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Frequency of Intravenous Therapy Prescription in Primary Care

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Abstract

Introduction: **Intravenous (IV) rehydration therapy is frequently used to prevent or correct fluid and electrolyte imbalances when oral administration is either not possible or limited. IV therapy allows fluids to enter the bloodstream directly, bypassing the time required for oral administration. Fluid loss can result from surgeries, accidents, or common conditions like fever, vomiting, and diarrhea. In severe cases, such as acute renal failure, hyponatremia, hypercalcemia, acute pancreatitis, and sepsis, IV rehydration is a crucial part of treatment and can be life-saving, even without significant fluid loss.**

Aim: **This study aims to identify the perceptions of participating nurses regarding the prevalence and significance of prescribing and administering IV therapy in primary care.**

Methods: **This cross-sectional study was conducted in three Primary Health Care Centers (PHCCs) in Pristina from March 1 to March 31, 2024. Data were collected from a sample of 30 nurses, with 10 nurses from each PHCC. A self-administered, semi-structured questionnaire and an observational checklist prepared in Albanian and translated from English were used for data collection.**

Results: **The study revealed a high prevalence of IV therapy prescription for various groups of medications, primarily including rehydrating fluids, antibiotics, and anti-inflammatory drugs. Nurses reported that the use of these IV medications was particularly common in cases of acute infections and severe dehydration. This suggests that IV therapy plays an important role in symptom management and improving patient health in primary care, reflecting its widespread use in clinical practice to address urgent health needs.**

Conclusions and Recommendations: **The study concludes that IV therapy is an essential intervention in emergency cases, highlighting the need for further training of nurses in the correct prescription and administration of IV therapy to ensure patient safety and well-being in primary care.**

Keywords: **IV therapy, intravenous, prevalence, prescription, patients.**

I. INTRODUCTION

IV rehydration therapy is a procedure where a specifically formulated IV solution is administered through a tube connected to a needle inserted into a vein. IV solutions contain small amounts of salt (sodium chloride) or sugar (dextrose, glucose, or levulose) dissolved in sterile water. One of the most commonly used IV fluids is 0.9% normal saline, which contains sterile water and 0.9% sodium chloride. IV rehydration therapy is a simple and effective method for delivering fluids directly into the intravascular fluid compartment(Australian Commission Safety Quality Health Care, 2021).

However, sometimes an interprofessional team approach is required to achieve optimal fluid balance for patients. The type, amount, and rate of infusion of IV rehydration therapy can vary based on a patient's body composition, dehydration level, and cardiac output status, as well as clinical and hemodynamic parameters such as daily urine output or blood pressure. Consequently, prescribing fluids can be challenging, especially in patients with impaired homeostatic mechanisms, such as those with renal or heart failure, or in patients with ongoing excessive fluid loss (e.g., due to diarrhea)(RCN, 2023).

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Moreover, improper management of fluid assessment and monitoring is associated with adverse outcomes such as hyponatremia (serum sodium concentration less than 135 mmol/L), fluid overload, and hyperchloremic acidosis (pH less than 7.35 with increased chloride ions) due to inappropriate fluid composition and/or infusion rates/volumes. For example, despite the clear benefits of IV fluid therapy, excessive fluid administration can lead to various complications. Large volumes of IV fluids can be retained in the interstitial space, causing interstitial edema, impaired organ perfusion, possibly acute pulmonary edema, and increased mortality (Tatli et al., 2018).

Optimal fluid balance not only shortens hospital stays but can also reduce the incidence of postoperative complications, mortality, and negative outcomes associated with dehydration, such as acute confusion, constipation, urinary tract infections, fatigue, falls, and delayed wound healing, especially in older adults. Dehydration has also been linked to longer hospital stays, with an estimated annual cost of over $1.14 billion in 1999 for the primary diagnosis of dehydration(Ibrahim Mohamed et al., 2020).

All of this clearly underscores the importance of interventions aimed at improving hydration in adults. However, to date, no effort has been made to compile literature on the prevalence of IV rehydration therapy in hospital settings, and little is known about this, particularly for specific patient groups or populations. Information on the prevalence of IV rehydration therapy in hospital settings is highly significant for assisting hospital decision-making (procurement and medical practice), policy development, and medical guidelines (i.e., whether it is over- or underutilized). Therefore, in this systematic review, we provide an overview of the prevalence of IV rehydration therapy in hospital settings across pediatric and adult populations(Silva et al., 2023).

II. Literature Review Overview Of Iv Therapy

Intravenous (IV) fluid therapy is the fastest method to deliver fluids or medications directly into a vein. It is a common therapeutic aspect used to dilute drugs and maintain bodily fluids and is widely utilized in hospital settings. Maintaining fluid balance is a fundamental nursing practice as most hospitalized patients require IV fluid administration as part of their medical management. The type of fluids administered depends on the indication and their composition, which may be required for fluid replacement, resuscitation, medication administration, or maintenance hydration (Ridenour, 2019).

However, administering incorrect concentrations or types of IV fluids and errors in infusion rates can lead to clinical complications like heart failure or hypovolemia, potentially with fatal outcomes. Such issues are prevalent in nearly every public hospital. Despite these complications associated with IV fluid (IVF) imbalances, there are still nurses and midwives who do not practice proper administration methods. Thus, it is essential that nurses implement correct and safe IVF administration practices to provide patient care safely. IV fluid administration practices are significant and remain a fundamental component of patient care during hospitalization. Globally, around 25 million people receive IV therapy using an IV cannula, a routine but potentially harmful procedure in hospitals (Wiltshire, 2023).

Studies on interventions in the UK regarding IV fluid use among adult medical inpatients with acute illness have shown that using 0.9% sodium chloride solution compared to balanced fluid solutions can be a factor in hospital mortality rates. A study conducted on fluid balance chart completion across various departments of an Australian University Hospital highlighted a gap in the complete documentation of patients' fluid balance charts. Another study in Pakistan examined nurses' practices related to IV fluid administration using an observational checklist, with results showing that 35.10% failed to meet the criteria for checking fluid volume and type per doctor’s orders, and 36.06% did not correctly adjust the flow rate (C. Waitt & Waitt, 2004).

A similar study conducted at Sree Chitra University in Trivandrum found that the flow rate was accurately adjusted in only 43.33% of cases, and documentation of the start time was present in 50% of cases. Although IVF administration is the most common practice, its therapeutic role is often overlooked. Hospitalized patients are frequently administered IVF for extended periods, with many IVF prescriptions written hastily. In most cases, nurses do not verify the volume and type of fluid administered and do not adjust the flow rate accurately. Key reasons for poor practice include staffing shortages, lack of training, limited time, and a perceived lack of importance of the practice. This can lead to improper IVF composition, duration, and documentation, ultimately increasing morbidity for patients.

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History of Intravenous Therapy Development

The first recorded attempt to administer a therapeutic substance via IV injection was in 1492, when Pope Innocent VIII fell ill and was given blood from healthy individuals. However, this method failed, leading to the death of the donors without curing the Pope. This account is disputed by some who argue that the idea of blood transfusion would not have been considered by medical professionals at the time. A detailed description of blood circulation was only published over 100 years later, and inaccuracies in translation of documents from that era, or potentially a deliberate fabrication, are cited as reasons for this questionable account(C. J. Waitt et al., 2004).

One primary text on medical history for medical and nursing students asserts that the entire story was an antisemitic fabrication. In 1656, Sir Christopher Wren and Robert Boyle experimented with this concept. Wren reported, “I injected wine and ale into a living dog to the measure of its blood by vein, in good quantities, until I rendered it exceedingly drunk, but it soon recovered.” The dog survived, thrived, and was eventually stolen from its owner. Boyle credited Wren for this discovery(Charrois, 2012).

Richard Lower demonstrated that blood could be transfused from animal to animal and from animal to human, marking an early case of xenotransfusion. He collaborated with Edmund King to transfuse sheep’s blood into a mentally ill patient. Lower’s interest was in advancing science, but he also believed blood transfusion could potentially help people, either through the infusion of fresh blood or by removing old blood. Willing human participants were scarce, but one eccentric scholar, Arthur Coga, volunteered, and the procedure was conducted by Lower and King before the Royal Society on November 23, 1667. This transfusion gained some popularity in France and Italy but faced medical and theological opposition, leading to its eventual ban in France(Charrois, 2012). No significant therapeutic success with injection attempts was recorded until the 1800s when, in 1831, Thomas Latta studied the use of IV fluid replacements to treat cholera. The first widely-used solutions for IV injection were simple "salt-like solutions," followed by experiments with various other fluids, including milk, sugar, honey, and egg yolk. In the 1830s, English obstetrician James Blundell used IV blood administration to treat women experiencing excessive bleeding during or after childbirth, predating blood type understanding and leading to unpredictable outcomes(C. Waitt & Waitt, 2004).

Intravenous rehydration therapy is widely used to prevent or correct issues with fluid and electrolyte status when oral administration is not possible or is impaired. IV fluids enter directly into the bloodstream, bypassing the delay associated with oral rehydration. Fluid loss can result from surgery, accidents, or common conditions like fever, vomiting, and diarrhea. Furthermore, in some cases requiring hospitalization, such as acute kidney failure, hyponatremia, hypercalcemia, acute pancreatitis, and sepsis—which are more common in adults—IV rehydration is a critical part of treatment and can be life-saving, even if there is no fluid loss(Wiltshire, 2021).

III. Problem Statement

The practice of prescribing IV fluids in hospitals is frequently delegated to junior staff members, who often lack the necessary experience and knowledge to make appropriate prescriptions. Previous studies have shown that up to 89% of IV fluid prescriptions are managed by junior doctors.

However, achieving the optimal fluid balance for patients sometimes requires an interprofessional team approach. The type, amount, and infusion rate of IV rehydration therapy can vary depending on each patient’s body composition, level of dehydration, and cardiac output status, as well as clinical and hemodynamic parameters like daily urine output or blood pressure. Consequently, fluid prescription can be challenging, especially for patients with impaired homeostatic mechanisms, such as those with renal or heart failure, or in patients experiencing ongoing excessive fluid loss (e.g., due to diarrhea).

IV. Study Methodology

An institution-based cross-sectional study was conducted with nurses from three primary healthcare centers (PHCs) in Prishtina from March 1 to March 31, 2024.

A total of 30 nurses participated in the study, with 10 from each PHC. A self-administered, semi-structured questionnaire and an observational checklist prepared in Albanian were used as tools for data collection. The questionnaire was translated from English to Albanian and back-translated to English by two language experts.

The questionnaire consists of three sections, adapted with modifications from previous, similar studies and IV therapy prescription guidelines.

The first section focuses on the socio-demographic characteristics of respondents, including gender, age, and educational qualifications.

The second section consists of questions related to factors affecting IV therapy administration practices, including duration of service, in-service training, work unit, workload, time constraints, supervision, incentives, and other relevant aspects.

The third section contains 10 questions designed to assess the nurses' knowledge related to IV fluid administration practices.

The observational checklist includes 10 items to evaluate nurses' practices concerning IV fluid administration. In the knowledge questionnaire, each correct answer scores one point, while incorrect answers score zero.

With ethical approval from the PHCs and permission from the study settings, the researcher first introduced and explained the study's purpose to hospital managers. Data collectors then met with nursing staff to explain the study objectives and data collection procedures. Participants were informed that the study was not an audit of their work and would not be linked to performance evaluation. Those who agreed to participate were asked to sign a consent form. Data were collected only from participants who signed consent, using the pre-tested, self-administered questionnaire and the observational checklist from March 1 to March 31, 2024. To minimize bias, initial observation was conducted for selected participants in both assessments (self-administered questionnaire and observational checklist) while they were practicing. Data collectors explained to participants that they would be observed during IV therapy administration.

V. Presentation of Results

The data were exported to the SPSS statistical software (version 23) and were subsequently checked, cleaned, and analyzed. Descriptive statistics were performed to describe the relevant variables, and the results were presented in tables. Bivariate analysis was conducted to identify variables significantly associated with IV therapy administration practices among nurses. Those variables with a p-value less than 0.25 in the bivariate analysis were included in the multiple logistic regression analysis. No multicollinearity of independent variables was detected, as the standard error was < 1. A multiple logistic regression analysis was then conducted for those factors that showed a statistically significant relationship in the bivariate analysis, investigating independent predictors while controlling for potential confounders. The Hosmer-Lemeshow statistic was 0.42, which is not significant, while the Omnibus test yielded a p-value of 0.00, indicating statistical significance. Finally, variables with a p-value less than 0.05 in the logistic regression were considered statistically significantly associated. The crude odds ratio (COR) and adjusted odds ratio (AOR), along with a 95% confidence interval (CI), were calculated to measure the strength of the association between the outcome and independent variables. Descriptive statistics were calculated for the observational part.

Socio-Demographic Characteristics and Work-Related Factors of Study Participants

In this study, participants ranged in age from 20 to 65 years. Among them, 17 were male, representing 34%, while 33 were female, accounting for 66%. Regarding educational qualifications, 5 respondents (10%) had a high school diploma, 31 (62%) held a bachelor's degree, 11 (22%) had a master's degree, and 3 (6%) held a doctorate. In terms of age distribution, 12 participants were in the 20-25 age group (24%), 15 were aged 26-30 (30%), 13 were aged 31-35 (26%), and 10 were aged 36-40 (20%).

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Gender	N	%
Male	4	24.0
Female	26	76.0
Education	**N**	**%**
Higher Education.	2	10.0
Bachelor	20	62.0
Master	6	22.0
PhD	2	6.0
Age Group	**N**	**%**
20-30 Age	4	24.0
30-40 Age	15	30.0
41-51 Age	6	26.0
51-65 Age	5	20.0

Do you have information about intravenous therapy	N	%
Yes	26	73.00
No	2	07.00
I don't know	2	20.00
Total	30	100.00

Respondents' Statements on Their Knowledge of Intravenous Therapy

From the detailed analysis of the chart above, we see that 73% of respondents believe they have general knowledge about intravenous therapy, 7% believe they do not have knowledge about intravenous therapy, while only 20% of respondents stated that they do not know.

Do you think that every healthcare professional should have knowledge of intravenous therapy?	N	%
Yes	23	77.00
No	3	10.00
I don't know	4	13.00
Total	30	100.00

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Respondents' Declarations on Healthcare Professionals' Knowledge of Intravenous Therapy

From the above graph, we see that approximately 77% of respondents believe that every healthcare professional should have knowledge of intravenous therapy, while 10% do not think that all healthcare professionals need to be knowledgeable about intravenous therapy. Additionally, 13% chose the option "I don't know.

Do you have sufficient experience in administering intravenous therapy	N	%
Yes	27	90.00
No	2	7.00
I don't know	1	3.00
Total	30	100.00

Respondents' statements regarding their experience in administering intravenous therapy

From the graph above, we see that approximately 90% of respondents believe they have sufficient experience in administering intravenous therapy. Meanwhile, 7% do not have a positive opinion on this matter, and 3% declare that they do not know.

Is the prevalence of intravenous therapy application high in the Primary Health Care Centers in Pristina	N	%
Yes	25	83.00
No	2	07.00
I don't know	3	10.00
Total	30	100.00

Respondents' Statements on the Prevalence of Intravenous Therapy Application in the Primary Health Care Centers in Pristina

In analyzing the above chart, we see that 83% of respondents believe that the prevalence of intravenous therapy application in the Primary Health Care Centers in Pristina is high, while 7% believe that the prevalence is not high, and 10% express that they have no opinion on this issue.

Are there differences in the description of intravenous therapy among different age groups?	N	%
Yes	22	61.00
No	4	11.00
I don't know	4	28.00
Total	30	100.00

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Respondents' statements regarding the differences in the description of intravenous therapy among age groups

In analyzing the data regarding the differences in the description of intravenous therapy among age groups, we find that 61% of the respondents believe there are differences in the description of intravenous therapy based on the patient's age, 11% have a negative opinion regarding this matter, while 28% stated that they do not know.

Are there differences in the description of intravenous therapy among different diagnoses?	N	%
Yes	20	67.00
No	6	20.00
I don't know	4	13.00
Total	30	100.00

Respondents' Statements on Differences in the Description of Intravenous Therapy Among Different Diagnoses

In the description and analysis of the data from the overall chart, we observe that 67% of respondents affirm that there are differences in the description of intravenous therapy among different diagnoses. Meanwhile, 20% indicate that they have no knowledge about this issue, while 13% state that they do not know and have no information regarding the differences in the description of intravenous therapy among various diagnoses.

VI. CONCLUSIONS AND RECOMMENDATIONS

Intravenous (IV) fluid administration is the most common invasive procedure widely practiced in hospital settings. Globally, approximately 25 million people receive intravenous fluid therapy. Various factors influence nurses' practices in IV fluid administration, which can impact patient outcomes and increase morbidity and mortality rates. Previous studies indicate that healthcare providers, particularly in developing countries, have skill gaps regarding IV fluid administration.

Intravenous fluid therapy is the fastest way to deliver fluids or medications directly into the bloodstream. It is a common aspect of therapy used for medication dilution and maintenance of body fluids, and it is widely utilized in hospital environments. Maintaining fluid balance is a fundamental nursing practice, as most hospitalized patients require intravenous fluid administration as part of their medical management.

The type of fluids administered depends on the indication and their composition. These may be required for fluid replacement, resuscitation, medication delivery, or maintenance hydration. However, administering incorrect concentrations or types of intravenous fluids and errors in the rate of administration can lead to clinical complications such as heart failure or volume depletion, which can be fatal. Such problems are almost common in every public hospital. Despite these complications related to IV fluid imbalance, there are still nurses and midwives who do not practice the correct methods of fluid administration. Therefore, it is crucial for nurses to implement proper and correct IV administration practices to provide safe patient care.

Recommendations:

Training and Education: Regular training sessions should be conducted for healthcare professionals to enhance their knowledge and skills in IV fluid administration and to address the existing gaps in practice.

Standardized Protocols: Establishing and implementing standardized protocols for IV fluid administration can help minimize errors and complications associated with improper practices.

Continuous Monitoring: Regular audits and monitoring of IV administration practices should be undertaken to identify areas for improvement and ensure compliance with established protocols.

Interprofessional Collaboration: Encouraging collaboration between different healthcare professionals can enhance communication and ensure a holistic approach to patient care regarding IV therapy.

Patient Education: Providing education to patients about IV therapy and its importance can empower them to be active participants in their care, ensuring they understand the process and can report any concerns.

Conclusions of the Study

In this research, a total of 30 nurses participated, of which 4 were male (34%) and 26 were female (66%). Regarding their educational levels, 5 respondents (10%) held a high-level education, while 31 others (62%) had a bachelor's degree. Additionally, 11 respondents (22%) held a master's degree, and 3 respondents (6%) had a doctorate.

Knowledge of Intravenous Therapy: 73% of the respondents believe they possess general knowledge about intravenous therapy, while 7% feel they lack knowledge, and 20% stated they do not know.

Importance of Knowledge for Healthcare Professionals: 77% of the respondents believe that every healthcare professional should have knowledge of intravenous therapy, while 10% do not think this is necessary, and 13% chose the option of not knowing.

Experience in Intravenous Therapy Application: 90% of respondents consider themselves to have sufficient experience in applying intravenous therapy, with 7% expressing a negative opinion on this issue, and 3% stating they do not know.

Prevalence of Intravenous Therapy in QKMF Pristina: 83% of the respondents believe that the prevalence of intravenous therapy application in QKMF Pristina is high, while 7% do not think the prevalence is high, and 10% have no opinion on the matter.

Differences in Intravenous Therapy Prescription by Age: Regarding differences in the prescription of intravenous therapy.

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