DEVELOPMENT AND VALIDATION OF QUESTIONNAIRE TO ASSESS KNOWLEDGE, ATTITUDE AND PERCEPTION AMONG NURSES ON RESPONSIBILITY AND PATIENT MANAGEMENT RELATED TO BLOOD TRANSFUSION

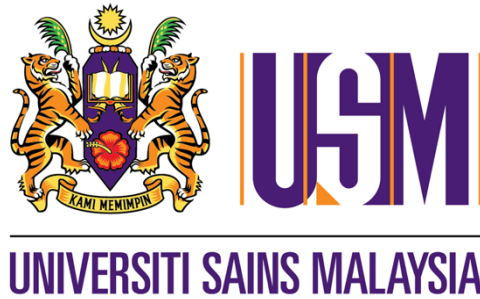## BY

CHEW POH LING

DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE (TRANSFUSION SCIENCE)

ADVANCED MEDICAL AND DENTAL INSTITUTE UNIVERSITI SAINS MALAYSIA

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DECLARATION

I hereby declare that I am the sole author of the dissertation entitled "Development and Validation of Questionnaire to Assess Knowledge, Attitude and Perception Among Nurses on Responsibility and Patient Management Related to Blood Transfusion". I declare that this dissertation is being summitted to Universiti Sains Malaysia (USM) for the purpose of the award of Master of Science in Transfusion Science. This dissertation is the result of my own reseach under the supervision of Dr. Nur Arzuar Abdul Rahim, Dr. Sharifah Azdiana Binti Tuan Din and Dr. Ernest Mangantig, except for quotation and citation which have been duly acknowledged. I also declare that this dissertation has not been previously or concurrently submitted to any other degree at USM or their institutions.

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CHEW POH LING

P-IPM 0038/18

ACKNOWLEDGEMENT

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ix

Page

LIST OF ABBREVATION

A&E	Accident and Emergency
AMDI	Advanced Medical and Dental Institute
CC	Clinical Complex
CCU	Critical Care Unit
CFA	Confirmatory Factor Analysis
CVI	Content Validity Index
EFA	Exporatoty Factor Analysis
FFP	Fresh Frozen Plasma
I-CVI	Content Validity Index for Individual item
ICC	Intraclass Correlation Coefficient
ICU	Intensive Care Unit
IPPT	Institut Perubatan & Pergigian Termaju
JEPeM	Jawatankuasa Etika Penyelidikan (Manusia) of USM
KMO	Kaiser-Meyer-Olkin Measure of Sampling Adequacy
MREC	Medical Research and Ethics Committee
NAT	Nucleic Acid Testing
PAF	Principal Axis Factoring
PCA	Principal Components Analysis
S-CVI/Ave	Scale of content validity index/ Average
SHOT	Serious Hazards of Transfusion
TACO	Transfusion-associated Circulatory Overload
TTI	Transfusion Transmitted Infections
USM	Universiti Sains Malaysia
WHO	World Health Organization

KAJIAN PEMBANGUNAN DAN VALIDASI BORANG SOAL SELIDIK UNTUK MENILAI PENGETAHUAN, SIKAP DAN PERSEPSI DALAM KALANGAN JURURAWAT MENGENAI TANGGUNGJAWAB KEJURURAWATAN DAN PENGURUSAN PESAKIT DALAM TRANSFUSI DARAH

ABSTRAK

Pengenalan: Menurut amalan perubatan moden, transfusi darah sering digunakan untuk memulihkan profil hemodinamik serta keadaan klinikal pesakit. Walau bagaimanapun, ralat dalam amalan transfusi darah ini, boleh mendatangkan akibat yang serius serta mengancam nyawa pesakit. Program "haemovigilance" telah melaporkan bahawa ralat manusia merupakan risiko tertinggi dalam memastikan transfusi darah yang selamat. Di Malaysia, reaksi transfusi yang berlaku akibat pemindahan komponen darah yang salah adalah 0.73% dan majoritinya (80%) berlaku di wad klinikal. Jururawat memainkan peranan yang penting dalam memastikan pemindahan darah adalah selamat kerana sebahagian besar daripada prosedur pemindahan darah adalah bergantung kepada kewaspadaan dan kemahiran jururawat tersebut. Pengetahuan yang cukup dalam kalangan jururawat adalah penting untuk memastikan amalan yang selamat dalam prosedur transfusi darah serta meningkatkan kualiti penjagaan pesakit dan keselamatan pesakit. Selain daripada pengetahuan profesional, sikap dan persepsi yang baik dalam kalangan jururawat juga akan mempengaruhi amalan dan tingkah laku jururawat dalam memastikan kualiti penjagaan pesakit. Sehingga kini, masih tiada lagi borang soal selidik yang sah untuk digunakan dalam menilai pengetahuan, sikap dan persepsi jururawat dalam pengurusan pesakit yang berkaitan pemindahan darah.

Objektif: Tujuan kajian ini dijalankan adalah untuk membangunkan dan mengesahkan borang soal selidik yang akan digunakan untuk menilai pengetahuan, sikap dan persepsi dalam kalangan jururawat mengenai pengurusan pemindahan darah kepada pesakit.

Kaedah: Kajian keratan rentas telah dijalankan dalam kalangan jururawat di Kompleks Klinikal, Institut Perubatan dan Pergigian Termaju (IPPT), Hospital Kepala Batas dan Hospital Seberang Jaya, Penang, Malaysia. Kajian ini menggunakan kaedah pengisian borang soal selidik sendiri yang mengambil masa dalam linkungan 30 minit. Proses pengesahan borang kajian melibatkan pengesahan kandungan (*content validity*), analisis faktor eksplorasi untuk membuktikan kesahan (*construct validity*), konsistensi dalaman dan ujian keboleh-percayaan (test -retest *reliability*).

Keputusan: Seramai 210 jururawat terlibat dalam kajian ini. *Kaiser-Meyer-Olkin measure of adequacy sampling* (KMO) adalah 0.60 dan *Bartlett's test of Sphericity* adalah signifikan (P <.001). Kaedah *Principal Axis Factoring (PAF)* dan putaran varimax digunakan untuk analisis factor dan menunjukkan terdapat 15 faktor dengan 39 item yang dikaitkan dengan pengetahuan, sikap dan persepsi jururawat. Konsistensi dalaman (*internal consistency*) untuk pengetahuan adalah 0.549, sikap adalah 0.713 dan persepsi adalah 0.586.

Kesimpulan: Borang soal selidik mengenai sikap jururawat adalah sah dan boleh dipercayai. Item tersebut boleh digunakan untuk menilai sikap jururawat dalam pengurusan transfusi darah pesakit. Walaubagaimanapun, item mengenai pengetahuan dan persepsi jururawat perlu dikaji semula dan proses pengesahan kestabilan domain perlu dilakukan dalam proses seterusnya.

DEVELOPMENT AND VALIDATION OF QUESTIONNAIRE TO ASSESS KNOWLEDGE, ATTITUDE AND PERCEPTION AMONG NURSES ON RESPONSIBILITY AND PATIENT MANAGEMENT RELATED TO BLOOD TRANSFUSION

ABSTRACT

Introduction: In modern clinical practice, transfusion of blood products was often used to improve the hemodynamic profile and clinical condition of patients. However, error in blood transfusion practice jeopardizing safe transfusion and may lead to severe and life-threatening consequences to the patients. Haemovigilance program over the year continue to report, human error is the greatest risks in safe blood transfusion. In Malaysia, reported transfusion reaction due to incorrect blood component transfusion was 0.73%, and the majority (80%) occur in the clinical ward. Nurses play a central role in ensuring safe blood transfusions, as more than half of the steps in blood transfusion are dependent on the nurse's awareness and skills. Sufficient knowledge among nurses were essential to ensure safe practice in patient care and improve patient safety. Besides professional knowledge, good attitudes and perception of health care worker can affect safe behaviours practice and quality of patient care. However, there was no validated questionnaire available to assess nurses' knowledge, attitude and perception in patient management related to blood transfusion.

Objective: To develop and validate a questionnaire about the knowledge, attitude and perception among nurses on blood transfusion management.

Methods: A cross-sectional study was conducted among nurses at the Clinical Complex (CC) of Advanced Medical and Dental Institute (AMDI), Hospital Kepala Batas and Hospital Seberang Jaya, Penang, Malaysia. The study used a self-administrated questionnaire that take approximately 30 minutes to complete. The validation involved

content validation, exploratory factor analysis for construct validity, internal consistency and test retest for reliability.

Results: A total of 210 nurses were responded. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) was 0.60 and Bartlett's test of Sphericity was significant (P<.001). The exploratory analysis was used with the extraction method of the Principal Axis Factoring (PAF) and the varimax rotation. The factor analysis shows 15 factor with the 39 items which were associated with knowledge, attitude and perception of the nurses. The internal consistency for knowledge was 0.549, attitude was 0.713 and perception was 0.586.

Conclusion: The questionnaire on nurse' attitude was valid and reliable with good items that enables it used for accessing nurse's attitude in blood transfusion patient management. One the other hands, items on nurse's knowledge and perception need to be review and once this is complete, confirmation of the stability of the domains will be included in the next stage

CHAPTER 1

INTRODUCTION

1.1   Background

In modern clinical practice, transfusion of blood products was often used to improve the hemodynamic profile and clinical condition of patients (Yaddanapudi & Yaddanapudi, 2014). However, error in blood transfusion practice jeopardizing safe transfusion and may lead to severe and life-threatening consequences to the patients. Haemovigilance program over the year continue to report that human error is the greatest risks in safe blood transfusion (Bielby *et al.*, 2011; Bolton-Maggs & Cohen, 2013; Bolton-Maggs, 2016; Bolton-Maggs & Poles, 2017)

Blood transfusion process involved multiple steps, and safe blood transfusion required the collaboration from multidisciplinary health professionals, including clinician, laboratory technicians and especially nurses (Bielby *et al.*, 2011). Nurses play a central role in ensuring safe blood transfusions, as more than half of the steps in blood transfusion are dependent on the nurse's awareness and skills (Bielby *et al.*, 2011). Nurse's responsibility covers from patients preparation before collection blood components, collection of blood components from the storage site, pre-transfusion activities, administration of transfusion and post-transfusion monitoring of the patient condition to ensure patients' safety (B. M. Hijji *et al.*, 2012). In Malaysia, reported transfusion reaction due to incorrect blood component transfusion was 0.73%, and the

majority (80%) occur in the clinical ward (Ayob, 2010). According to Serious Hazards of Transfusion (SHOT) Annual report 2017, a total of 61.5% of the incidents of right blood right patient (RBRP) error occurs at the clinical ward. The main contributing factors were bedside mix-ups of blood units, misidentification of the patient during pre-transfusion sampling, no bedside checking and wrong component collection from storage site (Saillour-Glénisson *et al.*, 2002; Noor Haslina *et al.*, 2012; Bolton-Maggs & Poles, 2017). Furthermore, the incident of the right blood right patient (RBRP) error reported is only the tip of an iceberg as compare to near-miss incident. The near-miss incident refers to any error that could result in the transfusion of an incorrect component if undetected but was identified before the blood transfusion procedure started (Bolton-Maggs & Poles, 2017). Near-miss incidents mostly resulted from wrong blood tube error due to the patient was not identified correctly and the sample was not labelled at the bedside (Bolton-Maggs & Poles, 2017). These human errors can be prevented by nurses who performed the blood transfusion.

Sufficient knowledge among nurses were essential to ensure safe practice in patient care and improve patient safety (Higgins & Evans, 2008). Despite from the previous research and review in establishing practice and protocols in the service, lack of knowledge or skills among nurses could compromise the safety and effectiveness of blood transfusion (B. Hijji *et al.*, 2012). Previous studies in France, Turkey, Jordan, Arab and the United Kingdom had reported a deficiency in nurses' knowledge underpinning their blood transfusion practice (Saillour-Glénisson *et al.*, 2002; B. Hijji *et al.*, 2012; B. M. Hijji *et al.*, 2012; Bolton-Maggs & Poles, 2017). Nurses need the knowledge for decision-making in their practice and ensure high-quality, safe and effective patient care. Besides professional knowledge, researchers also suggest that

attitudes and perception of health care worker will affect safe behaviours practice and quality of patient care (Durani *et al.*, 2013). The safety culture or behavior of health professionals in delivering care were reflected by their perceptions of processes and their attitudes relating to a culture of preventable errors (Zohar *et al.*, 2007). Although continuing professional education was conducted to resolve the knowledge and practice deficiency, but the incident of blood transfusion adverse event due to human error was still the highest. Saillour-Glénisson *et al.* in 2002 reported that the motivation of the participants, the willingness to change and the type of training were the factors related to the effectiveness of continuing professional education. Therefore, assessing nurses' safety attitudes and perception are important approach to improving patient safety in blood transfusion.

The primary aim of this study is to develop a valid and reliable questionnaire for the use at hospital in Malaysia that will evaluate the knowledge, attitude and perception of the nurses on nursing responsibility and patient management in blood transfusion. The finding could assist in identifying areas of weakness and highlight the needs to advice educational and training policy for improvements in safe blood transfusion.

1.2   Problem statement and study rationale

Human errors in blood transfusion were highly contributed to transfusion error. However, it can be prevented by having sufficient knowledge, right attitude and perceptions among health care worker (B. Hijji *et al.*, 2012). The nurses play a central role in performing blood transfusions as more than half of the steps in the transfusion involved nurses (Bielby *et al.*, 2011). Therefore, a safe behaviours in transfusion practice among nurse need to be identified, promoted and reinforced to ensure safe transfusion practices and consistent reduction in human errors. However, due to limited published studies address nurses' blood transfusion knowledge and up to my best knowledge, there are no study been carried out to address nurses' attitude and perception in patient management related to blood transfusion. Even though there were studies conducted in Malaysia, but the studies were limited in exploring the knowledge of nurses in blood transfusion. With the limitation that no validated questionnaire can be use to assess this three main contributing factor, this study was conducted to fill the research gap by developing a validated tool that could measure knowledge, attitude and perception among nurses concerning nursing responsibility and patient management in blood transfusion. This validated questionnaire can be used in hospital setting to evaluate in-house nurses' knowledge, attitude and perception on nursing responsibility and patient management related to blood transfusion. Each hospital setting can identify areas of weakness and highlight the needs to advice educational and training policy.

1.3   Objective

1.3.1   General Objective

The main objective of this research was to develop a valid and reliable tool that could measure knowledge, attitude and perception among nurses concerning nursing responsibility and patient management related to blood transfusion.

1.3.2   Specific Objectives

The specific objectives of this study were listed as follows:

1. To construct items that can be used as indicators to measure nurses' knowledge, attitude and perception on nursing responsibility and patient management related to blood transfusion.

2. To determine the validity of the tool.

3. To determine the reliability of the tool .

CHAPTER 2

LITERATURE REVIEW

2.1 Blood transfusion

Blood transfusion is a process involved blood collected from the donor and transfused into the patient's circulation via intravenous. World Health Organization (WHO) Blood Safety Guideline stated safe blood transfusion required few aspects including blood donated by a selected healthy donor, reliable method in blood component production, storage, transportation and pre-transfusion testing. Most importantly, a clinician decision to transfuse only upon needed and for the patient's health and post transfusion monitoring. Blood transfusion is needed for life-saving intervention, including treatment for anaemia that has failed to respond to other treatments and replace blood during blood lost (Tengku *et al.*, 2004). However, there are a number of risks that associated with blood transfusion including transfusion transmitted infections (TTI), alloimunisation, acute or delayed transfusion reactions (Clevenger & Kelleher, 2014). Although the blood supply had become increasingly safer through improved donor selection and nucleic acid testing (NAT) to shorter infectious disease's window period but there are still a variety of transfusion reactions encountered during blood transfusion (Rabeya *et al.*, 2011).

Human errors remained the greatest risks in safe blood transfusion that can lead to severe morbidity and mortality to the patients (Bielby *et al.*, 2011; Bolton-Maggs & Cohen, 2013; Bolton-Maggs, 2016; Bolton-Maggs & Poles, 2017). SHOT recommended human errors in blood transfusion can be preventable by confirming patient identity and improved communication among clinical staff especially during handovers (Bolton-Maggs & Poles, 2017).

2.2 Nursing responsibility in blood transfusion

Nurses play a central role in ensuring safe blood transfusions, they are responsible in four out of five of the transfusion procedures which includes patient preparation before collecting blood units from the storage site, blood bag collection, pre-transfusion activities, administrative blood components and post-transfusion initiation nursing activities (Bielby *et al.*, 2011; B. M. Hijji *et al.*, 2012).

2.2.1 Patient preparation before collecting blood units from the storage site

Blood component collection from the blood bank should only took place when the patient is prepared to receive blood transfusion to avoid wastage (Cowell, 2009). The nurse needs to check a written prescription from the clinician that provides sufficient information on the indication of blood transfusion, the availability and patency of an intravenous access line, premedication and other intravenous solutions that should be complete before blood transfusion (Saxena *et al.*, 2004; Elhy & Kasemy, 2017). Nurses also need to ensure consent is available and taken by the clinician before commencing the blood transfusion. The nurse shall explain the blood transfusion procedure to the patient or carer and evaluate for any history of transfusion reaction (Cowell, 2009). Nurses need to give patient and carer information about the sign and symptom of any possible transfusion reaction and remind them call for assistance, such as anaphylaxis may present as shivering, flushing, shortness of breath, pain in loins or feelings of agitation (Cowell, 2009). Moreover, nurses need to monitor and record patient's baseline vital sign 30 minutes before the initiation of transfusion, including pulse rate, temperature, blood pressure and respiratory rate. (Norfolk, 2015).

2.2.2 Blood bag collection

The blood component that is ready to be transfused will be stored in the blood bank before being issued to the ward. While, collecting blood components from the storage site is the high risk area for the error to occurs. The collection of blood components by the nurses who administer the blood component is the best practice to enhance patient safety and reduce human error (Cowell, 2009; Elhy & Kasemy, 2017). However, sometime the collection of blood component is delegated to a porter, health care assistant or another nurse. Upon collection of blood component, nurses are responsible to ensure the right unit is collected. Based on local guidelines, the nurses need to bring documentary proof of the patient identity (collection slip) during blood component collection. Nurses need to ensure patient's identification details on the collection slip and labels attached to blood bag are tally. Besides, nurses need to check on both patients and donor blood group ABO and Rhesus to prevent incompatibility of blood component. Therefore, nurses' knowledge of basic blood group ABO terminology and Rhesus are essential to ensure collecting the right blood component from blood bank and able to identify if wrong blood unit is issued from blood bank. However, the previous study show only half of the nurses had good knowledge in basic ABO and RhD blood group system (Lim *et al.*, 2016).

Blood component must be transport immediately by using a validated blood transport box to the patient bedside (Dr Norhayati Abu *et al.*, 2016). The blood component must never be left unattended nor put at the nurse's desk or treatment room as this is bad practice causes transfusion of wrong blood component (Cowell, 2009). Any infringement of the of blood components storage may impair the blood component quality.

2.2.3   Pre-transfusion activities

Upon receiving the blood component, nurse who administers the blood component must ensure the correct blood component was given to correct patient. The identification process must be performed at the patient's bedside, including checking patient information on the blood component label, blood compatibility label, request form, patient case note and patient's wrist band (Dr Norhayati Abu *et al.*, 2016). The nurse should identify patient's identity by asking question in open question with at least two identifiers (Norfolk, 2015). Patient identification is the foundation to prevent error of incorrect transfusion (Bolton-Maggs, 2016). According to Malaysia's local guidelines, two registered nurses are required for the checking process and each nurse must check the information individually in silence and then sign the appropriate document. Patient identification checking is the most critical step in ensure safe transfusion and final step in preventing transfusion of incorrect blood component (Dzik, 2007). Subsequently, the blood component shall also be inspected to ensure that it had not expired and that it does not conforms colour changing, clotting, foamy appearance and leakage. In a local clinical ward guideline, special blood administration set of 170 to 200-micron filter size should be used during transfusion to remove out micro-aggregates formed during storage of blood component. Nurses need to take note that medication or solution other than 0.9% Sodium chloride (NaCl) shall not be administered through the same tubing used for blood transfusion as others solution may affect the properties of the blood component (Norfolk, 2015).

Transfusion of blood component packed cell should start immediately or maximum 30 minutes after removal from temperature controlled blood refrigerator in blood bank or ward to avoid the risk of bacteria proliferation (Norfolk, 2015). While the

blood component platelet should be kept at room temperate within temperature around 20 to 24°C.

A blood warmer is rarely needed during routine blood transfusion procedure situation except in a massive transfusion case, transfusion for neonates patients and when there is an evidence of cold agglutinin syndrome (Dr Norhayati Abu *et al.*, 2016). A blood warmer should be performed only by using calibrated blood warmer. The others practice of blood warming procedure such as placing it in the hot water or running water are totally prohibited. In some institution, many nurses have the perception that blood component needs to be warm up nearer to human body temperature before being transfused to the patient. It is a common practice many nurses would leave the blood component at the nurses' station for some time before transfusion (Lim *et al.*, 2016).

From the previous study also shows that nurses have poor knowledge regarding pre-transfusion initiation nursing activities such as patient identification, indications for blood warming, the best time to start the transfusion, steps for patient identification, and a suitable filter size of transfusion (B. Hijji *et al.*, 2012; Elhy & Kasemy, 2017).

2.2.5 Administration of blood components and post-transfusion initiation nursing activities

The nurses need to pay attention throughout the setting up procedure and make sure a strict aseptic technique in order to negate the risk of bacterial contamination (Clarke, 1997). The attention should be more focus to the area of cannula site; a clear dressing should be used to ensure an early detection of extravasation of transfuse product and inflammation of the vein (Clarke, 1997). The nurses also, need to initiate blood infusion at slow rate during the first 15 minutes of transfusion. It is a good practice for the nurses to stay and observe with the patient for the first 15 minutes of each unit of blood component transfused (Janatpour *et al.*, 2008). The patient monitoring for the first 15 minutes of transfusion is essential as the majority of the severe transfusion reactions will occur within this period of time (Murphy *et al.*, 2001). However, an audit of clinical notes revealed that many nurses inconsistently comply for baseline vital signs monitoring procedure and they are lacking documentation of this step (Rowe & Doughty, 2000). The nurse also needs to check the vital sign and if there is no change has been observed from the baseline, then the rate of transfusion may be increased to the prescribed rate. Besides, the nurses checking the baseline vital sign and close observation for the first 5 to 10 minutes, the vital sign need to be monitored half hourly and then subsequent hourly until the completion of blood transfusion (Dr Norhayati Abu *et al.*, 2016). It is an essential to monitor the patient, at a periodic interval during the blood transfusion and the nurses will encourage the patient or the care taker to notify the nurse immediately when the patient develops any transfusion reaction symptoms. In a situation of unconscious patients who receiving blood transfusion, vital sign monitoring should be performed every 15 minutes (Dr Norhayati Abu *et al.*, 2016). Furthermore, the nurse must document the type of blood component

transfusion in the patient's intake and output chart in the patient folder. The nurse should aware of any signs and symptoms of transfusion reaction and they should stop the transfusion procedure immediately if any serious adverse reaction suspected and it must follow by appropriate step to save the patient's life (Norfolk, 2015). The transfusion reaction's sign and symptom include fever; chills; rigours; rash; hypotension; hypertension; respiratory distress; nausea and vomiting; haematuria; anaphylaxis; pain at infusion side; chest pain; abdomen pain; oliguria; anuria (Dr Norhayati Abu *et al.*, 2016). Many previous studies found that majority of the nurses had poor knowledge in regard of the complication related to blood transfusion (Elhy & Kasemy, 2017). Lim *et al* (2016) reported that nearly one-third of the nurses from his study, could not identify the correct vital sign to be monitored during a transfusion and symptom of transfusion reactions.

The transfusion-associated circulatory overload (TACO) is one of the most common cause of transfusion reaction causing mortality and morbidity in the patients (Bolton-Maggs & Poles, 2017). All nurses need to aware that slow transfusion is indicated in elderly patients and those with heart disease to reduce the risk of TACO. The slow infusion rate define as the rate of 2ml/minutes for an adult with approximately 2ml/kg/hour. Besides, the nurses also need to aware that TACO is associated with symptom such as fever, early detection of TACO can reduce the patient's risk of mortality (Bolton-Maggs & Poles, 2017). Transfusion of packed red cell in the non-emergency situation must complete within 4 hours from the time the blood component was taken out of the fridge to avoid bacteria contamination (Bonnar *et al.*, 2004). Platelets and thawed unit of fresh frozen plasma (FFP) should be transfused as soon as it is received from the blood bank and each unit should be transfused within 30 minutes

(Dr Norhayati Abu *et al.*, 2016). During the transfusion of platelet, the nurses need to do observation for any skin rashes, ensure patient level of consciousness and aware the changes in patient respiratory rate. Transfusion of blood component within recommended time is critical but majority of the nurses did not know the potential impact if the transfusion exceeding the recommended duration (Lim *et al.*, 2016).

2.2.6 Previous studies and available validated questionnaire

There are limited published studies that address nurses blood transfusion knowledge and up to now, no study have been carried out to address nurses attitude and perception in patient management related to blood transfusion. Before the year 2012, there are few studies were carried out by observation to assess nurses' blood transfusion knowledge and practice (Bradbury & Cruickshank, 2000; Saxena *et al.*, 2004; Hijji *et al.*, 2010). Bradbury and Cruickshank (2010) reported the crucial step that always neglected by the nurses in maintaining safe practice in blood transfusion for a patient, such as nurses had insufficient knowledge about blood transfusion and inadequate practice. Failure to verify adequately the identity of the patient before transfusion and failure in maintaining strict aseptic technique during setting up administration blood component procedure were the most common risks that lead to transfusion reaction. Hijji et at. (2010) observe that nurses at Emirate of Abu Dhabi and United Arab Emirates Hospitals had practice deficiencies included improper patient identification, suboptimal vital signs documentation and invalid methods of blood warming.

Researcher Hijii et al. (2012) had developed a validated questionnaire: *Routine Blood Transfusion Knowledge Questionnaire* (RBTKQ) and used to measure nurses' knowledge of blood transfusion in United Arab Emirates. The authors followed a review of literature surrounding blood transfusion and nursing care of transfused patient, in particular the British Committee for Standards of Haematology's (1999) publication: 'The administration of blood and blood components and the management of transfused patients'(B. Hijji *et al.*, 2012). RBTKQ questionnaire had six sections and a total of 49 items: Section A related to nurses' professional demographic details, Section B was related to patient preparation and blood bag collection from the blood

bank, Sections C focused on pre-transfusion, Section D related to post-transfusion initiation nursing activities, and Sections E was about complications related to blood transfusion. Lastly, Section F was issues related to blood transfusion policies and procedures. However, the authors reported that this questionnaire consisted of eight open-ended items that cause respondents to take a longer time to answer this questionnaire and cause difficulty for reseacher in coding the responses. This reseach revealed that nurses in the United Arab Emirates (UAE) achieved low scores in overall knowledge scores, ranging from 27–56 of a possible 70-point score.

Another study was carried out at the same year by Hijii et al. to investigate Jordanian nurse's knowledge of blood transfusion by using modified version of RBTKQ (B. M. Hijji *et al.*, 2012). The authors had removed one of two items that measured a single objective on nurses" awareness of bacterial contamination, converted all eight open-ended items to a multiple-choice or multiple-response item formats and converted two true-false items to a multiple-choice item formats. The authors reported that content validity of modified RBTKQ could have been reduced due to the shortening of its content. One of the limitations discussed in the study was nurses might have reported a knowledge that did not actually used in practice. This study had reported the mean knowledge score among nurses in Jordan was 51.3%. The majority nurses lacked knowledge with regard to patient preparation prior blood bad collection, proper patient identification and thaw up blood using invalid and potentially harmful methods.

In Malaysia, a study was conducted to assess the knowledge of blood transfusion among nurses at Hospital Pulau Pinang (Lim *et al.*, 2016). This study had

reported nurse in the Hospital Pulau Pinang achieved moderate in overall knowledge score. Research instrument used in this study was adopted from RBTKQ and the question was altered in line with local clinical policies and settings. The questionnaire consisted of four sections containing a total of 31 items: Section 1 consisted of nine items regarding "socio-professional factors"; Section 2 contained seven items related to "blood bag collection from blood bank and patient preparation before transfusion"; Section 3 was made up of eight items regarding "pre-transfusion nursing responsibilities"; Section 4 had seven items related to "during and post-transfusion nursing responsibilities and management of adverse reactions". The research tool was tested previously for its content validity, face validity, and reliability. However, the author mentioned the limitations of the questionnaires was the used of single best answer type of question which allowed respondents to guess. In addition, the use of English questionnaires for data collection might not generalized represent true knowledge among nurses in Hospital Pulau Pinang. Nurses with poor command of English might not able to understand the question correctly thus performed poorly.

2.3   Questionnaire development

Questionnaire is the most popular research tools with many advantages, including their apparent simplicity, their versatility and their low cost as a method of data collection (Fife-Schaw, 1995). The design and development of the questionnaires must be supported by a logical, systemic and structured approach (Rattray & Jones, 2005).

There are a range of scales available and may use in developing questionnaires such as Frequency scale, Thurstone scales, Guttman scales, Rash scales and Likert-type scales (Rattray & Jones, 2005). Likert-type or frequency scales are most commonly used in nursing research to measure attitudes or opinion (Bowling, 1997). Likert-type scale is an ordinal scale that determine the level of agreement or disagreement and assumes that the intensity of the experience is linear, example: continue from strongly agree to strongly disagree. Likert-type scale may offer five or seven pre-coded responses with neutral point for respondents (Rattray & Jones, 2005). There is some controversy over whether to offer a neutral point. This forces the respondent to choose a response if the neutral point is removed, which can lead to irritation of the respondent and increase non-response bias (Burns & Grove 1997).

When developing items and questions of the questionnaire, it is recommended that items are generated through literature review, focus group interview, and series of in-depth interviews for hypothesis gathering and decide precisely what the researcher wished to measure (Oppenheim, 1992). The most important point in the generation of item is to frequently review research questions to ensure the item remain relevant

(Oppenheim, 1992). The items of double negative or double barreled should be avoided, as it may lead to bias response (Bowling, 1997). Mixing both positive and negative word item can decrease bias in the acquiescent response, such as the tendency of the respondent to respond in the same way of items (Rattray & Jones, 2005). Next step involves a vital step in questionnaire development which are validity and reliability measure. Validity refers to whether an instrument measures what it was designed to measure while reliability refer to repeatability, stability or internal consistency of the questionnaire (Jack & Clarke, 1998; Bryman & Cramer 1997). Content validity should be generated through consultation with experts in the fields to ensure scale item represent the proposed domains (Rattray & Jones, 2005). Face validity can be carried out by piloting the questionnaire with a small sample size (N ≤ 100) to identify items that lack clarity or inappropriate. After initial pilot work and item deletion, the next pilot study will be carried out to measure content validity and reliability. The number of respondents are calculated based on the rule of thumb which are five respondents per item (Bryman & Cramer 1997). Construct validity related to how well the item in the questionnaire represent the underlying conceptual structure (Rattray & Jones, 2005). Construct validity can be established by using factor analysis, a statistical analysis technique that can used to determine the construct or domain of the newly developed questionnaire (Rattray & Jones, 2005). Principal components analysis (PCA) used to explore the inter-relationship of variables. PCA help to identify redundant and removal unnecessary item in developing measure (Anthony, 1999). Items with a loading factor of more than plus or minus 0.3 were retained and items below 0.3 were deleted. After completion of the construct validity, the reliability (internal consistency) for each item will be tested. The reliability can be demonstrated by using Cronbach's α statistical analysis. Cronbach's α statistical analysis uses inter-item correlation to determine

whether constituent item is measuring the same domain (Jack & Clarke, 1998). Cronbach's α for each item should equal to or more than 0.7 for newly developed questionnaire and 0.80 for a more established questionnaire (Bowling, 1997).

2.4   Operational definition

Item   :   A set of questions representing the domain of the study.

Domains   :   Body of knowledge, skills or abilities being measured or examined by a test, experiment or research study.

Knowledge   :   Mindfulness or experience-gained familiarity (of a person, fact, or thing); information range of a person; a hypothetical or viable understanding of a subject; dialect, the entirety of what is known, genuine, advocated conviction; certain understanding, as opposed to opinion (Biggam, 2001)

Attitude   :   Attitude are (a) a mental state— conscious or unconscious; (b) a value, belief, or feeling; and (c) a predisposition to behaviours or action. Besides, is bipolar and a response to a stimulus (Altmann, 2008).

Perception   :   The means of acknowledging (being mindful of), establishing (gathering and storing), and translating (binding to knowledge) sensory information (Ward, Grinstein and Keim, 2015).

Validity   :   Validity refers to whether an instrument measures what it was designed to measure (Bryman & Cramer 1997).

Content validity   :   Content validity refers to an expert opinion concerning whether the scale items represent the proposed domains or concepts the questionnaire is intended to measure (Bryman & Cramer 1997).

Face validity   :   The ability of an instrument to be understandable and relevant to the targeted population (Tsang *et al.*, 2017).

Construct validity   :   Construct validity related to how well the item in the questionnaire represent the underlying conceptual structure (Rattray & Jones, 2005).

Reliability   :   Reliability refers to repeatability, stability or internal consistency of the questionnaire (Jack & Clarke, 1998)

Internal consistency   :   The homogeneity of the items within a scale (DeVellis, 2003).

CHAPTER 3

METHOD

3.1 Overview of research methodology

The main aim of this research is to develop a validated questionnaire to assess knowledge, attitude and perception among nurses on blood transfusion management. This chapter describes the research protocol for this study. This study consists of two phase: Phase 1 involves development of the questionnaire whereas Phase II involves fields testing for construct validity and reliability of the questionnaire. Figure 3.2 summarizes the overall study methodology.

3.2 Phase I: Development of the questionnaire

Details of the methods used in developed the questionnaire was described in this section. The procedures included the selection of domains, sub-domains and items, scale construction review of items and structure of the questionnaire (content validity) and a pre-test of the final draft (face validity).

3.2.1 Selection of domains, subdomains and items

The questionnaire's items and subdomains were developed based on nurses random interview (experts opinion), literature review and previous published studies on knowledge, attitude and perception among nurses concerning nursing responsibility and patient management related in blood transfusion. Besides that, several meeting and discussion with supervisor and co-supervisors were conducted prior development of questionnaire.

3.2.1(a)   Comprehensive literature review

A comprehensive literature search was conducted on nurses responsible in blood transfusion and preventable transfusion error in clinical setting. The literature review included published scientific journals, reports, books and transfusion guidelines. Other sources included information from members of the supervisory team and experts in the relevant clinical field. Based on the results of the literature reviews, operational definitions for subdomains were developed. Items within the subdomains were selected and formatted into questions.

3.2.1(b)   Interview with nurses (expert opinion)

There were two (2) meeting conducted at Clinical Complex (CC) of Advanced Medical and Dental Institute (AMDI). The nurses who had experience in blood transfusion were invited to attend the meetings. The group discussions were carried out in guided open-ended questions designed to elicit common responses by the participants. The relevant issues such as standard operating procedure (SOP) in blood