Ethnographic study of incidence and severity of intravenous drug errors. *British Medical Journal.* 326(7391), 684.

Bruce, .J., Wrong .I. (2001). Parenteral drug administration errors by nursing staff on an acute medical admissions ward during day duty. *Drug safety: an international journal of medical toxicity and drug experience.* 24(11), 855- 62.

Allan, E. L., Barker, K. N. (1990). Fundamentals of medication error research. *American journal of hospital pharmacy*. 47 (3), 555 –71.

Han, P. Y., Coombes, I. D., Green, B. (2005). Factors predictive of intravenous fluid administration errors in Australian surgical care wards. *Quality and Safety in Health Care*. 14(3), 179-84.

Wright, K. (2007). Student nurses need more than math's to improve their drug calculating skills. *Nurse Education Today*. 27(4), 278- 85.

Cook, L.S. (2003). IV fluid resuscitation. *Journal of Infusion Nursing*. 26(5), 296- 303.

Suarez, J.I .et al. (1999). Administration of hyper tonic (3%) sodium chloride /acetate in hyponatremic patients with symptomatic vasospasm following subarachnoid hemorrhage. *Journal of Neurosurgical Anesthesiology*. 11(3), 178 –84.

Barsoum, N., Kleeman. C. (2002). Now and then, the history of parenteral fluid administration. *American Journal of Nephrology*. 22, 284- 289.

Gregory, S., Martin. An update on intravenous fluids. (*external links*). Saline (mediine) http:/en.wikipeia.org/wiki/saline (medicine) on 15/09/09 at 2.45 pm.

Prough, D. S., Bidani, A. (1999). Hyperchloremic metabolic acidosis is a predictable consequence of intraoperative infusion of 0.9% saline (*dead link*) *Anesthesiology*. 90, 1247- 1249.

Amoore, J., Ingram, P. (2002). Quality improvement report: learning from adverse incidents involving medical devices. *British Medical Journal*. 325,7358,272- 275.

Carlisle, D., Upton, D., Cousins, D. (1996). Infusion confusion. *Nursing Times*.92, 48,48-49.

Cooper, M. C. (1995). Can a zero defects philosophy be applied to drug errors? *Journal of Advanced Nursing*. 21(3), 487- 491.

Cousins, D., Upton, D. (1996). Drug administration; that dreaded moment. *Nursing Times*.92, 38, 48- 49.

Department of Health (2000). An Organization with a memory: Report of an Expert group on learning from adverse events in the NHS. The Stationery Office. London.

Dougherty, L.Lamb, J (Eds) (1999). Intravenous Therapy in Nursing Practice.Churchill Livingstone, London.

Hutton, M. (1998). Numeracy skills for intravenous calculations. Nursing Standard.12, 43, 49- 52.

Moreno de Vegaa, M. J., Dauden, E., Abajo .P., Bartolome, B., Fraga. J., Garcia- Diez, A.(2002).Skin necrosis from extravasation of Vinorelbine. *Journal of the European Academy of Dermatology and Venerology.* 16(5), 488- 490.

NHS Lothian- University Hospitals Division (2002a). Shared Governance framework. LUHD, Edinburgh.

NHS Lothian- University Hospitals Division (2002b). Infection Control Policy Manual.. LUHD, Edinburgh.

NHS Lothian- University Hospitals Division (2002a). Intravenous Therapy Pre. LUHD, Edinburgh.

National Patient Safety Agency (2004). Patient Safety Alert. www.npsa.nhs.uk/site/media/documents/344_crashcall.pdf (last accessed: Jjuly 18 2005)

Pandya, S. (2007). Practical Guidelines on Fluid Therapy. 2nd edition. (full text). Chennai.

ANNEXURE

"A study to assess nurses knowledge about infusion therapy"

I. SOCIO DEMOGRAPHIC DATA

1. AGE : ☐ Years
2. SEX : ☐ Male ☐ Female
3. QUALIFICATION : ☐ GNM ☐ BSc(N) ☐ MSc(N)
4. ADDITIONAL QUALIFICATION IF ANY :
5. PLACE OF WORK : ☐ NSICU ☐ NSWRD ☐ NMICU ☐ NMWRD
6. TOTAL YEARS OF EXPERIENCE : ☐ YEARS

II. KNOWLEDGE TEST

Note : Select the best answer, and place a tick ( ) mark in the space provided. Total fifteen questions, each one carries one mark.

1. While monitoring a patient who is receiving an infusion of 3% Saline, the nurse should look for :

   [ ] A. Brady cardia
   [ ] B. Hypo tension
   [ ] C. Decreased skin tugor
   [ ] D. Fluid overload

2. Which is the most physiological IV fluid ?
   [ ] A. Normal Saline
   [ ] B. Ringer's Lactate
   [ ] C. Isolyte_p
   [ ] D. 3% Saline

3. To treat hyponatremia, which is the most safe IV fluid ?

[ ] A. 5% D

[ ] B. 5% D + 0.45 NaCl

[ ] C. 0.9% NaCl

[ ] D. 3% NaCl

4. Find out potassium concentration in mEq in 10ml ampoule of 15%KCL ?

[ ] A. 6mEq

[ ] B. 10mEq

[ ] C. 18.2mEq

[ ] D. 19.5mEq

5. For a patient receiving a vasoactive drug such as intravenous dopamine, which of the following actions by the nurse is most appropriate ?

[ ] A. Monitor the drip rate closely and adjust as needed

[ ] B. Assess the patients cardiac function by checking the radial pulse

[ ] C. Assess the intravenous site hourly to rule out infiltration

[ ] D. Administer the drug by intravenous bolus according to the patients blood pressure

6. To minimize the risk of phlebitis, the intra venous tubing's (line) should be changed every ---------- hours.

[ ] A. 10 – 12 hrs

[ ] B. 12 – 24 hrs.

[ ] C. 24 – 48 hrs.

[ ] D. 48 – 72 hrs.

7. When a patient has experienced infiltration of a peripheral infusion of dopamine, the nurse knows that injecting the α - blocker phentolamine (Regitine) will result in :

[ ] A. Local vasodilation

[ ] B. Local vasoconstriction

[ ] C. Local analgesia

[ ] D. Local hypotension

8. Which of the following describes the term "isotonic" ?

[ ] A. A solution that has the same concentration of sodium as does the cell.

[ ] B. The natural tendency for substances to flow from an area of higher concentration to an area of lower concentration.

[ ] C. A solution that has a higher concentration of potassium than does the cell.

[ ] D. A solution that has a lower concentration of sodium than the cell.

9. Mr. X is on ventilator with CMV mode 12. He is on sedation and muscle relaxents. The physician orders a continuous infusion of inj midazolan 5μg/kg/minute. (30 mg/50 ml) Calculate the flow rate in ml/hr ? (Wt – 25 kg).

[ ] A. 12 ml/hr

[ ] B. 12.5 ml/hr

[ ] C. 13 ml/hr

[ ] D. 13.5 ml/hr

10. Mannitol (osmitrol) is administered intravenously to a client admitted to the hospital with loss of consciousness and a closed head injury, which one of the following statement's shows the most effective outcome of this drug ?

[ ] A. Diuresis of 500ml in 2 hours and a blood urea Nitrogen (BUN) of 15 mg/dl.

[ ] B. Improved level of consciousness and normal intracranial pressure

[ ] C. Weight loss of 1kg and a serum creatine of 0.8 mg/dl.

[ ] D. Serum creatine of 1.2 mg/dl and normal intracranial pressure.

11. Which one of the following statements about Nitroprusside is wrong ?

[ ] A. Nitroprusside should be reconstituted with normal saline only.

[ ] B. Once reconstituted, nitroprusside deteriorate in light.

[ ] C. The syringe should be covered with silver foil.

[ ] D. It should be reconstituted with 5% Dextrose.

12. What's the average dose of nitroprusside for adults ?

[ ] A. 3 mcg/kg/minute

[ ] B. 5 mcg/kg

[ ] C. 0.2 mcg/kg/minute

[ ] D. 10 mcg/kg/minute.

13. The physician orders a continuous infusion of normal saline 800 ml/shift (8 hour). Calculate the infusion rate in macrodrip set (15 gtt) ?

[ ] A. 25 gtt/minute

[ ] B. 26gtt/minute

[ ] C. 27gtt/minute

[ ] D. 28gtt/minute.

14. Administration of dobutamine (Dobutrex) is ordered at 6 mcg/kg/minute by way of an infusion pump in a 75kg client. The concentration is 250 mg in 50 ml of dextrose 5% in water. What's the infusion rate in milliliters/hour ?

[ ] A. 5.4 ml/hour.

[ ] B. 6.4 ml/hour.

[ ] C. 7 ml/hour.

[ ] D. 8 ml/hour

15. Administration of Mannitol 100 ml over 20 minutes. Calculate the infusion rate in gtt/minute (assuming the use of 15 gtt/ml tubing) ?

[ ] A. 55 gtt/mt

[ ] B. 65 gtt/mt

[ ] C. 75 gtt/mt

[ ] D. 85 gtt/mt

PROTOCOL

FLUID THERAPY IN NEUROLOGICAL DISODERS

Basic principle of fluid therapy in patients with stroke, increased intra cranial pressure and meningitis are as follows.

1- Maintain euvolemia. Avoid hypovolemia and hypotension.

There is no evidence that fluid restriction improves cerebral oedema. So avoid fluid restriction, which can exacerbate volume depletion leading to an increased risk of cerebral ischemia. Mannitol is used in the management of elevated ICP. Mannitol acts as a diuretic and continuous use will inevitably lead to hypovolemia, and potentially hypotension and cerebral hypo perfusion.

2- Avoid hypotonic fluid and hypoosmolality.

Hypoosmolality can induce or aggravate cerebral oedema so avoid infusion of hypotonic fluid.eg:- 5%D, 0.45% saline.

RL is an appropriate fluid if volume of infusion is small. But avoid RL if large amount of fluid administration is required.

3 Isotonic Saline (0.9% NaCl), the ideal IV fluid.

4 Avoid Hyperglycemia.

Hyperglycemia enhances brain injury and break down of the blood brain barrier.

In patients with stroke, clinically hyperglycemia is associated with increased cerebral oedema and haemorrhagic transformation of infarct. So in immediate period after stroke, avoid dextrose containing fluid.

5 Achieve hypervolemia in vasospasm.

Adequate hydration is essential in prevention and treatment of vasospasm and cerebral protection from ischemic complications. Medical treatment of vasospasm consists of triple – H therapy: Hypervolemic, hypertensive and haemodilution therapy, which are aimed at optimizing cerebral blood flow in ischemic territories with impaired auto-regulation.

6 Restrict fluid in SIADH.

PREVENTING DRUG ERRORS IN IV THERAPY

THE FIVE RIGHTS: -

RIGHT PATIENT

RIGHT DRUG

RIGHT DOSE

RIGHT ROUTE

RIGHT TIME

INFORMATION REQUIRED BEFORE IV DRUG ADMINISTRATION

PATIENT: -

NAME

ID TAG

ALLERGIES

TREATEMENT CHART

THE DRUG: -

NAME

DOSE

EXPIRY DATE

SIDE EFFECTS

SAFETY POLICIES: -

DOUBLE CHECKING

INFECTION CONTRL

SHARPS DISPOSAL

CHARACTERISTICS OF IV FLUIDS

Characteristics	Type of fluids
Most physiological	Ringer lactate
Rich in sodium	Isotonic saline, DNS
Rich in chloride	Isotonic saline, DNS, Isolyte G
Rich in potassium	Isolyte M, Isolyte P & Isolyte G
Correct acidosis	Ringer lactate, Isolyte E, Isolyte M & Isolyte P
Correct alkalosis	Isolyte G
Caution use in renal failure	Ringer lactate, Isolyte E, Isolyte M, Isolyte G & Isolyte P
Avoid liver failure	Ringer lactate & Isolyte G
Glucose free	Isotonic saline & Ringer lactate
Sodium free	5% Dextrose, 10% Dextrose, 20% Dextrose & 25% Dextrose
Potassium free	5% Dextrose, 10% Dextrose, 20% Dextrose, 25% Dextrose, DNS & Isotonic saline

Guidelines for fluid management in neuro-surgical patients

- Aim is to keep patient normovolemic and normo or slightly hyper osmolar, at the same time ensuring normal sodium balance. Watch for brain related disorders like SIADH (characterized by euvolemia, hyponatremia and increased urinary osmolality), and cerebral natriuresis. (Cerebral salt washing syndrome).

- In general do not replace overnight the fluid deficit unless the patient has inadequate oral intake, vomiting or excessive urine loss. Remember that blood loss is difficult to quantify and third space losses generally are not significant during neuro surgery.

- When large volume of fluids are required in addition to isotonic saline use of Voluven solution or albumin can maintain iso-osmolality, so this avoids increase ICP without deterioration in blood composition.

- To assess hypo-volemia in neuro surgical patients clinical signs including hypotension tachycardia and a 10mmHg or greater inspiratory expiratory variation in systolic blood pressure with positive pressure ventilations useful.

Formula for Calculating Infusion Rate: -

$$\frac{\text{Total Volume (ml) x drop factor}}{\text{Times in min}} = \text{Flow rate in drops/min.}$$

$$\text{Infusion rate ml/ hr} = \frac{\text{Prescribed dose in mcg X body weight X60}}{\text{Drug concentration in microgram in 1 ml}}$$

{Concentration (mg/cc) X 1000 mcg/mg}

Drip rate into microgram /kg /mt

$$= \frac{\text{Drug concentration in microgram in 1 ml X infusion rate ml/ hr}}{\text{Body weight in kg X 60}}$$

To calculate rate using hours

$$\frac{\text{VOLUME}}{\text{HOURS}} = \text{ml/hr}$$

To calculate rate using minutes

$$\frac{\text{VOLUME}}{\text{MINUTES / 60}} = \text{ml/hr}$$

All calculations must be confirmed before use.