



Original Article

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## IV Team Efficiency in Establishing Difficult Peripheral Cannulation at Dubai Hospital

### Abstract:

**Introduction:** Peripheral intravenous cannulation is the most common invasive procedure performed in hospitals. An expert- in first attempt cannulation would avoid failed or repeated attempts and evade delay in diagnosis, initiating treatment and care. Dubai Hospital being the regions one of the multispecialty hospital formulated an IV Team under the umbrella of VAT Nurses consisting of 21 nursing staff selected from different specialties across the hospital as per their skillfulness and experience in establishing difficult IV access.

**Objectives:** To build team in establishing difficult peripheral intravenous access and achieve success at first attempt cannulation.

**Methodology:** Retrospective analysis of the compiled data from august 2018 to July 2019 statistically analyzed in SPSS.

**Results:** The team achieved an overall success rate of 92.7% in Dubai Hospital for establishing difficult intravenous access. The overall success rate among the pediatric population is 87% and adult cannulation success rate is 94%. With 23%, prevalence in pediatric population, the first-attempt PIVC insertion success rate is 71%, 26% required a second attempt, 1.3% needed three attempts to achieve an intravenous access, and a 2% failure rate. Similarly, prevalence of 77% adult population had 75% success rate in first-attempt PIVC insertion, 22% requiring a second attempt, 3% needing three attempts to achieve an intravenous access. 50.8% of cannulation was by IV team members and 49.2% by VAT nurses, vein-viewing technology used in 46.7% of the cohort. The team faced a total failure rate of 7.2%, those cases were referred to anesthesiologist.

**Conclusion:** The formulation of IV Team has substantiated their effectiveness in insertion with very difficult cannulations at first attempt, minimize patient discomfort, complications and enhance patient satisfaction. Building focused teams in hospitals affect positively on the patient experience and improve outcomes.

**Key Words:** IV Team; Efficiency; Peripheral Cannulation; Dubai; Hospital; Retrospective Study.

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### Introduction

Peripheral intravenous cannula placement is the first choice of vascular access device (VAD) for stabilizing patients admitted to hospitals, with an estimated prevalence of up to 85% ,yet failure rates for first-time peripheral cannulation attempts are

surprisingly high. The procedure of peripheral intravenous cannulation is performed routinely in daily clinical practice, while the first attempt to obtain an intravenous access is not successful in every patient .Studies conducted among adults in emergency settings reveal up to one quarter – 26% – of first-insertion

attempts fail as mentioned by Lapostolle et al. 2007. Findings for pediatric patients are even more alarming: up to half – 51% of first-insertion attempts fail across diverse settings as per Hess, 2010. When a peripheral IV catheter insertion fails, caregivers and health care institutions traditionally have accepted it as necessary additional work to be performed. However, it is far more than this to the individual patient who is already affected by the illness being treated. A failed IV catheter means pain, dissatisfaction, prolongation of care, and venous depletion, compounded by the need to treat minor and severe IV catheter failure-related sequelae. Struggles with obtaining and maintaining peripheral IV access too often adversely affect a patient's overall hospital experience.

First-time peripheral intravenous cannulation peripheral intravenous cannulation success rates in the literature are varied and range from 18 to 98%<sup>1-3</sup>. A recently published systematic review and meta-analyses reported a failure rate of up to 30% on the first attempt of peripheral intravenous cannulation with the conventional approach<sup>7</sup>. This conventional approach of peripheral intravenous cannulation involves visual inspection and palpation of the extremity to locate a vein, followed by a needle puncture and catheter insertion<sup>8-10</sup>.

Intravenous access can be difficult to obtain with history of difficult PIVC insertion experience. Patient factors associated with higher failure rates include clinical factors like hypovolemia, recent chemotherapy, intravenous drug use and anatomical factors such as extremes of body mass index; skin shade; and the number, presence and size of visible and palpable veins. An expert- in first attempt cannulation would avoid failed or repeated attempts, which evade delay -in diagnosis, - initiating treatment and care. Identification of the presence of a difficult intravenous access prospectively, however, can possibly lower the incidence of a failed first attempt of inserting a peripheral intravenous catheter and improve patients' outcomes<sup>4</sup>. Substantial health benefits could be achieved by avoiding unnecessary central catheters placements<sup>6</sup>.

It is acknowledged that two failed attempts constitutes a difficult PIVC insertion, and this, together with the limited availability of senior clinicians, means repeated failed attempts prior to more senior intervention is commonplace<sup>11-13</sup>.

Dubai Health Authority mandate is to continuously develop the Dubai Hospital sector so it can deliver the best healthcare services to the Dubai residents and visitors, aiming to fully transform Dubai into a leading healthcare destination, inspired and aligned with the UAE vision 2021 to be among the best countries in the world.

Dubai Hospital is a multi-specialty hospital offering services to adult, pediatric and neonatal populations with centers of excellence in oncology /hematology, renal hemodialysis, cardiology and cardiothoracic surgeries, infusion centers. The need to initiate specialty teams services accountable for inserting short peripheral catheters with success rate for cannulation on the first attempt, was driven to improve patient safety and outcomes.

## Methodology

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Dubai Hospital being the regions one of the best multispecialty hospital, proudly holds the title to initiate the first Nurse led Vascular Access Team service. An IV Team formulated under the umbrella of VAT Nurses, aimed to improve success in difficult peripheral cannulation and improve patient outcomes. The Team consists of 21 nursing staff selected from different specialties across the hospital as per their skillfulness and experience in establishing difficult IV access. The selected staff underwent training on difficult IV access through educational sessions related to vascular access, orientation to the standards, practices and data collection record. Skill stations with hands on training for IV cannulation with and without use of vein viewer was organized. An IV pathway built on the criteria of visibility and palpability of vein including identified risk, number of attempts with an escalation pathway. After two attempts, if an access is

not established the primary nurse will contact the VAT Nurses/ IV Team for their service. Participants included both inpatients and outpatients of all ages, gender, physical status, demographics, and medical history. Retrospective analysis of the compiled data from august 2018 to July 2019 statistically analyzed in SPSS. The data consisted of variables: the number of attempts required for establishing an access among the pediatric and adult population, whether the attempt was successful or not. The cannulation performed by IV team members or VAT nurses. Vein site, size of cannula and the use of vein viewing technology has been included.

## Result

**Figure 1: Success rate in establishing difficult IV access in different groups.**

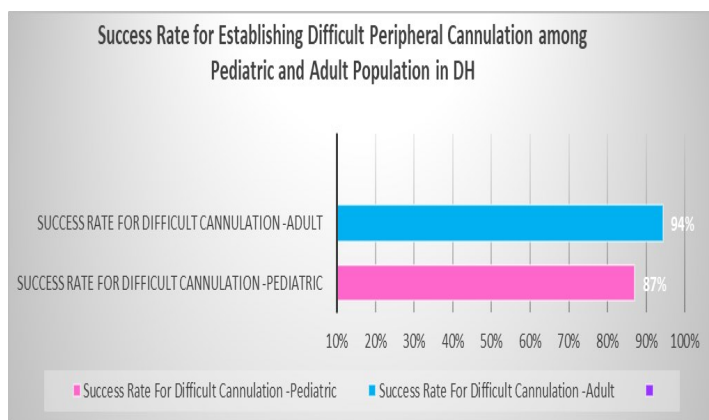


Figure 1 shows that the team achieved an overall success rate of 92.7% in Dubai Hospital for establishing difficult intravenous access. The overall success rate among the pediatric population is 87% and adult cannulation success rate is 94%.

**Figure 2: Number of cannulation attempts required to place an IV access.**

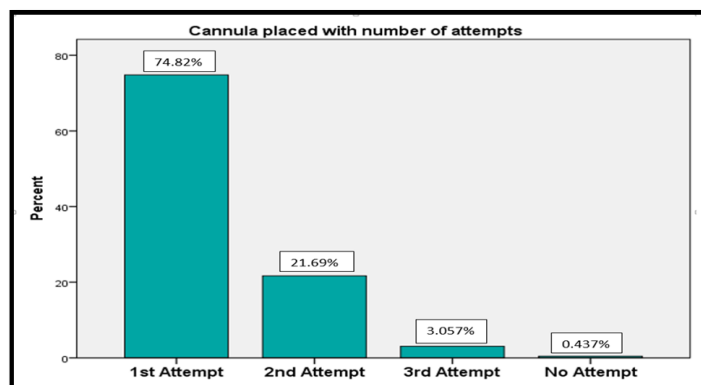


Figure 2 shows that the success rate of first attempt cannulation was 74.8 % ( 687 participants). Second attempt was needed in 115 participants (21.6%), whereas 12 participants (3.05%) needed a third attempt to create an intravenous access. A no attempt classified with refusal of cannulation. Data regarding the procedure intravenous cannulation is shown in the graph below, in which a distinction is made between the group of patients with a successful first attempt, and those with a failed first attempt of peripheral intravenous cannulation.

**Figure 3: Success rate of IV cannulation attempts among pediatric population**

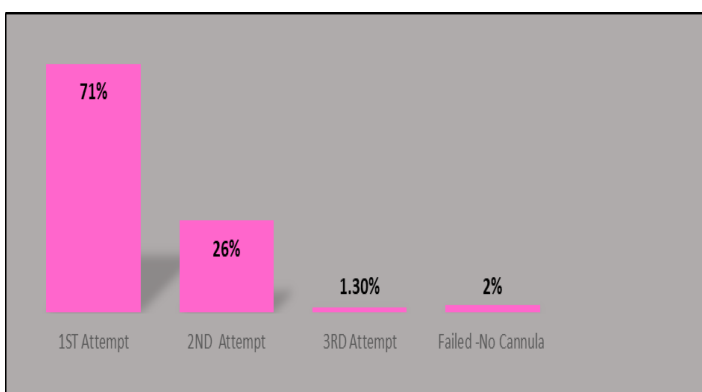
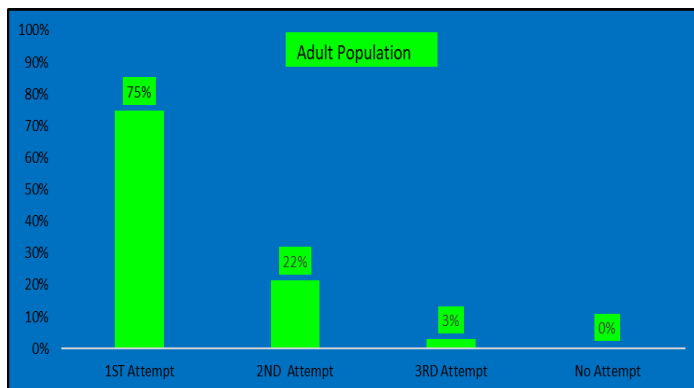


Figure 3 shows that Among the pediatric population there was a 71% first-attempt PIVC insertion success rate, with 26% requiring a second attempt, 1.3% needing three attempts to achieve an intravenous access, with a 2% failure rate .

**Figure 4 – Success rate of IV cannulation attempts among adult population**



Similarly, Figure 4 shows that the adult population has 75% success rate in first-attempt PIVC insertion, 22% requiring a second attempt, 3% needing three attempts to achieve an intravenous access.

Figure 5: Incidences of difficult IV cannulation among pediatric and adult group.

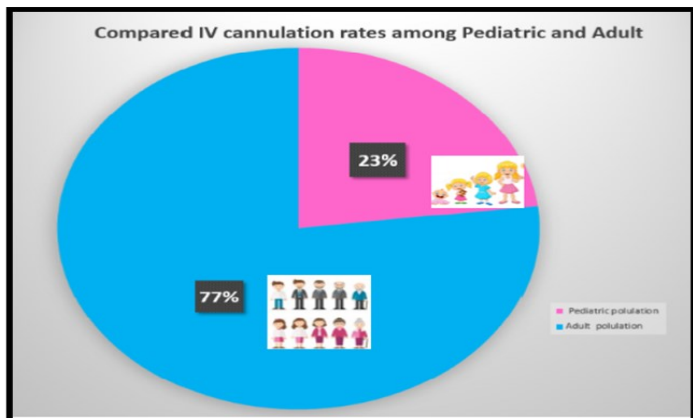


Figure 5 shows that out of the total number of attempted cannulation, 23% was pediatric group aged 0 to 12 years and 77% in adult population.

Figure 6: Different Gauges of Cannula used to maintain IV access.

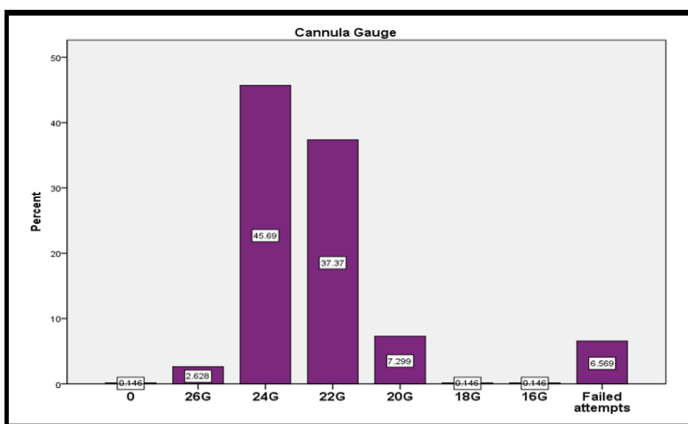


Figure 6 shows that vein viewing technology used in 46.7% of the cohort. 24 gauge in 45.6% and 22 gauge in 37.3% cannula was used, which support the standard smaller gauge to bigger vein cannulation to establish access in difficult cannulation.

Figure 7: Different Cannula Gauges used for establishing an access.

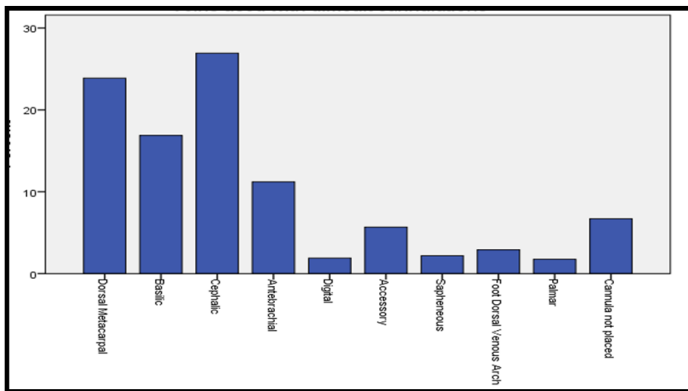


Figure 7 shows that the veins of upper extremity have been preferred for cannulation, and the frequently used veins for cannulation were cephalic, dorsal metacarpal, basilic and antebrachial veins; the digital and palmar veins were opted in the very extremes of an unavailable access. The frequent cannulation of dorsal venous arch and saphenous veins were done for the pediatric patients.

Figure 8: Units with frequency of IV Team service for difficult cannulation.

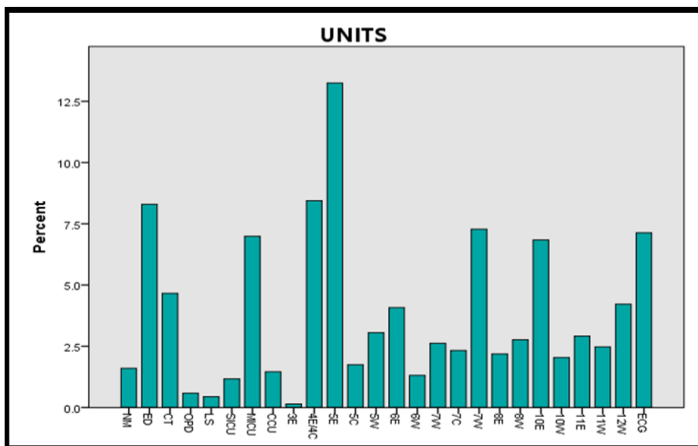


Figure 8 shows that the units who called for frequent cannulations were female surgical with 13%, emergency department and pediatrics units with 8% and female medical unit, hematology and ECG department with almost 7.5% respectively. The most challenging cannulations were done in pediatric oncology /hematology, adult oncology and CT department due to patient factors, recent chemotherapy, skin abnormality, chronic disease that affects the vessel health.

Figure 9: Rate of IV cannulation done by VAT & IV Team

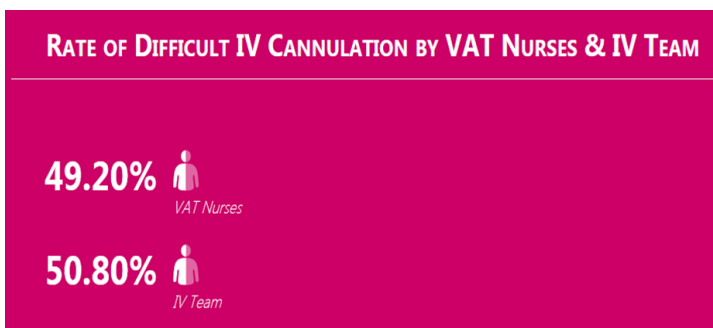


Figure 9 shows that the total number of cannulations by the IV team members and VAT Nurses were 687, of which 50.8% by the IV team members and VAT nurses cannulated 49.2%.

The team faced a total failure rate of 7.2%, those cases were referred to anesthesiologist, who choose to create an access through the external jugular vein, or opted for central venous access insertion as per the patient hemodynamic status and MRP decision.

## Conclusion

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Prospective identification of factors and patients at high risk for failure of peripheral intravenous cannulation creates a possibility to apply additional techniques in an earlier timeframe, possibly resulting in effective and efficient use of those techniques<sup>6</sup>. Professionally skilled hands with the efficient use of IV pathway and vein viewer (vein lite) enhanced service; increasing patient happiness enrooted with evidence based nursing standards. The IV Team at Dubai Hospital has proved their effectiveness in insertion with very difficult cannulations. Successful, cannulations at first attempt boost practitioner satisfaction minimize patient discomfort, complications and enhance patient satisfaction.

## Discussion

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The team achieved an overall success rate of 92.7% where a first-attempt success rate was 74.8 %, which is similar to the previous studies done in the emergency setting by Sebbane et al (79%) and Lapostolle et al (74%)<sup>1-9</sup>. Our strength lies with an 87% of success rate in attaining difficult access for pediatric patients, with 70.7% cannulations placed in first attempt, which is far above the international rates where up to half (51%) of first-insertion attempts fail. There is minimal data published on pediatric population first attempt success rate. Dedicated teams for difficult cannulation could affect hospital efficiencies by reducing waste (products used and the cost of repeat attempts) and an improved patient experience.

## Recommendation

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Peripheral intravenous cannulation success would be improved if clinicians with greater procedural experience, skills and an

increased perception of the likelihood of success performed the insertion. Hence, this document supports building of teams focused in inserting difficult intravenous cannulation in hospitals that could affect positively on the patient experience and improve outcomes. Pediatric population can immensely benefit from such teams.

## Acknowledgement

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