
The Effect Of Using The Diva Score Screening On The Success Of IV Insertion In The Pediatric Ward Unit Of M Hospital, Jakarta

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Abstract

IV insertion is an invasive procedure that can cause complications such as pain, anxiety, and trauma. In the Pediatric Ward Unit of M Hospital, Jakarta, IV insertion failures still occur in children, often due to factors like small vein diameters, non-linear vein shapes, and thinner, more fragile vein walls. The DIVA score was developed and is used as a guideline to determine the success rate of intravenous insertion. This study aims to analyze the effect of using the DIVA score screening on the success rate of IV insertions in the Pediatric Ward Unit of M Hospital, Jakarta. A quasi-experimental design with a control group was employed. The study population consisted of 36 pediatric patients aged 0-13 years in the Pediatric Ward of M Hospital, Jakarta. Data collection was carried out through observation by filling in the DIVA Score observation sheet. The study results that IV insertion without using the DIVA score screening, 8 respondents (44.4%) succeeded with one attempt, 7 respondents (38.9%) succeeded after two attempts, and 3 respondents (16.7%) succeeded after more than two attempts. In contrast, for IV insertion using the DIVA score screening, all 18 respondents (100%) succeeded with just one attempt. There is a significant difference in the success rate of IV insertion when using the DIVA score screening, with a p-value of $0.000 \leq 0.05$. It is recommended that the DIVA score be implemented comprehensively, especially in units that frequently deal with patients at risk of difficult venous access.

Keywords: IV Insertion, DIVA Score, Difficult Veins, Insertion

INTRODUCTION

IV insertion is a collaborative nursing procedure performed by nurses to administer fluids or medication directly into the venous blood vessels in large quantities and for extended periods using an infusion set. IV insertion in children when admitted to the hospital can cause prolonged trauma (Zannah, et al., 2015). IV insertion can also lead to infections and pain due to repeated needle punctures. This results in anxiety and trauma, causing children to resist the IV insertion procedure (Hartini, 2015). IV insertion is essential in children for nutritional or medication needs through parenteral routes and to maintain fluid and electrolyte balance. Parenteral nutrition is a form of nutrition provided directly through the bloodstream without passing through the digestive tract (Kemenkes, 2019). The difficulty of IV insertion in neonates is caused by their small vein size, and the limited expertise of professional nurses in inserting IVs in babies often leads to repeated punctures (Hastuti et al., 2021). Complications from IV insertion procedures and the administration of fluids through an IV include a stinging or painful sensation (Pramesti, 2018).

IV access can be established through peripheral or central veins, depending on the patient's needs. However, failure often occurs when attempting IV access, due to anatomical issues, clinical conditions, and the skill of the medical personnel performing the procedure. This procedure is performed on over 70% of hospitalized patients and is necessary during pediatric hospital care (Perdana, et al., 2020b). Ensuring patient safety during clinical practice requires quick and effective venous access, especially in emergencies and for all anesthesia procedures. Inhalational anesthesia is often administered to pediatric patients undergoing anesthesia procedures worldwide to facilitate access to IV insertion. However, in certain situations, this is not feasible, particularly in procedures conducted outside the operating room. One of the purposes of IV insertion is to administer medications, fluid therapy, transfusions, and contrast agents for imaging procedures.

In a study conducted in a pediatric hospital by Larsen et al. (2023), of 592 patients who underwent IV insertion, more than 50% succeeded after two or more attempts, with an average of 2.1 attempts. A similar study by Reigart et al. found that only 48% of patients succeeded in obtaining IV access on the first attempt. This highlights the difficulty of obtaining peripheral access during the early stages of IV insertion. Patients may experience challenges and trauma due to repeated injections, which can also result in more severe pain and potentially lead to complications such as hematoma and an increased risk of infection (Reigart, et al., 2022).

The Effect Of Using The Diva Score Screening On The Success Of IV Insertion In The Pediatric Ward Unit Of M Hospital, Jakarta

The DIVA score is based on four proportional variables, including age, vein visibility after tourniquet application, vein palpability after tourniquet application, and a history of prematurity (gestational age at birth <38 weeks) (Yen, et al., 2018). Each predictor variable is assigned a point value, with a total score ranging from 0 to 10. The Difficult Intravenous Access (DIVA) scale has been developed and used as a guideline in several studies to determine the success rate of IV insertion.

Preliminary studies conducted in the Pediatric Ward Unit of M Hospital, Jakarta, revealed that the number of patients each month is quite high. According to quality indicator data for IV insertion incidents of more than 2 attempts in 2024, over the past three months, 41 patients required IV insertion between April and June 2024, with 17 patients in April 2024, 17 patients in May 2024, and 7 patients in June 2024. Almost all of these patients underwent IV insertion. The difficulty of insertion in children is often due to their smaller vein diameter compared to adults, as well as non-linear vein shapes and thinner vein walls, which complicate the procedure. Therefore, the researcher is interested in conducting a study titled "The Effect of DIVA Score Screening on the Success Rate of IV Insertion in the Pediatric Ward Unit of M Hospital, Jakarta."

MATERIALS AND METHODS

The research design used in this study is a quasi-experimental design with a control group. The study population consisted of pediatric patients aged 1-13 years in the ward unit, with an average of 41 children per month. The sampling technique applied in this study was purposive sampling, with the inclusion criteria as follows: 1) Pediatric patients requiring IV insertion. 2) Aged 1-13 years. 3) Obtained informed consent from parents or guardians. The exclusion criteria were: 1) Children with certain medical conditions (e.g., severe edema or vascular abnormalities). 2) Children with a history of extensive IV insertion (more than four insertion attempts). 3) Children undergoing medical treatments, such as vasoconstrictor medication use.

The sample consisted of 36 children, divided into two groups: 18 children for the control group and 18 children for the intervention group. The dependent variable in this study was the success rate of IV insertion, while the independent variable was the DIVA Score Screening. The instruments used in this study were: 1) A respondent characteristic sheet covering age and gender. 2) A DIVA score observation sheet, which included the observation of IV insertion based on five

The Effect Of Using The Diva Score Screening On The Success Of IV Insertion In The Pediatric Ward Unit Of M Hospital, Jakarta

indicators: history of prematurity, age, vein visibility, vein palpability, and skin color. 3) The IV insertion SOP sheet used at M Hospital, Jakarta. Data analysis was conducted using the Mann-Whitney test.

RESULT

Table 1. Frequency Distribution of IV Insertion Success Without DIVA Score Screening in the Pediatric Ward Unit of M Hospital, Jakarta (n = 18)

Insertion Attempt	Number of Respondents	Percentage (%)
1 attempt	8	44.4%
2 attempts	7	38.9%
> 2 attempts	3	16.7%
Total	18	100%

Based on Table 1, regarding the success of IV insertion without using DIVA score screening, out of 18 respondents, 8 (44.4%) succeeded with 1 attempt, 7 (38.9%) succeeded after 2 attempts, and 3 (16.7%) succeeded after more than 2 attempts.

Table 2. Frequency Distribution of IV Insertion Success Using DIVA Score Screening in the Pediatric Ward Unit of M Hospital, Jakarta (n = 18)

Insertion Attempt	Number of Respondents	Percentage (%)
1 attempt	18	100%
Total	18	100%

Based on Table 2, regarding the success of IV insertion using DIVA score screening, all 18 respondents (100%) succeeded with 1 attempt.

Table 3. Effect of Using DIVA Score Screening on the Success Rate of IV Insertion in the Pediatric Ward Unit of M Hospital, Jakarta (n = 18)

Variabel	1 insertion	2 insertion	> insertion	p-value
Control	8	7	3	0.000
Intervention	18	0	0	

The statistical Mann-Whitney test results showed a p-value of 0.000 ($p\text{-value} \leq 0.05$), indicating that H_a is accepted, meaning there is a significant difference in the success rate of IV insertion when using DIVA score screening in the Pediatric Ward Unit of M Hospital, Jakarta.

DISCUSSION

Frequency Distribution of IV Insertion Success Without DIVA Screening

In this study, 8 respondents (44.4%) succeeded with one attempt, which suggests that most nurses or healthcare providers involved have sufficient skills to perform the insertion without the assistance of the DIVA screening tool. However, the results also show that some respondents required more than one attempt (38.9% with two attempts and 16.7% with more than two attempts), possibly reflecting the challenges in locating a suitable vein.

Previous research supports these findings, where the success of IV insertion is often influenced by the clinical experience and techniques used by medical personnel. A study by Fields et al. (2014) revealed that using aids such as ultrasound or DIVA screening can increase the success rate on the first attempt, especially in patients with difficult venous access (Fields, 2014)). However, in situations where such tools are unavailable, clinical experience and the skill of the healthcare provider become the primary determining factors.

Another study by Gorski et al. (2016) also emphasized the importance of clinical experience in improving IV insertion success rates. They found that more experienced nurses tend to have higher first-attempt success rates compared to less experienced nurses, even without tools like DIVA screening.

IV insertion requires good knowledge and skills to identify the right vein, particularly in patients with conditions like obesity, dehydration, or small and unclear veins. Ideally, the first attempt should succeed to reduce pain, tissue trauma, and infection risk. However, factors such as subcutaneous tissue thickness, skin color, and the condition of the patient's veins can affect the success of the procedure.

The results of this study show that despite not using DIVA screening, the success rate for the first insertion was relatively high at 44.4%. However, significant challenges remain, with 38.9% requiring two attempts and 16.7% more than two. This indicates a need for improved technical

skills and possibly the consideration of using aids in certain situations to reduce the frequency of repeated insertions.

Frequency Distribution of IV Insertion Success Using DIVA Screening

The study results, showing 100% success on the first attempt with the use of DIVA screening, demonstrate the effectiveness of this method in clinical practice. These results reflect not only advances in medical technology but also highlight the importance of evidence-based approaches in patient care requiring venous access.

Research by Schoenfeld et al. (2018) supports these findings, showing that the use of DIVA screening can improve IV insertion success rates in patients with difficult venous access. In this study, patients identified through DIVA and then given appropriate interventions (such as ultrasound use) showed significant improvement in first-attempt success rates compared to the control group.

Additionally, Fields et al. (2014) reaffirmed that technologies like DIVA enable early identification of patients with potential venous access difficulties, allowing for the use of more advanced techniques like ultrasound guidance or selecting alternative, more accessible veins. This study found that IV insertion success rates on the first attempt increased significantly when screening technology was used compared to procedures without screening.

DIVA screening is a method used to identify patients at high risk of experiencing difficult venous access before IV procedures are performed. This tool helps healthcare providers determine more effective strategies, such as using ultrasound or choosing veins that are easier to access. By conducting early identification, the likelihood of multiple insertion attempts can be minimized, not only improving patient comfort but also reducing the risk of complications such as phlebitis or infection. The results showing 100% success on the first attempt with the use of DIVA screening confirm the importance of this technology in clinical practice, particularly in patients at high risk for difficult venous access. DIVA screening not only helps in choosing the right technique but also minimizes risks associated with multiple insertions, such as tissue trauma, infection, and increased patient pain.

Effect of Using DIVA Score Screening on IV Insertion Success Rates

The Mann-Whitney statistical test results showing a p-value of 0.000 confirm that using the DIVA score has a significant positive effect on clinical outcomes. In the context of this study, these results demonstrate that the use of DIVA screening can positively impact IV insertion success rates, reduce the number of required insertion attempts, and decrease complications that may arise from repeated insertions.

Research by Fields et al. (2014) supports these findings, showing that the use of DIVA screening significantly increases IV insertion success on the first attempt compared to a control group without screening. In that study, patients identified through the DIVA score as high-risk were given special interventions, such as ultrasound use, which significantly increased insertion success.

Additionally, a study by Sebbane et al. (2013) also demonstrated that the DIVA score is an effective predictor for identifying patients with difficult venous access. This study confirmed that using the DIVA score allows medical personnel to prepare better, ultimately increasing first-attempt IV insertion success and reducing complications such as hematoma or phlebitis.

DIVA (Difficult Intravenous Access) screening is a tool used to assess and identify patients likely to experience difficulty during IV insertion (Schmidt, et al., 2022). This tool combines various risk factors, including the patient's physical condition, such as obesity, dehydration, and vein characteristics, to provide a risk score that healthcare providers can use to predict challenges in venous access (Eren, 2022). By using this screening, healthcare providers can take preventive steps, such as using specific techniques or tools (e.g., ultrasound), which can significantly improve first-attempt success rates (Perdana, et al., 2022a).

According to the researchers, using the DIVA score screening has a significant impact on IV insertion success rates. This study confirms that the DIVA score is an effective tool in predicting potential challenges during IV insertion and can help nurses choose the most appropriate strategy for each patient. Furthermore, this success is not only important for improving healthcare efficiency and effectiveness but also for reducing patient trauma, avoiding repeated insertions, and minimizing the risk of complications.

CONCLUSION

A total of 8 respondents (44.4%) succeeded with one IV insertion, 7 respondents (38.9%) succeeded with two insertions, and 3 respondents (16.7%) succeeded with more than two insertions. All 18 respondents (100%) succeeded with one IV insertion. This was because the healthcare staff understood and were able to coordinate effectively; if a DIVA score greater than 4 was detected, the IV insertion was performed by the scheduled insertion team. There is a significant difference in the success rate of IV insertion between those using the DIVA score screening and those not using it in the Pediatric Ward of M Hospital, Jakarta, with a p-value of 0.000 (≤ 0.05).

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AUTHOR'S CONTRIBUTION

Cholisah Suralaga as a principal investigator, conceptualised and designed the study, prepared the draft of the manuscript, conducted the study; Masniati Br Sidabalok as reviewed the manuscript, conceptualized and designed the research, provided advice on data analysis and data interpretation; Andi Mayasari Usman did the data analysis and interpretation; drafted the manuscript conducted research studies and assisted in drafting the manuscript.

DECLARATION OF CONFLICTING INTERESTS

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