STUDENTS’ PERCEPTION OF THEIR KNOWLEDGE ABOUT PERIPHERAL INTRAVENOUS CANNULATION AT A PRIVATE MEDICAL UNIVERSITY IN SEREMBAN, NEGERI SEMBILAN, MALAYSIA

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Abstract

Background: Health care providers must have knowledge inserting and maintaining intravenous (IV) infusion. It is a prerequisite to actually be skillful and competent in view of ensuring safe and quality care are delivered to the patients. To perform it, conceptual knowledge is an elementary requirement. Thus, the teaching must focus on cognitive and psychomotor aspects.

Objectives: The aim of this study was to determine the semester 6 undergraduate medical students’ knowledge level about peripheral intravenous cannulation (PIVC) at a private university in Seremban, Negeri Sembilan, Malaysia, after they have undergone the teaching and learning session.

Materials and Methods: This is a cross-sectional descriptive quantitative study using self-administered questionnaire. Section A consists of four socio-demographics items. Section B comprised of 17-items of True/False questionnaire related to knowledge in PIVC.

Statistical Analysis: Data was analysed using Statistical Packages for the Social Sciences (SPSS). Socio-demographics were analysed for frequency, mean, and standard deviation (SD). Chi-square test was utilised to identify any significant association between socio-demographics and knowledge in PIVC.

Results: 69 medical students participated. 100% (n=69) respondents were aware about self-introduction, clarification of patient's identity, obtaining verbal consent, and hand hygiene importance. Majority (98.6%, n=68) have the knowledge to clean insertion site before performing procedure, aseptic technique maintenance, and gloves donning. 53.6% (n=37) respondents were not aware that 18-gauge cannula was commonly used in adults for PIVC. The knowledge level will be measured using the McDonald’s standard of learning outcome. Overall, 40.6% (n=28) respondents has high knowledge about PIVC. There is no significant association between socio-demographics and knowledge about PIVC.

Conclusions: Majority of the semester 6 undergraduate medical students in a private medical university in Seremban, Negeri Sembilan, Malaysia, had high knowledge about PIVC. Teaching contents by the nurse tutors can be improved to provide sufficient theoretical knowledge in order to produce doctors with great quality, confidence and calibre.

Keywords: Perception, Knowledge, Peripheral intravenous cannulation, Medical student, University.
1 INTRODUCTION

Health care providers, be it a doctor, a nurse, or even medical student or nurse student, must have the required knowledge in order to function professionally while carrying out any clinical procedures. It is a prerequisite to actually be skillful and competent in view of ensuring safe and quality care are delivered to the patients. One of the important clinical skills that should be developed is placing and maintaining intravenous (IV) infusion. As cited by Mohd Ghazali and Arbaee (2013), annually, approximately 60% of the inpatients will undergo peripheral IV cannulation to enable them to receive therapeutic therapy intravenously (p. 3).

To gain competency in performing any procedural skills, most medical education literature recorded that having conceptual knowledge is an elementary requirement (Katowa-Mukwato & Banda, 2014, p. 1895). As stated by Miller (1990), in Miller’s Pyramid, out of four levels, the first two levels at the bottom are more to cognitive. The base represents the field “Knows” which means the student has fact-based knowledge of a particular skill. At the second level, the student “Knows How” that particular skill is executed theoretically. Cognitive includes explanation on what the procedure is, the indications and contraindications, where it is performed which involves anatomical composition, and its principles. The last two levels on top concentrate more in psychomotor. Thus, to ensure procedural skills are taught effectively, teachers or medical educators should focus on both cognitive aspect of the procedure and the psychomotor component (p. S63).

1.1 Statement of the Problem

In the modern medicine world, millions of patients are receiving IV therapy. IV therapy is a method of parenterally administering fluids and additives into a vein (Timby & Smith, 2014, p. 143). In view of this, one of the many essential clinical skills that a health care provider must develop is placing and maintaining intravenous cannulation (PIVC). The cannula is a small and hollow plastic like device that is inserted by advancing it over a sharp rigid stylet or needle that penetrates into a peripheral vein through the skin.

The health care providers’ approach and understanding in peripheral intravenous cannulation (PIVC) are very crucial. It is one of the most common invasive procedures that are usually performed for therapy in order to maintain or restore fluid and electrolyte balance when there is inadequacy or impossibility of oral replacement. This includes fluid infusion, blood transfusion, administration of medication, and nutritional support. However, when the integrity of the skin is compromised by usage of any venous access such as needle and cannula, the patient shall be at risk for infection as the vein wall has been traumatised. Some examples are phlebitis, infiltration, and thrombus formation (Timby & Smith, 2014, p. 152). Thus, the health care providers including interns, nurses, medical students, and nursing students, must possess latest knowledge in practising PIVC for safe clinical practice.

As per evidence-based guidelines, adequate knowledge and skills are required in order to carry out this PIVC procedure (Cicolini, Simonetti, Comparcini, Labeau, Blot, Pelusi, & Di Giovanni, 2013, p. 2583). Though there is no explicit consensus on how clinical evaluation or assessment shall best be attain, it is vital to ensure these students are well equipped with required knowledge and skills at the end of each course (Cant, McKenna, & Cooper, 2013, p. 163).

Although there is a proper guideline in PIVC for all categories of health professional, its effectiveness of implementation in the clinical area has received comparatively small attention (Ho, Liew, & Tang, 2016, p. 183). Excluding various patient-related factors accounting for peripheral IV cannula-related complications, knowledge deficiency in peripheral IV cannula management is also known as one of the reason for it to occur (Cicolini et al., 2013, p. 2584). As such, the rate of associated complications with regards to PIVC is on the rise, and definitely affects the patients’ safety.

1.2 Purpose of the Study

The researchers would like to identify whether the semester 6 undergraduate medical students are equipped with theoretical knowledge in managing a patient or client who requires PIVC after they have undergone the teaching and learning session.

Description of the conducted teaching session

IV cannulation has been introduced to the undergraduate medical students in the university while they were in semester 5 (pre-clinical year). Once entering the clinical phase, the medical students will have an interactive teaching and learning session on this topic that is conducted by the Clinical Skills & Simulation Centre (CSSC) nurse tutors during Internal Medicine posting in semester 6 of their third year. The didactic approach is to teach theoretical knowledge using Microsoft PowerPoint presentation slides where the nurse
tutor will deliver information about the indications and contraindications of PIVC, the instruments used in the procedure such as basic parts of intravenous cannulas and its different diameter and gauges, the relevant anatomy such as common sites and suitable veins selection for PIVC, expected outcome of PIVC, benefits and risk complications of PIVC, IV infusion calculation, IV drug calculation, the significance of safe technique and methodical approach to PIVC, the importance of self-introduction to the patient prior to PIVC, obtaining informed consent, and documentation post procedure. The nurse tutor using teaching aid such as upper limb training manikin (medium-fidelity simulator) then demonstrates the taught procedure and showed equipment that is required for PIVC. The medical students will then be given some time to practice the procedure on the limb-training manikin in small groups of five to six.

1.3 Research Objectives

The specific objectives of this study are:

1. To determine the semester 6 (third year) undergraduate medical students’ perception of their knowledge about peripheral intravenous cannulation (PIVC) at clinical campus of a private university in Seremban, Negeri Sembilan.

2. To determine whether there is an association between socio-demographics data and the semester 6 (third year) undergraduate medical students’ perception of their knowledge about PIVC at clinical campus of a private university in Seremban, Negeri Sembilan.

1.4 Research Questions

1. What is the semester 6 (third year) undergraduate medical students’ perception of their knowledge about PIVC at clinical campus of a private university in Seremban, Negeri Sembilan?

2. Are there any significant association between socio-demographics data and the semester 6 (third year) undergraduate medical students’ perception of their knowledge about PIVC at clinical campus of a private university in Seremban, Negeri Sembilan?

1.5 Hypotheses

Research hypotheses of the study are:

H0: There is no association between socio-demographics data and the semester 6 (third year) undergraduate medical students’ perception of their knowledge about PIVC at clinical campus of a private university in Seremban, Negeri Sembilan.

H1: There is significant association between socio-demographics data and the semester 6 (third year) undergraduate medical students’ perception of their knowledge about PIVC at clinical campus of a private university in Seremban, Negeri Sembilan.

1.6 Significance of the study

The researchers aimed to explore the undergraduate medical students’ perception of their knowledge about PIVC. The findings obtained can later act as a guide towards improving the teaching contents of PIVC. The findings will also be disseminated to the respective nurse tutors of CSSC for improvement of teaching and learning in order to attain the university’s assignment and commitment of becoming a centre of excellence for the undergraduate programme in medicine.

2 LITERATURE REVIEW

Although there is a proper guideline in PIVC for all categories of health professional, its effectiveness of implementation in the clinical areas has received comparatively small attention (Ho, Liew, & Tang, 2016, p. 183). Whilst the fundamental of PIVC is taught in the clinical skills laboratory to most medical students, their level of understanding may vary. In the policy statement of the Department of Health, Government of Western Australia (2017) entitled Insertion and Management of Peripheral Intravenous Cannulae in Western Australian Healthcare Facilities Policy, it was stated that the respective healthcare facilities might need the health care workers to accomplish a theoretical and practical assessment for PIVC. The assessment consists of capability to evince theoretical knowledge on vasculature and PIVC related complications, and applied skill in aseptic technique.

Morris, O’Neill, Gillis, Charania, Fitzpatrick, Redmond, Rosli, and Ridgway (2016) in their study found that IV cannulation was the most utilised clinical skills in respondents’ intern year (p. 88). Yet, in another study, Kamau (2014) in one of his worldwide review found that Irish interns continue to report incompetency in IV
cannulation, venepuncture and nasogastric tube insertion when compared to his previous study (p. 9). In choosing suitable size of cannula, Kumar, Jaladhar, and Bendigeri (2018) in their study found that 60% of interns agreed that common size of cannula being used for PIVC was 18-gauge (p. 1012).

For consent purpose, Vincent-Lambert and van Nugteren (2015) found that only 23% of the patients seen by medical students responded being clearly taught and explained of the indications for the procedure, and it is documented as evidence to avoid unethical form of overtreatment (p. 160). In recognising suitable vein and selecting the site for cannulation, Woody and Davis (2013) agreed that the most distal vein is appropriate for PIVC (p. 415).

On anatomical knowledge, a study by Ali, Khan, Konczalik, Coughlin, and El Sayed (2015) showed a result of only 50% adequate competency although 85% of those final year medical students felt that anatomical knowledge is important and vital for Foundation Doctors (p. 398-399). Due to knowledge lack in local anatomy, Dixon, Juszczak, Magee, Woodgate, and Handa (2018) reported a case of an eight weeks’ history of arm swelling following IV cannulation. The patient is then known to suffer pseudoaneurysm secondary to PIVC. The authors concluded that although insertion of cannula is a common clinical procedure, it might produce serious consequences (p. 2). In another study by Charkhat Gorgich, Sarbishegi, Barfroshan, and Abedi (2017), it was concluded that knowledge in anatomy enhances medical students’ clinical skills (p. 1).

As for the importance of hand washing, it has been identified as an integral part in patient care as number of patients requiring IV therapy is increasing according to suitability of prescribed treatment (Abraham, 2018, p. 1). Kumar, Jaladhar, and Bendigeri (2018) found that only 57 out of 100 interns were aware of the needs for hand washing before the procedure while another 30 were not aware, and the rest had no knowledge about it (p. 1012). Another study by D’Alessandro, Agodi, Auxilia, Brusaferro, Calligaris, Ferrante, Montagna, Mura, Napoli, Pasquarella, Righi, Rossini, Semeraro, Tardivo, and GISIO (2013) on the undergraduate health care students’ knowledge in standard precautions which includes hand washing, showed that the nursing students’ score reached the higher level when compared to the medical students’. In the same study, both nursing and medical students had the idea that main source of bacteria were from the environment instead of hand (p. 4).

Milutinovic, Simin, and Zec (2015) in their study stated that phlebitis was the most common complications in PIVC. Thus, knowledge in early recognition of risk factors for phlebitis can help in reducing conditions from aggravating (p. 678). Kumar, Jaladhar, and Bendigeri (2018) in a study about knowledge in PIVC complications found that 55% respondents thought phlebitis as inflammation, 20% as infection, 5% as chemical irritation, and the rest did not know at all (p. 1012). As such, the rate of associated complications like infections or thrombosis with regards to PIVC is on the rise and definitely affects the patients’ quality of life in terms of safety, morbidity, mortality, treatment costs, and extended length of hospital stay. Some other examples of PIVC complications are sepsis and high rates of culture-positivity (Khanna, Mukhopadhayay, Vandana, Verma, & Dabke, 2013, p. 2).

Onuoha, Best-Abhiram, Francis, Nelson-Castillo, Kissoon-Ramesar, and Lalla-Mathura (2016) in their study stated that only 20.3% of health care workers which comprised of physicians and nurses agreed that the type of dressing or adhesive used to secure the IV cannula can probably contribute to infection risk, while more than 40% disagreed or strongly disagreed (p. 68).

Finally, a study by Deshmukh and Shinde (2014) described that care of PIVC requires technical experts, discernment skills, and conscious, safe and logical decision-making (p. 900). Thus, health care professionals who perform PIVC must acquire theoretical and practical knowledge.

3 METHODOLOGY

3.1 Research Design

This is a cross-sectional, non-experimental, and descriptive quantitative study using a set of self-administered questionnaire designed with regards to the undergraduate medical students’ knowledge about PIVC.

3.2 Sampling plan

3.2.1 Study site

This study was conducted at the Seremban Clinical Campus of the International Medical University (IMU). It is the first and most established private medical and health sciences university in Malaysia. This university was selected with reason to obtain sufficient number of sample from the undergraduate medical students.
3.2.2 Sample Size and Procedure
Convenience samples of the semester 6 of third year undergraduate medical students were recruited from the university. The population number in this study was 69 medical students. This study utilised the Raosoft sample size calculator with 95% confidence level, 5% margin of error, 50% response distribution rate, and estimated attrition rate of 10%. From the Raosoft calculation, the recommended sample size was 59 medical students. 10% of the sample size was used to compensate the attrition rate, which means five medical students. As such, total number of sample size should be 64. However, due to the small number of population, the researchers recruited all 69 populations for this study.

3.2.3 Inclusion and Exclusion Criteria
Inclusion Criteria
Full time enrolled semester 6 third year undergraduate students in the medicine programme in the university.
Exclusion Criteria
Full time enrolled semester 6 third year undergraduate students in the medicine programme in the university that have failed and reseating semester 6.

3.3 Operational Definitions
• Perception
It is defined as the way in which something is regarded, understood, or interpreted (English Oxford Living Dictionaries, 2018). In this study, perception is referring to the semester 6 undergraduate medical students’ understanding and interpretation on their knowledge about PIVC. This will be measured using a questionnaire.

• Knowledge
It is defined as facts, information, and skills acquired through experience or education; the theoretical or practical understanding of a subject (English Oxford Living Dictionaries, 2018). In this study, knowledge is referring to theoretical facts and information that the semester 6 undergraduate medical students have in PIVC. No psychomotor skills or practical session is required. The knowledge level will be measured using the McDonald’s standard of learning outcome. The scores are categorised as:

<60% = very low knowledge (answered 10 and below number of questions correctly)
60-69% = low knowledge (answered 11 number of questions correctly)
70-79% = moderate knowledge (answered 12 or 13 number of questions correctly)
80-89% = high knowledge (answered 14 or 15 number of questions correctly)
90-100% = very high knowledge (answered 16 or 17 number of questions correctly)

• Peripheral intravenous cannulation
It is defined as the insertion of a cannula or catheter into the vein to enable the administration of medication and/or fluid (Clinical Quality & Patient Safety Unit, 2016). In this study, the questionnaire shall focus on the knowledge before, during, and after PIVC is performed on a patient or client. Peripherally inserted central line cannula or catheter is excluded in this study.

• Medical students
It is defined as a person who is studying medicine at a university (English Oxford Living Dictionaries, 2018). In this study, a medical student refers to the person who is currently studying medicine in semester 6 at the clinical campus of a private university in Seremban, Negeri Sembilan, Malaysia.

• University
It is defined as a high-level educational institution in which students study for degrees and academic research is done (English Oxford Living Dictionaries, 2018). In this study, university shall refer to the Seremban Clinical Campus of the IMU in Malaysia.

3.4 Instrument of the study
For this study, the instrument utilised was a set of self-administered questionnaire consisting of two sections;
Section A and Section B. Section A consist of the undergraduate medical students' socio-demographics with four items that includes age, gender, ethnicity, and nationality. Section B comprised of 17-items of True/False questionnaire related to knowledge and understanding in PIVC, adapted and modified from a study done by Mohd Ghazali and Arbaee (2013) with obtained permission from the authors via email. The questionnaire was modified to suit the local context. It is unidirectional where all “True” is the correct answer. The variables were measured as 1 = True and 0 = False/Don’t know.

### 3.4.1 Pilot Study

A pilot study was conducted based on 10% of the population sample of the same university but for a different semester of undergraduate medical students. It consists of the test-retest reliability method to enable the researchers to assess the stability of the instrument, and was done in a period of two weeks’ interval. Prior to distribution of the questionnaires, the medical students were given clear instructions to fulfil the requirement of the study. The pilot study helped in identifying weaknesses or errors, thus, the researchers did minor amendments before the actual study was carried out.

### 3.4.2 Validity and Reliability

An expert from the Surgery Department of the university validated the content validity of the questionnaire. The opinion of expert was taken into consideration in relevance of the items to ensure the questions were fair and suitable to assess the undergraduate medical students’ knowledge level.

The reliability of the questionnaire was assessed with a pilot test-retest study within two weeks’ interval check using Pearson correlation coefficient that is denoted by r in order to find how strong the relationship between the two sets of data for test and retest. Although the strength was moderate positive 0.518, the questionnaire was found to be fit with what the CSSC nurse tutors have taught and what the medical students should know, and it was finalised with 17 questions.

### 3.5 Data Collection Procedures

The commencement of data collection was done upon approval by the IMU Joint-Committee on Research & Ethics. A suitable time was allocated for the semester 6 undergraduate medical students in order to avoid any time conflict between data collection and other appointments. A calm and conducive environment was provided for the medical students to fill the questionnaire in order to avoid any disruption that may affect validity of the results. An explanatory statement was provided to the medical students who meet the inclusion criteria. Written consent was taken from them before the commencement of the study. The researcher was present to answer any queries while the medical students were completing the questionnaire. The questionnaire took about 15 minutes for them to answer and was collected once they have completed it.

### 3.6 Ethical Consideration

Proposal for the study was submitted to the IMU Joint-Committee on Research & Ethics, and approval was obtained before proceeding with this study. Permission was also obtained to conduct the pilot study with approval from the dean of the Seremban Clinical Campus of the IMU. Request to submit questionnaire to the expert for advice on minor changes was granted before the actual study was carried out. The study was carried out on the 3rd of August 2018 upon permission granted. Potential respondents were informed verbally of the purpose for this study and written consents were prepared and distributed for the potential respondents to sign for agreeing to participate and allowing the findings from this study to be published. They were also given the rights to refuse. Confidentiality was maintained and as such, anonymity was assured. No names, addresses or identification numbers of potential respondents were required in the questionnaire.

### 3.7 Data Analysis

The questionnaires were collected and the data was tabulated, coded and subjected for analysis. To analyse the data, the Statistical Packages for the Social Sciences (SPSS) version 19.0 was utilised. The socio-demographics data of the undergraduate medical students were analysed using descriptive statistics for frequency, mean, and standard deviation (SD). To identify any significant relationship or association between the medical students’ socio-demographics and knowledge in PIVC, the Chi-square test was utilised.

### 4 DATA ANALYSIS AND FINDINGS

#### 4.1 Description of Sample
A total of 69 questionnaires were distributed to the semester 6 undergraduate medical students at the study site. All respondents agreed to voluntarily participate and complete the questionnaires. As such, the response rate was 100%.

4.2 Research Findings

The findings were divided into five sections: socio-demographics characteristics data; knowledge about PIVC; total marks scored; total knowledge scored; and Chi-square test for relatedness or independence.

4.2.1 Socio-Demographics Characteristics Data

Table 4.2.1: Socio-demographics Characteristics (n=69)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Categories</th>
<th>Min</th>
<th>Max</th>
<th>Frequency (n)</th>
<th>Percentage (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>21-22 years old</td>
<td>21</td>
<td>28</td>
<td>34</td>
<td>49.3</td>
<td>22.62</td>
<td>1.273</td>
</tr>
<tr>
<td></td>
<td>23-24 years old</td>
<td></td>
<td></td>
<td>32</td>
<td>46.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt;25 years old</td>
<td></td>
<td></td>
<td>3</td>
<td>4.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td></td>
<td></td>
<td>27</td>
<td>39.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td></td>
<td></td>
<td>42</td>
<td>60.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Malay</td>
<td></td>
<td></td>
<td>13</td>
<td>18.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chinese</td>
<td></td>
<td></td>
<td>40</td>
<td>58.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indian</td>
<td></td>
<td></td>
<td>14</td>
<td>20.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td></td>
<td></td>
<td>2</td>
<td>2.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nationality</td>
<td>Malaysian</td>
<td></td>
<td></td>
<td>65</td>
<td>94.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td></td>
<td></td>
<td>4</td>
<td>5.80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The socio-demographics characteristics of the respondents were summarised in Table 4.2.1 above. Mean age is 22.62 (SD=1.273), ranging from 21 to 28 years old. The age of the respondents was categorised into three. There were 49.3% (n=34) respondents between the age of 21 to 22 years old, 46.4% (n=32) between the age of 23 to 24, and 4.3% (n=3) were above the age of 25.

There were 60.9% (n=42) female respondents and 39.1% (n=27) male respondents.

Out of 69 respondents, 58% (n=40) were Chinese, 20.3% (n=14) were Indians, 18.8% (n=13) were Malays, and 2.9% (n=2) were from other ethnicities.

94.2% (n=65) respondents were Malaysian while 5.8% (n=4) were from other nationalities.

4.2.2 Knowledge about PIVC

Table 4.2.2: Knowledge about PIVC (n=69)

<table>
<thead>
<tr>
<th>Part B</th>
<th>Questions</th>
<th>Response</th>
<th>Frequency (n)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>Self-introduction to the patient and clarification of the patient’s identity is important before performing intravenous cannulation.</td>
<td>True</td>
<td>69</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>False</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>B2</td>
<td>The patient should be informed of the procedure and verbal consent should be performed</td>
<td>True</td>
<td>69</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>False</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
The above Table 4.2 summarised the findings of semester 6 undergraduate medical students’ knowledge about PIVC. All respondents, 100% (n=69), were aware about self-introduction to the patient, and clarification of the patient’s identity and obtaining verbal consent prior to the procedure. The respondents obtained.

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>True</th>
<th>False</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>B3</td>
<td>18G cannula is suitable to be used for adult peripheral intravenous cannulation.</td>
<td>32</td>
<td>37</td>
<td>46.4</td>
</tr>
<tr>
<td>B4</td>
<td>Factors that influence choice of cannula are the purpose of cannulation, and size of the vein to be cannulated.</td>
<td>64</td>
<td>5</td>
<td>92.8</td>
</tr>
<tr>
<td>B5</td>
<td>Cephalic and basilic veins on the forearm are frequently used in intravenous cannulation.</td>
<td>43</td>
<td>26</td>
<td>62.3</td>
</tr>
<tr>
<td>B6</td>
<td>Peripheral intravenous cannula cannot be left in-situ for more than 72 hours irrespective of the presence of infection.</td>
<td>45</td>
<td>24</td>
<td>65.2</td>
</tr>
<tr>
<td>B7</td>
<td>Phlebitis is the most identifiable infection related to intravenous cannulation.</td>
<td>65</td>
<td>4</td>
<td>94.2</td>
</tr>
<tr>
<td>B8</td>
<td>Hand hygiene before performing intravenous cannula insertion is important to reduce risk of infection.</td>
<td>69</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>B9</td>
<td>Maintaining aseptic technique during insertion of intravenous cannula helps in reducing risk of infection.</td>
<td>68</td>
<td>1</td>
<td>98.6</td>
</tr>
<tr>
<td>B10</td>
<td>Wearing gloves during insertion of intravenous cannula is advisable.</td>
<td>68</td>
<td>1</td>
<td>98.6</td>
</tr>
<tr>
<td>B11</td>
<td>Skin preparation of the insertion site is required before intravenous cannulation is performed.</td>
<td>68</td>
<td>1</td>
<td>98.6</td>
</tr>
<tr>
<td>B12</td>
<td>Multiple attempts of intravenous cannulation increases the risk of phlebitis, thrombosis, and cannula related infection.</td>
<td>65</td>
<td>4</td>
<td>94.2</td>
</tr>
<tr>
<td>B13</td>
<td>Change to a new cannula if the first attempt of intravenous cannulation failed.</td>
<td>60</td>
<td>9</td>
<td>87</td>
</tr>
<tr>
<td>B14</td>
<td>Usage of transparent dressing will help in recognising early signs and symptoms of infection.</td>
<td>64</td>
<td>5</td>
<td>92.8</td>
</tr>
<tr>
<td>B15</td>
<td>Removing intravenous cannula immediately if it is not in use will help to reduce risk of infection.</td>
<td>58</td>
<td>11</td>
<td>84.1</td>
</tr>
<tr>
<td>B16</td>
<td><em>Staphylococcus aureus</em> is the most common organism identified with infected intravenous catheter.</td>
<td>57</td>
<td>12</td>
<td>82.6</td>
</tr>
<tr>
<td>B17</td>
<td>Patient education on care of intravenous cannula helps in reducing risk of infection.</td>
<td>64</td>
<td>5</td>
<td>92.8</td>
</tr>
</tbody>
</table>

The above Table 4.2 summarised the findings of semester 6 undergraduate medical students’ knowledge about PIVC. All respondents, 100% (n=69), were aware about self-introduction to the patient, and clarification of the patient’s identity and obtaining verbal consent prior to the procedure. The respondents obtained.
(100%, n=69) also knew about the importance of hand hygiene in order to reduce risk of infections. Majority (98.6%, n=68) have the knowledge with regards to cleaning the insertion site before the procedure is performed, and the needs to maintain aseptic technique in order to reduce the risk of infection. Majority also were aware of gloves donning for the procedure.

More than half of the respondents (53.6%, n=37) were not aware that 18-gauge cannula was commonly used in adults for PIVC.

In selection of vein for PIVC, only 62.3% (n=43) respondents knew that cephalic and basilic veins were the common ones selected for PIVC.

In terms of reducing infections, 65.2% (n=45) respondents had the knowledge to remove the cannula 72-hours after the insertion disregard presence of infection while the other 34.8% (n=24) were not aware of this. 15.9% (n=11) were also not aware that immediate removal of unused peripheral intravenous cannula helps in reducing risk of infections. Besides this, 82.6% (n=57) number of respondents agreed that Staphylococcus aureus was the most common organism related to infected IV catheter.

4.2.3 Total Marks Scored

Table 4.2.3: Total Marks Scored (n=69)

<table>
<thead>
<tr>
<th>Marks scored</th>
<th>Frequency (n)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1</td>
<td>1.4</td>
</tr>
<tr>
<td>11</td>
<td>2</td>
<td>3.0</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>1.4</td>
</tr>
<tr>
<td>13</td>
<td>11</td>
<td>15.9</td>
</tr>
<tr>
<td>14</td>
<td>19</td>
<td>27.5</td>
</tr>
<tr>
<td>15</td>
<td>9</td>
<td>13.0</td>
</tr>
<tr>
<td>16</td>
<td>2</td>
<td>3.0</td>
</tr>
<tr>
<td>17</td>
<td>24</td>
<td>34.8</td>
</tr>
</tbody>
</table>

34.8% (n=24) respondents were able to score full marks of 17 for the questionnaire as shown in Table 4.2.3 above. Scores ranged from 10 to 17.

4.2.4 Total Knowledge Scored

Table 4.2.4: Total Score of Knowledge about PIVC (n=69)

<table>
<thead>
<tr>
<th>Knowledge Level</th>
<th>Frequency (n)</th>
<th>Percentage (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;60% = very low knowledge (answered 10 and below number of questions correctly)</td>
<td>1</td>
<td>1.4</td>
<td>14.9</td>
<td>1.824</td>
</tr>
<tr>
<td>60-69% = low knowledge (answered 11 number of questions correctly)</td>
<td>2</td>
<td>2.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70-79% = moderate knowledge (answered 12 or 13 number of questions correctly)</td>
<td>12</td>
<td>17.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80-89% = high knowledge (answered 14 or 15 number of questions correctly)</td>
<td>28</td>
<td>40.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90-100% = very high knowledge (answered 16 or 17 number of questions correctly)</td>
<td>26</td>
<td>37.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Total knowledge scored for this study is shown in Table 4.2.4 above. Overall, the mean score for knowledge level was 14.9 (SD=1.824). Most of the respondents (40.6%, n=28) had high knowledge, scoring between 80-89% as compared to 37.7% (n=26) with very high knowledge, scoring at 90-100%. Meanwhile, 17.4% (n=12) had moderate knowledge with a score between 70-79%. A small number of respondents had low knowledge that scored between 60-69% and very low knowledge, scoring below 60% at 2.9% (n=2) and 1.4% (n=1) respectively.

### 4.2.5 Chi-Square Test for Relatedness or Independence

<table>
<thead>
<tr>
<th></th>
<th>Pearson Chi-square value</th>
<th>Significant value (p&lt;0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>2.977</td>
<td>.812</td>
</tr>
<tr>
<td>Gender</td>
<td>.966</td>
<td>.326</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>2.695</td>
<td>.441</td>
</tr>
<tr>
<td>Nationality</td>
<td>2.086</td>
<td>.149</td>
</tr>
</tbody>
</table>

The null hypothesis of the Chi-Square test was set as no relationship or association exists in the variables of the population and that they were independent. Table 4.2.5 demonstrated p-value that indicates the four variables were independent and that there was no statistically significant relationship between knowledge about PIVC with age, gender, ethnicity, and nationality of the respondents. The significant value was set at a value of .000 (p<0.05). Thus, an H0 hypothesis is accepted.

### 5 DISCUSSION

Miller (1990) indicated the importance of cognition in clinical skill performance by placing it at the bottom of the Miller’s Pyramid whereby “Knows” means having factual knowledge of a skill, and “Knows How” is having applied knowledge before demonstrating the skill (p. 563). From this study, the findings suggested that majority of the semester 6 undergraduate medical students had high knowledge about PIVC.

The semester 6 medical students scored high (100%, n=69) in areas such as self-introduction, patient’s identity clarification, and obtaining verbal consent before proceeding with the IV cannulation procedure. In contrast, Vincent-Lambert and van Nugteren (2015) found that only 23% of the patients seen by medical students responded being clearly taught and explained of the indications for the procedure, and it is documented as evidence to avoid unethical form of overtreatment (p. 160). Authors Timby & Smith (2014) stated that the given explanations should be understandable, concise, and instructive to avoid the patient from becoming unduly disturbed and anxious (p. 150).

In this study, 100% (n=69) of the medical students were also aware about the importance of hand washing before performing the procedure unlike a study done by Kumar, Jaladhar, and Bendigeri (2018) where only 57% (n=100) interns had the knowledge of hand hygiene while another 30 were not aware about it, and the remaining had no idea about it (p. 1012). Another study by Onuoha et al. (2016) stated that only a number of 56% respondents practiced both hand washing and gloves wearing while performing cannulation (p. 68). Precautions in order to control infections must be taken seriously by health care personnel, for example, application of medical asepsis such as performing hand washing before and after attending to the patients (Timby & Smith, 2014, p. 150). In the same article, Onuoha et al. (2016) also reported that 30.4% of the health care workers did not practice aseptic technique while inserting IV cannula (p. 68).

It was revealed that 53.6% (n=37) of the medical students were not aware that 18-gauge IV cannula was the suitable size commonly used in adults. This is in contrast to a study done by Kumar, Jaladhar, and Bendigeri (2018) where 60% (n=100) respondents agreed of the said size being commonly used as compared to the other sizes of cannula (p. 1012). Needles for venepuncture were available in variety of diameters or gauges, and sizes 18, 20, or 22 gauges were widely used for adults (Timby & Smith, 2014, p. 151). In this study, the authors were of the opinion that this happened due to common usage of size 20-gauge IV cannula for all practical and hands-on sessions in the university.

Cephalic and basilic veins are the commonly used in IV therapy (Clinical Quality & Patient Safety Unit, 2016). This study also disclosed that only 62.3% (n=43) of the medical students had the knowledge that cephalic and basilic veins on the forearm are frequently used in IV cannulation. It showed that the students were not really equipped with the anatomy knowledge which they have learnt during their basic sciences day. Mazouchian, Roshangar, Ranbarzadeh, Piri, Shoar, and Marzabadi (2014) stated that this scenario might be due to their negative attitude towards anatomical study and not being optimistic in application of basic sciences that was believed to be regarded to the inconsistency between theoretical and clinical
features (p. 23).

Due to the rising incidences of phlebitis in peripheral IV cannula, it was anticipated that most respondents in this study should be cognizant about it. 94.2% (n=65) of the medical students in this study were equipped with this knowledge. This is compatible to the study concluded by Kumar, Jaladhar, and Bendigeri (2018) which also reported 80% (n=100) of the interns in their study were aware of the complication (p. 1011).

Regarding knowledge on S. aureus being the most common organism identified related to infected PIVC, some 17.4% (n=12) medical students were not aware about it. In a study by Austin, Sullivan, Whittier, Lowy, and Uhlemann (2016), it was concluded that infected peripheral IV cannulas repeatedly represent as the main source of S. aureus bloodstream infection in patients (p. 3). Similarly, the Health Quality & Safety Commission New Zealand (2016) reported a case whereby the blood culture result from a systemically sick patient was found to grow S. aureus, and the source was identified to be from the infected PIVC site from his previous hospital admission.

This study also disclosed that only 65.2% (n=45) of the semester 6 medical students had the knowledge on the need to replace the IV cannula every 72 hours. Timby and Smith (2014) stated that the tubings and cannulas should be replaced every 72 hours to decrease the potential for infection though the actual parameters are based on the policy of the agency (p. 152). Immediate removal of unused IV cannula was also another step to be taken to minimised risk of infection (Ray-Barruel, Cooke, Mitchell, Chopra, & Rickard, 2018, p. 8). In their study, it was found that 30-50% unused IV catheters which were left in-situ either developed complications or fail to work before completion of treatment which required reinsertion of a new set. Only 84.1% (n=58) medical students in this study identified the need to promptly remove unused IV cannula.

Majority medical students in this study (92.8%, n=64) were observant that usage of transparent dressing does help to identify early signs and symptoms of infection. This is in align with a study by Bernatchez (2014) that stated this type of film dressing enables health care providers to do daily inspection at the cannula site without the need to remove the dressing. Simultaneously, a transparent dressing also provides blockade or barrier to contamination from air and external pathogens (p. 259).

In regards to any significant association, this study revealed that there is no relationship between the socio-demographic characteristics which comprised of age, gender, ethnicity, and nationality, with knowledge of the respondents about PIVC.

Overall, the findings showed the medical students in this study had high knowledge about PIVC whereby they scored between 80-89% as compared to medical students in a study by Katowa-Mukwato and Banda (2014) (p. 1900). In that study, the medical students scored 76.7% in a Multiple Choice Questions knowledge test on IV cannula insertion. The results from this study indicated the need to realise actions that can minimised patients from being put at risk.

5.1 Limitation

This study was done in a single university, thus, it cannot be generalised to other universities, specifically medical universities in Malaysia. It was also specifically dedicated to find out the knowledge level of the semester 6 undergraduate medical students in the IMU. As such, the findings are not applicable to other medical students from other semesters. Besides that, this study focused purely on the medical students’ theoretical knowledge only. The findings may be biased or may reflect inaccuracy as knowledge is not certain, and people keep changing their mind.

5.2 Recommendations

A further study on the undergraduate medical students’ psychomotor skill is recommended in future to enable measurement of their clinical competency. This will complete the Miller’s Pyramid by assessing on the third and top level of the pyramid that is known as “Shows How” and “Does” (Miller, 1990, p. S63). A similar study can also be conducted in larger sample scale in order to enable generalisation of the findings.

It will also be interesting to dedicately study the effect and outcome in the approach of nurse-led teaching on nurses’ self-confidence, nurse-physician cooperative relationship, and long-term consequences on nurse recruitment and turnover. Abdallah, Irani, Sallljan, Gebran, and Rizk (2014) in their previous study on nurses teaching medical students suggested that this sort of study is important as it focuses on the distinctive and subtle role of nursing profession in medical education (p. 432). Therefore, nurses’ capacities are no less significance than other professionals in the healthcare system and industry.
6 CONCLUSION

PIVC is known to be one of the most common clinical skills performed by the health care providers. This descriptive study concluded that majority of the semester 6 undergraduate medical students in a private medical university in Seremban, Negeri Sembilan, had high knowledge about PIVC. In contrast, more than half of them did not identify that common size of IV cannula being used in adults is 18-gauge. The teaching contents of this subject by the CSSC nurse tutors can be improved in order to ensure the medical students are fully equipped with sufficient theoretical knowledge that is known to be the foundation of being competent in all procedural clinical skills. With rising complaints and high patients’ expectations in this era, it is of paramount importance to produce doctors with great quality, confidence and calibre.

7 ACKNOWLEDGEMENT

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REFERENCE LIST


