

**DEVELOPMENT AND VALIDATION OF
QUESTIONNAIRE TO EVALUATE KNOWLEDGE,
ATTITUDE AND PRACTICE OF POINT OF CARE
ULTRASOUND (POCUS-Q) AMONG MEDICAL
OFFICERS IN EMERGENCY DEPARTMENT**

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TABLE OF CONTENTS

	Page Number
ACKNOWLEDGEMENT	ii
TABLE OF CONTENTS	iii
ABSTRAK (BAHASA MALAYSIA)	vi
ABSTRACK (ENGLISH)	vii

CHAPTER 1: INTRODUCTION

1.1 Introduction	1
1.2 Literature Review	3
1.3 Justification of the Study	10

CHAPTER 2: STUDY PROTOCOL

2.1 Introduction	11
2.2 Research Question and Objectives	13
2.3 Research Methodology	14
2.4 Research Tools	18
2.5 Data Entry and Analysis	18
2.6 Study Flowchart	19
2.7 Gantt Chart	20
2.8 Project Milestones	21
2.9 Ethical Consideration	22
2.10 References	23

CHAPTER 3: MANUSCRIPT

3.1 Title Page	25
3.2 Abstract	27
3.3 Introduction	29
3.4 Materials and Methods	30
3.5 Results	33
3.6 Discussion	41
3.7 Limitation & Recommendation	43
3.8 Conclusion	44
3.9 Acknowledgement	45
3.10 Declaration	45
3.11 References	46
3.12 Selected Journal Format	49

CHAPTER 4: APPENDICES

4.1 Ethical Approval Letter	62
4.2 Consent Form	65
4.3 Draft of First Version Questionnaire (POCUS-Q)	75
4.4 Final Validated Questionnaire (POCUS-Q)	90
4.5 Raw data on SPSS softcopy	104

LIST OF TABLES AND FIGURES

1. Content Validity Index	105
2. Face Validity Index	108
3. Item Correlation & Screen Plot – Attitude	110
4. Item Correlation & Screen Plot - Practice	111

ABSTRAK (BAHASA MALAYSIA)

PEMBANGUNAN DAN PENGESAHAN BORANG KAJI SELIDIK UNTUK MENILAI PENGETAHUAN, SIKAP DAN AMALAM BERKENAAN POINT OF CARE ULTRASOUND (POCUS-Q) DI KALANGAN PEGAWAI PERUBATAN DI JABATAN KECEMASAN DAN TRAUMA.

Latar Belakang: Point of Care Ultrasound (POCUS) adalah pemeriksaan teliti di sampingan katil yang membolehkan pakar kecemasan mentafsir dan menggunakan maklumat untuk menangani pembentangan klinikal, untuk membantu prosedur, menangani diagnosis tertentu, dan untuk membimbing pengurusan berterusan pesakit. Walau bagaimanapun, tiada alat penilaian yang disahkan untuk menilai tahap pengetahuan, sikap dan amalan POCUS di kalangan pegawai perubatan yang bertugas di jabatan kecemasan di Malaysia. Kami berhasrat untuk membangunkan dan mengesahkan borang kaji selidik POCUS-Q untuk menilai pengetahuan, sikap dan amalan di kalangan pegawai perubatan di jabatan kecemasan.

Metadologi: Kajian ini terdiri daripada dua fasa, pembangunan soal selidik dan penilaian psikometrik. Item yang dijana seterusnya melalui process pengesahan kandungan oleh lima panel pakar dan kesahihan melibatkan 30 peserta. Analisis psikometrik melibatkan pegawai perubatan dari dua pusat berbeza iaitu Jabatan Kecemasan Hospital Universiti Sains Malaysia dan Jabatan Kecemasan Hospital Pulau Pinang. Pengetahuan dinilai menggunakan “Item Response Theory” (IRT), manakala sikap dan amalan dinilai dengan “Exploratory Factor Analysis” (EFA) dan “Internal Consistency”.

Keputusan: 57 item yang mewakili bahagian pengetahuan, sikap dan amalan dihasilkan dari garis panduan dan tinjauan literatur, dan 52 item disimpan setelah pengesahan kandungan dan

muka. Semua item di bahagian pengetahuan memperoleh “standardized loading” yang baik >0.3 dan “root mean square error of approximation” sebanyak 0.081. Dua item dikeluarkan dari bahagian sikap kerana “factor loading” <0.5 , manakala semua item disimpan di bahagian latihan. Kedua-dua sikap dan amalan menunjukkan “Internal consistency” masing-masing 0.822 dan 0.897.

Kesimpulan: Kajian ini menunjukkan bahawa borang soal selidik POCUS-Q adalah alat penilaian yang sah dan boleh dipercayai.

Kata Kunci: Point of care ultrasound (POCUS), borang kaji selidik, penilaian, psikometrik

ABSTRACT (ENGLISH)

DEVELOPMENT AND VALIDATION OF QUESTIONNAIRE TO EVALUATE KNOWLEDGE, ATTITUDE AND PRACTICE OF POINT OF CARE ULTRASOUND (POCUS-Q) AMONG MEDICAL OFFICERS IN EMERGENCY DEPARTMENT

Background: Point of Care Ultrasound (POCUS) is a focused bed-side examination that enable the emergency physician to interpret and use the information to address clinical presentation, to assist procedures, to address specific diagnosis, and to guide an on-going management of a patient. However, there is no standardized validated tool of assessment to evaluate knowledge, attitude and practice of POCUS among medical officers working in emergency department in Malaysia. We aim to develop and validate a new tool of assessment, POCUS-Q questionnaire to assess the knowledge, attitude and practice among medical officers in emergency department.

Methods: This study consist of two phases, questionnaire development and psychometric assessment. The newly generated items were subjected to content validation by five panel of experts and face validation by 30 participants. Psychometric analysis involved medical officers from two different centres, Emergency Department Hospital Universiti Sains Malaysia and Emergency Department Hospital Pulau Pinang. Knowledge section was assessed using 2-parameter logistic model of Item Response Theory (IRT), while attitude and practice was assessed with Exploratory Factor Analysis (EFA) and internal consistency.

Results: 57 items representing the knowledge, attitude and practice section were generated from guidelines and literature review, and 52 items were retained after content and face

validation. All the items in the knowledge section obtained good standardized loading value of > 0.3 and adequate Root Mean Square Error of Approximation of 0.081. Two items were removed from attitude section in view of factor loading < 0.5 , meanwhile all the items were retained in the practice section. Both attitude and practice demonstrated good internal consistency of 0.822 and 0.897 respectively.

Conclusion: This study demonstrate that POCUS-Q questionnaire is a valid and reliable tool of assessment.

Keywords: Point of care ultrasound (POCUS), questionnaire, validation, psychometric

CHAPTER 1: INTRODUCTION

The first ultrasound waves were generated by Francis Galton in 1876; however, it wasn't till late 1940 that ultrasound was first used in clinical medicine (Cristina et al., 2018). The term point of care ultrasound (POCUS) was coined and incorporated into emergency medicine in early 1980. Point of care ultrasound is an extremely useful skill of set for emergency physician that can be applied at bedside, in managing patients in a fast-paced environment. The use of POCUS has directly contributed to improvement in quality and value, specifically in aspect of procedural safety, diagnostic accuracy, timeliness care and cost reduction (ACEP Guideline., 2016). With the support of American College of Emergency Physician (ACEP) and Society of Academic Emergency Medicine, many emergency medicine training centres worldwide have introduced POCUS as a standard part of training (Whitson and Mayo., 2016). In Malaysia, the establishment of Society of Critical and Emergency Sonography Malaysia (SUCCES), has serve as a platform for training, education and research in POCUS.

A tool of assessment is an important key in any curriculum development. Various studies have been carried out across different fields of medicine, to determine the use of POCUS and its competency among medical officers and specialist. However, many inconsistencies were seen among these studies which lead to suggestion for development of a validated tool to assess the use of POCUS (Joshua et al.,2010).

This purpose of this study was to develop a validated and reliable questionnaire to assess the knowledge, attitude and practice among medical officers in emergency department pertaining to POCUS, knows as POCUS-Q. Various steps of validation such as content validation, face validation and construct validation have been carried out in this study to ensure its reliability before it can be applied to a targeted group (Streiner and Norman.,2008). A well validated and

reliable questionnaire can be adapted by any organization or at different times and yet produce a similar result.

Until now, there is no publish data on questionnaires measuring the knowledge, attitude and practice (KAP) of POCUS among medical officers in emergency department in Malaysia. This study provides the evidence of validity and reliability of POCUS-Q, so that it can be used as a tool of assessment pertaining to POCUS in future.

1.2: LITERATURE REVIEW

Point of Care Ultrasound (POCUS)

With the ever-changing landscape of healthcare system worldwide, a greater proportion of patients are receiving their initial treatment and diagnostic testing in emergency department. Hence, efforts have been made to improve the speed and accuracy of diagnostic testing, mainly using point of care testing to minimize the time between onset of symptoms and initiation of definitive treatment (Sofia M et al 2017). Point of care ultrasound (POCUS) has shown to achieve this goal. POCUS has grown tremendously over the past few years. Initially developed for specific indication such as focused assessment with sonography for trauma (FAST), POCUS has virtually expanded into every clinical environment (Meera K et al 2015). POCUS is synonymous with the term such as clinical, bedside or emergency ultrasound, but is part of a larger field of clinical ultrasonography. POCUS is a bedside ultrasound examination performed by a caregiver with primary aim for evaluation and management of patient (Irma et al 2018). In emergency department, use of POCUS can optimize patient management by providing timely care, diagnostic accuracy and procedural safety. Timely and accurate diagnosis in emergency department can decrease morbidity and mortality, prevent prolonged stay and adverse effects of initiating incorrect treatment (Weile J et al 2018).

The American College of Emergency Physician (ACEP) has classified emergency POCUS into 5 main functional clinical categories.

- i) Resuscitative – Use of POCUS directly related to an acute resuscitation.
- ii) Diagnostic – Use of POCUS in an emergent diagnostic imaging capacity.
- iii) Symptoms or sign-based – Use of POCUS in a clinical pathway based upon the patient symptoms or signs.
- iv) Procedural guidance – Use of POCUS as an aid to guide a procedure.

- v) Therapeutic and monitoring – Use of POCUS in therapeutics or physiological monitoring.

Within these broad functional categories, 12 core emergency POCUS applications have been identified. These are ultrasound in trauma, ultrasound in pregnancy, basic cardiac ultrasound or hemodynamic assessment, abdominal vascular ultrasound, biliary ultrasound, urinary tract ultrasound, ultrasound for deep vein thrombosis, airway and lung ultrasound, soft tissue and musculoskeletal ultrasound, bowel ultrasound, ocular ultrasound and ultrasound for procedural guidance.

POCUS being widely available and cost effective has shown to reduce the use of more invasive diagnostic modalities, and has been shown to be effective when performed by a variety of clinical providers in various clinical setting (Teri AR et al 2018). In an assessment of 345 scans performed in rural Rwanda, ultrasound use changed management plan in 43% of patients (Shah SP et al 2008).

In trauma patients, studies show use of point of care ultrasound has a shorter disposition time to operating room with reduced requirement for CT scan (Melnikar LA et al; 2006). Studies of ultrasound use among emergency physician in pregnancy, demonstrated sensitivity of 90% with specificity of 92% in detection of ectopic pregnancy (Jang et al; 2010). In study of POCUS by emergency physician shows 100% detection for pericardial effusion in trauma patients and cardiac tamponade (Goodman A et al; 2012). Studies in patients with gall stones, detection of gall stones by bedside ultrasound shows sensitivity of 96% with specificity of 90% (Kendall JL et al; 2001). POCUS has shown to be highly sensitive for elbow fractures and reduces the needs for radiography exposure in young patients (Joni ER et al; 2012). Bedside ocular ultrasound has shown to be quick, accessible and accurate tool for assessment of ocular pathology when performed by emergency physicians (Wilkinson J et al; 2013).

Detection of hydronephrosis via POCUS helps in management of patients with acute renal colic in emergency department. Bedside ultrasound by emergency physician shows sensitivity of 90% and specificity of 85% compare to CT scan (Rosen CL et al; 1996). In patients with deep vein thrombosis, study shows early initiation of treatment for patients that undergo POCUS in emergency department compare to radiology department deep vein thrombosis assessment (Theodoro D et al;2004). POCUS has also shown to improve the clinical assessment of patients presenting to emergency department with various types of skin or soft tissue lesions such as cellulitis and abscess (Adhikari S et al;2010). In use of POCUS as procedural guidance, studies show higher success rate with reduced rate of complication in these patients (Freeman K et al;2007).

Given its numerous benefits, many emergency medicine training centers worldwide has listed POCUS as a core component in their program. The introduction of POCUS has even extended into medical undergraduate education (Wee MP et al;2018).

Up to this date, no local or international data is available regarding the knowledge, attitude and practice of POCUS among medical officers in emergency department. Few studies have been conducted to determine knowledge or competency or practice of POCUS in various departments such as emergency department, internal medicine, surgical and critical care. However, all these studies have shown contradicting results. In a study regarding use of POCUS in critical care, knowledge and attitude was identified as the main barrier for use of POCUS among the medical residents (Lewis AE et al;2010). Study done among surgical residents, demonstrated a higher level of confidence towards the use of POCUS after a series of training (Meera K et al;2015). Meanwhile, study among internal medicine residents shows significant gap of knowledge and skills regarding POCUS and its core components (Watson K et al;2018). Another study among medical doctors in internal

medicine shows positive attitude towards the application of POCUS, but stated lack of training program as the main factor for poor practice of POCUS (Wee MP et al;2018).

In emergency department, study among emergency physician in Qatar shows an underutilization of POCUS. Main barriers identified for POCUS application were lack of time and availability of appropriate training centers (Khalid B et al;2017).

QUESTIONNAIRE DEVELOPMENT

Questionnaire offers an objective means of collecting information about people's knowledge, attitude, practice, prevalence or confidence level in a targeted group of people.

A questionnaire format should be sequenced in a logical order, thus allowing smooth transition from one topic to another. It is essential that participants understand the purpose and objective of the questionnaire. This can be achieved by grouping related questions under specific domains describing the section theme (Bird et al;2009).

Item can be presented in open ended or close ended questions. Close ended item is easy to administer, easily coded, enable researcher to produce aggregated data quickly and likely to have higher rate of completion, while avoiding irrelevant responses (Houtkoop SH et al;2000). Meanwhile, open ended questions are time consuming and response are difficult to code and interpret. Close ended questionnaire is usually presented in dichotomous type or multiple-choice questions or scale questions such as Likert Scale. It is recommended to write the source of construct or concept while designing the questionnaire, whether the data is self-developed or adapted from certain guideline or previous study (Agarwal et al;2011).

VALIDATION

A tool or instrument capacity to measure what it is designed to measure is known as validity. Validity refers to appropriateness, meaningfulness and usefulness of the specific interference made from test score (Mc Dwermt and Sarvella;1999), how close the data reflects the true state of what being measured or the true value of the phenomenon under study (Fletcher et al;1996). Validity of a questionnaire is determined by analyzing whether the question measure what it intended to measure (Siny Tsang et al;2017). Validation process is important to perverse the quality and standard of the questionnaire. There are few types of validity stages that is concerns regarding questionnaire such as face validity, content validity and construct validity (Arifin;2014).

CONTENT VALIDATION

Content validity is stated as to what extend an item can reflect the universe of items in a specific concept. In other words, how representative the items are of its concept (Cronbach et al;1955). It consists a judgment whether the instrument sample is relevant or important to its content or domains (Streiner et al;2003). Content validity usually involves subject matter expert review the test specification and the selection of items. A good content validation usually judged of few things such as appropriateness of item included, number of questions, topics to be covered, wording and whom wants to be measured (Fayer et al;2000).

4 steps to effectively evaluate content validity includes 1) identify and outline the domain of study 2) form a panel of expert 3) develop consistent matching methodology, and 4) analyze result from the matching task. According to study (Karin B et al;2012) a content validity consists of a panel of expert of 6-10 people, where extensive dialogue on different aspects needs to be done.

FACE VALIDATION

Face validity indicates that a test which used in targeted population, should not only be valid but should also appears to be valid. In other words, instrument used appears to measure the construct under consideration and appears appropriate for the respondents. Face validity is an inferior form of validity (Mc Dermott; 1993) It evaluates a certain instrument in terms of feasibility, readability, consistency of style and its format, and the clarity of language used (De Von et al;2007). Face validity is judged and rated by the respondents. Respondents has the power to object of omit an item if it appears irrelevant. Given that face validity is based on respondent's judgement, there will always be possibility of wrong or incorrect judgement by the respondents (Streiner et al;2008).

CONSTRUCT VALIDATION

Construct validity, being commonly measured, usually referred to ability of a measurement to distinguish between groups with well-known difference in attributes (Yusof et al;2013). It involves theory and the relationship of data to the theory. Construct validity is the extent to which a measure of concern is related to other measures with similar concept or construct (Fletcher et al;1996).

Construct validity applies the convergence validation to observe how accurately the item is related to other variables and other measures of the same construct (Streiner et al;2015). There are 3 steps involved in construct validity: 1) States the theoretical relationship between concepts 2) examine the empirical relationship between measures of the concepts, and 3) interpretation of the empirical evidence (Carmines et al;1979). Factor analysis is a well-designed and standardized method to investigate the construct validity (Cronbach et al;1955).

RELIABILITY

Reliability is stated as the accuracy or precision of a measuring instrument (Kerlinger;1986). In other words, is the extent to which an instrument produces the same results on repeated trials. It is the stability or consistency of the score over the time or across raters. Reliability of a questionnaire is usually carried out using a pilot test. There are many ways to measure reliability. 3 most common ways used in measuring reliability of a questionnaire are 1) Test- retest, 2) Alternate-form reliability, and 3) Internal consistency (Oladimeji;2015).

ITEM ANALYSIS

Item analysis is known as one of the methods to enhance validity, especially in the measurement based on test (McDermott, 1993). Item analysis is used to identify good questions or item, suggest improvement of poorly performing items and identify areas learned poorly by students for future improvement (Rahim, 2010). Item analysis also allow assessment of the effectiveness of an individual test item. Item response theory can provide a better insight into the difficulty and discriminative ability of an item or question. (Arifin and Yusoff, 2017). Difficulty index is the percentage of students who answered an item correctly, meanwhile Discrimination index is the degree to which an item discriminates between students of high and low achievement (Arifin and Yusoff, 2017). Commonly applied is the two-parameter logistic item response theory (2-PL IRT) model for the estimation of difficulty and discrimination parameters, also known as location and slope parameter.

1.3: JUSTIFICATION

Over the past 25 years, POCUS has been recognized as integral to emergency medicine practice and training. The use of POCUS has shown to improve not only the management of critically ill patient and patients care but also the confidence level of medical officers in performing a procedure. Thus, POCUS is recognized as an important and required skill for graduating emergency physicians. Currently, POCUS has been incorporated into all level of government and private hospitals including teaching hospitals and even into some medical schools.

Many studies have been conducted worldwide on certain aspects of POCUS in various medical fields such as knowledge or perception or practice among its medical residents and specialist, however the results were inconsistent. Hence, there is a need to develop a validated tool to assess the use of POCUS. Moreover, there is no local data found regarding development of validated tool to determine the use of POCUS among its medical residents. Up to this date, there is no previous study done to assess the level of knowledge, attitude and practice of POCUS among medical officers in emergency department.

The purpose of this study is to develop a questionnaire to assess the knowledge, attitude and practice of POCUS among medical officers in emergency department. A series of validation steps such as content validation, face validation and construct validation are important aspect of a questionnaire study before it can be carried out to the targeted population. A valid and reliable questionnaire is important and can be applied to ant population, country or culture at different times and yet raising the similar results precisely.

CHAPTER 2: STUDY PROTOCOL

2.1 INTRODUCTION

Point of care ultrasound (POCUS) in emergency department has come a long way since its introduction in early 1990s. Prior to 1990s, standard consultative ultrasonography requires the emergency department to rely on radiologist or cardiologist to perform in timely and clinically relevant manner. POCUS being a quick, focused bed-side examination, able the emergency physician to interpret and use the information immediately to address specific diagnosis or guide an on-going management of a patient. In 1990, American College of Emergency Physician (ACEP) issued a statement in support of POCUS in emergency medicine. In 2001, ACEP developed a guideline, which describe the scope of practice of POCUS in emergency medicine. The American College of Graduate Medical Education (ACGME) has also recognized POCUS as an important requirement in training of postgraduate in emergency medicine. Following this, many emergency medicines programs in United States and Canada introduced POCUS a standard part of its training. Currently, POCUS is considered as a standard practice and endorsed by major emergency medicine organization worldwide.

POCUS has shown to have many benefits, not only in emergency medicine but various medical fields. An emergency physician trained in POCUS can optimize patient management by providing timely care, improve diagnostic accuracy and increase procedural safety. With the rising cost of healthcare in these recent years, POCUS is also an effective means of cost reduction.

Up to this date, studies have been conducted across various medical fields, including emergency medicine to determine the use of POCUS among the medical officers and

specialists. However, gross difference noted in terms of utilization of POCUS and its competency in these studies. Due to its inconsistent results in previous studies, Joshua E. M. et al;2010 suggested for development of a validated tool to assess the use of POCUS. Questionnaire design research is a well-established tool in research field to assess knowledge, attitude, practice, prevalence or confidence level in a targeted group of people.

The purpose of this study is to develop and validate a set of questionnaires on point of care ultrasound (POCUS-Q), to assess the knowledge, attitude and practice of POCUS among medical officers in emergency department. In this study will include, steps in development of questionnaire, content validation by a panel of experts, face validation and construct validation via a cross sectional study and reliability measurement of the questionnaire.

2.2 RESEARCH QUESTION

What is the validity and reliability of POCUS-Q questionnaire created to evaluate the knowledge, attitude and practice of point of care ultrasound (POCUS) among medical officers in emergency department?

RESEARCH OBJECTIVES

2.21 GENERAL OBJECTIVE

To develop and validate POCUS questionnaire (POCUS-Q), to evaluate the knowledge, attitude and practice of point of care ultrasound among medical officers in emergency department.

2.22 SPECIFIC OBJECTIVE

1. To determine the validity of POCUS-Q which includes:
 - Content Validity and Face Validity.
 - Construct Validity via Factor Analysis and Item Response Theory (IRT) analysis.
2. To determine the reliability of POCUS-Q by assessing the internal consistency.

2.3 RESEARCH METHADODOLOGY

This study will be divided into 2 phases:

1) Phase I – Development of the questionnaire

The process of questionnaire development will be based on literature review and guidelines.

2) Phase II – Validation (Content Validation, Face Validation & Construct Validation) and Reliability process.

Content validation will be a series of review of the questionnaire by panel of experts.

Face validation and Construct validation will be a cross-sectional study.

2.3.1: PHASE I

The development of questionnaire (POCUS-Q) will consist of 4 section which is 1) sociodemographic data, 2) knowledge, 3) attitude, and 4) practice. Questionnaire on knowledge, attitude and practice will be based on closed-ended questions (dichotomous type or multiple-choice type or Linkert Scale type). The decision to choose the type of close-ended questions will be based on literature review and guideline (American College of Emergency Physicians: Ultrasound guidelines 2016).

2.3.2: PHASE II

I) CONTENT VALIDATION

STUDY DESIGN: Validation Study

METHOD OF CONTENT VALIDATION

A panel of expert (Emergency physicians and Medical Directors), 3-5 persons (Shweta et al;2017, Arifin;2014) will evaluate the newly developed POCUS-Q questionnaire and will give their expert opinion regarding the content of the questionnaire. POCUS being a one of the core aspect of emergency medicine, hence emergency physician will be part of the panel of expert and involvement of medical director will help to strengthen the methodology and validation process.

The panel of expert will evaluate the questionnaire based on 3 main expects; 1) Relevance of an item or question to its concept, 2) Adequacy of number of items or questions to its concept, and 3) Number of items or questions is proportionate to the importance of its concept.

The questionnaire will undergo series of adjustment to fulfill the purpose of the study.

II) FACE VALIDATION

STUDY DESIGN: Validation Study and Cross-Sectional Study

METHOD OF FACE VALIDATION

- 1) Face validation will be carried out via pre-testing.
- 2) Sample Size: 30 participants (Perneger TV;2015).
- 3) Sample Population: Medical officers working in emergency department, Hospital Universiti Sains Malaysia (HUSM), Kubang Kerian, Kota Bharu, Kelantan.

- 4) Sampling Method: Convenience sampling.
- 5) Inclusion Criteria: Medical officers working in emergency department, HUSM during the time of data collection, that are willing to participate in the study.
- 6) Data Collection:
 - Questionnaire will be self-administered.
 - Participants will be approached individually by the researcher during their convenient time, mainly during the weekly department's CME day (Tuesday).
 - Participants who agree will be given a consent form.
 - Explanation regarding the purpose and procedure of the questionnaire will be given to participants after consent received from them.
 - Participants will be given enough time to read, understand and answer the entire questionnaire.
 - Participants will be asked to comment regarding the clarity and comprehensibility of the questionnaire.
 - Comments and suggestions can be noted by the participants in a column prepared below each question item.
 - Questionnaire are to be returned back to the principal investigator once completed in the given time.
 - Result of the pre-testing will be discussed with panel of experts.
 - Each comment or suggestion will be evaluated by the researcher and panel of experts and necessary adjustment will be carried out.
 - Once face validation is completed, questionnaire is ready to be validated via construct validation.

III) CONSTRUCT VALIDATION

STUDY DESIGN: Validation Study and Cross-Sectional Study

METHOD OF CONSTRUCT VALIDATION

- 1) Sample Size: Will be determine by subject to variable ratio, 1:5 with 20% of dropout rate (Gorsurah; 1983, Hatcher;1994).
- 2) Sample Population: Medical officers working in emergency department, HUSM, Kubang Kerian, Kota Bharu, Kelantan & emergency department, Hospital Pulau Pinang.
- 3) Sampling Method: Convenience sampling.
- 4) Inclusion Criteria: Medical officers working in emergency department, HUSM and emergency department, Hospital Pulau Pinang during the time of data collection and will willing to participate in the study.
- 5) Exclusion Criteria: Participants who was involve in the Face Validation study.
- 6) Data Collection:
 - Participants will be approached individually by the researcher during their free time.
 - Participants who agree to participate will be given consent form.
 - Once researcher have obtained the consent, participants will be handed the newly developed POCUS-Q questionnaire.
 - Explanation will be given regarding the study.
 - Participants will be given time to answer the questionnaire in the presence of the researcher and returned immediately once completed.

2.4: RESEARCH TOOL

Newly developed POCUS-Q questionnaire (after Content Validation and Face Validation).

2.5 DATA ENTRY AND ANALYSIS

Data will be analyzed in 2 ways: Descriptive Analysis & Statistical Analysis.

2.5.1: DESCRIPTIVE ANALYSIS

Descriptive analysis will be done for sociodemographic data.

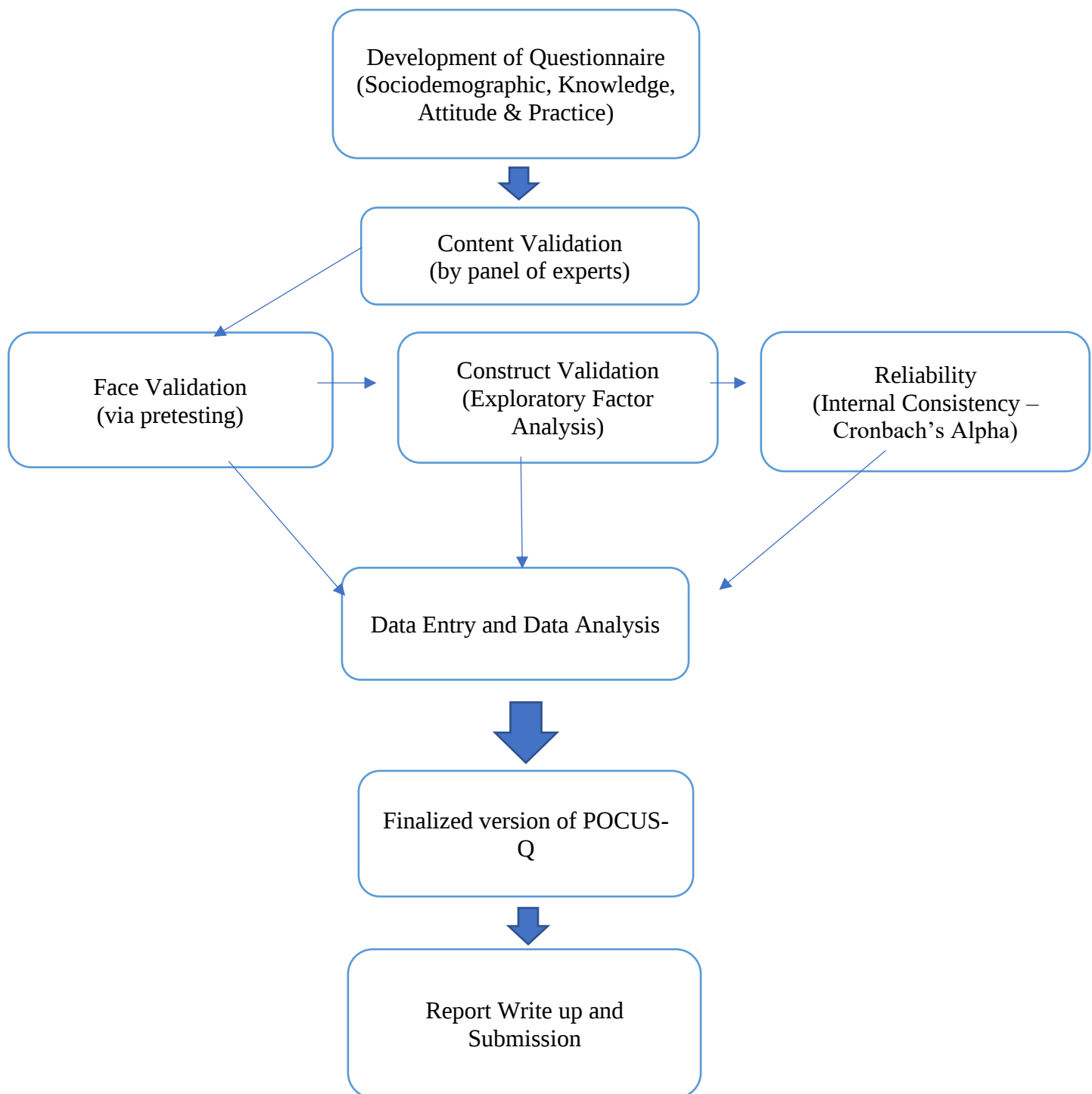
- Continuous variables will be described as mean and standard deviation (SD).
- Categorical variables will be described in frequency and percentage.

2.5.2: STATISTICAL ANALYSIS

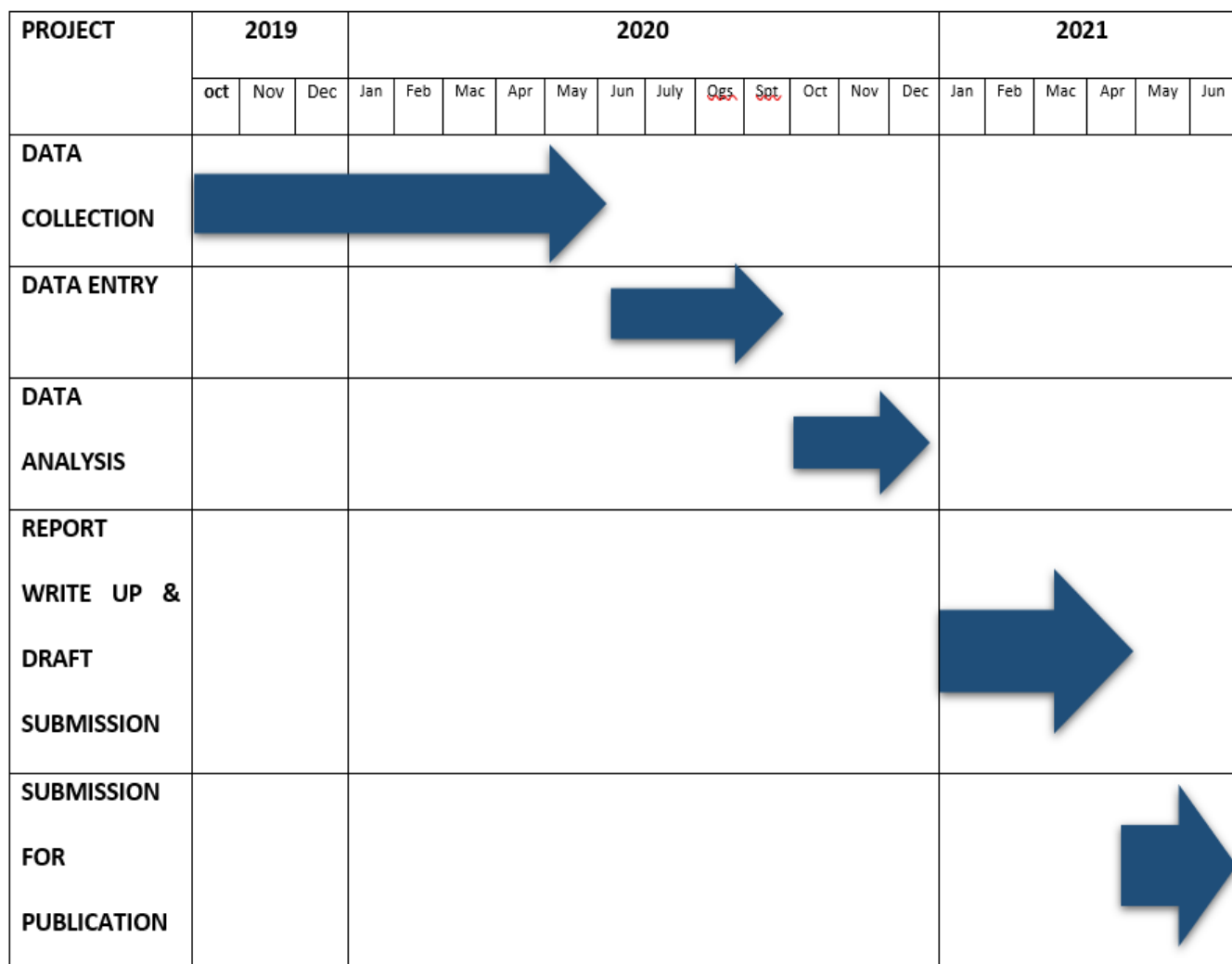
Statistical analysis will be done for section of knowledge, attitude and practice.

- Item Response Theory (IRT) via R-studio will be done for knowledge segment.
- Exploratory Factor Analysis (EFA) via SPSS 24.0 will be done for attitude and practice segment.
- Reliability on attitude and practice sections will be assessed using internal consistency via Cronbach's Alpha.
- Kaiser Meyer Olkin (KMO) measure of sampling adequacy & Bartlett's Test of Sphericity to determine suitability of data for EFA will be done.

2.6 STUDY FLOWCHART



2.7 GANTT CHART



2.8 PROJECT MILESTONES

- ✓ Data Collection: 31/05/2020
- ✓ Data Entry: 31/08/2020
- ✓ Data Analysis: 30/11/2020
- ✓ Report Write up & Draft Submission: 31/03/2021
- ✓ Submission for Publication: 30/06/2021

2.9 ETHICAL CONSIDERATION

- **Subject vulnerability**

Subjects will be coworkers with the principal investigator. They will be given full freedom not to participate in the study if they choose to. Principle investigator does not have any power in the institution; as such there is no conflict of interest. The data will be independent and will not be used for any achievement assessment and decision related to work.

- **Declaration of absence of conflict of interest**

There is no conflict of interest.

- **Privacy and confidentiality**

All forms are anonymous. Only research team members can access the data. Data will be presented as grouped data and will not identify the participant individually.

- **Community sensitivities, benefits and feedback**

Participants will be given feedback regarding the score obtained during the questionnaire once the data collection process is completed. Feedback on the score will be given individually to each participant and will not be disclosed to others.

- **Honorarium and incentives**

There will be no honorarium or incentives to be given to the participants.

2.10 REFERENCES

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