THE IMPACT OF ADULT TRAUMA TRIAGE TRAINING ON DECISION- MAKING SKILLS AT EMERGENCY DEPARTMENTS IN KELANTAN HOSPITALS

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THE IMPACT OF ADULT TRAUMA TRIAGE TRAINING ON DECISION- MAKING SKILLS AT EMERGENCY DEPARTMENTS IN KELANTAN HOSPITALS

ABSTRACT

The Emergency Department (ED) is a “front door” facility that provides emergency treatment and care in hospitals for various conditions and for trauma patients. Patients brought into the ED require a fast and precise triage process by healthcare providers (HCPs) in a dynamic environment. An accurate triage category is vital to ascertain the best impact for patients’ health and it is a very challenging task. Inaccurate triage decisions may cause unnecessary harm due to the deterioration of patients’ condition, long waiting hours, misuse of resources, patient dissatisfaction towards ED services and the professionalism of HCPs. Therefore, HCPs who perform triage need to equip themselves with knowledge and skills of triaging. The purpose of the study was to identify triage decision-making skills, accuracy of triage decisions, and the effectiveness of an educational intervention among HCPs working in EDs. The study was conducted in the EDs of ten hospitals in Kelantan State, Malaysia. The study has three phases: Phase 1 was a cross-sectional, baseline study that provided pre-test data for 202 participants recruited from ten EDs using universal sampling. Phase 2 involved the development of an educational module on triage for adult trauma patients. Phase 3 was an interventional study, with the educational module as the intervention, and a randomized controlled trial design, followed by a two weeks (post-test) and four weeks interval (follow-up test) as measurements. The hospitals that obtained low Triage Decision Making Inventory (TDMI) scores were randomly allocated to a control group and an intervention group. The intervention group (69 participants) was exposed to the educational intervention that completed in 140 minutes, while no intervention was given to participants in the control group (74 participants), the TDMI and Patient Scenario-Based Questions (PSBQs) for adult trauma patients were used to measure triage decision making skills and accuracy of triage decisions for participants of both groups in the post-test and follow-up test, after the intervention group was exposed to the educational intervention. The results showed, 70.8% participants had summative TDMI score of less than 184 (mean =175; SD=20.21). For PSBQs, 69.8% scored a low accuracy of triage decisions (mean=10.52; SD=1.71). Two weeks post intervention, 92.8% of participants in the intervention group produced good scores for TDMI (mean=207.80[a]; SE=1.85), compared to only 45.9% in the control group (mean=181.13[a] SE=1.76). Meanwhile, for the PSBQs test, 97.1% of participants in intervention group produced good scores for accuracy of triage decisions (mean=14.25[a]; SE=0.18), compared to 16.2% in the control group (mean=9.64[a]; SE=0.17). In the follow-up test, 81.2% of participants in the intervention group produced good scores for TDMI (mean=197.93[a]; SE=2.44), compared to 43.2% in the control group (mean=178.07[a]; SE=2.33) ; for the PSBQs test, 98.6% participants in the intervention group produced a good level of accuracy in triage decisions (mean=13.83[a]; SE=0.19) compared to 9.5% in the control group (mean=9.48[a]; SE=0.18). There was a significant effect for TDMI between the control group and intervention group ($F_{(1,138)}$ =60.72, p <.001, η^2 = .31), while for PSBQs the effect was ($F_{(1,139)}$ =270.31, p <.001, η^2 = .66) across time. There was an improvement of score for TDMI and PSBQs for intervention group after exposure to educational intervention across time.

Key words: accuracy of triage decisions, trauma triage, triage category, knowledge and skills, Triage Decision Making Inventory, patient scenario-based questions, educational intervention

IMPAK LATIHAN SARINGAN PESAKIT DEWASA YANG MENGALAMI TRAUMA TERHADAP SKIL MEMBUAT KEPUTUSAN SARINGAN DI JABATAN KECEMASAN HOSPITAL DI KELANTAN

ABSTRAK

Jabatan kecemasan merupakan kemudahan ‘pintu masuk’ yang menyediakan rawatan dan perawatan dalam hospital bagi pelbagai keadaan terutama kes trauma. Pesakit perlu melalui proses saringan yang cepat, ringkas dan tepat oleh perawat kesihatan (PK) dalam persekitaran yang dinamik. Ketepatan kategori saringan penting bagi memastikan impak terbaik perawatan terhadap kesihatan pesakit dan saringan merupakan tugas yang sangat mencabar. Ketidaktepatan keputusan saringan boleh mengakibatkan kemudaratan yang tidak munasabah dan kerosakan disebabkan penurunan kondisi pesakit, masa menunggu lama, pembaziran sumber-sumber, ketidakpuasan pesakit terhadap perkhidmatan dan mencemarkan profesionalisme PK. Oleh sebab itu, PK yang melakukan saringan perlu melengkapkan diri dengan pengetahuan dan kemahiran penyaringan. Tujuan kajian adalah untuk mengenal pasti skil membuat keputusan saringan dan ketepatan keputusan saringan dan keberkesanan intervensi pendidikan dalam kalangan PK di jabatan kecemasan. Kajian ini dilaksanakan di 10 buah jabatan kecemasan di hospital negeri Kelantan. Kajian ini mempunyai 3 fasa: Fasa 1 adalah reka bentuk kajian rentas, bagi ujian prapasca dengan 202 peserta di 10 buah jabatan kecemasan tersebut menggunakan pensampelan sejagat. Fasa 2 merupakan pembentukan modul pengajaran saringan bagi pesakit trauma. Fasa 3 adalah fasa intervensi, menggunakan modul pengajaran untuk intervensi, dan reka bentuk kajian rawak terkawal digunakan, diikuti pengukuran skor pada selang dua minggu (ujian pasca) dan empat minggu (ujian susulan). Hospital yang memperoleh skor *Triage Decision Making Inventory (TDMI)* yang rendah dipilih secara rawak bagi kumpulan

intervensi (69 peserta) dan kumpulan kawalan (74 peserta). Kumpulan intervensi diberi pendedahan kepada intervensi pendidikan, intervensi selesai dalam masa 140 minit dan tidak kepada kumpulam kawalan. Kemahiran membuat keputusan saringan menggunakan *TDMI* dan ketepatan membuat saringan menggunakan *Patient Scenario-Based Questions (PSBQs)* bagi pesakit trauma dewasa diukur di peringkat ujian pasca dan ujian susulan selepas pendedahan kepada intervensi pendidikan kepada kedua-dua kumpulan. Keputusan penyelidikan mendapati 70.8% peserta memperoleh skor terkumpul bagi *TDMI* kurang daripada 184 (min =175; SP=20.21). Bagi *PSBQs* 69.8% memperolehi skor yang rendah bagi ketepatan keputusan saringan (min=10.52; SP=1.71). Keputusan pada selang dua minggu selepas pendedahan kepada intervensi pendidikan menunjukkan 92.8 % peserta kumpulan intervensi memperoleh skor yang tinggi bagi *TDMI* (min=207.80[a]; *SE*=1.85), berbanding dengan kumpulan kawalan 45.9% (min=181.13[a] *SE*=1.76). Bagi *PSBQs* 97.1% peserta kumpulan intervensi memperoleh skor yang tinggi bagi ketepatan keputusan saringan (min =14.25[a]; *SE*=0.18), berbanding dengan kumpulan kawalan 16.2% (min=9.64[a]; *SE*=0.17). Keputusan ujian susulan menunjukkan 81.2% peserta kumpulan intervensi memperoleh skor yang baik bagi *TDMI* (min=197.93[a]; *SE*=2.44), berbanding dengan 43.2% bagi kumpulam kawalan (min=178.07[a]; *SE*=2.33). Manakala bagi *PSBQs* 98.6% peserta kumpulan intervensi memperoleh skor yang baik bagi ketepatan keputusan saringan (min=13.83[a]; *SE*=0.19) berbanding dengan 9.5% bagi kumpulan kawalan (min=9.48[a]; *SE*=0.18). Keputusan menunjukkan terdapat efek yang signifikan bagi TDMI antara kumpulan kawalan dan intervensi ($F_{(1,138)}$ =60.72, $p < .001$, $\eta^2 = .31$), manakala bagi *PSBQs* efek tersebut adalah ($F_{(1,139)}$ =270.31, $p < .001$, $\eta^2 = .66$) merentasi masa. Kesimpulannya, selepas pendedahan kepada intervensi pendidikan, terdapat peningkatan skor *TDMI* dan *PSBQs* bagi kumpulan intervensi merentasi masa.

Kata kunci: ketepatan keputusan saringan, saringan trauma, kategori saringan, pengetahuan dan kemahiran, *Triage Decision Making Inventory*, *patient scenario-based questions,* intervensi pendidikan

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LIST OF SYMBOLS AND ABBREVIATIONS

ATD	Accuracy of Triage Decisions
ATP	Adult Trauma Patients
CC (cc)	Cognitive Characteristic
CT (ct)	Critical Thinking
DM	Decision Making
ED	Emergency Department
EXP (exp)	Experience
Follow-up	At Four Weeks Interval After Educational Intervention
GZ	Green Zone
HCPs	Health Care Providers
HJ	Hospital Jeli
HKK	Hospital Kuala Krai
HOGUM	Hospital Gua Musang
HOSIM	Hospital Daerah Pasir Mas
HOSMAC	Hospital Machang
Hospital USM	Hospital Universiti Sains Malaysia
HRPZ II	Hospital Raja Perempuan Zainab II
HT	Hospital Tumpat
HTA	Hospital Tengku Anis
HTM	Hospital Tanah Merah
INT (int)	Intuition
MOAs	Medical officer Assistants
NMRR	National Medical Research Registry
Post test	At Two Weeks Interval After Educational Intervention
PSBQs	Patient Scenario- Based Questions
RNs	Registered Nurses
RZ	Red Zone
TCCC	Triage Colour Code Category
TDMI	Triage Decision Making Inventory
TDMS	Triage Decision Making Skills
YZ	Yellow Zone

LIST OF APPENDICES

CHAPTER 1: INTRODUCTION

1.1 Introduction

The emergency department (ED) is a “front door” facility that provides emergency treatment and care in hospitals. Several types of patients are brought into the department, especially those with heart problems, severe pain, motor vehicle accident injuries who require highly time-sensitive emergency treatment. Usually patients who were admitted into EDs were in life threatening condition and required immediate intervention (Elmqvist, Fridlund and Ekeberg, 2012). Initially, these patients go through a triage process by healthcare providers to determine their urgency for treatment. Triage is one of the core requirements for the provision of effective emergency care and has been shown to reduce patient mortality (Dalwai,Twomey, Maikere, Said, Wakeel, Jemmy, Valles, Tayler-Smith, Wallis Zachariah, 2014). In the ED after going through a precise health assessment each of the patients will be allocated to appropriate triage category according to the severity of patient’s condition and urgency for treatment. Accurate triage decisions in prioritizing a patient’s urgency for treatment in adult patients, especially for trauma, are the essential task to ascertain the best care or intervention to the patient who seeks treatment in the EDs. An accurate triage decision is vital to ensure patients receive care and intervention timely to save their lives or limbs. Inaccuracy of triage decisions may cause unnecessary harm and damage due to deterioration of condition, long waiting hours, misuse of resources, patient dissatisfaction and bad impressions of ED service and nursing professionalism. Delayed making decisions upon patient’s arrival may lead to fatality due to late delivery of care or intervention (O’Neill & Molczan, 2003). Delayed making decisions upon patient’s arrival may lead to fatality due to late delivery of care or intervention (O’Neill & Molczan, 2003). This is supported by Guttmann et al. (2011 cited in Claret et al., 2016) who reported that delay in delivering of care to the patient causes overcrowding in ED, deceased patient management, patient dissatisfaction and high risk for morbidity and mortality.

Many factors influence triage decision-making practices. The factors are insufficient related knowledge, experience, environment and protocol. According to Cone and Smith (2002) knowledge is one of the identified factors that cause a big impact on the accuracy of triage decisions. It was supported by Fields, Okudan, and Ashour (2013) who state that decision making efficiency is based on knowledge, experience and intuition. While Olofsson, Carlström, and Bäck-Pettersson (2012), they found that inexperienced and lack of knowledge and skills in regard with triage contributed to unnecessary prolong waiting time, hence may associated with morbidity and mortality. Cioffi (1999) revealed that knowledge is a known factor to influence triage decision-making which potentially contributes to a patient's outcome. Nevertheless, experience, environment and protocol also affect accuracy of triage decision-making. This is supported by a study in Britain by McBrien (2009), who found that lack of experience actually contributes to the difficulties in triage. According to Gerdtz and Bucknall (1999) guidelines and protocol may reduce the risk of triage decision inaccuracy. Triage decisions and the process are becoming very difficult in the overcrowded environment with limited of resources (Fields et al., 2013; Funderburke, 2008) Since the skills of making triage decision and the accuracy of the triage decisions led to a tremendous impact to patient's health and health institutions the aims of this study were to assess triage decisions making skills and accuracy of triage decisions and the effectiveness of an educational intervention among HCPs at ED hospitals in Kelantan.

1.2 Background

Patients who came into ED to seek treatment will be assessed, and sorted by triage staffs. The aims of the triage are to determine patient's priority and ensure immediate interventions provided accordingly. The primary aim of the triage is to identify patients who can safely wait from those who cannot. The secondary aim is to ensure patients receive safe treatment within certain time frame (Brown & Clarke, 2014). Triage staff will decide and allocate patient urgency for treatment and care into emergent, urgent and non-urgent, according to patient's condition and the priority of care to ensure the patient receives treatment appropriately. According to Horne, Vassallo, Read, and Ball (2013) triage is the process of sorting critically ill patients who need immediate life saving interventions from patients who need medical attention but can safely wait to be seen. According to Robison et al. (2012) triage in the EDs was recognised as the core requirements for the provision of effective emergency care and has been shown to reduce patient mortality and was supported by (Dalwai et al., 2014). Halim, Annamalai, Ahmad, and Ahmad (2012), they indicate that an accurate and fast triage decision is crucial to ascertain patient survival and maintain good quality of service in ED. According to La Vonne, Zun, and Burke (2015), the accuracy of triage decision have had a positive impact on the emergency department with reduced waiting times and improved management of patients. Inaccuracy of triage decision leads to a waste of resources, delays of patients' treatment, dissatisfaction and undesirable consequences (Gilboy, Tanabe, Travers, & Rosenau, 2012; Rahmani, Sepehri Majd, Ebrahimi Bakhtavar, & Rahmani, 2018).

With the intention to provide the best emergency care, many countries struggle to find ways to ensure accurate triage decisions for allocation and the best emergency care given to the attended patients. According to Beveridge et al. (1998) many countries struggle with the need for a good emergency department (ED) triage system and different algorithms to ensure effective resource management and the best quality of care. There were few triage systems developed for triage purposes. Azeredo et al. (2015) stated that EDs in Italy applied Manchester triage systems, whereas in Canadian triage and acuity system (CTAS) was developed and used in the EDS in Canada. In Japan Japanese triage and acuity scale was adapted from CTAS and used for triage purpose and Australasian triage scale was used in Australia. In United Kingdom Manchester triage systems was practice for triage purposes (Bambi et al., 2016). However Canada has strived to redesign emergency care in order to deliver quality, improve the access, shorten waiting time and increase efficiency in the EDs (Melon, White, & Rankin, 2013). Yet Canada still strive to redesign emergency care in order to deliver quality are by improved the access, shorten waiting time and increased efficiency in the EDs (Melon et al., 2013). Vassallo, Beavis, Smith, and Wallis (2017) stated that worldwide at least three different triage systems was used. Validations done on the practice triage systems have discovered limited sensitivity. In conclusion worldwide there was no gold standard of triage system to ascertain for accurate triage decision that could satisfy all. La Vonne et al. (2015) stated that several triage systems have been tested for reliability and validity across patient population in the EDs to ensure appropriateness and worthiness for best practice.

Currently in Malaysia three tiered triage system colour code is practice. The triage roles were executed by HCPs who were among registered nurses (RNs) and medical officer assistants (MOAs) in Ministry of Health Hospitals in Kelantan and the tertiary hospital at USM. However, in Ministry of Health hospitals, triage roles are mostly performed by a medical officer assistant whereas in hospital USM the task were performed by RNs and MOAs. HCPs who assigned at triage have to make quick assessment and rapid triage decisions in a very limited time frame, with a lack of sufficient support and in a dynamic environment to determine patient urgency for treatment. According to Travers, Waller, Bowling, Flower, and Tintinalli (2002), assessment involves a combination of the chief complaint of the patient, general appearance and at times, recording of vital signs (Aacharya, Gastmans, & Denier, 2011). According to Dateo (2013) a triage nurse must use critical thinking skills to efficiently advocate for patients through a quick triage process which is structured by gathering data, generating hypotheses and make rapid triage decisions in a dynamic and complex environment. This task is very challenging because in an unpredictable patients' condition, healthcare providers may under triage or over triage the patients at triage.

In case of under-triaged, patients may be placed at a lower level of priority than they require leading to increased morbidity and mortality. Alternatively, over-triaged, minor cases also lead to increased morbidity of critical patients as the limited resources of the department become overburdened (Leprohon & Patel, 1995). Vatnøy, Fossum, Smith, and Slettebø (2013) supported that making triage assessment and determining accurate triage decision and acuity is a challenging responsibility in unpredictable circumstances, hence skilful personnel is required for the particular task. Any delay in making precise triage decisions for triage categorization, especially in adult trauma patients, may cause delay in treatment which may usher in complications or lead to deterioration of the patient's progress. According to Hodge, Hugman, Varndell, and Howes (2013) accuracy of triage decision making is a critical component of ED practice, inaccuracy of the decisions may affect access to care in relation to clinical urgency, patient disposition within the department and subsequent allocation of staff and equipment resources. Nowadays, the provision of best quality of care is an important agenda for healthcare institutions to fulfil. They must meet client demands and maintain their communities' well-being. Therefore, definite and accurate triage decision is vital to ensure that patients will receive the right treatment at the right time to save their limb or life. Worldwide studies were conducted in regards to triage, ensuring patient acuity and priority of care. Since the triage system has been upgraded, few countries have tailored changes to suit current healthcare demands and to provide the best quality of care to their clients. Therefore, the instillation of current knowledge of emergency nursing is required to aid registered nurses and medical assistants in executing their roles and enhancing triage skills and triage accuracy. There was a consistency in accuracy of triage decisions when it was carried out by trained HCPs (Lim, Tay, Vasu, & Heng, 2013).

1.3 Problem Statement

Skilful HCPs and accuracy in triage decision-making is crucial in hospital Emergency Departments. Inaccuracy in making triage decisions can have many undesirable consequences when appropriate intervention and care are not delivered in a timely manner. In order to assess the adult patient’s trauma and provide care accordingly, healthcare providers must decide precisely how urgent each patient’s trauma is so they can care for them appropriately. As a consequence of this, healthcare professionals (HCPs) have to prepare their knowledge and skill of triaging in order to effectively act in such triage roles. This is essential to ensure that the patient is prioritized accurately. Incorrect triage decisions may jeopardize a patient’s life or limb. Therefore, triage should be conducted by those who are knowledgeable and skilful. Knowledge is a mandatory element for efficiency in providing emergency care and increasing patients’ flow in EDs (Melon et al., 2013).

Inaccuracy of triage decisions may lead to deterioration of a patient’s condition, patient dissatisfaction, long waiting hours, misuse of resources, and misuse of stipulated policies which may have an impact on patients’ health and tarnish the quality of service provided. Over-triage may contribute to unnecessarily assigning resources to a patient, while under-triage could potentially cause morbidity or mortality as a result of delays in receiving treatment (Goldstein et al., 2017). According to Ineke van der Wulp and van Stel (2009), in situations of over-triage which is an overestimation of urgency, a truly urgent patient may have to wait because resources such as beds are scarce; under-triage, which is an underestimation of urgency, can result in a patient being forced to wait while their status deteriorates and their condition becomes life-threatening.

Inaccuracy in triage decisions can thus contributes to an unnecessarily prolonged waiting time, with life threatening consequences due to a deterioration in the patient's condition (Olofsson et al., 2012). Therefore, triage should be practiced in tandem with current standards of healthcare and demand. As the scope of ED staff roles and practice have evolved, it is a requirement for hospitals in Malaysia to move forward and adapt to the current international standards of health practice. This is to ensure the quality of care and the accuracy of each triage decision. A study has been conducted on emergency departments in Malaysia; however it was it was concerned with patients' satisfaction (Saiboon et al., 2008). According to the researchers, in the competitive healthcare arena of today, patients' satisfaction with the care they receive in the emergency department is a priority issue. Hence, the capability of triage staff to execute the triage task must be improved and upgraded, in line with current standards. This would ensure the practice is at par and competitive locally and globally to fulfil current demand and enhance patient satisfaction with emergency department services. A study conducted by Halim et al. (2012) supported the need for a system that could assist emergency department healthcare providers to make accurate triage decisions, because under-triaging could result in high-risk patients having unnecessarily long waiting times, thus causing their condition to deteriorate, while over-triaging might result in lower risk patients receiving treatment earlier than high-risk patients.

A number of studies concerning triage decisions in the emergency department have been conducted in Asian countries. In Singapore, a study conducted by Yang, Lam, Low, and Ong (2016) reported that improvements in triage processing had a great impact on the effective allocation of resources across an entire ED's workflow which was the key to achieving a smooth and efficient ED process. Meanwhile, in regard to patient satisfaction with the emergency department, Wong, Ooi, and Goh (2007) found that dissatisfaction and complaints were related to staff triage roles at the triage counter, low standards of care at the emergency department, and long waiting hours for treatment. Chen et al. (2010) found that nurses in EDs in Taiwan tended to under-triage and over-triage, and the average score for triage accuracy is low. They stressed the importance of education to enhance triage accuracy. Meanwhile, in South Africa, although triage was a new concept in the ED, an effective triage system was able to enhance the care delivered and patient management (Augustyn, 2011).

Many studies have been carried out in other countries regarding the accuracy of triage decisions in the emergency department such as in Sweden a study conducted by Gorranssson, et al. (2006), and in Switzerland by Jordi et al. (2015). While a study conducted in Norway by Nilsson et al. (2015), concerning the accuracy and the effect of the education on the triage accuracy. Davis and Bush (2003) studied patient satisfaction with emergency nursing care in the United States, Slovenia and Australia and asserted that an understanding between both parties regarding triage acuity and care has a good association with patient expectations and satisfaction when attending the emergency department. According to Rehman and Ali (2016) patients who are satisfied with the ED triage and care are less likely to complain about the ED or the hospital. This may have consequences for an institution's reputation as well as financial consequences.

A brief conversation between the researcher and the person responsible for EDs in hospitals in Kelantan revealed that HCPs there perform only simple primary triage and do not proceed to secondary triage, and more than half triage officers (HCPs) were not trained or did not have emergency post basic training for the particular roles. There was a shortage of HCPs, which meant that triage officer did not stay permanently at the triage desk for triage purpose. In addition, from observation, the researcher found that in some EDs, there was no proper triage counter provided for the triage process. According to Broadbent et al. (2014), the triage process and management are likely to be influenced by structural, logistical, organizational, and clinical variables, including the design of triage area and the environment (Bambi et al., 2016). These may have a negative effect on the facility and the service provided, creating dissatisfaction, possibly jeopardising the lives of patients, and tarnishing the professionalism of healthcare providers in the EDs.

Based on the researcher’s own experience of more than 11 years in the emergency department of Hospital USM, it is evident that more than half of ED staff who held triage roles did not have sufficient experience, knowledge or skill about triaging, and many of them had not attended post-basic accident and emergency courses. The ED staff gain knowledge and skills via on-the-job training. In comparison, in developed countries such as the USA, Australia or United Kingdom, the emergency nurse practitioners carry out triage tasks with the autonomy to make decisions for any provision of care and treatment for best patient outcomes.

In addition, from the researcher's observation, less attention was given to patients with minor injuries who attended EDs compared to patients with major injuries, thus causing dissatisfaction among the patients and the persons accompanying them. According to Lutze, Fry, and Gallagher (2015) people with minor injuries will be allocated a low urgency triage category since their condition is considered to be stable and not a life-threatening condition. However, patients who sustained a minor injury may actually be experiencing severe pain, and waiting for pain relief for a long time may contribute to their discomfort and dissatisfaction (Alavi, Aboutalebi, & Sadat, 2016).

In the literature, there are studies conducted in Singapore, Taiwan, Malawi, and Hong Kong concerning triage and the accuracy of triage decisions, including factors that may influence triage decisions among emergency department staff. There are studies in other countries on this subject, too, such as Australia, New Zealand, the United States, Sweden and the United Kingdom. Research continues to be carried out on this subject because of the importance of the accuracy of triage decision-making in emergency departments. This current similar research was conducted continuously to improve emergency service provided and to reduce the mortality and morbidity rate in the EDs simultaneously to curb waste of resources unnecessarily.

A study was carried out in Malaysia conducted by Saiboon et al. (2008) that focused on patients' satisfaction with the Emergency Department in Kuala Lumpur, but it was not specifically concerned with triaging. The absence of any study on this topic in Malaysia led the researcher to undertake research to identify and investigate triage decision skills and assess their accuracy for adult trauma patients in EDs among registered nurses and medical assistants (HCPs) in Malaysian hospitals, specifically hospitals in Kelantan State.

The absence of prior research in Malaysia highlights the need to undertake this study project. Decisions to determine the priority of emergency care offered to each patient in the ED cannot be taken lightly. The triage decision made must be precise and appropriate, because the accuracy of a triage decision has an immeasurable impact on the clinical outcome of a patient such as physical disability due to traumatic spinal cord injury. The global prevalence of traumatic spinal cord injury was reported between 236 to 4187 per million (Lee, Cripps, Fitzharris, & Wing, 2014). Physical disability as a result of traumatic spinal cord injury that affected the quality of life after treatment. Due to the significance of the decision at this crucial point, there was a need to identify triage decision-making skills and to investigate the level of accuracy of each triage allocation decided upon by triage registered nurses and medical assistants, as well as the effectiveness of any intervention.

1.4 Significance of the Study

Little is known about the exact skills of triage decision making among registered nurses and medical assistants in the EDS of hospitals in Malaysia. Furthermore, the level of knowledge and triage accuracy among registered nurses and medical assistants needs to be assessed in order to improve the practice. Simultaneously, it is necessary to examine factors that may influence registered nurses and medical officer assistants ability to reach accurate triage decisions in adult patients in the actual environment of Emergency Departments. These matters must be identified to improve the triage decision-making.

It was not known whether registered nurses and medical officer assistants in Malaysian hospitals viewed the issues of triage decision-making as important, along with the standard of care which should be provided to adult trauma patients. To date, none of the studies carried out in the nursing discipline that have been published in Malaysia have investigated or identified triage decision-making in terms of skills and accuracy of the triage decisions for adult patients made by registered nurses and medical officer assistants in Malaysian emergency departments.

Arising from the situation mentioned in the problem statement and since skilful HCPs are essential to be effective in triage roles, the researcher intends to identify the current level skills and knowledge among the HCPs who conduct triage in EDs, using hospitals in Kelantan as the source of the sample. When skills and knowledge level have been identified, strategies can be put in place to address the issues and improve the ability of HCPs to carry out their roles as a triage officer with greater effectiveness. Apart from reducing morbidity and mortality, the improvement in skill levels and triage accuracy among triage officers (HCPs), will enhance the reputation of the institution and healthcare professionalism, and increase patients' satisfaction with EDs' facilities and services by reducing waiting time and providing early treatment as a result of proper triaging decisions.

In this study, an educational intervention was introduced in accordance with a needs assessment. It is postulated that the educational program will improve the triage process through enhancing triage skills and the accuracy of triage decisions. These may boost patient satisfaction and reduce morbidity and mortality. Häske et al. (2016) has supported the importance of education and continuous training, rather than relying merely on EMS training to promote and maintain skilful healthcare providers in triage and the delivery of emergency care in EDs. In their study, Negarandeh, Pedram Razi, and Khosravinezhad (2013) found that the presence of skilful HCPs providing care in the ED significantly increased patients' safety and satisfaction. Educated and knowledgeable HCPs are required in the EDs to enhance safety, patient satisfaction, and quality of care.

1.5 Conceptual Framework of the Study

A research framework is researcher's perspective regarding how the concept and the interest variables of a study fit together, which will guide the development of a study and lead to a significant finding of new knowledge. Kitson (2009) created a conceptual framework that identifies a set of variables and relationships that should be examined in order to explain the phenomena. In addition, a theoretical framework presents a huge, general explanation of the relationship between concepts of interest in a study (Norwood, 2000). The conceptual framework will assist and lead the researcher in the study simultaneously may help the researcher in supporting or disputing the researcher's assumption and discussion. The conceptual framework for this study was shown in Figure 1.1.

Triage decisions in determining priority of emergency care for patient are vital and the accuracy of triage decisions has a major influence on patient outcomes. Triage decisions determine the right patient receive treatment at the right time. Therefore HCPs at triage should be skilful and able to make accurate decisions to ascertain a good impact on patient's health. In order to enhance HCPs's skills and ability in making triage decisions, researcher postulate that education is very crucial to improve HCPs' skill of triage decisions making. Indeed HCPs are accountable for their decisions and inaccurate triage have a great negative impact on patients and the organization.

In present study researcher is interested to examine the levels of triage decision making skills and the triage accuracy among HCPs in the emergency department. The Triage Decision Making Inventory (TDMI) and Patient Scenario-Based Questions (PSBQs) were used for the purposes. The TDMI contained items of cognitive characteristic, critical thinking, experience and intuitive. Meanwhile PSBQs the items contained elements of knowledge and skill including demographic characteristic. Any association between demographic characteristic and TDMI and PSBQs was examined as well. Later in phase 2 educational module (for intervention) was developed based on the results of the survey in phase 1, literature reviews and Knowles' andragogy in learning theory which is described in detail in Chapter 2.9. The design, research instruments and educational intervention guided the researcher in the process of conducting phase 3 of the study. HCPs level of' skill and accuracy of making triage decisions were measured using TDMI and PSBQs at pre-test and after exposure to educational intervention at two week (post-test) and four weeks (follow-up). The interval of two is preferable compared to a longer interval such as at six months, because it is supposed to be long enough to reduce the effect of memory however short enough for alteration (Moy et al.,2015).

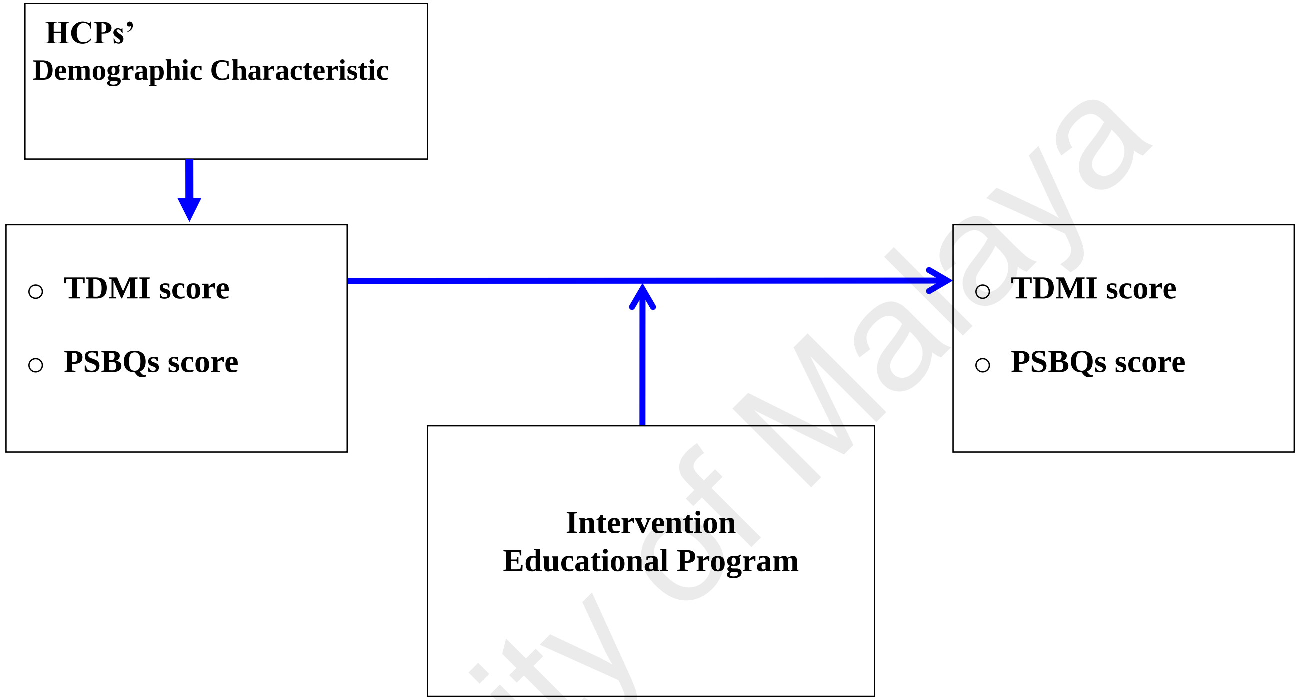

Figure 1.1: Conceptual Framework of The Impact of Trauma Triage Training on Decision- Making Skills at EDs Hospital

1.6 Research Questions

i. What is the level of triage decision making skills among HCPs?

ii. What is the accuracy level of triage decisions for adult trauma patients among HCPs?

iii. What are the demographic characteristics that associated with triage decision making skills?

iv. What are the demographic characteristics that associated with accuracy of triage decisions for adult trauma patients?

v. What is the effect of educational intervention on the triage decision making skills among control and intervention group?

vi. What is the effect of educational intervention on the accuracy of triage decisions among control and intervention group?

1.7 Study Objectives

1.7.1 General Objective

The objective of the study project to examine the level of triage decisions making skill and the accuracy level of triage decisions for adult trauma patients and to evaluate the effectiveness of educational intervention on the triage decisions making skills and the accuracy of triage decisions for adult trauma patients among HCPs in EDs of hospital in Kelantan.

1.7.2 Specific Objectives

i. To determine triage decision making skills among HCPs

ii. To determine accuracy of triage decisions for adult trauma patients among HCPs

iii. To develop educational module for triaging of adult trauma patient

iv. To determine the association of demographic characteristic with the triage decision making skills

v. To determine the association of demographic characteristic with the accuracy of triage decisions for adult trauma patients

vi. To evaluate the effectiveness of educational intervention on the triage decision making skills among control and intervention group.

vii. To evaluate the effectiveness of the educational intervention on the accuracy of triage decisions among control and intervention groups

1.8 Research Hypothesis

Null Hypothesis (H_o)	:	There is no significant association between demographic characteristics with triage decision making skill among HCPs
Alternative Hypothesis (H_A)	:	There is a significant association between demographic characteristics with triage decision making skill among HCPs
Null Hypothesis (H_o)	:	There is no significant association between demographic characteristics with the accuracy of triage decisions for ATP among HCPs
Alternative Hypothesis (H_A)	:	There is a significant association between demographic characteristics with the accuracy of triage decisions for ATP among HCPs.
Null Hypothesis (H_o)	:	There is no significant difference of triage TDMI score among HCPs before and after execution of educational intervention
Alternative Hypothesis (H_A)	:	There is a significant difference of TDMI score among HCPs before and after execution of educational intervention
Null Hypothesis (H_o)	:	There is no significant difference of accuracy of triage decisions for ATP among HCPs before and after exposure to educational intervention
Alternative Hypothesis (H_A)	:	There is a significant difference of accuracy of triage decisions for ATP among HCPs before and after exposure to educational intervention

1.9 Operational Definition

1.9.1 Triage

Triage is defined as the initial assessment and sorting of patients in an emergency setting to determine triage category, and allocate to an appropriate area for treatment (Considine, Botti, & Thomas, 2007; Tanabe, Gimbel, Yarnold, Kyriacou, & Adams, 2004). In this study triage refer to the process of assessing and categorizing patient priority for care according to severity of patient condition using colour coding 3 tier triage system.

1.9.2 Decision-making in Triaging

Dowie (1993, cited in Lamond and Thompson, 2000) decision is defined as a selection between two or more distinct option. Decision is making a choice among several options (Klein, 2015). In this study decision making refers to an option to be made after brief assessment on patient. The option is between red, yellow and green triage colour code

1.9.3 Triage Accuracy

Triage accuracy is the degree to which clinicians agree on the allocation of a triage code across populations (Gerdtz et al., 2008). In the current study triage accuracy refers to the degree of accurateness in allocating triage category for adult patient in the ED due to trauma.

1.9.4 Healthcare Provider

Peate (2006) defined registered nurses and medical assistant as individuals who have a minimum of three years' education in the field of healthcare. In this study, healthcare providers are registered nurses and medical officer assistants who performed triage roles at Emergency Departments 10 hospitals in Kelantan State, Malaysia.

1.9.5 Skills

According to Thompson (1998), skills is defined as ability to do something well. In this study, skills refer to ability in making triage decision appropriately.

1.9.6 Adult Trauma Patients

Centre for Disease control and prevention (2009) defined individual with age range of 18 and above as an adult. Dinh, Bein, Oliver, Veillard, and Ivers (2014) they define adult trauma patient is one aged 15 years and over. In this study adult trauma patient refer to physically injured adult patients who visited ED who aged 18 and above.

1.9.7 Emergency Department in Kelantan

A hospital ED is known as a front access door where a significant number of in-patient admissions take place (Saiboon et al., 2008). Accident and emergency (A&E) unit is the entry point for critical healthcare (Buttigieg, Dey, & Cassar, 2016). The Emergency Department (ED) in this study is an emergency unit/department of hospital in Kelantan State of Malaysia which practiced triage procedure using a 3-level colour coding scale triage system.

1.9.8 Educational Intervention Program

A module developed and used as an intervention to educate and improve the ED nurses skill of communication (Taylor, Kennedy, Virtue, & McDonald, 2006). Yusoff and Esa (2015) have implemented an educational intervention based on a DEAL model to improve mental health among medical students. In this study researcher implement an educational intervention program in the form of 140 minutes classroom learning process which contains lectures and discussion on triage decision using patient scenario-based questions (PSBQs). It was based on a review of the literature and results of the baseline study with regard to the accuracy of triage decisions for adult trauma patients.

1.10 Outline of the Thesis

The thesis is organized into six chapters to facilitate understanding and clarity of the research study. The chapter concisely brief as below;

Chapter one presents the introduction, background, problem statement, significant of the study, research questions, objectives and hypothesis of the study, conceptual framework and operational definition.

Chapter two provides critical review of the previous studies on the skill of triage decision and the accuracy of the triage decisions, to provide evidence of the effectiveness on the particular matter that related to the current study which is similar, and with arguments that could support the statements for discussion in the next chapter.

Chapter three describes the methodology of the current research study. This chapter comprised of the explanation on study design, phases of the study, study setting, population and sample of the study including the instruments, ethical considerations, pilot study, data collection and statistical test used for the data analysis.

Chapter four provides the results for phase 1 and phase 3 of the research study. The results of the phase 1 of the study commenced with brief description on the response rate and demographic characteristics. Followed by the level of triage making skill (using TDMI) and the accuracy of triage decisions (PSBQs), correlation of the domains of TDMI, the factors that associated with triage making skill and the accuracy of triage decisions. Subsequently the results of phase 3 of the study is reported starting with response rate, homogeneity of demographic characteristic of the participants and the research variables at baseline for intervention and control group. This is followed by preliminary test of the assumptions for ANOVA/ANCOVA, the distribution of HCPs who obtained good and low score of TDMI and PSBQs. This chapter concluded with the results on the the effectiveness of the educational intervention on the triage decisions making skills and the accuracy of triage decisions among control and intervention groups.

Chapter five provides the discussion of the findings of the research study. The findings of the previous study were used to support or dispute and to draw conclusion for this research study. The strenghts and limitations of the study was also discussed.

Chapter six presents the conclusion of the study. This chapter provide a short description on introduction, the conclusion of the baseline in regard with the level the triage decisions making skills and the accuracy of triage decisions and the conclusion of the phase 3, which was the effectiveness of the educational intervention on the triage decisions making skills and the accuracy of triage decisions among control and intervention groups. Implication for practice and education, and recommendation for future education, practice and research concluded this chapter .

1.11 Summary

Precise decisions in classifying a case for proper triage categorization and appropriate intervention are very crucial. ED staff has to decide very quickly on the priority of patient care while not forgetting the yellow and green categories of trauma patients, to prevent overcrowding, long waiting hours and dissatisfaction among patients. Registered nurses and medical assistants should be able to decide an accurate triage categorization according to the priority of patients' needs for care, determining optimum nursing care, and the intervention or treatment to provide the best care possible for a patient's well-being.

An efficient and effective triaging and delivering of care in ED may contribute to efficiency in resources consumption, less waiting time in ED, less stress amongst ED staff, right treatment for the right patient, and prevention of legal actions and satisfied customers. According to Grossman (1999, cited in Andersson, Omberg, and Svedlund, 2006), nurses are expected to play their role in a triage system with a professional method, and their qualifications and personal qualities are immensely crucial for effective triage. Chung (2005) study on nurses' experience of triage in Hong Kong revealed that triage decision-making among nurses is influenced by a series of contextual factors that occur in daily practice, and these factors should be overcome to improve accuracy of triage decision-making. In addition, the application of a standardized protocol or guideline, and the application of knowledge into practice, may enhance accuracy and consistency of triage decision-making.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter described the literature review which is related to the triage decisions making among HCPs (registered nurses and medical officer assistants) in the Emergency Department and factors that may influence HCPs to reach a triage decision accurately. This chapter will commence with a search strategy, followed by triage and triage decision-making, triage system and current practice, factors that may influence decision-making, and the theoretical framework that underpin the study. Intervention and educational module to improve accuracy and ability of triage decision were also described.

2.2 Search Strategy

The initial literature review search involved browsing through multiple internet links such as Wiley online library, ProQuest and EMERALD. Further searches for literature used the following databases because they are the most comprehensive used by healthcare professionals. The databases include: evidence-based medicine (EBM), full text journal @ OVID, UMlibrary's full text journal through Cochrane, OVID, Medline through EBSCO host and Cumulative Index to Nursing and Allied Health Literature (CINAHL) including a full text journal search via ScienceDirect, and Google Scholar's full text articles. The electronic literature searched for published health care research to identify studies that reported on triage decision making skills and the accuracy and the factor that may influence triage decisions. The initial search key terms used were triage, triage decisions, triage system, skills of triage, accuracy of triage decision in emergency department, triage decision-making of trauma patient, decision-making theory, emergency care, factors associated with triage and educational intervention for triage skills and accuracy. Later key word search expanded to critical thinking, intuitive, experience and cognition. The inclusion criteria are studies which is in regard with triage practice and decisions conducted either in actual situation, using simulation or paper based scenarios. Exclusion criteria are studies which is on instrument validity and reliability. However books, compiled articles, expert opinions and unpublished thesis were also included in the searching methods as well. The ultimate goal of researching the literature was to identify all studies that provide evidence of a particular intention, to critically critique each study, synthesize all the studies and provide evidence of the effectiveness of a particular matter which is similar and with arguments that could support the statements.

2.3 Triage System and Current Practice

Historically in medicine triage is used to sort and determine priority for immediate care for ill or injured person in the field of casualties (Mezza, 1992). While according to Kennedy, Aghababian, Gans, and Lewis (1996) originally triage described the first aid treatment of battle casualties in collection stations at the front before their evacuation to hospitals. Later triage system evolved from field to hospital setting mostly in emergency department. Then triage was developed and utilized as an effective way to separate those patients who required immediate medical attention compared to patients with non-urgent problems in the emergency departments of hospitals, which offered service 24 hours per day. According to Farrohknia et al. (2011b) triage in the ED was introduced in 1950s in United States. According to Considine et al. (2007) triage is the point which emergency care begins. According to (Edwards and Sines (2008) triage system was adopted particularly for HCPs to select urgent and non-urgent patients effectively. Triage in the EDs was a process of assessment started as soon as the triage nurse see the person walk in to the triage counter.

Triage is a process of sorting patients according to their need and the most sick people will receive early treatment in the EDs (Iserson & Moskop, 2007; Rouhani, Aaronson, Jacques, Brice, & Marsh, 2017). Patients need to go through an assessment then assigned to appropriate category and area for treatment (Tanabe et al., 2004). Triage process in the ED was performed to ascertain the right patient to receive the right treatment and ensuring the appropriate waiting times (Ajani, 2012). Patient categorization was based on severity of illness or injury, prioritization of patient for treatment was the most of ED operation (Fernandes et al., 2005; Travers, Waller, Bowling, Flowers, & Tintinalli, 2002).

The triage system is supposed to be useful in sorting out cases rather than to be a burden on an individual. According to Iserson and Moskop (2007) triage system tends to rely on three different values: to protect endangered human lives, efficiently use resources, and establish guidelines to assist in each decision made on a basis of standards instead of personal preferences. Several triage systems have been tested for reliability and validity across all the patient populations seen within the emergency department, for example Canada such as Canadian Triage Assessment Scale (La Vonne et al., 2015). Meanwhile according to Schuetz et al. (2013), triage systems preferably permit patient care to be delivered within an acceptable time to decrease overcrowding, increased patient satisfaction, allowed urgent patients to receive appropriate care, and prevent non-urgent patients from receiving unnecessary treatment.

Triage system models are used to stratify patients in categories based on severity of patient condition on arrival in the ED from urgent to non-urgent or from critical to non-critical. The aim of the primary triage is to identify patients who can safely wait from those who cannot, to ensure patients receive safe treatment within certain time frame without negative impact (Brown & Clarke, 2014). Triage was used to sort, tag and determine the priority for immediate care for ill or injured persons in the field (Mezza, 1992). According to Möller, Fridlund, and Göransson (2010) the overall objective of the triage system is to decrease the rate of morbidity and mortality. FitzGerald et al, (2010) indicated that triage systems are underpinned by principles of the fair and efficient use of resources, which is achieved by identifying which patients will be least disadvantaged by waiting, and which patients need immediate treatment to optimize clinical outcomes (Sands et al., 2014).

Besides that, the aim of the triage is to prevent negative impact for patients' prognosis due to delay of getting treatment (Farrohknia et al., 2011a). Implementation of triage system is to improve the efficacy of assessment strategies scales to prioritization system in ED and giving safe treatment in the time frame may avoid (Vatnøy et al., 2013). However many studies found that poorly designed and complex triage systems and failure to comply with triage protocols are so significantly contribute to over-triage (Shawhan et al., 2015). Halim et al. (2012) supported the need of the system which may assist emergency department healthcare providers to make an accurate triage decision, because under-triaged might cause at-risk patients to wait, thus deteriorating their condition, whereby over-triaged might cause stable patients to receive earlier treatment unnecessarily.

In the absence of a gold standard for the genuine degree of urgency, many countries struggle with the need for a good ED triage system (Christ, Grossmann, Winter, Bingisser and Platz, 2010; Beveridge et al., 1998). According to Moll (2010) there are few triage system models in the world currently that were widely used such as Manchester Triage System, Emergency severity index, and Canadian triage acuity scale and Australasian triage scale (Sands et al., 2014). Furthermore according to Eithel, Travers, Rosenau and Gilboy (2003) the 3-level system predominates in the United States, which typically used either level 1, 2, 3; or emergent, urgent and non-urgent classification assignments, however, 4 level and 5 level systems are becoming more popular.

A different algorithms have been developed in Canada such as Canadian Triage Assessment Scale (Beveridge et al., 1998). The South African Triage Scale (SATS) was developed in 2004 for implementation for pre- and in-hospital emergency units throughout South Africa by Emergency Medicine Society of South Africa (Dalwai et al., 2014). O'neill and Molczan (2003) the 5-level acuity system is the most complex and advanced method to classify patients into appropriate categories, for example a patient may be classified as critical: immediate treatment, emergent: target time treatment < 30 minutes, urgent: target time to treatment 30 to 60 minutes, non-urgent: target time to treatment: 60 to 120 minutes, and fast track: target time to treatment when possible. Van der Wulp, Schrijvers, Van Stel (2008) mentioned that, according to Manchester, a triaging system patient is classified in one to five categories: red mean patient need to see doctor immediately, orange mean patient can wait ten minutes, yellow for patient who can wait for one hour, green mean patient can wait two hours and blue mean patient can wait four hours (Parenti, Reggiani, Iannone, Percudani, & Dowding, 2014). According to Azeredo, Guedes, de Almeida, Chianca, and Martins (2015) the Manchester Triage System was widely used in the European Union. Meanwhile in Japan, Japanese triage acuity scale was introduced which was proven to have positive effect on nursing triage decision making and medical care in the ED (Hamamoto, Yamase, & Yamase, 2014).

In Malaysia, current hospitals (including Hospital Universiti Sains Malaysia) are using a 3-tier triage scale in categorizing a patient into the triage allocation, except for University Malaya Medical Centre and Hospital Universiti Kebangsaan, Malaysia. Both of the hospitals have practice a 4-tier triage scale. The 3-tier triage scale means that level one is emergent, level two is urgent and level three is non-urgent. Level 1 patient will be attended to immediately; level 2 within 30 minutes; and for level 3, within 120 minutes. Meanwhile, for the 4-tier triage scale, a level 1 (color code is red) patient will be seen within 10 minutes, level 2 (color code is yellow) will be seen within 30 minutes. Meanwhile, a level 3 (color code is green) patient will be seen within 90 minutes and level 4 (the color code is blue) will be seen within 120 minutes.

In 2012 the first Emergency Medicine and Trauma Services (EMTS) Policy was published by Ministry of Health Malaysia. The triage system was categorized into 3 colour code, which indicate red colour code is critical, yellow colour code is for high risk and green colour code is for non-critical which requires many resources, minimal resources and non-emergency. Patient who was tagged with red colour code will be seen immediately, yellow colour code will be seen in within 30 minutes and for green colour code the patient time to be seen is not stated however by observation patient were seen within one or more than one hour or accordingly. Hospitals EDs in State of Kelantan practice the 3-level triaging systems using colour coding to categorize patients' priority for care according to the severity of patient's condition. Red is for critical cases which need immediate treatment; yellow is for high risk cases which need treatment within 30 minutes and green is cases who can be seen in within one hour or more.

2.4 Triage Decision-making

Triage is about sorting patients into categories according to the urgency level of the patient's condition to get any treatment or care after gathering information and performing a health assessment. According to Ganley and Gloster (2011) triage has emerged as way for optimising attendance and minimising possible damage caused by overcrowding by identifying patients who need immediate care by classification according to clinical severity level of suffering and risk to their own health, therefore triage is defined as a dynamic process of patient classification that allows patients to be allocated to the most suitable service for faster treatment (Azeredo et al., 2015).

Many authors have defined triage in many ways. Triage in emergency is the systematic process to allocate patients' priority for treatment based on the severity of their condition and to ascertain the patients receive appropriate and quality of care accordingly (Dalwai et al., 2013). According to Funderburke (2008) triage is a French word which is defined as sort or chooses. Meanwhile Tanabe et al. (2004) defined triage as an initial assessment and sorting of patients in an emergency setting to determine clinical priority and appropriate area for treatment. For Fitz Gerald et al (2010) triage was a dynamic process and vital in emergency department. It required high level of clinical assessment skills in order to allocate patient to appropriate area for proper treatment (Russell, Dinh, & Bell, 2017). According to Iyer (1999, cited in O'neill & Molczan, 2003), triage concerns sorted or classified patients according to their presented symptoms.

It is said that triage commences once a patient enters into the ED. According to Edwards and Sines (2008) the process of triage assessment begins prior to the triage encounter, and is started as soon as the triage nurse sees the person. Whitby et al. (1997, cited in Edwards and Sines, 2008) triage is the point which emergency care begins. According to Estrada (1981, cited in Cook and Sinclair, 1997), a patient is assessed upon arrival to determine the urgency of the problem and to designate appropriate healthcare resources to care for the identified problem through the triage process. Elshove-Bolk, Mencl, van Rijswijck, Simons and van Vugt (2007) indicated that triage is a rapid and preliminary assessment of patients identifying those who need to be seen quickly and those who cannot wait. The essential skills of triage officer to make highly quality of judgement and decisions either using structured algorithm or ABCDE triage system (Noon, 2014).

A patient will be assessed physically using provided facilities, and will be recorded. Then a decision will be made to allocate the patient using triage accurately according to their present condition after the process. Wong et al. (1994) supported that triage decisions were based on the vital sign and the presenting problems. Vital signs data are important in emergency care decision making, especially for prioritization and identification of severe illness and were the key factors to improve patient survival (Elshove-Bolk et al., 2007). According to Lake, Moss, and Duke (2009) the key component required in nursing assessment in order to make an accurate decision is the recognition of a pattern of problems.

In the ED triage process is essential in order to determine triage allocation accurately and it was a very challenging task. According to Lake et al. (2009) triage is a complex task and making triage decisions is challenging. Gerdtz and Bucknall (1999) mentioned that a dynamic decision-making process is required to prioritize a patient's need for medical attention in the ED to improve patient outcome or need to relieve suffering. HCPs have a huge responsibility to ensure the assessment and decisions are done timely to ascertain the appropriate care and intervention. George et al. (1992) conducted a survey on the evaluation of nurse triage in a British Accident and Emergency Department in United Kingdom. It indicated that the purpose of triage is to categorize patients according to the urgency of their problems, to improve the waiting time so that urgent cases are seen earlier. Triage accuracy may contribute to efficiency in resource consumption, less waiting time in ED, decreased stress amongst HCPs, the right treatment for the right patient, and so forth.

HCPs at triage desk of the ED are expected to make triage decisions in a very short time frame, and must allocate patients to the appropriate zone to ensure timely intervention. Triage is supposed to be performed as fast as possible and the triage decision must be precise to avoid an unnecessary outcome. Failure to make correct and fast triage decisions in categorizing patients for immediate medical attention may cause further harm to the patient, thus raising dissatisfaction. According to Gerdzt et al. (2009, cited in Russell et al. 2017) triage is a brief process of assessment and completed in two to five (2-5) minutes. According to Welch et al. (2011) the starting point of adequate safety timing for triage process was less or within five (5) minutes from arrival time to triage time (Bambi et al., 2016). Since triage is a crucial and very precise process in a limited time frame, triage officers are supposed to be a well train HCPs that are able to make triage decisions within a very limited time and dynamic environment. Therefore

HCPs who were at triage desk required wise observational, assessment skills and be vigilant, thus HCPs have to equip themselves with sufficient knowledge to aid them in making decisions while executing triage tasks.

2.5 Triage Accuracy and the Consequences of Inaccuracy

Thompson (1998) defined accuracy as exactness, or careful precision. During triage, the most essential task is sorting patients into accurate triage category according to the urgency of that patient's condition demand. An accurate triage decision in allocating the patient to the right category for nursing or intervention is crucial for saving his or her life. The appropriate and accurate triage of the severed injury patient is a foundation of modern trauma care and effective trauma systems. According to Rehn et al. (2012) accurate triage decision among patients especially trauma patients' can be determined by early detection of the seriousness of patient condition and the mechanism of the injury (Haley et al., 2017). Farrokhnia and Göransson (2011), stated that the purpose of triage scales is to optimize waiting time and to treat the most severely traumatized patients as soon as possible to reduce negative effects caused by delayed interventions.

Multiple studies have demonstrated the positive impact of accurate triage on morbidity and mortality in the EDs (Shawhan et al., 2015). For example according to Shawhan et al. (2015) under triage were feared to result in patient morbidity and mortality because of delayed or missed interventions. Over-triage greatly cause increase in consuming resources, simultaneously raised up cost, that burden the institutions and patients (Egberink, Otten, IJzerman, van Vugt, & Doggen, 2015). An accurate triage in the EDs reduced the imbalance between the need for emergency care and available resources simultaneously reduced crowded in the EDs (Van der Linden, Meester, & Van der

Linden, 2016). Furthermore the accuracy of triage decisions have positive impact on the emergency department by decrease waiting times and improve management of patients (La Vonne, Zun, & Burke, 2015). Therefore skilful HCPs in determine triage decisions were vital to prevent the issues of under and over triage including ED overcrowd.

Knowledge and related information are required to ensure triage decisions are made accurately. Minimizing uncertainty in order to make accurate triage decisions by seeking available knowledge and information to promote improvement rather than harm (Sands, 2009). Considine, LeVasseur, and Villanueva (2004), stated that an appropriate triage category according to a patient's current problems is essential to prevent long waiting hours and to reduce the risk of an adverse outcome after care. Yet, triage accuracy may increase efficiency in health services and increase patient satisfaction. George et al. (1992) indicated that significant factors influencing satisfaction include waiting time and time of treatment. Soleimanpour et al. (2011), also point-out that waiting time and staff courtesy are the two important factors influencing patient satisfaction. Andersson et al. (2006, cited in Rehman and Ali, 2016), supported the statement that appropriate triage decisions will be able to boost management of the patient care and increased patient's satisfaction with emergency care.

Making accurate decision regarding triage allocation in uncertain patient's conditions are difficult to say the least. According to WHO, the most practical use for triage guidelines is to help in the accurateness of priority allocation and presence of priority signs among ED personnel (Robertson & Molyneux, 2001). Fast and accurate triage decisions in allocating patients for nursing or medical intervention has a huge impact among adult trauma patients. A precise triage decision is very crucial and will make a great difference to an adult trauma patient's quality of life. The earlier the treatment received, the better the patient outcome, due to this triage now functions as an approach of timely critical intervention (King, Ben-Tovim, & Bassham, 2006). Kondo et al. (2011), stated that accuracy of triage decision and early intervention in the EDs has proven to reduce the rate of mortality among trauma patients. According to Chen et al (2010), inaccuracy of triage decisions may lead to under and over triage (cited in Brown & Clarke, 2014). An inaccuracy of triage decision leads to a waste of resources, delays of patients' treatment, dissatisfaction and undesirable consequences (Rahmani et al., 2018; Gilboy, Tanabe Travers and Rosenau, 2012).

Inaccuracy in triage decision-making among staff nurses and medical assistants in adult trauma patients could be resolved with an appropriate education program. Provisions of such education programs will minimize the uncertainty and inaccuracy in making decisions related to triage, and will increase the positive impact on adult trauma patient care and enhance patient satisfaction. According to Happell, Summers and Pinikahana (2003), triage education and training with triage guidelines will help triage nurses prioritize patients who were brought into the emergency department in all healthcare settings accurately (Qureshi, 2010). Accuracy of triage decision may help for a smooth flow of the patient management in the ED however inaccuracy may cause overcrowding, delay of care and increased length of stay in the ED (Claret et al., 2016). According to Massingale (2012, cited in Scrofine and Fitzsimons, 2014) long waiting time significantly related to poor patient outcomes.

2.6 Challenges in Triage Decision-making

According to Anna-Karin Andersson (2006) almost every nurse has experienced uncertainty in triage decision-making contexts, especially with borderline cases, since it is difficult to decide how long a patient can wait for treatment before irreversible damage occurs. Uncertainty is defined as a situation wherein one is unable to assign a probability outcome of an event or unable to predict an outcome accurately (Luce and Raiffa, 1957). Norton (1975) defined uncertainty as an individual state of mind. Khulthau (1993) defined uncertainty as the critical connection between information and decision-making. Worster, Sardo, Eva, Fernandes, and Upadhye (2007) regarded inconsistency as diversity of disagreement among ED personnel in assessing the same patient's condition scenarios, thus resulting in variations of triage category allocation.

Many HCPs have experienced uncertainty and inconsistency in making triage decisions that lead to inaccuracy of triage decisions in real environments of practice (Considine et al., 2012). Meanwhile Dallaire, Poitras, Aubin, Lavoie, and Moore (2012), found that there was a disparity between documented and observed nursing practices, for example experienced nurses usually used their instinct rather than provided guideline compare to novice in making triage decisions. Experienced nurses are more likely to use well-developed heuristics rather than external guidelines (Lyneham, Parkinson, & Denholm, 2008). According to Patel, Gutnik, Karlin, and Pusic (2008), they found that during triage process, different triage officer used triage guidelines differently. Inability in making precise triage decisions may lead to over and under triage whereby under-classification of severity may lead to potentially dangerous situations (Van der Linden et al., 2016). Cioffi (1999) emphasized that many scholars have described the context of uncertainty among nurses in clinical decision-making and stressed to avoid inaccuracy in triage decision-making.

The Emergency Department is a complex and dynamic environment, often resulting in possibility of an uncontrolled and unpredictable workload (Källberg et al., 2015). Null or inadequate resources to support ED staff in triage decisions making and lack of skills may lead to uncertainty and inaccuracy in triage decision-making. In accuracy , under-triage or under-classification and over-triage or over-classification are the common possibility consequences occurred in the EDs. Morbidity and mortality were the impact of inaccuracy of triage decision for trauma patients occurred in developed and developing country. A study conducted by Haagsma et al. (2013) has showed a prevalence of 973 million people sustained injuries that warranted some type of healthcare and 4.8 million people died from injuries in 2013. An under-triage triage decision for a severe chest and abdominal trauma may cause death in 60 minutes (Jelinek, Fahje, Immermann, & Elsbernd, 2014). Therefore accuracy in triage decision making among triage officer remains as on-going challenge among HCPs who assigned for the task at triage desk. Bambi et al. (2016) affirmed that HCPs triage performance is immensely determined by education, factual knowledge, experience, expertise and communications that may assist HCP to ease the challenges.

Other than uncertainty, under triage and over triage , ED can be crowded with simple cases which do not required medical emergency but caring intervention. These can contribute to unnecessary attention and time used that may be the golden hours for certain patients. Worldwide, EDs have faced problems of overcrowding due to increasing number of non-critical patients attending to EDs (Boh et al., 2015). EDs were attended with those cases which do not need urgent treatment. HCP as a front liner has to provide unnecessary caring intervention that consume plenty of time instead of emergency care in the ED. Therefore a clear definition of emergency care that value caring intervention as same value as medical intervention may facilitate HCPs to fulfil their task and respond to patient at triage as appropriate (Elmqvist, Fridlund, & Ekebergh, 2012).

Attendance of non-urgent patient to ED may cause ED overcrowding with the mixture of urgent and non-urgent resulting in scarcity due to overwhelming resources consuming (Hamamoto et al., 2014). ED overcrowding may influence the operation due to insufficient trained HCPs and a shortage of ED and hospital beds that cause increased in length of stay in the ED that may burden HCPs' work load capacity unnecessaryly (Cha, Song, Cho, Singer, & Shin, 2015). It is supported by Fields et al. (2013), that ED overcrowding of urgent and non urgent patients would cause long awaiting for treatment, availability of resources and HCPs to atttend to them. It exposed HCPs in the EDs to negligence and unnecessary legal claims (Nailon et al., 2015). According to Olshaker and Rathley (2006) ED overccrowding simultaneosly increased stress among family, patient and HCPs (Hsiao et al., 2017). In conclusion all such challenges experienced by HCPs at triage not only could jeorpadised the patients' condition, it even could tarnish institution reputation and profesionalism of HCPs.

2.7 Factors Influence Triage Decision-making

In many studies, knowledge and experience of HCPs are the common features which describe the characteristics of effective triage HCPs, which influence their ability in triage decision making (Fernandes, Wuerz, Clark, Djurdjev, & Group, 1999). According to Considine, Botti, and Thomas (2007) and Patel, Kaufman and Arocha (2002), past experience and knowledge have a major influence on making timely, critical decisions in EDs, while Rahmani et al. (2018) emphasized that the working environment has an effect on HCPs' ability in TDM. Indeed, the triage nurse needs a broad knowledge base including assessment skills, experience, critical thinking, and intuition in order to be effective in making triage decisions (Dateo, 2013). Patient factors such as vital signs and patients' own complaints were among the factors that influence triage decisions. Elements of vital signs are important in emergency care decision-making in order to prioritize and identify the severity of illness, and are the key factors to sustain patient survival (Skyttberg, Vicente, Chen, Blomqvist, & Koch, 2016).

2.7.1 Knowledge

Knowledge related to triage and triage decision making (TDM) is important for HCPs to make a precise and accurate triage allocation. Knowledge is known to be one of a nurse's characteristics that influence her triage decision-making. According to Patel, Kaufman and Arocha (2002) and Considine et al. (2007) knowledge covers factual, procedural and conceptual elements. Factual knowledge is a set of facts comprised of procedural knowledge. The knowledge is related to the performance of an activity or associated with actions such as decision rules and clinical guidelines; while conceptual knowledge is the integration of new information with prior knowledge, resulting in a deeper level of understanding.

Nurses' knowledge is known to be a factor influencing triage decision-making, which potentially contributes to patient outcomes (Cioffi, 1998). Lack of knowledge in triaging may cause delays and harm to vulnerable patients (Aloyce, Leshabari, & Brysiewicz, 2014). According to McCallum Pardy (2007, cited in Hodge, Hugman, Varndell and Howes, 2013) lack of knowledge is a known as factor that affects accuracy of triage decisions in EDs. A study in the United Kingdom by Offredy, Kendall, and Goodman (2007) supported the importance of appropriate knowledge among nurses in order to make decisions. Wuerz, Fernandez and Alrcon (1998) also emphasized that knowledge is a factor that influences nurses' triage decisions. Meanwhile, Cioffi (1998) stressed that in order to avoid inaccuracy in triage decision-making, existing knowledge of triage should be applied in the actual practices in the ED. Lack of knowledge may cause delay in triaging and will put patients at risk (Aloyce et al., 2014).It should be noted that most of the above studies are dated and conducted in western countries where the healthcare system may be different from Malaysia.

In many studies, knowledge is defined as the common feature describing the characteristics of triage nurses with regard to triage decision-making. Considine et al, (2007) found that the common characteristic that influenced the accuracy of decision-making by nurses tasked with carrying out triage was their level of knowledge, and the researchers stressed that the existence of factual knowledge contributes to better triage decision-making. As front-liner in hospitals EDs, HCPs performing triage tasks need a broad knowledge base related to triage decisions so that they can be effective in triaging and delivering patient care (Dateo, 2013).

Knowledge which is related to triage decisions is important in order to make precise and accurate triage allocations. Knowledge is the best chance to reduce uncertainty and increase accuracy in triage decision-making (Thompson & Yang, 2009). A nurse's knowledge is known as a factor to influence triage decision-making that have potential to lead to patient's outcome and indeed to avoid inaccuracy in triage decision-making an existing triage decision knowledge should be applied in the triage decision-making process (Cioffi, 1998). Fry and Stainton (2005) points out that the process of triage decision-making interacting with prior knowledge will provide nurses with a way of understanding what is known and what is to be believed so that they can provide effective care to a particular patient. In Gerdzt et al.'s (2012) study, nurses reported that knowledge was among the critical factors that influence them when making accurate triage decisions and ensuring patient safety.

2.7.2 Experience

A nurse's personal characteristics are said to be important in influencing her skill in triage decision-making. Apart from knowledge, experience is another very important characteristic of nurses dealing with a triage situation. Many studies show that experience is one of the most important factors that may influence ED staff's triage decisions. The common characteristic of triage nurses featured in triage decision-making is experience that can assist them in making triage decisions (Considine, Botti, and Thomas, 2007). HCPs' characteristics such as length of experience and level of qualification were factors that influence triage decision accuracy, according to Varley et al. (2016). Earlier triage experiences greatly assist ED staff members in making judgment calls and reaching triage decisions (Cioffi, 1998). More recently, Gerdtz, Weiland, Jelinek, Mackinlay, and Hill (2012) also found that possession of experience of the particular field was the critical factor for skilful HCPs making accurate decisions and enhancing patient safety.

However, the definition of experience is always vague. Johnson and Webber (2001) defined nursing experience as the unique and active process of defining, refining and changing knowledge, skill, value and meaning used in clinical reasoning as an outcome when actively engrossed in nursing situations over time. According to Considine et al. (2007) experience is recognized as having these three measures: the passage of time; the gaining of skills or knowledge; and exposure to the event. Past experiences and knowing the patients plays a big role in recognizing patient deterioration in EDs (Cioffi, 1999). According to Lee, Chan, and Phillips (2006), experienced nurses recognize patients' problems more promptly than inexperienced nurses. According Bucknall et al. (2016) cues obtained from previous triage situations resulted in different triage decisions among HCPs who possessed extensive experience compared to those with less experience. A skilful nurse was defined by (McCarthy, Cornally, O'Mahoney, White, & Weathers, 2013) as one who has 6 years to 10 years of ED experience.

The literature shows clearly that experience is required to enhance triage decision-making skills. On-the-spot experience is necessary for novice emergency nurses to gain skills for triage decision-making (Cioffi, 1999). In their study, for example, Varley et al. (2016) found that HCPs' previous experience was less likely to have a positive impact on their preparation to perform triage via phone accurately. However, HCPs with vast ED experience reported that they were better prepared for triage roles compared to HCPs who have less experiences. A study by Mattar, Liaw, and Chan (2015) on accuracy among nurses using the Glasgow Coma Scale (GCS), found that experienced nurses were able to use the GCS skilfully and accurately, whilst nurses with less experience and training demonstrated a lack of skill in using the scale with lower levels of accuracy. In addition, Garbez, Carrieri-Kohlman, Stotts, Chan, & Neighbor, (2011) found that experienced nurses used different criteria for triage decisions than did the less experienced nurses. This has led Fry (2007) to point out that experienced triage nurses are a valuable resource to assist novice triage nurses in the process of triage decision-making.

Patel et al. (2008) found that inexperienced nurses used guidelines much more frequently and rigorously than experienced nurses, who had already internalized the guidelines. According to Chalkright and Nurse (2017) past experience balanced with provided policy can help to reach accurate triage decisions. According to McBrien (2009), ED staff who lack of experience have difficulties in performing triage. However, this was disputed by McDonald, Butterworth, and Yates (1995), who believed that performing appropriate triage allocations in Accident and Emergency Departments is more closely related to the personality and character of individual nurses’ rather than to seniority, although the researchers conceded that experience can assist nurses in triage decision-making. Hicks, Merritt, and Elstein, (2003) argued that clinical experiences are an important determinant of nurses’ decision-making ability, a finding supported by Garbez et al. (2011) who found that allocation of the appropriate triage category to patients by triage officers was influenced by previous ED experiences of the officers concerned. However, in a different context, Nilsson, Åslund, Lampi, Nilsson, and Jonson (2015), in their study of the triage accuracy of different groups of firemen, demonstrated that previous experience of multi-casualty incidents, years in service, level of education nor age had any influence on triage accuracy.

2.7.3 Intuitive

Intuition is a mode of thinking. It is an unconscious thought arising from a good understanding of the situation (Sarvimäki & Stenbock-Hult, 1996). Hamm (1998, cited in Lamond and Thompson, 2000) suggested that intuition is one way of many different modes of thinking that exist for decision makers. Rew (2000, cited in Hicks et al., 2003) stated that clinical intuition is an immediate thoughtful application of knowledge or understanding and is independently distinct from analytical reasoning processes: intuitive decision processes are preconscious, connected understandings of a clinical situation. According to Alligood (2013), nursing knowledge can be attained via empirical, aesthetic, personal and ethical knowing, while according to Pearson (2013, cited in Hassani, Abdi, and Jalali, 2016) intuition is the "art of nursing" or aesthetic knowing.

Intuition is the consequence of a relationship between knowledge and experience. Experienced HCPs often practice intuitively and use their own rules of thumb, thereby making triage decisions skilfully and faster with higher level of accuracy compared to less experienced HCPs (Lyneham et al., 2008). Crosskerry et al. (2013, cited in Smyth and McCabe, 2017) reported that the combination of intuitive and analytical approaches may reduce errors in making decisions in ED. HCPs with better ability at making triage decisions are usually the ones who have blended knowledge, skill and expertise prior to making the decisions. For Hassani, Abdi, and Jalali (2016), intuition is the result of the merging of knowledge, skill and expertise which places the nurses who apply these processes in a higher level of competency.

Experienced HCPs are said to use intuition most frequently in making triage decision. Experienced triage nurses often use a subjective assessment, which can be called intuition, to make triage decisions appropriately (Chung, 2005). According to Dateo (2013) stated that intuitive knowledge is the preserve of experienced and expert nurses. According to Benner (1984) unlike novice nurses, experienced nurses were able to develop an intuitive grasp of the situation, even in complex situations. On the other hand, novice nurses who depended heavily on intuition were unable to explain the reasons behind their decisions (Adam, Odell, & Welch, 2010; Ruth-Sahd & Hendy, 2005). Lyneham et al. (2008) also found that the experts used intuition efficiently, compared to those with less experience. Cioffi (1999) found that, in fact, experienced nurse midwives increasingly depended on heuristics as task complexity increased.

Most previous studies, such as that by Pretz and Folse (2011), found experience was associated with intuition. Many studies stressed that nurses used personal experience and intuition when deciding on the appropriate triage category (Fields et al., 2013). As Miller and Hill (2017) discovered, the more experience nurses gained, the more their intuitive judgement increased. Experienced nurses who followed their intuition made accurate measurements more frequently (Hassani, Abdi, Jalali, & Salari, 2016b). However, Alba (2016) found no association between experience of working in an ED with intuition, and Ruth-Sahd and Hendy (2005) found no relation between intuition and professional experience. Intuitive knowledge was associated with experienced and expert nurses (Benner and Tanner 1987; Dateo, 2013) . Although Pretz and Folse (2011) stated that experience is not equivalent to expertise, there was an association beweeen intuition, cognition and experience. (Hassani, Abdi, et al., 2016b; Lyneham et al., 2008).

According to Kenny (1994), nurses often use intuition to understand that something is wrong based on their past experience to assist them in making accurate decisions. In fact, Poole et al. (1993) and Patel and Currie (2005) (cited in Patel et al. 2008) reported that compared to inexperienced nurses, experienced nurses are more likely to use intuition rather than guidelines to make decisions. In another study, conducted by Pearson, Goldman, Garcia, Cook and Lee (1994), they found that more experienced physicians were more likely to break from protocols or guidelines to assess the disposition of patients with possible cardiac chest pain than their less experienced counterparts, and Hicks et al. (2003) found that among critical care nurses, the more complex the task, the greater the likelihood of using heuristics in making decisions. McCutcheon and Pincombe (200I) found that there was a strong interaction between knowledge, experience and expertise, which resulted in high levels of intuition among

HCPs who practiced in clinical areas (cited in Hassani, Abdi, Jalali, & Salari, 2016a). Meanwhile, Gilboy, Tanabe, Travers, Rosenau and Eitel (2005, cited in Dateo, 2013) commented that the current emphasis on evidence-based practice for clinical decisions is reflective of present day thinking, which expects that health care providers to combine individual clinical expertise acquired through an intuitive approach and analytical approaches. Although the evidence seems to point to the connections between years of experience and intuition, there are other confounding factors that could have influence a person's intuition for example the type of experience, maturity of a person (age) which was not highlighted.

2.7.4 Critical thinking

Critical thinking is an essential activity associated with information processing in which available knowledge, resources, capability, and recognised strengths and weaknesses are considered to in order to make decision (Jack, 2013). Rainbolt and Dwyer (2014) defined critical thinking as a skill of correctly evaluating arguments made by others and composing good arguments of your own, while according to Facione (1990), critical thinking is a frame of mind for thinking, or dispositions and skills that enhance decision-making processes through cognitive abilities such as analysis, inference, and evaluation. Yahiro and Saylor (1994, cited in Cone and Murray, 2002) defined critical thinking as consisting of a specific knowledge base, experience, competencies, attitudes and standards. Meanwhile, according to Nair and Stamler (2013) critical thinking is not a method to be learned, but rather a process that involves cognitive and affective domains of reasoning.

Elements of critical thinking are essential for making a good triage decision. Several authors have pointed out that critical thinking is an important characteristic for decision making in a crucial situation (Murray & Berwick, 2003). Dateo (2013) observed that nurses use critical thinking skills in making decisions in a dynamic and complex environment, and nurses with higher levels of critical thinking dispositions and skills should make better clinical decisions (Hicks et al., 2003). Novice nursing personnel do not have access to a store of experience when making a decision, so their decision is more likely to be based on critical thinking compared to expert nursing personnel. However, at later stage of professional development, critical analysis and knowledge are applied, even when knowledge is sufficient to guide action (Wood & Toronto, 2012).

Cone and Hick (2001) suggested that critical thinking among nurses in EDs could improve through nursing education or clinical experiences; however, it is unclear if nurses' critical thinking is influenced by professional education and clinical experience, or if critical thinking improves clinical decision making (Hicks et al., 2003). Odell (2015, cited in Smyth and McCabe, 2017) stressed that critical thinking ability was one of the factors can be practiced and that would be able to assist in the decision-making processes in EDs. When making a triage decision, HCPs need to integrate all the information obtained either from the patient himself/herself or from the person who accompanies them, or from observation, experience, reasoning or communication while trying to reach an appropriate triage decision by critically conceptualizing, analysing, evaluating and synthesizing, then make an inferential conclusion. When applying the results of critical thinking skill to an individual patient, such as a clinical judgment, the nurse integrates the aforementioned factors like patient's information data to tailor the final decision to the care for the specific patient (Nair & Stamler, 2013). Possession of critical thinking skill among front-liners in the dynamic EDs environment is vital to ensure that information obtained from cues is able to be analysed and transformed into accurate triage decisions for positive impact on the patients (Noon, 2014). Various demographic factors such as age, gender, clinical experience, educational qualification, clinical specialties could have influenced both nurses' critical thinking and clinical decision-making. The evidence of significant relationships between critical thinking skills and clinical decision-making is still inconclusive due to lack of evidence from the studies conducted.

2.7.5 Patient Factors

Patient factors, such as vital sign and their complaints, are a further consideration in determining triage categorizations in the ED. Patient factors and resources are the elements of HCPs' ED experience that are most likely to influence assignment to specific triage levels (Van der Linden et al., 2016). According to Vatnøy et al. (2013) presenting a complaint and the severity of the patient's signs and symptoms were the basic consideration when assigning triage categorization. Vital signs are widely used in clinical practice to recognise signs of deterioration in a patient (Skyttberg et al., 2016). The overall accuracy of triage decisions also depends on a patient's clinical condition and clinical history; various examinations and tests are considered, which subsequently result in a priority being assigned (Andersson et al., 2006).

Vital signs are also the measurement used to indicate how well triage decisions have been determined and the status of the vital signs revealed and indicated the physiological status of an individual (Hong et al., 2013). Patients are assigned a level of triage urgency after a brief assessment of whether they constitute a trauma or a non-trauma patient. In addition, information about the mechanism of injury for trauma cases is crucial. According to Rossaint et al. (2010), the mechanism of injury is an important screening element used to identify patients at risk for significant traumatic haemorrhage. A study in the Netherlands by Van Laarhoven, Lansink, Van Heijl, Lichtveld, and Leenen (2014) included respiration rate, pulse rate, blood pressure, Glasgow coma scale, and stress the description of mechanism of injury as elements required when identifying the severity of trauma in a patient.

For non-trauma patients attending the ED, the usual physiological parameters observed and inspected include airway, breathing, circulation, disability, and the surrounding environment, including their complaint. However, for trauma patients, focussed assessment is performed according to the Advanced Trauma Life Support (ATLS) algorithm. The Advanced Trauma Life Support (ATLS) was developed as a concept to treat patients in the trauma bay, using the ABCDE algorithm, the core components of which consist of airway and C-spine protection (A), breathing (B), circulation (C), disability (D), exposure (E) (Häske et al., 2016). In Europe, the multidisciplinary Task Force for Advanced Bleeding Care in Trauma was formed in 2005 with the goal to develop bleeding management guidelines after severe injury and it was presented, updated and published in 2007 (Rossaint et al., 2010). In Malaysia, the ATLS guideline is applied in hospital EDs.

The Glasgow Coma Scale (GCS) has been the benchmark in assessing the neurological measure of trauma patients. According to Mattar et al. (2015) GCS is the gold standard in neuro-monitoring. A GCS score ranging from three to eight is considered severe, nine to twelve is moderate, and 13 to 15 is considered mild brain injury (Kim, 2012) or mild trauma (Ratcliff et al.,2014). HCPs at triage stations should take extra caution to examine others parameter such GCS when attending a trauma patient with a history of loss of consciousness, because delay in assessing the situation may cause more injury to the brain and have an irreversible effect, as well as jeopardising the patient's life. A combination of parameters such as pulse, systolic blood pressure, and Glasgow Coma Score, can predict provision of time-sensitive interventions for life saving (Challen, Bradburn, & Goodacre, 2015).

Salvador et al. (2008, cited in Lira and Carvalho, 2013) contends that in current discussions pain is acknowledged as the fifth vital sign. In assessing pain, self-report of level of pain is considered to be the most accurate measurement (Oman, 2007). Patients who may have sustained a minor injury may actually be in pain and in need of pain relief, but they are often allocated a low urgency triage category (Lutze et al., 2015). According to Alavi, Aboutalebi, and Sadat (2017) uncontrolled severe pain has adverse physiological effects that may cause the patient's condition to deteriorate, so HCPs at triage need to assess a patient who complains of pain appropriately so as to prevent an unnecessary deterioration of the patient's condition. The Malaysian Ministry of Health has issued a guideline on pain management, and the Numerical Rating Scale (NRS) is recommended to be used in service to assess pain among patients who attend EDs. Following this scale, a pain score 7 out of 10 is severe pain and should be categorized as yellow colour code, or high risk case (Emergency Medicine and Trauma Services Policy, 2012).

Other factors such as age are not so crucial, since the age of a patient does not have much effect on the triage decision. A patient's age factor was less counted after taking into account all vital signs data during patient assessment (Stanfield, 2015).Current patient condition and assessment of ABCDE are the most important factors that influence triage decisions. The core components of the ABCDE algorithm are the main elements that need to be assessed as soon as a patient enters the Emergency Department (Häske et al., 2016). Vital signs, current condition of the patient (on arrival), medical history, and pain are among the most important elements to observe and collect at triage from patients in order to make an accurate decision.

2.7.6 Environment Characteristics

The environment has a great impact on HCP triage decision making as well. Environment characteristics is one of the elements that aids HCPs in the ED to determine triage decisions making. According to Gerdtz and Bucknall (2001) the ED environment, including patient complexity, physical structure, equipment available, and social interaction, influences nurses' decision-making in an actual care setting. A conducive and appropriate working environment may help ED staff to execute their triage roles more effectively, while a chaotic and overcrowded situation may negatively affect triage decision-making. In particular, environmental circumstances may influence triage decision-making in prioritizing a patient for care (Andersson et al., 2006). Brown and Clarke (2014), for example, claimed that the environment influences triage decisions to some degree because it introduces a level of uncertainty in making those decisions. Källberg et al. (2015) found that ED working conditions were a possible factor that could influence triage accuracy among HCPs. However, according to Einhorn and Hogarth (1981), while environmental aspects may influence the process of decision-making, they are not directly as a part of the decision task. Nevertheless, in his study, Bucknall (2003) found that the patient's situation, availability of resources, and interpersonal relationships, were the main clinical factors in the environment which influenced nurses in decision making. Chung (2005) also found that triage decision-making is influenced by contextual factors such as interruptions to nurses' activity, that occur daily.

Pressure and an unconducive environment affect triage decisions among emergency department staff. Triage nurses are exposed to high levels of pressure, such as work load, antagonistic attitudes in the waiting area, and a lack of resources and these factors affect triage decision-making significantly (Gerdtz & Bucknall, 1999). Fry and Burr, (2002) reinforced this view when they found that staffing levels, patient information, and environmental issues have a strong influence on the ED staff's ability to make appropriate triage decisions. Triage decisions and the process of making them become an important issue in an overcrowded environment with limited resources (Funderburke, 2008). Summarizing, Gerdtz et al. (2012) contended that situation and the surrounding environment were important factors that can influence the accuracy of triage assessments and triage categorization.

In an earlier study, Bucknall (2003) found that clinical decisions were firmly influenced by the context in which the decision is made, whereby status of patients' condition, relationship among staff, patients' families, and resources in term of staff or equipment has a significant influence on triage-related decisions. Some studies have looked at personal characteristics of nursing clinical practitioners. Burnard and Morrison (1991) claimed that an interpersonally skilled person who can remain in motion and adapt appropriately in a given context, is able to manipulate the context as a guide for deciding the appropriate therapeutic action in clinical practice. Benner (1984, cited in Kihlgren, Fagerberg, Skovdahl, and Kihlgren, 2003) also believed that understanding the context and interactions with a patient were important and inseparable in the process of determining accurate decisions. According to Broadbent et al. (2014, cited in Bambi et al. 2016), the triage process and categorization of patients into accurate triage and treatment are strongly influenced by structural, logistical, organizational and environmental factors.

2.8 Educational Intervention

Triage roles in EDs are carried out by skilful and trained HCPs, to ensure patients are assigned to the appropriate triage category and receive treatment according to the severity of their condition's. Nakahara's (2010, cited in Shawhan et al. 2015) study showed that lack of education regarding triage itself led to under-triage and over-triage in the EDs the researcher studied. Education programs in the form of training or continuous education have been proven to be able to improve knowledge as well as skills of triage decisions (Merchant et al., 2015). Qureshi's (2010) findings supported the notion that continuing training and research in triage decisions would facilitate emergency department staff to make accurate triage decisions more consistently.

According to Brown and Clarke (2014), educational intervention has improved the understanding of how to make triage decisions and, according to La Vonne et al. (2015), education promoted positive changes in the classification of patient urgency by the ED staff they studied. Bolin et al. (2011) reported that competency of skills in specialty areas is correlated with on-going education among HCPs. A continuing educational program which is evidence-based is believed to enhance interest and added value on particular topics. Aloyce et al. (2014) were strong proponents of the requirement of an educational program to improve triage decision making skills among HCPs in emergency departments.

Knowledge of performing triage, including basic assessment of adult trauma or patients' condition, is essential in order to assist HCPs in triage decision-making. According to Vatnøy et al. (2013), the vital aim of triage assessment is to determine a patient's triage category and to prioritise the urgency treatment for the patient. Therefore, a relevant educational program needs to be conducted to enhance triage decision-making. According Qureshi (2010) there are a variety of triage training programs worldwide, but there is a need for a well-planned uniform triage education curriculum and triage guidelines. In example Kirkpatric training evaluation model was used to assess in-service nursing's efficacy on cardio-pulmonary resuscitation, which conducted by Dorri, Akbari and Sedeh (2016) result has indicated a positive impact on the tested level of nurses' reaction, learning, behavior, and results.

Research has clearly shown that education improves triage decisions in actual practice: a study in Australia by Innes, Plummer, and Considine (2011) found that education increased the accuracy and consistency among triage nurses, while earlier Round (2001), stated that education improves the accuracy of decision-making, even for experienced clinicians. Triage education has proven to support skilled ED staff in executing the triage role (Bambi et al., 2016). In addition, Goransson and von Rosen (2010) stressed that an educational program should be a requirement to improve triage decision-making, and Innes et al. (2011) agreed that an education programme had assisted and improved HCPs' ability to make more accurate triage decisions. According to Considine, Ung, and Thomas (2001), to date there are not many studies that dispute the notion that factual knowledge improves triage decisions.

Maintaining skilful HCPs to meet the criteria to handle triage roles to deal with traumatically injured patients is a matter of great concern for hospital administrators. Recognizing and understanding the need for educational preparation for workforces is vital for a positive impact on patient outcomes. Petroze et al. (2015) emphasized that an educational program may enhance HCPs' skills and improved accuracy of triage decisions as well. Trauma education requires a focus on mechanisms of injury and the resulting pathophysiological responses. Mechanism of injury has sometimes been a factor in the over-triaging of trauma patients in EDs. According to Haley et al. (2017), the development of an educational program which focuses on trauma may contribute to decreased mortality of trauma patients.

However, the form that education takes is important. Grol and Grimshaw (2003), for example, observed that education is not very effective unless it is included interactively, continuously, and includes discussion and feedback on performance. According to Wong, Tseng and Lee (1994) knowledge acquired will be able to enhance triage nurses role in the ED. Knowledge is important in making accurate decisions regarding triage, and, conversely, Offredy (2007) mentioned that an insufficient level of knowledge leads to inaccuracy of the decisions. Gerdtz et al. (2012) agreed that there was evidence to indicate that expanded triage training programmes can specifically address the causes for and early management of patients, and foster positive attitudes among the HCPs involved. Each nurse has a responsibility to maintain their skills according to requirements of institutional or regulatory bodies to boost quality of service (Bolin et al., 2011). Therefore, the present study incorporated an educational program designed to enhance HCPs' knowledge to improve the accuracy of triage decisions, when there was pre-existing evidence of an unfulfilled need for such training.

2.9 Theory of Malcolm Knowles' Andragogy in Practice

Malcolm Knowles' Andragogy in practice 1998 (as shown in Figure 2.1) was applied in this study, using a classroom teaching method. Knowles' Andragogy theory is well-known in adult education theory (Holton, Swanson, & Naquin, 2001) and includes six principles, that are described below.

1. Learners' need to know — adult learners need to know why they need to learn something before undertaking to learn it.
2. Learner self-concept —adults need to be responsible for their own decisions and to be treated as capable of self-direction
3. Prior experience of learners —adult learners have a variety of experiences of life which represent the richest resource for learning. These experiences may, however be imbued with bias and presupposition.
4. Readiness to learn —adults are ready to learn those things they need to know in order to cope effectively with life situations.
5. Orientation to learning —adults are motivated to learn to the extent that they perceive that it will help them perform tasks they confront in their life situations or exercise in daily work place as appropriate
6. Motivation to learn—As a person matures the motivation to learn is internal rather than external

This theory is suitable to act as a framework for education module developed for this study, since the learner-participants in this study are adults, whose motivations learner-teacher relationships are very different from those of child learners. The learners' need to know means adult learners need to know what and why they need to learn and how to learn. Prior to the education session, participants are informed about value of attending the session. The results of the baseline survey have revealed that they lack sufficient knowledge and skill to make reliable triage decisions therefore they are invited to attend the education sessions. Furthermore, many participants had given some information regarding what they, themselves, felt they needed to know as a preparation for playing an effective role in carrying out triage activities. All these are resulted in the development of the module. Meanwhile, the Learner self-concept means the participants are allowed to make decisions independently; they need to be responsible for their own decisions and to be treated as capable of self-direction. This concept suits the participants of the study, because it means that upon completion of the education session, participants should be able to take responsibility for the triaging decisions they make when categorizing patients into accurate triage code.

Prior experience of learners, means the adult learners have a variety of experiences of life which represent the richest resource for learning. These experiences may, however be imbued with bias and presupposition. The characteristic learners' experience absolutely belong to the participants of the study, whereby participants who are involved in the study have experience in emergency field in term of performing triage roles and have experience in other specialty fields too. These experiences are the resources that may assist them during the learning session and the discussions which follow, and later influence their ability in making triage decisions in actual situations.

The third principle is readiness to learn, which mean adults are ready to learn those things they need to know in order to cope effectively with life situations. This characteristic, too, is suited to the study participants, in that the participants are interested to be involved in the educational session because it is related to their job in the actual situation. This means that the knowledge and skills acquired can be applied and practiced in their real life workplace situation.

Orientation to learning, which means adults are motivated to learn to the extent that they perceive that the input of the educational session can be integrated into their daily practice in the actual situations. This principle or characteristic is important to encourage participants to thoroughly immerse themselves in the educational session. The educational session uses problem centred learning prompts (PSBQs) that consist of realistic patient complaints or problems with health assessment of patient when they arrive at the ED. This is likely to help the participants reflect on their own experiences in the ED and share them in the class, as well as to expose them to other situations they have not yet experienced.

Lastly, motivation to learn refers to the fact that as a person matures, the motivation to learn becomes internalised rather than being imposed externally, as in children. The drive to learn becomes the centre or core, and is not merely a superficial expression. The nature of this feeling is very important and essential to enable a person to continuously develop and strive to become a better person, even in daily work practices to strive for self-improvement and at the same time to improve the institution, as well for the community who receives the health care. Good healthcare care and services have an influence on the reputation of the individual and the institution, as well as on the patients' health and the way they live their lives.

ADNRAGOGY IN PRACTICE

(Knowles, Holton & Swanson, 1998)

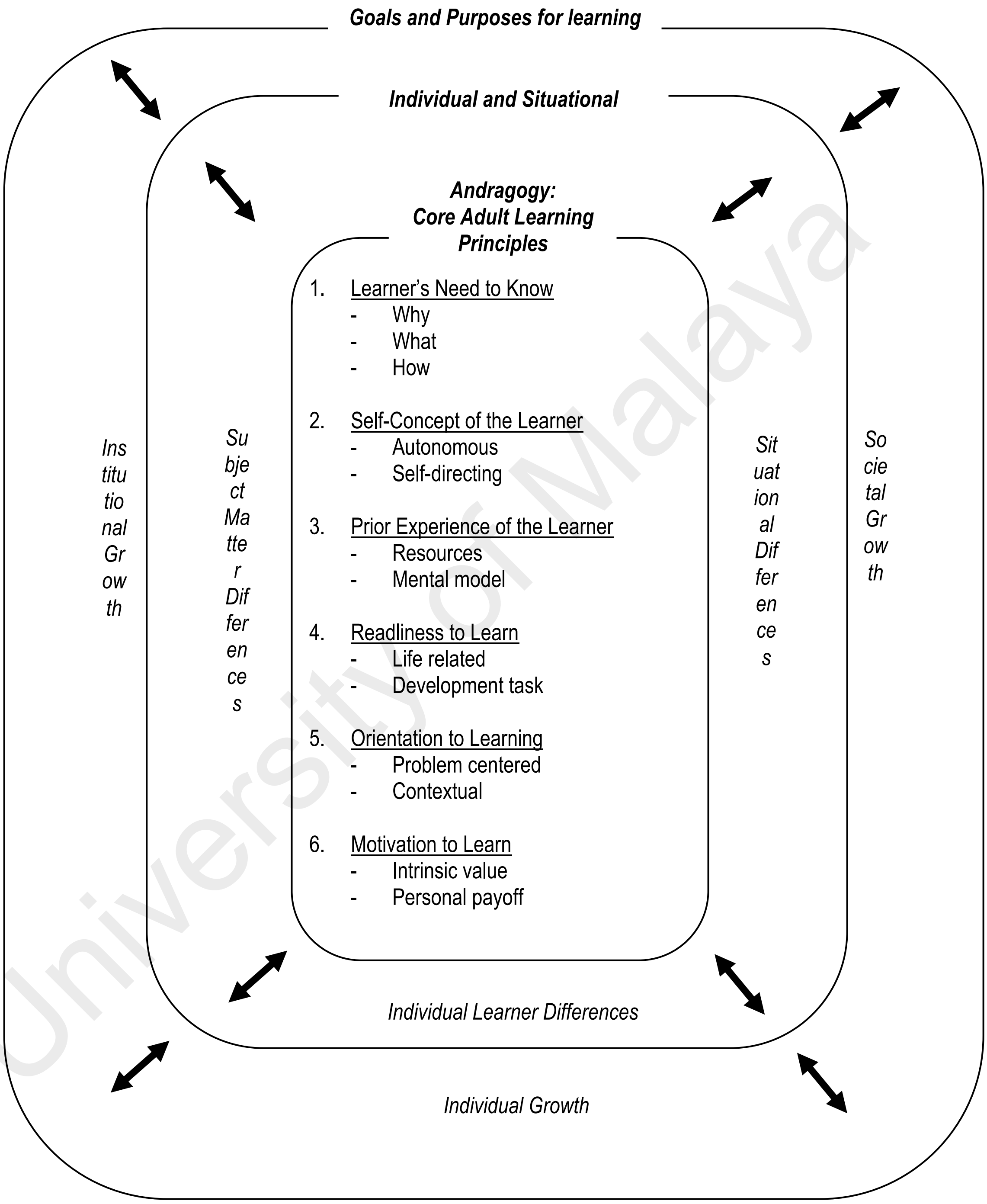

Figure 2.1: Andragogy in Practice Model (Knowles' et al 1998)

2.10 Summary

Fast and accurate triage decisions that allocate patients for treatments according to priority have a huge impact on the outcomes of adult trauma patient care. A precise triage decision is crucial and can make a great difference to an adult trauma patient's quality of life: the earlier the treatment is received, the better the patient outcome.

Accurate triage decision making is a very challenging task for healthcare providers. Making a triage assessment, identifying the mechanism of injury and determining accurate triage decisions is a challenging responsibility in unpredictable circumstances, hence skilful personnel are required for the task (Vatnøy et al., 2013). Inaccurate triage decisions, in terms of mis-tagging patients according to their priority for treatment, may cause unnecessary harm and damage due to deterioration of their condition, long waiting hours, misuse of resources, and ultimately patient dissatisfaction towards the ED service and HCPs professionalism. In order to make accurate triage decisions, HCPs need to equip themselves with the relevant knowledge and skills of triaging. For this reason, an educational intervention program for adult trauma patients is necessary to promote and implement improvements in HCPs' ability to make accurate triage decisions. From a broader perspective, it may assist in reducing the morbidity and mortality related to inappropriate triage decision making arising from a lack of specialized triage knowledge and skills, especially for adult trauma patients.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter outlines the overall plan of the research project as a blueprint for conducting this study. The chapter describes the research design, the phases of the current study, study setting, population and sampling method, and ethical considerations. It includes a description of a pilot study, data collection, and analysis of the data.

3.2 Study Design

The study design involves three phases: Phase 1 is a cross-sectional study; Phase 2 involves the development of an educational intervention; while Phase 3 is a randomized controlled trial (RCT) study. Cross-sectional design was used to identify the level of triage decision-making (TDM) skills among HCPs at a certain point of time to identify the prevalence of them recommending further investigation when appropriate. Cross-sectional studies are executed over a short period, usually to estimate the prevalence of the outcome of interest for a given population (Levin, 2006). On the other hand, a RCT design was appropriate to evaluate the triage TDM skills of personnel and the accuracy of their triage decisions for adult trauma patients when comparing control and intervention groups after exposure to educational intervention. Randomization refers to group or clustered randomization (Katz, 2010). According to Jadad (2007), RCT is a quantitative comparative controlled experimental study where people or clusters are allocated at random to receive one or several interventions. It is typically used to measure and compare the outcomes that are obtained before and after the intervention/s.

3.3 Study Phases

This study was conducted in three phases. The phases of the current study are described as below;

3.3.1 Phase 1: Baseline Study

The purpose of this phase is to determine the existing level of triage decision-making skills and the accuracy of the triage decisions made, measured in terms of the triage categorization of adult trauma patients, among healthcare providers (HCPs) in EDs of hospitals in Kelantan. The triage decision-making inventory (TDMI) and patient scenario-based questions (PSBQs) were the instruments used for the purposes. All 10 hospitals in Kelantan with healthcare providers (HCPs) who have undertaken triage roles were invited to participate in phase 1 of the study.

3.3.2 Phase 2: Development of the Educational Intervention Triage Module

This phase consisted of the development of the educational intervention triage module for adult trauma patients. It was developed based on literature reviews, adaptations from emergency triage training kits, and the results of the baseline survey. It took the form of classroom lectures and discussions.

3.3.3 Phase 3: Measuring the Effectiveness of the Educational Intervention

Phase 3 is an evaluation of the educational intervention. The purpose of this phase is to identify the effectiveness of the educational intervention on the level of triage decision-making skill and accuracy of triage decisions for adult trauma patients. The hospitals with HCPs who obtained low scores on the instruments used in phase 1 were invited to participate in phase 3 of the study; they were later were randomized into intervention and control groups. After exposure to the educational intervention, the level of triage decision-making skills and accuracy of the triage decisions were measured for the intervention and control groups, respectively, after an interval of two weeks (post-test) and four weeks (follow-up).

3.4 Study Setting

The study project was conducted in EDs hospitals in Kelantan which practiced triage procedures in their emergency department or unit. All of these hospitals use a 3-level colour coding scale triage system. The hospitals are Hospital Universiti Sains Malaysia (Hospital USM), Hospital Raja Perempuan Zainab II (HRPZ II), Hospital Daerah Pasir Mas (HOSIM), Hospital Tumpat (HT), Hospital Machang (HOSMAC), Hospital Tanah Merah (HTM), Hospital Kuala Krai (HKK), Hospital Tengku Anis (HTA), Hospital Jeli (HJ) and Hospital Gua Musang (HOGUM).

Hospital USM's ED receives approximately 43,500 patients per year (Statistic ED HUSM, 2012), with more than 20,000 injury cases per year. The ED of HUSM was staffed by 34 registered nurses (RN), eight (8) medical assistants (MA), and four (4) sisters . Both MA and RN staff have performed triage. Meanwhile, the number of admissions into ED HRPZ (II) per year is approximately 55,000, and in 2011 the number of injury cases was more than 25,000. The staff includes 38 medical assistants, 16 registered nurses, 1 assistant nurse, 9 community nurses, and 2 sisters. Triage decisions are performed mostly by medical assistants.

The number of patients attending the ED at Hospital Tengku Anis was 42,366, with 5,100 of injury cases per year. The number of ED staff members who were involved in ED care were 27, including: 10 medical officer assistants (MOA), 7 registered nurses (RN), and 10 medical health assistants (MHA). Typically, triage was conducted by MOAs, followed by RNs for secondary triage. A total of 42,718 patients were admitted into the ED of HOSIM for the year of 2012, with around 5000 trauma cases. Seventeen (17) MAs, 6 RNs and 10 MHAs were involved in ED care. Other hospitals, such as HT, HM, HTM, HKK had a similar number of staff members and patients admitted into their respective EDs; HJ and HOGUM had the lowest number of ED staff members. Table 3.1 summarizes the study setting, ED staff who played triage roles, and ED admissions of trauma patients. Rahman, Baharuddin & Mohamad (2015) reported that according to Malaysian police force there was a 400,0000 of trauma patient admitted into ED per year (2011) due road traffic accidents (RTA). According to World Health Organization Malaysia was at 20th world ranking for RTA death and the death rate due to RTA in Malaysia was 34.5 per 100, 000 population.

Table 3.1 Study Setting and HCPs Who Played Triage Roles and Trauma Admissions

No	Hospital	Triage Staff	Design	ED Admission	Trauma Cases
1.	HOGUM	10	MOA	41,700	4000
2.	HJ	9	MOA	40,500	3400
3.	HKK	17	MOA	43,500	5500
4.	HM	12	MOA	40,000	3350
5.	HOSIM	20	MOA	42,718	5000
		7	RN		
6.	HRPZ II	51	MOA	55,000	25000
		35	RN		
7.	HT	14	MOA	40000	2000
8.	HTA	12	MOA	42,366	5,100
9.	HTM	13	MOA	41,200	3900
10.	Hospital	61	RN	43,500	20,000
	USM	13	MOA		

Statistic in 2012/2013 (ED & Record Unit)

For logistical reasons, it was decided to conduct the study project in the EDs of hospitals of one state, Kelantan, rather than involving hospitals in all states of Malaysia, since there are no differences in terms of triage roles and tasks performed between public hospitals in different states. The similarity of triage tasks and roles among HCPs in all these hospitals will not cause any ambiguity of the samples which could affect the findings of the study, which can therefore be generalized nation-wide. Furthermore, the study sites selected were hospitals in Kelantan that use the 3-level colour coding scale triage system, as practiced in hospitals throughout West Malaysia. In the 3-level colour coding scale triage system, red indicates the most emergent or critical cases, yellow indicates urgent or high-risk cases, and green is used for non-urgent or non-critical cases. HCPs roles are the same in all hospitals; triage registered nurses or medical officer assistants perform assessments and allocate cases admitted into any of these three triage colour code categories. In other words, the practice of triage and tasks performed among ED staff in hospitals in Kelantan, including the university hospital in Kelantan (HUSM) and so the Ministry of Health hospital in Kelantan are comparable to any emergency department of any hospital in other states of Malaysia. A map of Peninsular (West) Malaysia and the study setting areas are displayed in Figure 3.1. and Figure 3.2

Figure 3.1: The Penisular (West) Malaysia

Figure 3.2: Areas of Study Setting in Kelantan State of Malaysia

3.5 Ethic Consideration

Ethical approval was sought from the Ethics Committee (Human) Universiti Sains Malaysia Health Campus (JEPeM USM code: USM/JEPeM/[282.3(7)]), Universiti Malaya Medical Centre (Ethics Committee Reference Number/IRB: 1031.1) and the National Medical Research Registration for Kelantan Ministry of Health hospitals (NMRR-13-1477-16716). Before conducting the study project, permission was obtained from the Hospital Directors of UMMC, Hospital USM, HRPZ II, HOSIM, HTA, HM, HTM, HKK, HJ and HOGUM in Kelantan, as well as from the Heads of the Emergency Departments. Documents pertaining to Ethical approval can be found in Appendix A.

Verbal and written consent from all HCPS who were willing to participate was obtained prior to the study. The consent form includes clear explanations that detail the purpose of the study and the procedures to be carried out. In addition to the written consent, an information sheet about the study was also given to eligible participants. Prior to obtaining participants' consent, potential participants were informed that participation was entirely voluntary and that confidentiality and anonymity would be protected. HCPs were free to choose whether or not they wished to complete the survey, and they were given the option of declining to participate in the other phases of the study. Upholding the rights of the participants remained a paramount concern of the researcher throughout this research study. The research information sheet for participants is included in Appendix B (for phase 1) and Appendix C (for phase 3). A sample of the participant's written consent form can be found in Appendix D.

3.5 Phase 1: Baseline Study

3.5.1 Target Population

The study population consisted of registered nurses and medical officer assistants who worked and performed triage roles at Emergency Departments (ED) of 10 hospitals in Kelantan. They are qualified staff members, who underwent at least three years of training at any healthcare institution, and are qualified to practice. All qualified staff members were invited to participate in the study.

3.5.2 Sampling method

A universal sampling method was used for Phase I, this means that all registered nurses and medical officer assistants (HCPs) in the 10 hospital EDs in Kelantan who had previous experience in performing triage roles, regardless of the length of time they were in such roles, were invited to participate in the current study.

3.5.3 Sample Size Calculation

All eligible HCPs were invited to enrol in the study project. Sample size was calculated using the method of single proposition calculation. In Göransson, Ehrenberg, Marklund, and Ehnfors (2006), the lowest accuracy percentage in triage decision-making based on the use of written patients' scenarios was 39.3%.

The sample calculation;

Absolute precision (Δ) = 0.08

Poor Percentage (P) = 39.3% = 0.393

Calculation:

$$n = \left[\frac{1.96}{\Delta}\right]^2 \times P \times \left[1-P\right]$$

$$n = \left[\frac{1.96}{0.08}\right]^2 \times 0.393 \times \left[1-0.393\right]$$

n = (600.25 x 0.393) x 0.607

n= 143 + (20% drop out)

Sample size (n) = 143 (± 29)

n = 172

The recommended sample size was n= 172. However, all HCPs (N=274) from the 10 hospital EDs were invited to participate in phase 1 of the study, which was a baseline study. In the event, 202 HCPs from the 10 EDs agreed to participate, which is more than the required sample size. According to Peat (2002), a research study needs to be large enough to ensure the generalizability and the accuracy of the results, but small enough so that the study question can be answered within the research resources that are available.

3.5.4 Instrument

From a review of the literature, it was found that a variety of measurement tools have been used to evaluate HCPs' skills in making triage decisions. The tools include unstructured interviews, observations, written patients' scenarios, a combination of interviews and questions, using the clinical decision-making in nursing scale, and the triage decision-making inventory (TDMI). Questionnaires have been widely used to evaluate the perception of triage decision-making among HCPs in many countries. For example, a study in Taiwan by Chen et al. (2010) used questionnaires to examine factors that influence the triage accuracy among nurses in emergency departments, and in USA, a study by Rankin, Then, and Atack (2013) used self-administered questionnaires, interviews and a chart audit to examine emergency nurses' skills in triaging. In an Australian study, however, Gerdtz and Bucknall (2001) used observations as a tool to assess nurses' triage allocation acuity in the emergency department. According to Milne (1999), compared to interviews, a questionnaire is a relatively quick way to collect information, and the responses that are gathered are more standardized and tend to be fairly structured, since the data collection process uses a formal instrument that elicits the same information from every subject (Polit & Beck, 2004). Osborne (2008) has also supported the use of the structured questionnaire, because it largely eliminates the effect of the researcher on the subject, thereby reducing the risk of bias, as well as gaining similar information from every respondent.

In this study, validated self-administration questionnaires were utilized. The instruments were: (1) the Triage Decision Making Inventory (TDMI), and (2) Patient Scenario-based Questions (PSBQs). Permission was granted by the original developers of the questionnaires. The Triage Decision-Making Inventory (TDMI) was modified for this study. The instrument used consisted of 37 items with 6-point Likert scale responses and 15 written patient scenarios based on questions adapted from the Emergency Triage Kit (Australia). The Patient Scenario-Based Questions (PSBQs) instrument was adapted according to the objectives of the present study and the triage system practiced in Malaysia.

The questionnaire used in the present study has 4 sections for phase 1 and 3 sections for phase 3. Sections of phase 1 (A, B, C and D) are described as follows: Section A, containing 8 questions, elicits demographic data. The questions concern respondents' gender, age, academic level, possession of post basic course, designation, length of ED working experience, length of experience in triage roles in ED, and respondents' view of how much emergency experience is necessary before a member of staff should be allowed to perform triage roles. Section B comprised two questions: the first question for the purposes of clarifying whether the participant has attended any continuous nursing education (CNE), seminar or course related to triage: the question was: "Did you participate in any formal or informal education program related to triage in you ED?". The second question was to determine HCPs' perceptions of what was required as preparation for triage roles. The question was: "What topics to be taught as a preparation prior to performing triage?". Section C consisted of the Triage Decision Making Inventory (TDMI), and section D consisted of Patient Scenario-Based Questions (PSBQs) for ATP.

In phase 3, there were 3 sections: Section A had 9 questions. Question number eight (no. 8) was changed from ‘How long emergency working experience you should have, to allow you to perform triage role” to date of participant’s birthday (which is “My birthday is on ..……”). Responses to this question served as an identity marker for each participant, because they were measured at two points after intervention. (However, the researcher also maintained manual records of the participants at each measurement stage: pre-, post- and follow-up). Question number nine (no. 9) was ‘Have you attended any continuous nursing education/seminar/short course that provided knowledge regarding triaging?’. Section B is TDMI and section C is PSBQs. The questionnaire (TDMI and PSBQs) for both phases are described in sections 3.5.4.1 and 3.5.4.2, below. The questionnaire used for phase 1 and phase 3 is attached in Appendix E and F, respectively.

3.5.4.1 Triage Decision Making Inventory (TDMI)

TDMI was included in section C of the questionnaire. The TDMI instrument was adapted from Cone (2000) for the purpose of identifying HCPs’ triage decision making skills among HCPs who are working in Emergency Departments in hospitals in Kelantan State, Malaysia. It is suitable for self- administration, provides standardized responses, and less time consuming for a relatively large sample. The subscales of TDMI can assist in identifying the areas where HCPs require further education or training in order to improve their ability to make triage decisions (Smith & Cone, 2010).

The TDMI tool consists of 37 questions that cover four domains, with 6-point Likert scale responses. The four domains or subscales are: cognitive characteristics, experience, intuition, and critical thinking. According to Cone and Murray (2002), elements of experience, intuition, cognitive characteristics, and critical thinking are essential for triage decisions. The four domains or subscales are: cognitive characteristics, experience, intuition, and critical thinking. According to Cone and Murray (2002), elements of experience, intuition, cognitive characteristics, and critical thinking are essential for triage decisions.

In the questionnaire, cognitive characteristic are measure with 7 items, experience with 11 items, intuition with 7 items, and critical thinking with 12 items. The cognitive characteristic domain has items related to knowledge, judgement, prioritization, and organization. The experience domain is comprised of items related to experience and skills that are required for triage decision-making and nursing judgement. The experience domain section in the questionnaire has two negatively worded items (item 11 and item 14) which were recoded as appropriate. The intuitive domain refers to gut feeling, sixth sense, or inner feeling. Meanwhile, for the critical thinking domain, the items reflect the ability to link assessment finding and patient's complaint. and knowing the right question to ask the patient at triage in order to obtain information for triage decision-making either through evaluation or communication.

Cognitive characteristics are the most important component in the process of decision making, according to Cone and Murray (2002). Cognitive characteristics such as a diverse knowledge base, ability to think critically, ability to make decisions quickly, and knowing when not to act are essential in assisting HCPs to make triage decisions (Dateo, 2013). According to Benner and Tanner (1987), intuitive knowledge is essential for nursing experts and is normally gained from experience and possessing a vast range of experiences (Dateo, 2013). Benner, Tanner, and Chesla (1992) also emphasize the importance of the intuitive element possessed by highly experienced personnel. Experience in specific areas increases over time (Benner & Wrubel, 1982). Critical thinking is a nonlinear cognitive process that represents a high level of knowledge (Conger & Mezza, 1996). Overall, these four domains are essential in assisting HCPs in triage decision-making (Smith & Cone, 2010).

In the TDMI, a 6-point Likert scale was used for all answers. The response choices are as follows: 1 is "strongly disagree", 2 is "moderately disagree" , 3 is "minimally disagree", 4 is "minimally agree", 5 is "moderately agree" and 6 is "strongly agree". The summative score for the whole TDMI instrument is 222. Table 3.2 summarizes the summative score for each of the four domains that total 222. Cone (2002) used the mean total score for TDMI as a cut-off point; in her study, the mean total score for nurses who had less than 5 years of ED experience was 203, and for nurses with more than 5 years of ED experience, the mean total score was 208. Participants who obtained a total score of less than 206:222 which was equivalent to 93% were deemed to need a further review on education or to gain more experience in order to improve their ability in triage decision making skills for the sake of patients' well- being and to assure the best quality of health care was provided. The cut-off point set for the current study was set at 184:222, which was equivalent to 82.8%. In this study researcher used median as a cut-off point for good and low score. The median among participants with 5 years and less of ED working experience was 177 meanwhile the median among participants with five years and more of ED working experience was 191 as indicated in pilot study. The range of the median was 177 to 191. Therefore the cut of point set for this study was 184.

Table 3.2: Summative Score for Each Domains

Domains	Score
Cognitive Characteristic	42
Experience	66
Critical Thinking	72
Intuition	42
Total	222

3.5.4.2 Patient Scenario-based Questions (PSBQs)

PSBQs were included in section D of the questionnaire. The purpose of PSBQs is to identify the accuracy of triage decisions for adult trauma patients (ATP) among HCPs who are working in Emergency Departments in Kelantan, Malaysia. Worster et al. (2007), who conducted a study on live and paper triage scenarios has supported the suitability of paper scenarios to test triaging skills and accuracy among triage officers in EDs. A study by Martin et al. (2014) also used PSBQs to examine the relationship between accuracy of triage decisions in EDs with attitude and experience among HCPs.

The current study utilised 15 PSBQs. which were derived from a review of the literature and adaption from an emergency triage training kit. There were five PSBQs for each of the three triage categories: that is, five questions each for the Red colour code triage category (critical), which is for patients to receive treatment and care immediately; for the Yellow colour code triage category (high risk), which means that patients should receive treatment within 30 minutes; and for the Green colour code triage category (non-critical), which means patients should receive treatment within about 90 minutes. The patient scenario-based questions included neurology, burn, musculoskeletal, ophthalmology and surgical cases.

Considine et al. (2004) used 14 adult written case scenarios to examine emergency department nurses' performance in terms of accuracy in allocating the appropriate triage category for adult patients, and 14 paediatric written case scenarios to examine emergency department nurses' triage decisions for paediatric patients. The written case scenarios covered level one (two cases), level two (two cases) level three (four cases), level four (four cases) and level 5 (two cases) to identify accuracy of triage allocation among nurses. Chen et al. (2010) used 10 written emergency case scenarios to examine factors that influence triage accuracy among emergency triage nurses. One (1) mark was allocated to each correct answer. Göransson et al. (2006) a study in Sweden, used 18 patient scenarios that covered medicine, surgical operations, neurological operations, and infections. Both orthopedic and pediatric cases were used to look into the accuracy of triage decisions and nurses' characteristics. Meanwhile, Nilsson et al. (2015) used fifteen trauma scenarios to examine skill in triaging and accuracy of triage decisions among firemen using same calculation, which one (1) mark was allocated to each of correct answer.

A high score for PSBQs for the present study was twelve to fifteen. One (1) mark was allocated to each correct answer. Participants who were able to answer accurately twelve out of the fifteen questions (that is, 80%) were considered to be high score in making triaging decisions, while those who scored fewer than 12 out of fifteen were categorized as having low accuracy in triaging. The cut –off point is set at 12 to stress the crucial roles of triaging and accuracy of triage decisions in the ED that may cost life, therefore this cut-off point was set, it is consistent with the cut-off point set for TDMI then reduce bias of the instrument.

This latter group who scored low were invited to enrol in the intervention phase of the study. According to Möller et al. (2010), some studies have used scores to measure excellent or very good performance. In their study, patients who scored 88% were rated as an excellent nurse. Jansen et al.s (1995) study to test technical skill competency set A for scores of 70% (scores ranged from 61 to 70%).

3.5.5 Pilot Study

A pilot study was conducted in the Universiti Malaya Medical Centre from February 2014 until May 2014. Participants included 12 experts for content validity, and 46 HCPs to determine the reliability of the TDMI and PSBQs. The questionnaires were distributed to an expert panel which consisted of 12 experts for content validity. The experts included assistant medical officers, nurses and emergency physicians. These experts were emergency physicians (n=6), senior medical officer assistant (1) and senior nurses specialised in emergency medicine (n=5) who have experienced triage decision making of more than 6 years. All suggestions were taken into account and the instrument was rectified according to their suggestions and recommendations. The questionnaires were distributed twice to ensure clarity and appropriateness and better comprehension among HCPs, according to their language of use.

3.5.6 Validity and Reliability of TDMI Questionnaires

The content of the self-administered questionnaires was reviewed and validated by the HCPs and experts in the particular area to ensure better understanding and comprehension. Cronbach's alpha was used to determine the reliability of internal consistency and Fleiss Kappa calculation for inter-rater reliability. Description of validation and reliability of the instruments are detailed in subsection 3.5.6.1 and 3.5.6.2

3.5.6.1 Triage Decision Making Inventory (TDMI)

Content validation was conducted for the TDMI. In a few cases, wording of the items were changed in accordance with the experts' suggestions to promote better understanding without altering the meaning. Words of four items (out of 37 items) were re-worded for better comprehension. The changes were for items 7, 12, 32, and 36. In item number seven (7),'I can *count* on my skills and judgement while working at triage', the word 'count' was changed to 'rely'. For item number 12, which was 'I can often tell something *detrimental* is going to happen when I first assess a patient at triage', the word 'detrimental' was changed to 'harmful'. For item number 32, which was 'I *associate* the mechanism of injury with the history given by the patient at triage' the word 'associate' was changed to 'relate', while for item number 36, which was ' I am someone that my co-worker can *count* on to make good decision', the word 'count' was changed to 'rely'.

The TDMI instrument was also assessed for reliability. TDMI has 37 items with 4 domains. The domains are cognitive characteristic, intuition, experience, and critical thinking. Test-retest results for the intra-class co-relation coefficient (ICC) scores show excellent value 0.95, 95% CI= 0.90 - 0.96 and Cronbach's Alpha 0.97 for the entire instrument. For the four domains of cognitive characteristics, intuition, experience, and critical thinking, the ICC test indicated that each domains produced moderate to good correlations. ICC ranged from 0.55 to 0.73 for the subscale domains and Cronbachs' Alpha was 0.92 for the domains as a whole, and were highly significant ($P < 0.001$). The cognitive characteristic domain displayed good ICC values of 0.65, 95% CI= 37-80; the values for the intuitive ICC value domain were 0.55, 95% CI= 0.18 – 075; the experience domain yielded good ICC values of 0.73, CI= 0.51-0.85; and the critical thinking domain generated ICC values of 0.70, 95%

CI= 0.45-0.83. Cronbachs' Alpha (was 0.92, P = < .001) for all domains. According to Fleiss (1986, cited in Oremus et al., 2012), ICC values can be interpreted as follows: > 0.75 is excellent; 0.40 - 0.75 is fair to good; and < 0.40 is poor. However, Nunnally (1994, cited in Singh et al. 2011) indicated that ICCs can be classified as excellent when the value is ≥ .81; good values range from .61 - .80; moderate values range from 0.41 - 0.60; and values are considered poor when the value ≤ .40 . Consistent with the values and findings of previous studies', the pilot study confirmed that the TDMI instrument is strongly reliable and robust to measure the skills of triage decision-making among HCPs in hospital EDs in Malaysia. Table 3.3 summarizes the reliability test results of the TDMI instrument.

Table 3.3: Reliability Test of the TDMI Instrument (n=46)

			Reliability	
	Mean	**± SD**	**1CC**	**95% CI**
Total Score R1	170.70	40.30	0.95	0.90-0.96
Total Score R2	173.58	32.63		
R1 Cognitive Characteristic	32.89	8.44	0.65	0.37-0.80
R2 Cognitive Characteristic	35.06	5.74		
Intuition R1	30.30	7.54	0.55	0.18-0.75
Intuition R2	32.02	5.56		
Experience R1	52.06	12.43	0.73	0.51-0.85
Experience R2	53.76	9.01		
Critical Thinking R1	55.43	13.06	0.70	0.45-0.83
Critical Thinking R2	59.15	9.07		

R1: test; R2: retest

3.5.6.2 Patient Scenario-based Questions (PSBQs)

Initially the written patient scenario-based questions (PSBQs) consisted of 30 questions; that is, 10 PSBQs for each of the three triage colour code categorizations (TCCC), red, yellow, and green. However, in the main study, 15 PSBQs were selected for use based on the kappa (k) value; five PSBQs were selected for each triage category (red, yellow and green triage colour code category) for the current study, and some of the PSBQs were selected for discussion.

Experts in the field of emergency medicine were invited, on the basis of purposive sampling, for content validity to evaluate the appropriateness and clarity of the PSBQs and to obtain consensus from the experts on the appropriate triage colour code categorization for each patient scenario. The experts comprised emergency physicians (n=6), senior assistant medical officer (1), nursing educators (n=2) and senior nurses (n=3) who specialized in emergency medicine and who have experience in departments and established triage experience of 6 years and more. All of them possess tertiary qualifications, either master degree (emergency physicians and nursing lecturer) or bachelor degree (senior assistant medical officer and senior registered nurses). Modifications of the PSBQs were made according to their recommendations.

The purpose was to evaluate the appropriateness of the content and the triage colour code for each of the written patients' scenarios. According to Olofsson and Carlstrom (2009, cited in Brown and Clarke, 2014), measuring triage accuracy using simulated patient scenarios relies on an expert panel to assess the level of urgency, and for assessing the degree to which study responses are in agreement with those of the expert panel. Chen et al. (2010) employed five experts to validate the content of 10 emergency case scenarios for their study. Considine et al. (2007) obtained the services of five experts to look into the content and agreement of each triage category of the paper-based questions they used in their study. A study by Göransson et al. (2006) utilized five experts to evaluate the scenarios for content and face validity, while Innes et al. (2011) used three experts to assess face and content validity of the questionnaires. In the present study, 12 experts were used for face and content validity of the patient scenario-based questionnaires.

The Fleiss Kappa test can be used to measure the level of agreement for each of the items and for all items among the raters. Gerdtz et al. (2008) used the Fleiss kappa test (weighted) to calculate each of the triage categories for the scale. According to Landis and Koch (1977), inter-rater reliability analysis using the Kappa statistic was performed to determine consistency among raters; it is suggested that a value between 0.61 – 0.80 indicates substantial agreement, and a value between 0.81-1.0 indicates almost perfect agreement (Osborne, 2008).

In the present study, results showed agreement of k= 0.73 overall, for all the items, while for each of the items individually, kappa agreement ranged from 0.5 to 1.0. On the basis of these test results, fifteen written patient scenario-based questions with k values ranging from k = 0.7 to k = 1.0 were selected from the 30 questions in the pilot study, and were utilized in phase 1 and phase 3 of the study. As recommended and implemented by Considine et al. (2007), for the emergency triage education kits, a k value higher than 0.6 is considered good. According to Altman's (1991) kappa interpretation, a k value less than 0.40 is poor, values of 0.40-0.59 are fair, values of 0.60=0.74 are good, and values of 0.75-1.00 are excellent. Therefore, 15 PSBQs with k values ranging from good to excellent were selected for subsequent phases of the current study.

3.5.7 Data Collection

3.5.7.1 Period

The study project started with a pilot study carried out in the Universiti Malaya Medical Centre from January 2014 until May 2014, to test the validity and reliability of the questionnaires. The main study project was executed in three phases; phase 1, phase 2 and phase 3. Data collection for Phase 1 started in early November 2014 and was completed in early April 2015. Phase 2 involved the development of the educational intervention triage module for adult trauma patients, and content validation was conducted prior to phase 3. The period of data collection for phase 1 was delayed due to floods in most of the study areas at the end of 2014/beginning of 2015 which meant that data collection had to be postponed until the situation had normalised.

3.5.7.2 Baseline Study

A total of 10 Emergency Departments (EDs) at hospitals in Kelantan, with a total of 274 HCPs, were invited to participate in phase 1 of the study. A briefing with instructions for completing the questionnaires was given to all the participants before they attempted to answer the questions. Questionnaires were distributed by hand and were collected on the same day to avoid discussion among the participants. The researcher was available at the study site to provide assistance for any clarification regarding the questionnaires when required. A total of two hundred and two (202) completed questionnaires were returned. The flow of the data collection for Phase 1 is displayed in Figure 3.3.

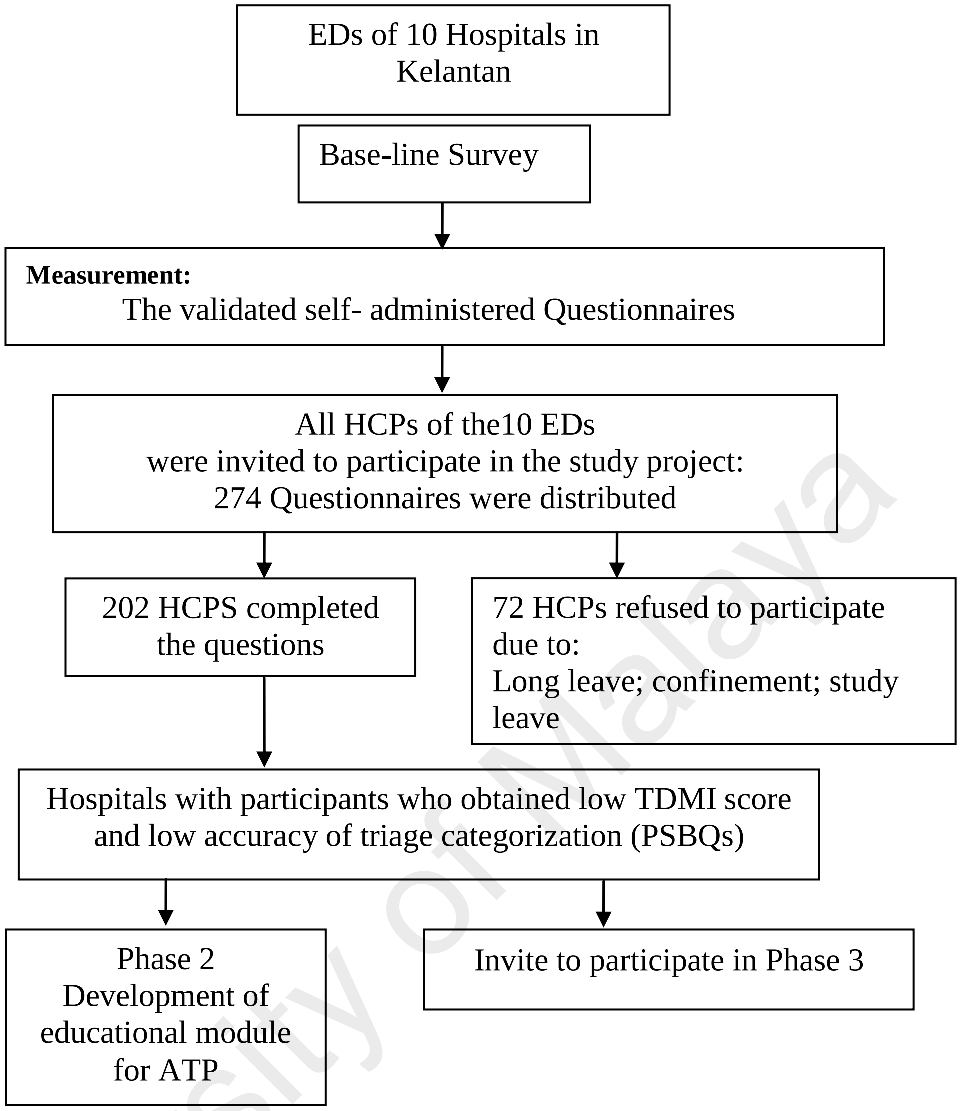

Figure 3.3: Study Flow Chart of Phase I

3.5.8 Data Analysis

The data were processed and entered for data analysis using descriptive statistics into the Statistical Package for the Social Sciences (SPSS) version 20. (SPSS, Chicago, II., USA). Data were checked for the normality distribution. A 95% confidence interval was reported for numerical variables. The significance level was pre-set at 0.05. Descriptive statistics were used for examining the frequency distribution of demographic characteristic and items of the questionnaire, including mean score of TDMI and PSBQs. The Pearson correlation coefficient was applied as appropriate. Chi square and Fisher exact tests, including multivariate logistic regression, were applied to examine associations between independent and dependent variables as appropriate. The results are displayed in tables and figures accordingly.

3.6 Phase 2 : Development of the Triage Educational Intervention Module

3.6.1 Educational Intervention

This section describes the development of the triage module of the educational program (for intervention), its aim, learning outcomes, and Knowles' theory of andragogy (adult learning) in practice. The module's development was based on results of the baseline study, literature reviews, Knowles' theory, and adaptation from the emergency triage education kit. There are eight (8) sessions included in the triage educational intervention module. Session one (1) to session seven (7) provided in phase 2, the rest of the content of the module was in the Appendix G. Details of the content validation of the module and application of the educational program in the study setting are described later in this chapter.

3.6.2. Content of the Triage Module (Educational Program for Intervention)

3.6.2.1 Section 1: Introduction

The intervention program designed for this study is an educational program. A module of triage decision-making for adult trauma patients was developed. Its main objective is to provide knowledge and enhance ED HCPs' ability in triage decision-making and to improve their triage accuracy. The educational program adopted a classroom teaching method approach. Total time allocation for the education session is 140 minutes and completed in one session. Participants were gathered in small groups for each educational program, with a maximum number of 15 participant HCPs and a minimum number of 5 participants in each group (Table 3.4).

Table 3.4: Title of Module, Total Time Allocation and Participant for Educational Intervention Program

Title of Module:	Educational Module of Triage for Adult Trauma Patients
Total Hour:	2 Hours and 20 minutes (approximately140 minutes educational program)
Participant:	Nurses and Medical Officer Assistants
No of Participants:	5 (minimum) and 15 (maximum) per session

This educational module was developed as an intervention instrument. It was based on a review of the literature and results of the baseline study with regard to the accuracy of triage decisions for adult trauma patients. In addition, HCPs' opinions or suggestions about aspects of triage that they required as a preparation prior to performing the triage roles were taken into account as a source for the development of the module. In fact, a specific question was added to the questionnaire for this purpose; that is, to identify areas that HCPs considered necessary as a preparation for triage. The educational intervention module was implemented in phase 3. The content was delivered in the form of lectures (knowledge), and patient scenario-based questions were included for triage discussion to enhance skills (Table 3.5). The module was formatted in the form of a power point presentation.

Table 3.5: Allocation of Time for Each of the Outlined Sub-topics

No	Outline of the sub-topics	Percentage of Content %	Duration (minutes)	Audio Visual Aids (AVA)
		100	**140**	
1.	Overview	5	2	
2.	Common mechanism of the injury	10	10	i. Power Point presentation
3.	Basic assessment at triage that may influence triage decisions	20	25	ii. Patient Scenario-based Question
4.	Condition and assessment of other parameters: - Altered mental status - Pain - Musculoskeletal Injury - Fall - Burn - Foreign body in eye (Corneal) - Elderly	25	40	iii. Discussion
5.	Perform triage and make decision on triage categorization accurately Appreciate the accuracy of the triage decision for life saving and beneficial impact on patients' health	25	40	
6.	Summary and discussion	15	23	

The aim of the educational module is to enhance HCPs' ability to make triage decisions, to improve triage accuracy, and to ensure that HCPs appreciate that the accuracy of their triage decisions can have significant impacts on patients' quality of life. Education consisted of activities conducted to create changes in knowledge, skills and attitude of individual, group or community (Knowles, Holton & Swanson, 2014).

The learning outcomes of the module were as follows:

Upon completion of the educational program, HCPs will be able to;

1. Explain the common mechanism of injury that may cause altered mental status, pain, musculoskeletal injury, burn, fall, injury in the elderly, and foreign bodies in the eye.
2. Discuss basic assessment at triage that may influence triage decisions
3. Explain briefly the condition, such altered mental status, pain, musculoskeletal injury, burn, fall, injury in the elderly, and foreign bodies in the eye, and assessments of other parameters at the point of triage
4. Allocate the triage category skilfully and accurately for adult patients suffering from trauma, using PSBQs and measure triage decision skills using TDMI
5. Appreciate the importance of knowledge integration and apply in practice skilfully and accurately for the saving of lives and limbs

Andragogy learning theory was applied in this module. The andragogy theory was based on Malcolm Knowles' adult learning theory. Knowles' Andragogy theory is a leading "brand" in adult education theory (Knowles & Smith, 2002). Knowles' 1998 Six Principles of Andragogy were applied in the practice learning model. Knowles' six principles or assumptions are: first, the learner’s need to know; adult learners need to know why they need to learn something before undertaking to learn it. The second principle is learner’s self-concept: adults need to be responsible for their own decisions and to be treated as capable of self-direction.

The third principle relates to prior experience of learners: adult learners have a variety of experiences of life which represent the richest resource for learning. These experiences are, however, often imbued with bias and presupposition. The fourth principle is readiness to learn: adults are ready to learn those things they need to know in order to cope effectively with life situations. The fifth and the last principle is motivation to learn: adults are motivated to learn to the extent that they perceive that it will help them perform tasks they confront in their life situations. Furthermore, as a person matures the motivation to learn is internal. Table 3.6 summarizes the application of the six principles of the theory in the module of the study. (Details of the six principles were explained in Chapter 2.9.)

The education module for adult trauma triage was developed according to the literature review and based on the phase 1 study results, and guided from Knowles' Andragogy Learning in Practice Theory. This module was adapted from the Emergency Triage Education Kit (2007), with permission. Taylor et al. (2006) developed and used module as an intervention to educate and improve ED nurses' competency in communication. However, there were no existing well-defined standards or clear guidelines for emergency preparedness training prior to performing triage roles (Slepski, 2007). According to Samsiah Mohd Jais (2015), the module approach facilitates the teaching process, supports students' understanding, and improves mastery and achievement.

Table 3.6: Summary of the Structure for Educational Intervention Development

Source	6 Principles	Action
Knowles' Andragogy Learning in Practice Theory	Learners' need to know	Based on the baseline survey results
	Learner self-concept	Encourage learners in discussion
		Allow them to make decisions independently (PSBQs)
		Require them to take responsibility for their triage decisions
	Prior experience of learners	Have ED working experience Triage roles
	Readiness to learn	Attentiveness to learn due to content related to their task at work
		Develop and improve accuracy skill of triage decisions
	Orientation to learning	PSBQs similar to patients' condition in actual practice
	Motivation to learn	Drive to improve, to boost self-performance (skills and accuracy of triage decision)
		Impact on the HCPs themselves, patients, and the institution

However, the requirement for education varies among organizations. In healthcare institutions where there are multidisciplinary teams or units, the need for continuing education varies among units or institutions in order to enhance HCPs' skills and knowledge. For example, HCPs in the EDs may need more knowledge about and practice on basic life support, advanced trauma life support, advanced cardiac life support, and paediatric advanced life support compared to HCPs in other areas, according to Bolin et al. (2011). Häske et al. (2016) has stressed the importance of education and continuous training. The ED necessarily relies on Emergency Medical Services (EMS) training itself, but it depends on identified need to promote and maintain skilful healthcare providers in triage and the delivery of emergency care in the EDs.

In the current study, the baseline survey has indicated deficiencies in most of the areas, highlighting the need for improvement to enhance HCPs' ability to make effective triage decisions. Table 3.7 summarizes the results. It reveals that more than 50% of participants were unable to allocate an accurate triage category for elderly patients (PSBQs 8) and for patients who present with musculoskeletal injury with a pain score of 7/10 (PSBQs 11). Nearly 50% of participants were unable to tag uncritical (green) cases accurately, which was for mild pain and musculoskeletal cases (PSBQs 5 and 6), respectively.

Table 3.7: Distribution of Accuracy of PSBQs Triage Decisions for ATP (n=202)

No	PSBQs	Correct TCCC	Accurate		Inaccurate	
			Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
1	Fall from horse riding with GCS 8/15	**R**	179	88.6	23	11.4
2	Hot oil burn of the anterior of thigh with pain score 7/10	**Y**	179	88.6	23	11.4
3	Twisted right knee 2 hour ago. Ice pack applied. Very swollen and unable to bear weight.	**G**	152	75.2	50	24.8
4	Fall with injury of left shoulder. Very swollen, cannot move the shoulder joint itself, and pain score 7/10	**Y**	136	67.3	66	32.7
5	Dog bite on the upper left leg with six to seven square centimetres of skin loss with mild pain.	**G**	103	51.0	99	49.0
6	Fall from stairs with right ankle injury. Swollen and unable to walk at all.	**G**	118	58.4	84	41.6

TCCC; Triage colour code category; R= red; Y=Yellow; G= Green

Table 3.7, continued'

No	PSBQs	Correct TCCC	Accurate		Inaccurate	
			Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
7	Right hand cut by broken glass. Deep, six centimetres laceration to the palm of his right hand. Cannot feel his right index or second finger at all.	**Y**	127	62.9	75	37.1
8	Age of 60 with fall. Bruised right hip. Able to walk. Unsure pain score.	**G**	81	40.1	121	59.9
9	High impact MVA with painful chest and abdomen and has visible seatbelt marks. SpO2 is 93%. Skin is pale, cool and dry.	**R**	186	92.1	16	7.9
10	Cut of left hand with a carving knife. Sustained 4 cm laceration across the palm. Tendons are on view. Pain score 7/10	**Y**	149	73.8	53	26.2
11	Fall with injured right foot while playing netball. Pain to weight bear. Pain score is 7/10	**Y**	82	40.6	120	59.4
12	Electric shock. Received a 240 volt charge to his right hand with irregular heart rate.	**R**	129	63.9	73	36.1
13	Stab wound of the chest. and Glasgow Coma Score of 9/15	**R**	191	94.6	11	5.4
14	Foreign body Lt eye with normal vision test 6/6	**G**	165	81.7	37	18.3
15	Fall from height, more than 10 feet onto a concrete block, Glasgow Coma Scale on arrival was 13/15. Large haematoma on his occiput and has generalised headache with history of loss of consciousness and vomiting.	**R**	149	73.8	53	26.2

TCCC; Triage colour code category; R= red; Y=Yellow; G= Green

In the baseline study (phase 1), HCPs were asked to suggest a few topics or knowledge that need to be obtained as a preparation prior to performing triage roles. Based on the results, the majority of participants mentioned that they need triage patients at a triage counter, followed by assessment at triage, Glasgow Coma Score (GCS), and pain assessment, while 8.9% gave no answer. The results are displayed in Table 3.8. Assessment is the core and crucial element in the triage process. According to Cone and Murray (2002), assessment skill and casualty patient's appearance are among the major factors considered in nursing triage (Arbon et al., 2008). The physiological condition of patient is usually assessed by vital signs such as heart rate, breathing rate, temperature, and blood pressure. These vital signs can be observed, measured, and monitored to assess the level of physical functioning of a patient (Hong et al., 2013).

Table 3.8: Knowledge Preparation Prior to Performing Triage Roles for ATP

Knowledge Requirement	**Frequency (n)**	**Percentage (%)**
Triage patient	116	57.42
Assessment of trauma patient at triage	25	12.37
Glasgow Coma Score assessment	23	11.4
Pain management	20	9.9
No answer	18	8.9

ATP: adult trauma patient

The Glasgow Coma Scale (GCS) is one of most common measures used to assess trauma patients who come into an ED. According to Wijdicks (2006, cited in Mattar et al. 2015) GCS has been the gold standard in neuro-monitoring. According to Taheri et al. (1993, cited in Mattar et al. 2015) an altered level of consciousness is a salient indicator of change in neurophysiology, signifying early signs of deterioration. Hence rapid assessment of neurological status is very crucial. Therefore knowing, understanding, and being able to perform GCS is compulsory for all HCPs who execute the triage.

More recently, pain has been included as a fifth vital sign. Pain is one of the reasons patients come to an ED (Clarke et al., 1996, cited in Alavi et al. 2017), the majority of trauma patients come for pain relief. Poor assessment of pain may due to lack of knowledge that causes under-assessment and under-treatment of pain. According to Alavi et al. (2017) uncontrolled pain will cause changes in patient's physiological status, and Pak et al. (2015) stressed that one of the primary goals of ED is to relieve pain.

Since the above parameters were considered to be the important elements while triaging, especially for trauma patients, they have been included in the educational intervention. Therefore, the researcher has focused on topics such as altered level of consciousness (ALOC), the Glasgow Coma Scale (GCS), pain, musculoskeletal, burn, fall, foreign body in the eye (FB), and the elderly, and according to the early assessment. Examples of the topics are set out below in subsections 3.6.2.1, 3.6.2.2, 3.6.2.3, 3.6.2.4, 3.6.2.5, 3.6.2.6 and 3.6.2.7, while details of the rest of the section can be found in Appendix G. Each of the topics follows a common outline, with sub-topics such as overview, common mechanism of the injury, basic assessment at triage, general appearance of patient, physiological parameters that should be assessed at triage, triaging practice, and summary.

3.6.2.2 Section 2: Altered Level of Consciousness

(a) Overview

Loss of consciousness or unconsciousness is defined as a state when a person is unaware of his or her surroundings, place, people and time. Unconsciousness is a condition in which there is a depression of cerebral function ranging from stupor to coma. According to Ludwig (1966), altered level of consciousness can be defined as 'any mental state induced by various physiological, psychological, or pharmacological manoeuvres or agents, which can be recognised subjectively by the individual himself (or by an objective observer) as representing a deviation in subjective experience or psychological functioning from certain norms for that individual during alert, waking consciousness' (Kevric, Jelinek, Knott, & Weiland, 2010). Altered level of consciousness (ALOC) may be due to primary injury or secondary injury. The development of brain injuries, such as intracranial hematomas, may occur hours after the trauma, leading to clinical deterioration of the patient (Settervall, Sousa, & Silva, 2011). Henzler et al. (2007, cited in Nayduch, 2009), stated that it may occur due to secondary injury such as hypoxia, hypercapnia, hypotension or hypovolumia, hypothermia, coagulopathy, and increased intracranial pressure. Therefore, HCPs at the triage counter need to execute a basic assessment of physiological parameters and a neurological assessment of the patient who presented with, or has had a history of, an altered consciousness state to determine the patient's priority for treatment and to prevent a deterioration of the patient's condition. Prolonged unnecessary waiting time may cause irreversible damage to the brain and further changes in physiological parameters.

(b) Common Mechanisms of Injury Which Cause Altered Level of Consciousness: Blunt and Penetrating

- High speed motor vehicle accident (MVA)
- Assault
- Fall from height or ground level
- Wounded chest with deterioration of vital signs that may cause
    - respiratory failure or cessation of breathing
    - cardiac failure
    - or other organ dysfunction e.g. acute renal failure
- Gunshot wound, stab wound, blast injury, burn with deterioration of vital signs
    - shock due to profuse bleeding/altered body fluids

(c) Basic Assessment at Triage

- Look at patient
    - for sign of airway obstruction: blood or vomit
    - chest
- Listen to patient
    - response, and for sign of airway obstruction: stridor, wheeze, or gurgling
- Feel for
    - pulse, breath, bony tenderness or crepitus (crunching)
- Smell
    - of alcohol or hazardous material e.g. petroleum inhalation

(c) i. General Appearance of Patient

- Alertness, unconscious, pale, cyanosis, in pain, unable to walk and etc.
- Trauma; either blunt or penetrating
- Any penetrating injury of head or from neck to thigh

(c) ii. Physiological Parameters

- **Airway and cervical**
  - **Airway**: normal, partially obstructed or obstructed (any hoarseness, gurgling, wheezing, stridor, apnoea)
  - any airway occlusion need immediately attention
    - critical and need the highest priority
  - normal pattern of airway
    - non-critical

  - **Cervical** Restriction**:** maintain restriction of the cervical area to prevent further damage or triggered alteration of airway pattern until its proven that there is no evidence of injury. In a conscious patient, you could ask about any neck pain. Cervical injury must be suspected in any patient with multiple system trauma, especially with altered level of consciousness or blunt injury above clavicle.

- **Breathing:** Rhythm and rate normal or abnormal such as bradypnea or tachypnea, orthopnoea, shallow breathing or cessation of breathing
  - altered breathing pattern or evidence of respiratory dysfunction
    - critical and need the highest priority
  - normal pattern of breathing
    - non-critical

- **Circulation and Haemorrhage Control**
  - **Circulation**: normal or altered haemodynamic status evidenced by changes in skin or mucus membrane characteristics such as pale, cold and clammy, changes in pulse rate and rhythm or heart rate, bradycardia or tachycardia, any abnormal capillary refill (> 2 second) and low blood pressure (a late sign)
    - altered haemodynamic status
      - critical and need the highest priority
    - normal circulation function
      - non critical

  - **Haemorrhage Control**: if any evidence of bleeding, appropriate measures should be taken immediately to stop bleeding.
    - patients with evidence of haemodynamic compromise (hypotension, severe hypertension, tachycardia or bradycardia)

- altered haemodynamic status evidenced by changes in skin or mucus membrane characteristics such as pale, cold and clammy, abnormal capillary refill or low blood pressure
  - critical
    - need the highest priority
  - normal circulation function
    - non critical

- **Disability: Alteration Level of Consciousness and Eye Problem**
  - **Disability of Central Nervous System**: Alteration level of Consciousness
    - respond to call or question or obey command
    - use AVPU scale (see Table 3.9)
    - any alteration in level of consciousness needs higher priority

  - **Patient with Eye Problem;** check for vision acuity and to exclude eye injury and foreign bodies.
    - decrease or loss of sight and painful eye
      - need higher priority for prevention of blind

- **Environment**: Temperature either hypothermia or hyperthermia or hazardous environment and exposure for assessment

(c) iii. Assessment of Level of Consciousness

At the triage counter, level of consciousness can be determined by patient's responsiveness using the AVPU scale as below (Table 3.9)

Table 3.9: AVPU Scale

A	Alert to people, time and surrounding
V	Responds to voice
P	Responds to pain - purposefully - non-purposefully - withdrawal/flexor response - extensor response
U	Unresponsive: and later Glasgow Coma Scale (GCS) including pupils

According to Taheri et al. (1993, cited in Mattar et al. 2015) altered level of consciousness is a salient indicator of change in neurophysiology, signifying early signs of deterioration; therefore, rapid assessment of neurological status is very crucial. In addition, according to Wijdicks (2006, cited in Mattar et al. 2015), the Glasgow Coma Scale (GCS) has long been the accepted benchmark in neuro-monitoring. A GCS score ranging from three to eight is severe, nine to twelve is moderate, and 13 to 15 is mild brain injury (Kim, 2012; Ratcliff et al., 2014). Table 3.10 summarizes the Glasgow Coma Scale and Table 3.11 summarizes GCS severity levels. According to Emergency Medicine and Trauma Services Policy (2012) is that unresponsive is critical (red colour code), whereas altered conscious level but not comatose, GCS $\geq$13 or GCS 15 with unequal pupils is high risk (yellow colour code).

Table 3.10: Glasgow Coma Scale Assessment

Assessment	Score
Eye Opening	
• Spontaneous	4
• To speech	3
• To pain	2
• No response	1
Verbal Response	
• Oriented	5
• Confused conversation	4
• Inappropriate words	3
• Incomprehensible sounds	2
• No response	1
Best Motor Response	
• Obey command	6
• Localised pain	5
• Withdraws / flexes to pain	4
• Abnormal flexion	3
• Extension	2
• No response	1
Total	15

Table 3.11: GCS Severity Level

GCS Score	Severity Level
13-15	Mild
9-12	Moderate
≤ 8	Severe

Meanwhile eye examination is as essential as the GCS, because pupils are controlled by cranial nerve III. A normal pupil is rounded and sized between 2 mm – 3 mm. The pupil normally responds quickly to light. An oval pupil indicates early cranial nerve III compression; a sluggish response to light indicates increased intracranial pressure (ICP); non-reaction means severe ICP; and fixed and dilated pupil indicates cranial nerve III compression (Nayduch, 2009). Table 3.12 summarizes assessment of pupils' size and reaction to light, and Table 3.13 summarizes indications of pupil shape and reaction to light.

Table 3.12: Pupil Assessment: Pupil Size and Reaction to Light

Pupil		
Size (mm)	Right	Left
Reaction to light		

Table 3.13: Indication of Pupil's Shape and Reaction to Light

Pupil	**Indication**
Shape	
• Rounded	Normal
• Oval	Early compression of cranial nerve III
Reaction to light	
• Brisk response	Normal
• Sluggish	Increased intracranial pressure (IICP)
• Non-reactive	Severe IICP
• Fixed and dilated	Compression of cranial nerve III

HCPs who are responsible for triaging have to bear in mind that if there is any evidence of airway obstruction, respiratory dysfunction, haemodynamic compromise, and alterations in conscious status, immediate intervention should be carried out and require higher triage code category.

(d) Triage Practice

Discussion of Patient Scenario-based Questions (PSBQs)

Discussion Flow

You are assigned as **triage officer** at triage counter

Patient presents to your Emergency Department
Refer to Patient Scenario-based Questions below

How do you make a triage decision?
(triage categorization using colour code)

What should you do **when** patient presents into ED?

Patient assessment
(Gather Data)
What and **how** to assess?
- General appearance
- Basic assessment for trauma
- including mechanism of injury

What is the finding?
(Refer to PSBQs)

What is your triage decision?

Red colour code
or
Yellow colour code
or
Green colour code

Why?
Justify your answer

(d) i. Patient Scenario-based Questions (PSBQs) and Discussion 1

Please choose **one (1) correct** triage colour code for each of the scenarios.

The colour code indication is as below;

Colour Code	Red Colour Code	Yellow Colour Code	Green Colour Code
Time to Receive Treatment	Immediately	within 30 minutes	≥ 90 minutes

Please **tick your answer** and give **justificatio**n for your answer in the **provided box**

Zakaria 35 years, presented to ED at 0230am with his friend who had been stabbed in the chest by a known person while having a late meal at the restaurant. His friend reported profuse bleeding from the wound and altered level of consciousness and did not respond to call. His pulse rate is 130 per minute, breathing is 26 and shallows, Spo2 is 89 per cent and centrally cyanosed.

Red colour code	Yellow colour code	Green colour code

Justification:

(d) ii. Patient Scenario-based Questions (PSBQs) and Discussion 2

Please choose **one (1) correct** triage colour code for each of the scenarios.

The colour code indication is as below;

Colour Code	Red Colour Code	Yellow Colour Code	Green Colour Code
Time to Receive Treatment	Immediately	within 30 minutes	≥ 90 minutes

Please **tick your answer** and give **justificatio**n for your answer in the **provided box**

Shamilawati 19 years, was riding her horse near the beach 60 km away from town when the animal was startled and threw her about three metres. She was wearing a helmet but it broke in half when her head struck a tree. Her companions noted an initial loss of consciousness, she was drowsy and vomiting, but she did not appear to have any injuries elsewhere. After regaining consciousness she said she had no neck pain when asked. Shamilawati was transferred to your Emergency Department by public transport. On arrival she has a Glasgow Coma Score of 8 out of 15. Her respiratory rate is 24 breaths per minute and her heart rate is 62 beats per minute

Red colour code	Yellow colour code	Green colour code

Justification:

(d) iii. Patient Scenario-based Questions (PSBQs) and Discussion 3

Please choose **one (1) correct** triage colour code for each of the scenarios.

The colour code indication is as below;

Colour Code	Red Colour Code	Yellow Colour Code	Green Colour Code
Time to Receive Treatment	Immediately	within 30 minutes	≥ 90 minutes

Please **tick your answer** and give **justificatio**n for your answer in the **provided box**

Laxmi 27 years. Brought to the ED via ambulance following a high-impact motor vehicle accident. She is 38 weeks pregnant (G2P1) and is normally well. She was a passenger in a car that collided head-on with another vehicle. The ambulance officers reported significant damage to both vehicles. The driver conveyed that Laxmi had an altered stat of consciousness then regained full consciousness state. She was wearing a seatbelt and the passenger airbag was inflated. She complained of painful in chest and abdomen and has visible seatbelt marks. Her respiratory rate is 28 breaths per minute, her SpO2 is 93 per cent and her heart rate is 134 beats per minute. Her blood pressure is100/60. Her skin is pale, cool and dry. She has no PV loss.

Red colour code	Yellow colour code	Green colour code

Justification:

(e) Summary

Altered level of consciousness may be due to primary or secondary injury; therefore while triaging, being fast in detecting issues or vital signs that may jeopardise a patient‘s life and determining accurate triage code allocation for a patient with altered consciousness and compromised physiological parameters is extremely crucial. Indeed, HCPs at the triage counter need to be able to assess and analyse the collected data and transform it to accurate action to prevent harm and risk to the patient’s life.

3.6.2.3 Section 3: Pain

(a) Overview

Pain is an unpleasant sensory and emotional experience that may be due to blunt or penetrating injury. It is one of the leading reasons people come for treatment and it should be treated at an early stage. The American Emergency Nurses Association has identified pain management as a leading clinical issue and a high priority issue. Pain has been equated to the fifth vital sign to stress the importance of assessing pain, and self-report pain is the most accurate (Oman, 2007). The International Association of America for the Study of Pain (1986) defined pain as an unpleasant sensory and emotional experience arising from actual or potential tissue damage (Riganello et al., 2015). However, pain is a subjective matter: different people describe different experiences of pain.

(b) Common Mechanisms of Injury which cause Pain: Blunt or Penetrating

- **Fall, or MVA, or Assault;**
  - Laceration or abrasion wound
  - Sprain of ligament or strain of muscle /tendon
  - Fracture
    - Extremities
    - Ribs
    - Other parts of body, e.g. pelvis and spine

- **Burn or Blast**
  - Skin
  - Extremities (Musculoskeletal)
  - Other part of body e.g. injury of the eye or face and etc.

- **Industrial or Domestic Injury**
  - Cut by sharp instrument, glass or machine

- **Other Injury**
  - Animal or insect bite

(c) Basic Assessment at Triage

- Look at patient
  - for sign of airway obstruction: blood or vomit
  - chest
- Listen to patient
  - response and for sign of airway obstruction: stridor, wheeze, or gurgling
- Feel for
  - pulse, breath, bony tenderness or crepitus (crunching)
- Smell
  - of alcohol or hazardous material e.g. petroleum inhalation

(c) i. General Appearance of Patient

- Alert, unconscious, pale, cyanosis, in pain, unable to walk and etc.
- Trauma; either blunt or penetrating
  - any penetrating injury of head or from neck to thigh

(c) ii. Physiological Parameters

- **Airway and Cervical**
  - **Airway**: normal, partially obstructed or obstructed (any hoarseness, gurgling, wheezing, stridor, apnoea)
    - any airway occlusion need immediately attention
      - critical and need the highest priority
    - normal pattern of airway
      - non-critical

- **Cervical** Restriction**:** maintain restriction of the cervical area to prevent further damage or triggered alteration of airway pattern until its proven no evidence of injury. In conscious patient, you could ask for any neck pain. Cervical injury must be suspected in any patient with multiple system trauma especially with altered level of consciousness or blunt injury above clavicle.

- **Breathing:** Rhythm and rate normal or abnormal such as bradypnea or tachypnea, orthopnoea or cessation of breathing
  - altered breathing pattern or evidence of respiratory dysfunction
    - critical and needs the highest priority
  - normal pattern of breathing
    - non-critical

- **Circulation and Haemorrhage Control**
  - **Circulation**: normal or altered haemodynamic status evidenced by changes in skin or mucus membrane characteristic such as pale, cold and clammy, changes in pulse rate and rhythm or heart rate is bradycardia or tachycardia, any abnormal capillary refill (> 2 second) and low blood pressure (a late sign)
    - altered haemodynamic status
      - critical and needs the highest priority
    - normal circulation function
      - non critical

- **Haemorrhage Control**: if any evidence of bleeding, appropriate measures should be taken immediately to stop bleeding.
  - patients with evidence of haemodynamic compromise (hypotension, severe hypertension, tachycardia or bradycardia)
  - altered haemodynamic status evidence by changes in skin or mucus membrane characteristic such as pale, cold and clammy, abnormal capillary refill or low blood pressure
    - critical and needs the highest priority
  - normal circulation function
    - non critical

- **Disability: Alteration Level of Consciousness and Eye Problem**
  - **Disability of Central Nervous System**: Alteration level of Consciousness
    - respond to call or question or obey command
    - use AVPU scale (as in Table.3.9)
    - any alteration in level of consciousness need higher priority
  - **Patient with Eye Problem;** check for vision acuity and to exclude eye injury and foreign bodies.
    - decrease or loss of sight and painful eye
      - need higher priority for prevention of blind

- **Environment**: Temperature either hypothermia or hyperthermia or hazardous environment and exposure for assessment

Bear in mind that any evidence of airway obstruction, respiratory dysfunction, haemodynamic compromise or alteration in mental status requires higher triage code allocation. Similarly, a patient who comes to ED with severe pain, should be attended to and appropriate triage decision and provision of treatment should be carried out accordingly. Any untreated pain may cause changes in physiological parameters.

(c) iii. Assessment of Pain

For patients who come to the ED with complaints of pain and whose basic physiological parameters are normal, HCPs at triage should able to assess the level of pain, whether it is severe, moderate or mild. Pain can be assessed and rated using a scale; the verbal descriptor scale is suggested as the most accurate. The patient will verbalise pain according to the scale. Self-report pain is the most accurate (Oman & Koziaol-McLain (2007). The Ministry of Health, Malaysia has issued a guideline on pain management. Numerical Rating Scale (NRS) is recommended to be used to assess pain among patients who are attended to in the ED.

NRS is used to measure the pain score on a 0 - 10 scale. The patient will verbalize her/his pain scores. Pain severity is defined as follows: 0 means no pain, mild, 1–3; moderate pain, 4–6; and severe pain 7–10. Table 3.14 summarizes NRS severity of pain. A pain score 7 or more out of 10 is severe pain and should be categorized as yellow colour code, or high risk case (Emergency Medicine and Trauma Services Policy, 2012).

Table 3.14: Numerical Rating Skill: Severity of Pain

Score of NRS	Severity of Pain
0	No pain
1-3	Mild
4-6	Moderate
7-10	Severe

(d) Triage Practice

Discussion of Patient Scenario-based Questions (PSBQs)

Discussion Flow

You are assigned as **triage officer** at triage counter

↓

Patient presents to your Emergency Department
Refer to Patient Scenario-based Questions below

↓

How do you make a triage decision?
(triage categorization using colour code)

↓

What should you do **when** patient presents into ED?

↓

Patient assessment
(Gather Data)
What and **how** to assess?

- General appearance
- Basic Assessment for trauma
- including mechanism of injury

↓

What is the finding?
(Refer to PSBQs)

↓

What is your triage decision?

↓

Red colour code
or
Yellow colour code
or
Green colour code

↓

Why?
Justify your answer

(d) i. Patient Scenario-based Questions (PSBQs) and Discussion 1

Please choose **<u>one (1) correct</u>** <u>triage colour code</u> for each of the scenarios.

The colour code indication is as below;

Colour Code	Red Colour Code	Yellow Colour Code	Green Colour Code
Time to Receive Treatment	Immediately	within 30 minutes	≥ 90 minutes

Please **tick your answer** and give **justificatio**n for your answer in the **provided box**

Sarita is a 19-year-old girl who arrives to the ED via a car accompanied by her coach. She fell while playing netball, injuring her right foot. She is transferred to the triage desk in a wheelchair as it is painful for her to bear weight. The pain score is' 7 out of 10'. Her blood pressure is 130/90, pulse 110 per minute, respiratory rate is 16 breaths per minute and afebrile.

Red colour code	Yellow colour code	Green colour code

Justification:

(d) ii. Patient Scenario-based Questions (PSBQs) and Discussion 2

Please choose **<u>one (1) correct</u>** <u>triage colour code</u> for each of the scenarios.

The colour code indication is as below;

Colour Code	Red Colour Code	Yellow Colour Code	Green Colour Code
Time to Receive Treatment	Immediately	within 30 minutes	≥ 90 minutes

Please **<u>tick your answer</u>** and give **<u>justificatio</u>**n for your answer in the **<u>provided box</u>**

Khatijah 25 years. She attends to the ED at 12.30 pm with a work colleague. Her hand is wrapped in a tea towel and she appears pale and anxious. She tells you she has cut her hand with a carving knife. On examination you see a four centimetres incision across her left palm. Tendons are visible and the wound bleeds slowly. Khatijah tells you she is feeling nausea and her pain is '7 out of ten'. Movement and sensation of her fingers are intact. Her blood pressure is within normal limits, heart rate is 78 beats per minute and her respiratory rate is 16 breaths per minute.

Red colour code	Yellow colour code	Green colour code

Justification:

(d) iii. Patient Scenario-based Questions (PSBQs) and Discussion 3

Please choose **one (1) correct** triage colour code for each of the scenarios.

The colour code indication is as below;

Colour Code	Red Colour Code	Yellow Colour Code	Green Colour Code
Time to Receive Treatment	Immediately	within 30 minutes	≥ 90 minutes

Please **tick your answer** and give **justification** for your answer in the **provided box**

Jamal 57 years, works for Kelantan Water, reading meters. During his rounds today he was attacked by a dog and bitten on the upper left leg. On inspection you noted six to seven square centimetres of skin loss. The wound is irregular, fat tissue is exposed and it looks dirty. There is a small amount of blood loss. Jamal says the injury is 'a bit painful' but he is not obviously distressed. His blood pressure is within normal limit, heart rate is 100 beats per minute and his respiratory rate is18 breaths per minute.

Red colour code	Yellow colour code	Green colour code

Justification:

(e) Summary

Rapid and accurate assessment of pain at triage is very crucial. Recognition of the severity level of the pain score is very important to ensure the patient gets appropriate treatment. Immediate and appropriate measures to reduce pain such as analgesic administration, splinting, or immobilization are important to prevent unnecessary changes in physiological parameters which may cause risk to patient's life.

3.6.2.4 Section 4: Musculoskeletal Injury

(a) Overview

Musculoskeletal injuries include injury to the bones, joint, tissue and muscle. The term musculoskeletal disorders (MSDs) refer to conditions that involve the nerves, tendons, muscles, and supporting structure of the human body (Deros et al., 2014). The incidences are very common in motor vehicle accidents, at construction sites, while doing daily activities, playing, working and etc., and may cause sprain, strain, dislocation or fracture. Musculoskeletal injury may require prolonged treatment and cause disability temporarily or permanently among the victims, that may interrupt victims' activities for their entire life.

(b) Common Mechanisms of Musculoskeletal Injury: Blunt or Penetrating

- Speeding vehicle, road traffic injury
- Height fall with or without any impact on en route to the ground
- Sport
- Fall
- Pedestrian versus vehicle
- Cyclist versus vehicle
- Assaulted
- Restraints used
- Gunshot
- Blast
- Cut, crush injury and burns

(c) Basic Assessment at Triage

- Look at patient
  - for sign of airway obstruction: blood or vomit
  - chest
- Listen to patient
  - response and for sign of airway obstruction: stridor, wheeze, or gurgling
- Feel for
  - pulse, breath, bony tenderness or crepitus (crunching)
- Smell
  - of alcohol or hazardous material e.g. petroleum inhalation

(c) i. General Appearance of Patient

- Alert, unconscious, pale, cyanosis, in pain, unable to walk and etc.
- Trauma; either blunt or penetrating
    - Any penetrating injury of head or from neck to thigh

(c) ii. Physiological Parameters

- **Airway and Cervical**
    - **Airway**: normal, partially obstructed or obstructed (any hoarseness, gurgling, wheezing, stridor, apnoea)
        - any airway occlusion need immediately attention
            - critical and need the highest priority
        - normal pattern of airway
            - non-critical

    - **Cervical Restriction:** maintain restriction of the cervical area to prevent further damage or triggered alteration of airway pattern until its proven no evidence of injury. In conscious patient, you could ask for any neck pain. Cervical injury must be suspected in any patient with multiple system trauma especially with altered level of consciousness or blunt injury above clavicle.

- **Breathing:** Rhythm and rate normal or abnormal such as bradypnea or tachypnea, orthopnoea or cessation of breathing
  - altered breathing pattern or evidence of respiratory dysfunction
    - critical and need the highest priority
  - normal pattern of breathing
    - non-critical

- **Circulation and Haemorrhage Control**
  - **Circulation**: normal or altered haemodynamic status evidenced by changes in skin or mucus membrane characteristic such as pale, cold and clammy, changes in pulse rate and rhythm or heart rate is bradycardia or tachycardia, any abnormal capillary refill (> 2 second) and low blood pressure (a late sign)
    - altered haemodynamic status
      - critical and need the highest priority
    - normal circulation function
      - non critical

- **Haemorrhage Control**: if any evidence of bleeding, appropriate measures should be taken immediately to stop bleeding
  - patients with evidence of haemodynamic compromise (hypotension, severe hypertension, tachycardia or bradycardia)
  - altered haemodynamic status evidenced by changes in skin or mucus membrane characteristics such as pale, cold and clammy, abnormal capillary refill or low blood pressure
    - critical
      - needs the highest priority
    - normal circulation function
      - non critical

- **Disability: Alteration Level of Consciousness and Eye Problem**
  - **Disability of Central Nervous System**: Alteration level of Consciousness
    - respond to call or question or obey command
    - use AVPU scale (see Table 3.9)
    - any alteration in level of consciousness need higher priority

  - **Patient with Eye Problem;** check for vision acuity and to exclude eye injury and foreign bodies.
    - decrease or loss of sight and painful eye
      - need higher priority for prevention of blind

- **Environment**: Temperature either hypothermia or hyperthermia or hazardous environment and exposure for assessment

Bear in mind that any evidence of airway obstruction, respiratory dysfunction, haemodynamic compromise and altered mental status require higher triage code allocation. Furthermore, when a patient with musculoskeletal injury comes to the ED, HCPs at triage should, at the same time, be able to perform vascular injury and nerve assessment such as circulation, motor and sensory.

(c) iii. Assessment of Vascular and Nerve Injury

- **Circulation:**
    - colour, temperature, capillary refill, and pulse.
    - dcreased pulse or pulselessness indicates vascular injury

- **Movement**:
    - able to move freely
    - or limited movement or pain upon movement

- **Sensory:**
    - paresthesia indicates nerve injury

In musculoskeletal injury, HCPs at triage should be able to observe for any vascular and nerve injury by assessing the colour, temperature, capillary refill, any decrease of pulse or pulselessness and paresthesia. These signs and symptoms are important to detect for any evidence of compartment syndrome, which commonly involves calf and thigh. Increased compartmental pressure will lead to circulation and nerve function compromise. Untreated compartment syndrome results in muscle necrosis, partial or complete nerve injury, and vascular compromise ,which can lead to loss of extremity function.

A patient with impaired circulation, sensory function and movement requires higher triage code allocation. These elements may influence triage decisions for limb and lifesaving. A severely crushed limb is critical; open fracture of upper limbs or dislocation of major joints or total or near total amputation is high risk, which is yellow colour. Meanwhile, a closed fracture of an upper limb, or ankle with major angulations, or dislocation of small joints is non-critical, which is green colour code (Emergency Medicine and Trauma Services Policy, 2012).

(d) Triage Practice

Discussion of Patient Scenario-based Questions (PSBQs)

Discussion Flow

You are assigned as **triage officer** at triage counter

↓

Patient presents to your Emergency Department
Refer to Patient Scenario-based Questions below

↓

How do you make a triage decision?
(triage categorization using colour code)

↓

What should you do **when** patient presents into ED?

↓

Patient assessment
(Gather Data)
What and **how** to assess?
- General appearance
- Basic Assessment for trauma
- including mechanism of injury

↓

What is the finding?
(Refer to PSBQs)

↓

What is your triage decision?

↓

Red colour code
or
Yellow colour code
or
Green colour code

↓

Why?
Justify your answer

(d) i. Patient Scenario-based Questions (PSBQs) and Discussion 1

Please choose **one (1) correct** triage colour code for each of the scenarios.

The colour code indication is as below;

Colour Code	Red Colour Code	Yellow Colour Code	Green Colour Code
Time to Receive Treatment	Immediately	within 30 minutes	≥ 90 minutes

Please **tick your answer** and give **justification** for your answer in the **provided box**

Marsiah 36 years. She presents to the hospital with an injured right leg. She was brought to the triage desk in a wheelchair by her father who told you she has multiple sclerosis. Today she was found by her father after falling down four steps at the front of her home. Normally she was able to walk using a walking stick, but since the fall she has not been able to walk at all. On examination you note that her right ankle is swollen and a right pedal pulse is palpable. Her blood pressure is within normal limit, heart rate is 84 beats per minute and her respiratory rate is16 breaths per minute.

Red colour code	Yellow colour code	Green colour code

Justification:

(d) ii. Patient Scenario-based Questions (PSBQs) and Discussion 2

Please choose **one (1) correct** triage colour code for each of the scenarios.

The colour code indication is as below;

Colour Code	Red Colour Code	Yellow Colour Code	Green Colour Code
Time to Receive Treatment	Immediately	within 30 minutes	$\geq$ 90 minutes

Please **tick your answer** and give **justificatio**n for your answer in the **provided box**

Rashid 33 years. He was escorted to the ED by police. He was having been arrested while climbing out of a window of an abandoned warehouse. While trying to escape he cut his right hand on some broken glass. He has a deep, six centimetres laceration to the palm of his right hand. There has been minimal blood loss, but he says he cannot feel his right index or second finger at all. His blood pressure is within normal limit, heart rate was 94 beats per minute and her respiratory rate was 20 breaths per minute.

Red colour code	Yellow colour code	Green colour code

Justification:

(d) iii. Patient Scenario-based Questions (PSBQs) and Discussion 3

Please choose **<u>one (1) correct</u>** <u>triage colour code</u> for each of the scenarios.

The colour code indication is as below;

Colour Code	Red Colour Code	Yellow Colour Code	Green Colour Code
Time to Receive Treatment	Immediately	within 30 minutes	≥ 90 minutes

Please **<u>tick your answer</u>** and give **<u>justificatio</u>**n for your answer in the **<u>provided box</u>**

Hambali 28 years, twisted his right knee while playing basketball. The knee was very swollen and he was unable to weight-bear on it. The injury occurred about two hours prior to his arrival in the ED and an ice pack has been applied. His blood pressure was within normal limit, heart rate is 72 beats per minute and his respiratory rate is18 breaths per minute.

Red colour code	Yellow colour code	Green colour code

Justification:

(e) Summary

As well as rapid assessment of basic physiological parameters at triage, an additional appropriate assessment and accurate collected data at triage may help a patient to obtain appropriate treatment in a timely manner, and may save limbs, and reduce morbidity and mortality.

3.6.2.5 Section 5: Fall

(a) Overview

Fall is a common presenting problem to the emergency department Harper et al. (2013) Fall is a most common mechanism across the age groups (O'mara, 2013). The highest incidence occurred among children and elderly (Nayduch 2009). Fall could be due physiological and pathological processes of aging, or due to cardiac arrhythmias, strokes and some diseases: pulmonary, neurological, Parkinson's or Alzheimer's (Porto Gautério et al., 2015). Buksman, Vilela Pereira, Lino, Santos Quedas Prevençã (2008, cited in Porto Gautério et al., 2015) defined fall as unintentional displacement of the body, resulting in the change of the body position to an inferior level than the initial position, with the incapacity of correction in time, and may be caused by intrinsic and extrinsic factors. Fall can be as simple as slipping or tripping on wet surface to fall from significant height. Height, surface and position of landing contribute to the severity sustained by victims. Therefore fall may cause injury to the head or other part of body injury depending on the mechanism of the event. Injury to the head (Brain Traumatic Injury) will contribute to altered level of consciousness. Injury to other parts of body may cause wound, sprain or strain of muscle, dislocation or close or open fracture

(b) Common Mechanisms of Fall that Cause Injury

- Slippery and tripping from wet or due uneven floor or ground level
- fall from height: e.g. parachutes, construction site
- Collision or skidded: e.g. motorbike versus motorbike
- Diving: striking e.g. the head or neck on the bottom surface
- Others:
  - fall from stairs
  - off-playground instrument
  - jump from bridge or balcony

(c) Basic Assessment at Triage

- Look at patient
  - for sign of airway obstruction: blood or vomit
  - chest
- Listen to patient
  - response, and for sign of airway obstruction: stridor, wheeze, or gurgling
- Feel for
  - pulse, breath, bony tenderness or crepitus (crunching)
- Smell
  - of alcohol or hazardous material e.g. petroleum inhalation

(c) i. General Appearance of Patient

- Alertness, unconscious, pale, cyanosis, in pain, unable to walk and etc.
- Trauma; either blunt or penetrating
- Any penetrating injury of head or from neck to thigh

(c) ii. Physiological Parameters

- **Airway and cervical**
  - **Airway**: normal, partially obstructed or obstructed (any hoarseness, gurgling, wheezing, stridor, apnoea)
  - any airway occlusion need immediately attention
    - critical and need the highest priority
  - normal pattern of airway
    - non-critical

- **Cervical** Restriction**:** maintain restriction of the cervical area to prevent further damage or triggered alteration of airway pattern until its proven that there is no evidence of injury. In a conscious patient, you could ask about any neck pain. Cervical injury must be suspected in any patient with multiple system trauma, especially with altered level of consciousness or blunt injury above clavicle.

- **Breathing:** Rhythm and rate normal or abnormal such as bradypnea or tachypnea, orthopnoea, shallow breathing or cessation of breathing
  - altered breathing pattern or evidence of respiratory dysfunction
    - critical and need the highest priority
  - normal pattern of breathing
    - non-critical

- **Circulation and Haemorrhage Control**
  - **Circulation**: normal or altered haemodynamic status evidenced by changes in skin or mucus membrane characteristics such as pale, cold and clammy, changes in pulse rate and rhythm or heart rate, bradycardia or tachycardia, any abnormal capillary refill (> 2 second) and low blood pressure (a late sign)
    - altered haemodynamic status
      - critical and need the highest priority
    - normal circulation function
      - non critical

- **Haemorrhage Control**: if any evidence of bleeding, appropriate measures should be taken immediately to stop bleeding.
  - patients with evidence of haemodynamic compromise (hypotension, severe hypertension, tachycardia or bradycardia)
  - altered haemodynamic status evidenced by changes in skin or mucus membrane characteristics such as pale, cold and clammy, abnormal capillary refill or low blood pressure
    - critical
      - need the highest priority
    - normal circulation function
      - non critical

- **Disability: Alteration Level of Consciousness and Eye Problem**
  - **Disability of Central Nervous System**: Alteration level of Consciousness
    - respond to call or question or obey command
    - use AVPU scale (see Table 3.9)
    - any alteration in level of consciousness needs higher priority

  - **Patient with Eye Problem;** check for vision acuity and to exclude eye injury and foreign bodies.
    - decrease or loss of sight and painful eye
      - need higher priority for prevention of blind

- **Environment**: Temperature either hypothermia or hyperthermia or hazardous environment and exposure for assessment

(c) iii. Assessment Should be Consider for a Patient with Injury due to Fall

- **Inspection of Injury and Collection of Data**

  Look for other injuries, that a patient may sustains due to fall (when the above physiological parameter is within normal limit) is vital as well. Data collection in regards with the incidence such as the mechanism of the injury may assist healthcare providers (HCPs) to make accurate triage decisions at triage. Appropriate assessment should be performed as soon as possible to prevent unnecessary complications.

  - for musculoskeletal injury cases, always examine for vascular and nerve injury by assessing the colour, temperature, capillary refill, any decrease of pulse or pulselessness and paresthesia In rib injury cases always observe for any difficulty in breathing or impaired in breathing pattern or abnormal of chest.
  - for head injury cases, always bear in mind of the possibility that patient has brain injury. Therefore cervical immobilization, neurological assessment (Glasgow Coma Scale) and early detection of signs and symptoms of increase intracranial pressure such as headache, nausea, vomiting, blurring of vision, amnesia of an event, changes level of consciousness, changes in pupil size and sluggish or non-reactive to light and high blood pressure is very crucial.

  - for any evidence of airway obstruction, respiratory dysfunction, haemodynamic compromised and altered mental status, need a higher triage colour code.

(d) Triage Practice

Discussion of Patient Scenario-based Questions (PSBQs)

Discussion Flow

You are assigned as **triage officer** at triage counter

↓

Patient presents to your Emergency Department
Refer to Patient Scenario-based Questions below

↓

How do you make a triage decision?
(triage categorization using colour code)

↓

What should you do **when** patient presents into ED?

↓

Patient assessment
(Gather Data)
What and **how** to assess?
- General appearance
- Basic assessment for trauma
- including mechanism of injury

↓

What is the finding?
(Refer to PSBQs)

↓

What is your triage decision?

↓

Red colour code
or
Yellow colour code
or
Green colour code

↓

Why?
Justify your answer

(d) i. Patient Scenario-based Questions (PSBQs) and Discussion 1

Please choose **one (1) correct** triage colour code for each of the scenarios.

The colour code indication is as below;

Colour Code	Red Colour Code	Yellow Colour Code	Green Colour Code
Time to Receive Treatment	Immediately	within 30 minutes	$\geq$ 90 minutes

Please **tick your answer** and give **justificatio**n for your answer in the **provided box**

Fadli 39 years, walks to the triage desk. He tells you he has pain in his left shoulder after he fell in a driveway. On examination you note that his left shoulder is very swollen. He has very limited range of movement, in fact he cannot move the shoulder joint itself, and he rates his pain as 'seven out of ten'. His left radial pulse is present, but he has some 'numbness' around the shoulder area. His arm is in a sling. He says 'it occurred a couple of hours ago'. His blood pressure is within normal limit, heart rate is 80 beats per minute and her respiratory rate is18 breaths per minute.

Red colour code	Yellow colour code	Green colour code

Justification:

(d) ii. Patient Scenario-based Questions (PSBQs) and Discussion 2

Please choose **one (1) correct** triage colour code for each of the scenarios.

The colour code indication is as below;

Colour Code	Red Colour Code	Yellow Colour Code	Green Colour Code
Time to Receive Treatment	Immediately	within 30 minutes	≥ 90 minutes

Please **tick your answer** and give **justification** for your answer in the **provided box**

Zainab, a 23-year-old university student, fell off her motorbike two days ago and was seen in another ED. She is complaining of stiffness and pain to her left wrist. Her left hand is swollen but she has full range of movement; her left hand is pink and warm. Her vital signs are within normal limits.

Red colour code	Yellow colour code	Green colour code

Justification:

(d) iii. Patient Scenario-based Questions (PSBQs) and Discussion 3

Please choose **<u>one (1) correct</u>** <u>triage colour code</u> for each of the scenarios.

The colour code indication is as below;

Colour Code	Red Colour Code	Yellow Colour Code	Green Colour Code
Time to Receive Treatment	Immediately	within 30 minutes	$\geq$ 90 minutes

Please **<u>tick your answer</u>** and give **<u>justificatio</u>**n for your answer in the **<u>provided box</u>**

Upandi 27 years. He presents to the ED via a private car following a fall from scaffolding at a construction site approximately 20 minutes prior to presentation. Upandi fells more than 10 feet onto a concrete block. He was observed by his work mates to be unresponsive for 'about five minutes then he regained conscious'. He has vomited four times and has a large haematoma on his occiput and has generalised headache. On arrival to the ED his Glasgow Coma Score is 13 out of 15, heart rate is 74 beats per minute, and respiratory rate is 14 breaths per minute.

Red colour code	Yellow colour code	Green colour code

Justification:

(e) Summary

Patient who come into ED with history of fall, with basic physiological parameters are in within normal limit and when injury involved with musculoskeletal (and in pain) or involved with brain injury. Assessment of the musculoskeletal, pain and level of consciousness are required for appropriate triage allocation and treatment to prevent further damage or irreversible effect.

3.6.2.6 Section 6: Burn

(a) Overview

Burn patients are considered as trauma patients, this is due to severity or extensiveness of the injury that able to affect organ system, it depends on the circumstance, or degree of the injury (Wiebelhaus & Hansen, 2001). Skin is the largest body organ, usually affects by burn injury. Burn may involve a small area of skin and it may cause deep and massive wound. Major burn has potential to a life threatening injury due to multi-organ dysfunction. Burn injuries are dynamic in nature and can progress into deeper injuries over time. The mechanism of the injury may have a great influence to the outcome of burn patients. Burn injury may contribute to a range of pain from mild to severe, also possibility of being disable either permanently or temporarily. It has a great impact on socioeconomic and psychological (Bourke & Dunn, 2013).

(b) Common Mechanisms of Burn Injury

- Thermal
- Electrical burn
- Chemical agents (alkali, acid or petroleum)
- Cryogenic burns (exposure to gases)
- Radiation burns (radioactive materials)

(c) Basic Assessment at Triage

- Look at patient
  - for sign of airway obstruction: blood or vomit
  - chest
- Listen to patient
  - response, and for sign of airway obstruction: stridor, wheeze, or gurgling
- Feel for
  - pulse, breath, bony tenderness or crepitus (crunching)
- Smell
  - of alcohol or hazardous material e.g. petroleum inhalation

(c) i. General Appearance of Patient

- Alertness, unconscious, pale, cyanosis, in pain, unable to walk and etc.
- Trauma; either blunt or penetrating
- Any penetrating injury of head or from neck to thigh

(c) ii. Physiological Parameters

- **Airway and cervical**
  - **Airway**: normal, partially obstructed or obstructed (any hoarseness, gurgling, wheezing, stridor, apnoea)
  - any airway occlusion need immediately attention
    - critical and needs the highest priority
  - normal pattern of airway
    - non-critical

- **Cervical** Restriction**:** maintain restriction of the cervical area to prevent further damage or triggered alteration of airway pattern until its proven that there is no evidence of injury. In a conscious patient, you could ask about any neck pain. Cervical injury must be suspected in any patient with multiple system trauma, especially with altered level of consciousness or blunt injury above clavicle.

- **Breathing:** Rhythm and rate normal or abnormal such as bradypnea or tachypnea, orthopnoea, shallow breathing or cessation of breathing
  - altered breathing pattern or evidence of respiratory dysfunction
    - critical and needs the highest priority
  - normal pattern of breathing
    - non-critical

- **Circulation and Haemorrhage Control**
  - **Circulation**: normal or altered haemodynamic status evidenced by changes in skin or mucus membrane characteristics such as pale, cold and clammy, changes in pulse rate and rhythm or heart rate, bradycardia or tachycardia, any abnormal capillary refill (> 2 second) and low blood pressure (a late sign)
    - altered haemodynamic status
      - critical and needs the highest priority
    - normal circulation function
      - non critical

  - **Haemorrhage Control**: if any evidence of bleeding, appropriate measures should be taken immediately to stop bleeding.
    - patients with evidence of haemodynamic compromise (hypotension, severe hypertension, tachycardia or bradycardia)
    - altered haemodynamic status evidenced by changes in skin or mucus membrane characteristics such as pale, cold and clammy, abnormal capillary refill or low blood pressure
      - critical
        - needs the highest priority
      - normal circulation function
        - non critical

- **Disability: Alteration Level of Consciousness and Eye Problem**
  - **Disability of Central Nervous System**: Alteration level of Consciousness
    - respond to call or question or obey command
    - use AVPU scale (see Table 3.9)
    - any alteration in level of consciousness needs higher priority

  - **Patient with Eye Problem;** check for vision acuity and to exclude eye injury and foreign bodies.
    - decrease or loss of sight and painful eye
      - need higher priority for prevention of blind

- **Environment**: Temperature either hypothermia or hyperthermia or hazardous environment and exposure for assessment

(c) iii. Estimation of Total Body Surface Area (TBSA) Using 'Rule of Nines'

There are few guidelines available to assess severity of burn. They are Palmer surface according to Kirby and Blackburn (1987, cited in Willian, 2009), Wallace's 'rule of nine' as indicated by Kyle and Wallace (1951, cited in William, 2009) and the Lund and Browder chart by Lund and Browder (1944, as cited in William, 2009). However, ' rule of nine' is commonly used in the ED because it is a quick and easy method for burn assessment. The rule of nine is a quick method for estimating total body surface area (TBSA). Under this rule an adult's head and neck account for 9% of total BSA, each arm is 9%, each leg is 18%, the front and back of the torso are 18% each, and the perineum is 1% (Wiebelhaus & Hansen, 2001). Table 3.15 summarizes the 'rule of nines' guideline to estimate TBSA for a patient with burn injury.

Table 3.15 : Rule of Nines Guideline

Affected Area	**TBSA %**
Head	9 %
Torso: front and back	18% each
Arm	9 % each
Leg	18 % each
Genital area	1%

HCPs at triage should have to be alert and able to estimate the degree of burn either it is a superficial, second degree or third degree burn according to the characteristics of the affected area and estimate the total body surface area (TBSA) of a burn injury patient concurrently. In Malaysia extensive burn > 25% of TBSA or involve facial region is critical which means red colour code, 15-25% of TBSA regardless of depth and /or 10-20% third degree burns with no compromise to the airway and circulation is high risk case which means yellow colour code (Emergency Medicine and Trauma Services

Policy, 2012). Patient with second degree burn, will suffer an extreme pain and untreated pain will cause changes in physiological parameters. Assessment of a patient's circulation and identify injury to the extremities and thorax area are crucial, because burned skin that encircling these areas can quickly become tight later will constrict blood flow into the extremities and able to impede patient’s ability to breath respectively (Wiebelhaus & Hansen, 2001).

For a patient who suffering from burn injury, there are many life-threatening conditions that may occur such as: blunt chest trauma, tension pneumothorax, or inhalation injuries, facial, and neck trauma, musculoskeletal injury including penetrating burn such as domestic electrical burn that can cause arrhythmias that also require urgent intervention. Furthermore HCPs need to inspect victim’s genitalia (when appropriate) and non-accidental injury (NAI) need urgent attention as well. A proper assessment and rapid treatment able to prevent complication and reduce risk to the patient’s life. Therefore assessment on fluid status (for electrolyte imbalance) and level of pain are crucial, in order to prevent hypovolemia and changes in physiological parameters. All these conditions are associated with the mechanisms of burn, degree of burn and TBSA.

(d) Triage Practice

Discussion of Patient Scenario-based Questions (PSBQs)

Discussion Flow

You are assigned as **triage officer** at triage counter

Patient presents to your Emergency Department
Refer to Patient Scenario-based Questions below

How do you make a triage decision?
(triage categorization using colour code)

What should you do **when** patient presents into ED?

Patient assessment
(Gather Data)
What and **how** to assess?
- General appearance
- Basic assessment for trauma
- including mechanism of injury

What is the finding?
(Refer to PSBQs)

What is your triage decision?

Red colour code
or
Yellow colour code
or
Green colour code

Why?
Justify your answer

(d) i. Patient Scenario-based Questions (PSBQs) and Discussion 1
Please choose **one (1) correct** triage colour code for each of the scenarios.

The colour code indication is as below;

Colour Code	Red Colour Code	Yellow Colour Code	Green Colour Code
Time to Receive Treatment	Immediately	within 30 minutes	≥ 90 minutes

Please **tick your answer** and give **justification** for your answer in the **provided box**

Bazli, 34 year old male, was installing a ceiling fan with the assistance of a friend in his own home. He received a 240 volt charge to his right hand, and was thrown back against the roof. His friend immediately switched the power off and called an ambulance. Bazli had a brief period of loss of consciousness, but was alert when the ambulance crew arrived. His heart rate is 80 beats per minute and irregular, his respiratory rate is 20 breaths per minute. He has a five centimetres blackened area to his right hand. No exit wound is seen.

Red colour code	Yellow colour code	Green colour code

Justification:

(d) ii. Patient Scenario-based Questions (PSBQs) and Discussion 2
Please choose **one (1) correct** triage colour code for each of the scenarios.

The colour code indication is as below;

Colour Code	Red Colour Code	Yellow Colour Code	Green Colour Code
Time to Receive Treatment	Immediately	within 30 minutes	≥ 90 minutes

Please **tick your answer** and give **justification** for your answer in the **provided box**

Hasanah 32 years. She was sent to the ED following an accident at work. She was carrying a pot of hot oil and slipped, spilling it on her upper legs. She immediately removed her clothing and stood under a cool shower for 15 minutes. On arrival in the ED she complains of pain '7 out of ten'. You estimate she has approximately 8 per cent burn to her anterior thighs. Her blood pressure is 130/80, heart rate is 110 beats per minute and her respiratory rate is 24 breaths per minute.

Red colour code	Yellow colour code	Green colour code

Justification:

(e) Summary

A severely changes of basic physiological parameters need immediate resuscitation. Indeed the history of the mechanism of the injury is very important. HCPs' ability to estimate victim's TBSA is crucial. For domestic electrical burn (with 240 volt), the current may cause arrhythmias and further interruption to the cardiac function. An extra precaution should be given to a patient with inhalation injury as well (e.g. chemical inhalation) because it may alter breathing and airway pattern. Meanwhile thermal burn (depend to the degree) will cause a lot of pain except for third degree burn (when nerves is affected). Nevertheless for burn injury that involved genitalia part and non-accidental injury (NAI) need urgent attention as well. Assessment of body fluids adequacy is very important to prevent hypovolemic shock. These elements may cause impairment of the physiological parameters and put patient's life at high risk, therefore immediate assessment and instant treatment for a patient's airway, breathing, circulation and disability are the first priority.

3.6.2.7 Section 7: Eye

(a) Overview

Eye injury is one of the common reasons for patient to come to Emergency Department. Fenton and Fenton (2001, cited in Quirke, Mullarkey, Askoorum, Coffey & Binchy, 2014). A non-penetrating corneal foreign is the most common eye injury seen in emergency departments. Foreign body flicking into the eye is the common reason patient come into emergency department due to uncomfortable, pain, red eye and infection. Delay to determine patient's acuity and priority to access to an appropriate treatment may cause vision impairment or permanent loss of vision. HCPs at triage are responsible to assess the severity of the patient's injury to ascertain a good outcome.

(b) Common Mechanisms of Injury: Foreign Body in the Eye

A non-penetrating corneal foreign body or penetrating corneal foreign body.

- Dust
- Drilling or grilling material
- Pounding material
- Flicking material into the eye while cutting grass
- Alleged plant or soil prick into eye
- Industrial material, flicking of wood or metal into eye
- Speed blow of material into the eye
- Blast injury
- Motor-vehicle accident/road traffic accident

(c) Basic Assessment at Triage

- Look at patient
  - for sign of airway obstruction: blood or vomit
  - chest
- Listen to patient
  - response, and for sign of airway obstruction: stridor, wheeze, or gurgling
- Feel for
  - pulse, breath, bony tenderness or crepitus (crunching)
- Smell
  - of alcohol or hazardous material e.g. petroleum inhalation

(c) i. General Appearance of Patient

- Alertness, unconscious, pale, cyanosis, in pain, unable to walk and etc.
- Trauma; either blunt or penetrating
- Any penetrating injury of head or from neck to thigh

(c) ii. Physiological Parameters

- **Airway and cervical**
  - **Airway**: normal, partially obstructed or obstructed (any hoarseness, gurgling, wheezing, stridor, apnoea)
  - any airway occlusion need immediately attention
    - critical and needs the highest priority
  - normal pattern of airway
    - non-critical

- **Cervical** Restriction**:** maintain restriction of the cervical area to prevent further damage or triggered alteration of airway pattern until its proven that there is no evidence of injury. In a conscious patient, you could ask about any neck pain. Cervical injury must be suspected in any patient with multiple system trauma, especially with altered level of consciousness or blunt injury above clavicle.

- **Breathing:** Rhythm and rate normal or abnormal such as bradypnea or tachypnea, orthopnoea, shallow breathing or cessation of breathing
  - altered breathing pattern or evidence of respiratory dysfunction
    - critical and needs the highest priority
  - normal pattern of breathing
    - non-critical

- **Circulation and Haemorrhage Control**
  - **Circulation**: normal or altered haemodynamic status evidenced by changes in skin or mucus membrane characteristics such as pale, cold and clammy, changes in pulse rate and rhythm or heart rate, bradycardia or tachycardia, any abnormal capillary refill (> 2 second) and low blood pressure (a late sign)
    - altered haemodynamic status
      - critical and needs the highest priority
    - normal circulation function
      - non critical

- **Haemorrhage Control**: if any evidence of bleeding, appropriate measures should be taken immediately to stop bleeding.
  - patients with evidence of haemodynamic compromise (hypotension, severe hypertension, tachycardia or bradycardia)
  - altered haemodynamic status evidenced by changes in skin or mucus membrane characteristics such as pale, cold and clammy, abnormal capillary refill or low blood pressure
    - critical
      - need the highest priority
    - normal circulation function
      - non critical

- **Disability: Alteration Level of Consciousness and Eye Problem**
  - **Disability of Central Nervous System**: Alteration level of Consciousness
    - respond to call or question or obey command
    - use AVPU scale (see Table 3.9)
    - any alteration in level of consciousness needs higher priority

  - **Patient with Eye Problem;** check for vision acuity and to exclude eye injury and foreign bodies.
    - decrease or loss of sight and painful eye
      - need higher priority for prevention of blind

- **Environment**: Temperature either hypothermia or hyperthermia or hazardous environment and exposure for assessment

(c) iii. Assessment of the Eye

- **Examine for;**
  - vision acuity test: decrease, loss of sight or normal vision
    - decrease or loss of sight
      - need a higher triage colour code
  - pain and redness of the eye
    - need a higher triage colour code
  - ability to open the eye
  - injury or foreign body in the eye
  - symmetry and movement of the eye
  - or any other abnormality

A patient who come in the ED with acute eye problem, the causes in regard with the current problem should immediately be divided into those causing altered vision (which need referral for a specialist opinion) and those which are not affecting it. HCPs at triage should be able to make brief and rapid vision acuity of the eye either patient able to read or identify any number: colour (HCPS at triage should aware of patient's colour blind, if any): counting finger: hand movement: or light perception.. Patient's vision acuity test is examined at certain point of distance such as at one feet or 6 feet or as appropriate according to patient condition. Decrease or altered vision and pain in the eye need urgent attention. Eye injury with loss or impaired vision is categorized as high risk which is yellow colour code triage allocation (Emergency Medicine and Trauma Services Policy, 2012).

At triage HCPs also require to obtain a thorough history of the mechanism of the FB in eye and aware of type of foreign body (as well as surgical and medical history). Ferrous substance in an eye may cause the affected eye at risk for siderosis. when it is left in the eye and retained copper particle excite a purulent reaction (Crick, 1997). Nevertheless alkaline in the eye will cause harm to the eye and need higher priority.

(d) Triage Practice

Discussion of Patient Scenario-based Questions (PSBQs)

Discussion Flow

You are assigned as **triage officer** at triage counter

↓

Patient presents to your Emergency Department
Refer to Patient Scenario-based Questions below

↓

How do you make a triage decision?
(triage categorization using colour code)

↓

What should you do **when** patient presents into ED?

↓

Patient assessment
(Gather Data)
What and **how** to assess?

- General appearance
- Basic assessment for trauma
- including mechanism of injury

↓

What is the finding?
(Refer to PSBQs)

↓

What is your triage decision?

↓

Red colour code
or
Yellow colour code
or
Green colour code

↓

Why?
Justify your answer

(d) i. Patient Scenario-based Questions (PSBQs) and Discussion 1

Please choose **<u>one (1) correct</u>** <u>triage colour code</u> for each of the scenarios.

The colour code indication is as below;

Colour Code	Red Colour Code	Yellow Colour Code	Green Colour Code
Time to Receive Treatment	Immediately	within 30 minutes	≥ 90 minutes

Please **<u>tick your answer</u>** and give **<u>justificatio</u>**n for your answer in the **<u>provided box</u>**

Saniah a 43 year-old cook. She tells you, she was using a food pounder today and now has a foreign body in her left eye. The eye is red and painful. She states that the pain is ‘7 out of 10’. Vision test of left eye 9/6 and the right 6/6. Her vital signs are within normal limits.

Red colour code	Yellow colour code	Green colour code

Justification:

(d) ii. Patient Scenario-based Questions (PSBQs) and Discussion 2

Please choose **one (1) correct** triage colour code for each of the scenarios.

The colour code indication is as below;

Colour Code	Red Colour Code	Yellow Colour Code	Green Colour Code
Time to Receive Treatment	Immediately	within 30 minutes	≥ 90 minutes

Please **tick your answer** and give **justification** for your answer in the **provided box**

Ashaari, 56 years, was accidentally splashed material of plaster ceiling into his right eye. He ran water from the tap over his eye for fifteen minutes, before his wife drove him to the ED. At triage he appears very uncomfortable; the eye is closed and there is blistering to the skin surrounding the right orbit. Vision test of right eye 12/6, left eye 6/6. His vital sign within normal limit.

Red colour code	Yellow colour code	Green colour code

Justification:

(d) iii. Patient Scenario-based Questions (PSBQs) and Discussion 3

Please choose **one (1) correct** triage colour code for each of the scenarios.

The colour code indication is as below;

Colour Code	Red Colour Code	Yellow Colour Code	Green Colour Code
Time to Receive Treatment	Immediately	within 30 minutes	≥ 90 minutes

Please **tick your answer** and give **justification** for your answer in the **provided box**

Anuar 44 years, was cutting the grass on friday morning when a foreign body flicked up out of the grass and into his left eye. His wife drove him to the hospital. On presentation at triage, his eye is tearing quite a bit, and he still has the sensation that 'something is there'. He says he has 'no pain' but the eye is 'uncomfortable'. A quick check of vision reveals that he has no problems with visual acuity. His blood pressure is 130/80, pulse rate is 80 beats per minute and respiratory rate is 16 breaths per minutes

Red colour code	Yellow colour code	Green colour code

Justification:

(e) Summary

Rapid assessment and determine accurate triage decision for foreign body in the eye may ease patient's discomfort and avoid decrease of vision acuity of loss of vision. Decrease or loss of sight is very distressing. Knowing mechanism of the injury and fast assessment of vision acuity using appropriate method will assist HCPs at triage to make accurate triage decision and preserve patient sight and enhance the outcome of the problems.

3.6.3 Validation of the Content of Educational Module

The educational program was examined for content validation. Content validation of the educational program was conducted at the Hospital of Universiti Sains Malaysia. The content of the module was validated by seven experts. They included six (6) senior medical lecturers and emergency medicine physicians and a nursing lecturer; their individual experience of emergency services ranged from six (6) years to more than 10 years, and they were purposively chosen for content review. The purposes of the review were to examine the modules' conciseness and appropriateness, to ensure the content is informative and suited to the purpose of adult trauma triage. Content validation from the emergency physicians and nursing experts were obtained twice, which means the content was reviewed twice to ascertain its accuracy and appropriateness. No major correction was required; there were, however, some minor corrections of terminology and sentence structures. The content of the educational intervention was adjusted and arranged as suggested by the experts.

3.6.4 Application of the Educational Program (Intervention)

Intervention in this study was in the form of an educational program. The purpose of the intervention was to improve HCPs' knowledge and to enable them to make more accurate triage decisions for adult trauma patients. The intervention was delivered in the form of classroom teaching. Total time allocated for the education session was 140 minutes. The Head of Department or Head Nurse in charge of particular EDs of the hospitals identified for the intervention (intervention group) and HCPs were informed, and a list of participants was submitted in order to form a group of participants in each of the educational sessions, according to the requirement. According to Armson et al. (2007, cited in Zaher and Ratnapalan, 2012), staying up to date with current evidence is a challenge for physicians owing to the immense quantity of new knowledge produced every day. Learning in a small group makes it possible to focus on the targeted knowledge, and small-group learning is regarded as an equally effective method of continuing medical and nursing education as the lecture method.

In the interventional education session, the vital teaching contents were delivered in the form of lectures, followed by patient scenario-based questions for triage practice and discussion session to ensure participants' understanding and to enhance their skill. Intervention using lecture and educational videos had approximately similar effectiveness after exposure (Aghababaeian et al., 2013). The Australian Department of Health and Aging developed Emergency Triage Education Kits that were issued in 2007. They used written patient scenarios as the basis for an educational program to enhance triage ability among HCPs. The Advanced Trauma Life Support (ATLS) program also used scenario-based questions to assess patients' need for care and to enhance HCPs' ability to make appropriate emergency care management decisions (Ali et al., 1996).

In the current study, the intervention group was exposed to educational intervention, while the control group was not exposed to any educational intervention. However, educational intervention will be conducted for the control group after completion of the whole study project. In addition, the educational module will be printed and placed at the emergency triage desk for referral, after the current study has been completed.

Measurements were conducted at two points after the educational intervention session for both the intervention and control groups. The questionnaires were distributed after an interval of two weeks (post-test) and 4 weeks (follow-up) for both intervention and control groups. According to Streiner and Norman (2008, cited in Moy et al. 2015), a two-week interval is considered sufficiently long enough to reduce the effects of memory, but short enough to diminish the likelihood of systematic alterations. Participants remained anonymous, but their questionnaires at each of the measurement points were coded with their birth date and series number to enable identification. Questionnaires were collected upon completion in the presence of the researcher or an assistant. Furthermore researcher was in the clinical area during office hour and left her telephone number to all participants for the purposes of discussion and enquiry if any to assist and ease them in triaging.

It was postulated that the educational program would improve HCPs ability to make accurate triage decisions and enhance patients' management. According to Dateo (2013), supported the importance of training and education to enhance skilful triage among HCPs. Training and education has been shown to have a positive impact on consistency and accuracy of triage among triage officers.

3.7 Phase 3 : Intervention Study

3.7.1 Sampling Method

3.7.1.1 Sample Criteria

Participation criteria for phase 3 were the EDs of hospitals in Kelantan (with HCPs) which were participated in phase 1 of the study, which obtained a low TDMI score, and were willing to enrol in phase 3 of the study.

3.7.1.2 Randomization

Clustered randomization was chosen because it can reduce the risk or likelihood of contamination in the control group to the intervention. According to Katz (2010), beside being easier to perform, a randomized sample makes it less likely that the control group is exposed to intervention, that may cause contamination. Randomization helps to ascertain that the characteristics of the participants across the groups is likely to be similar from the start for comparison and minimizing the confounding factors (Jadad, 2007).

All the 10 EDs of the hospitals with participants who have obtained low TDMI score were identified. They were invited to enrol into phase 3 of the study. There was 143 HCPs at the 10 EDs, after excluding 59 participants from the 10 EDs who obtained a high score on the TDMI. The EDs of the 10 hospitals were divided into two categories: specialist and non-specialist hospitals. The specialist hospitals included Hospital USM, HRPZ II, Hospital Kuala Krai, and Hospital Tanah Merah. While the non-specialist hospitals comprised Tengku Anis, Machang, Tumpat, Pasir Mas, Jeli, and Gua Musang Hospitals.

The names of the hospitals were written on pieces of paper and placed in one of two boxes; one box for specialist hospitals, and the other box for non-specialist hospitals. The unit of selection for participation into either the intervention or control group was the hospital, not the individual HCP, due to the logistics of delivering the intervention. Selection of hospitals into either the intervention or the control group was carried out by a neutral person, who had no interest in the study.

The hospitals were selected by drawing, one-by-one, the folded papers on which the names of the hospitals had been written from the two boxes consecutively (specialist hospitals, and non-specialist hospital). The papers drawn were placed, alternately, into containers labelled one (1) and two (2). The hospitals that randomized into the box labelled one (1) constituted the intervention group, while hospitals that randomized into the box labelled two (2) constituted the control group. The process of the sample selection was executed as soon as phase 1 and the data analysis were completed. Figure 3.3 summarizes the randomization. The results were concealed to curb contamination. Moher, Schulz, Altman, et al. (2005) stated that clusters are usually randomized all at once.

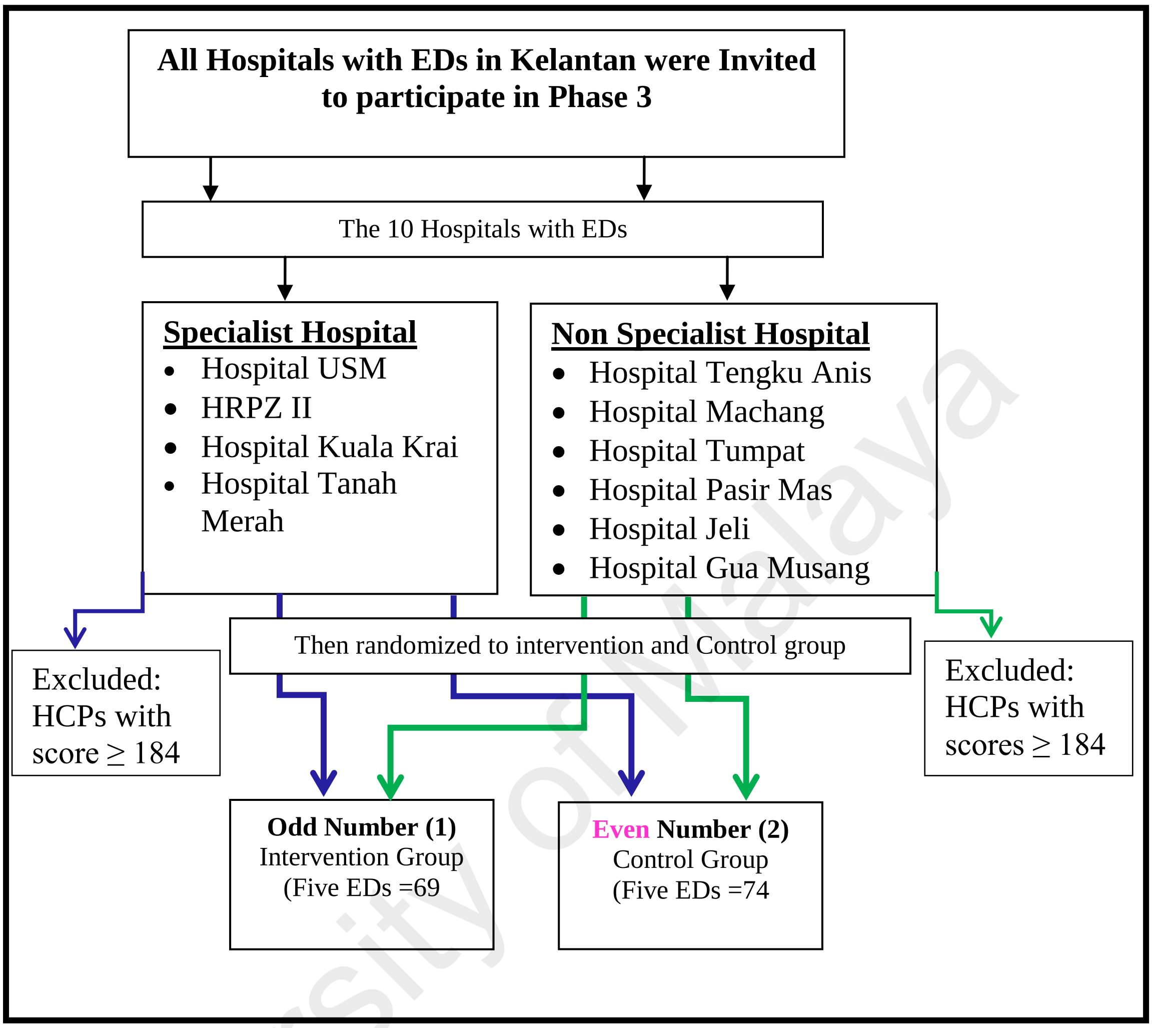

Figure 3.4: Randomization for Intervention and Control group

3.7.2 Size Sample Calculation

In the current study the sample effect size calculation was utilised to calculate sample size for phase 3 of the study. The sample size was calculated manually using the effect size formula (Kadam & Bhalerao, 2010). An effect size of the skills for triaging after educational intervention was 0.24. The formula was as showed below;

$$n=\frac{2(Z_{\alpha} + Z_{1-\beta})^{2\ \sigma 2}}{\Delta^2}$$

P= ≤ 0.05 therefore the $Z_{\alpha\,=}$ 1.96

Power was set at 80% and ($Z_{1-\beta}$) =0.842

Effect size = 0.24 (Kaakinen, Kyngäs, Tarkiainen, & Kääriäinen, 2016)

SD = 0.22

Therefore, the following is the calculation for the number of study participants;

$$n = \frac{2(Z_{\alpha} + Z_{1-\beta})^{2\ \sigma 2}}{\Delta^2}$$

$$\frac{2(1.96+ 0.842)^{2\ x\ 0.22x2}}{0.24^2}$$

$$\frac{2(1.96+ 0.842)^{0.88}}{0.0576}$$

$$\frac{2(2.802)^{0.88}}{0.0576}$$

$$\frac{4.9522}{0.0576}$$

n = 86 (± drop out 20%)

= 103

A total of 103 participants were required for the intervention and control group, respectively, for phase 3 of the study (interventional phase). Randomization of the 10 EDs of the hospitals with participants who obtained low scores in Phase 1 of the study resulted in 5 hospital EDs in each of the intervention and control groups, respectively. The number of individual HCPs in each group was: control group (n=74), and intervention group (n=69). Although the number of participants for current study was less than that specified by the sample effect size calculation, there was in a previous study conducted by Nilsson et al. (2015), using prospective randomized controlled trial have recruited 40 participants and 46 participants for each arm.

The sample size in a controlled trial cannot be arbitrarily large. The total number of participants potentially available, the budget, and the amount of time available, all limit the number of participants that can be included in a trial. The sample size of a trial must be large enough to allow a reasonable chance of answering the question posed, but not so large that continuing randomization past the point of near-certainty will lead to ethical discomfort (Wittes, 2002). Thus, it was considered that given the constraints of the total number of HCPs available, the sample size for the current study was sufficient.

3.7.3 Instrument

Self -administration Questionnaires

The instrument used in phase 3 was the same questionnaire used in Phase 1, as described in 3.5.4.1 (TDMI) and 3.5.4.2 (PSBQs). However for Section A, two questions were added to the version used in Phase 3: one was the participant's date of birth, to be used as a means of identifying the participant in order to match their questionnaires from the post-test and the follow-up test; and the second questions was 'Have you attended any continuous nursing education/seminar/short course that provided knowledge about triaging? and if so, please specify. Section B consisted of the TDMI and contained 37 items; and section C consisted of PSBQs and contained of fifteen questions. Details of the both sections were described earlier.

3.7.4 Data Collection

Phase 3 was an intervention study. The intervention was executed immediately after the content of educational module was reviewed and validated by the experts in the field of emergency and trauma. Data collection for the post-test (held at an interval of two weeks after completing the intervention) and follow-up test (at a four-week interval) started in January 2016 and was completed in April 2016. Figure 3.5 shows the flow of data collection for phase 3.

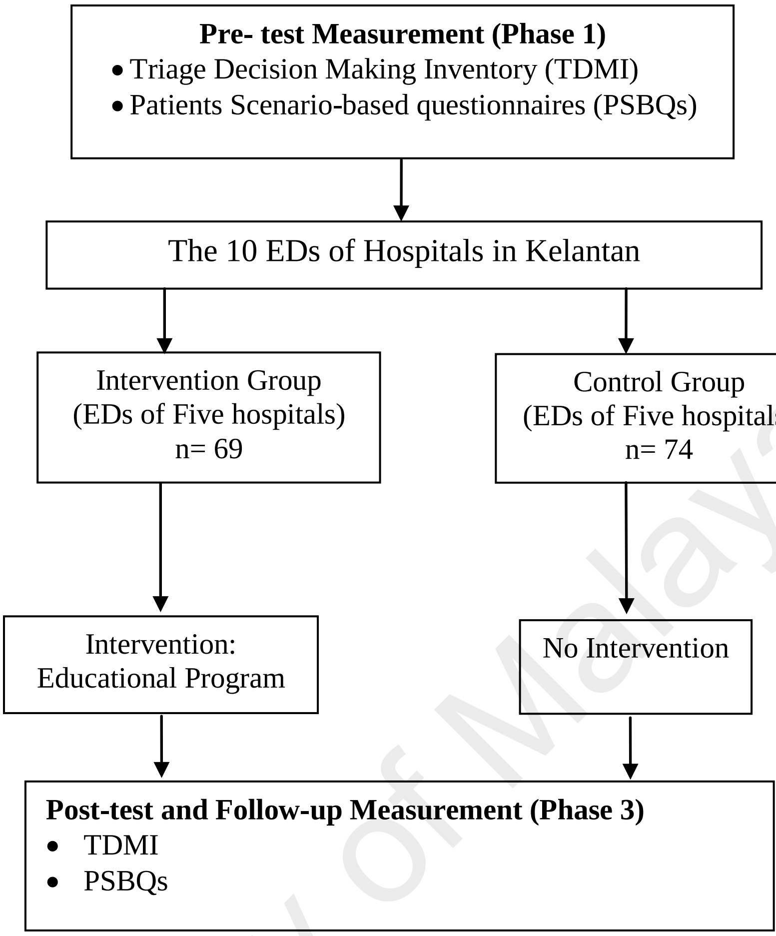

Figure 3.5: Study Flow Chart for Phase 3

3.7.5 Data Analysis

The data were entered and analysed using the Statistical Package for the Social Sciences (SPSS) version 20. (SPSS, Chicago, II., USA). The questions were checked for missing data. The 95% confidence interval was used to report numerical variables. The significance level was pre-set at 0.05. Descriptive statistics were reported when appropriate, using mean, standard deviation and frequency; demographic categorical variables were reported using Chi Square Test and Fisher Exact. Continuous variables were compared using t-test for comparison of means. For preliminary tests of assumption, normality test, tests of homogeneity for variance, and homogeneity of regression slopes were conducted. A General Linear Model Repeated Measures (RM) ANCOVA, followed by Bonferroni test for mean comparison between intervention and control group at pre-test, post-test and follow-up were performed. Partial eta square (η^2) was used to estimate effect size according to test efficacy of the education intervention and the difference between triage accuracy scores before and after exposure to the intervention. The partial eta value is rated as follows: 0.01 is a small effect, 0.06 is a moderate effect, and 0.14 is a large effect (Cohen, 1988). Results are displayed in tables and figures for reference.

3.8 Summary

The current study was divided into three phases and was conducted in the Emergency Departments of 10 hospitals in Kelantan State, Malaysia. The study design for phase I was a cross-sectional study in which a pre-test was administered to participants. This was followed in Phase 2 by the development of a triage educatioal module for adult trauma patients. Phase 3 consisted of a randomized controlled trial design in which the intervention group was exposed to the educational intervention while the control group was not. Phase 1 was a baseline study to identify triage the level of decision-making skills and to examine the accuracy of triage decisions in terms of triage categorization among HCPs. It also investigated the factors that are associated with triage decision making skill and accuracy among HCPs in the Emergency Departments in hospitals in Kelantan that practice a 3-tier triaging system. In phase 2, an educational triage module for adult trauma patients was developed. An intervention in the form of educational program was developed for the purpose of improving the level of triage decision-making skills and the accuracy of triage decisions among the participants. Phase 3 was the intervention phase. Using a ballot method, the 10 hospitals involved in the study, both specialists and non-specialist hospitals, were randomly assigned to either the intervention or the control group, and HCPs at the respective hospitals who tested with a low level of triage decision-making skills participated in Phase 3 of the study, Measurement of skills and accuracy of triage decision-making was conducted at three points in the study: at pre-test (all participating HCPs), post-test, and follow-up test (for HCPs who had low scores in the pre-test). Figure 3.6 summarizes the flow of procedures and data collection for the entire study project.

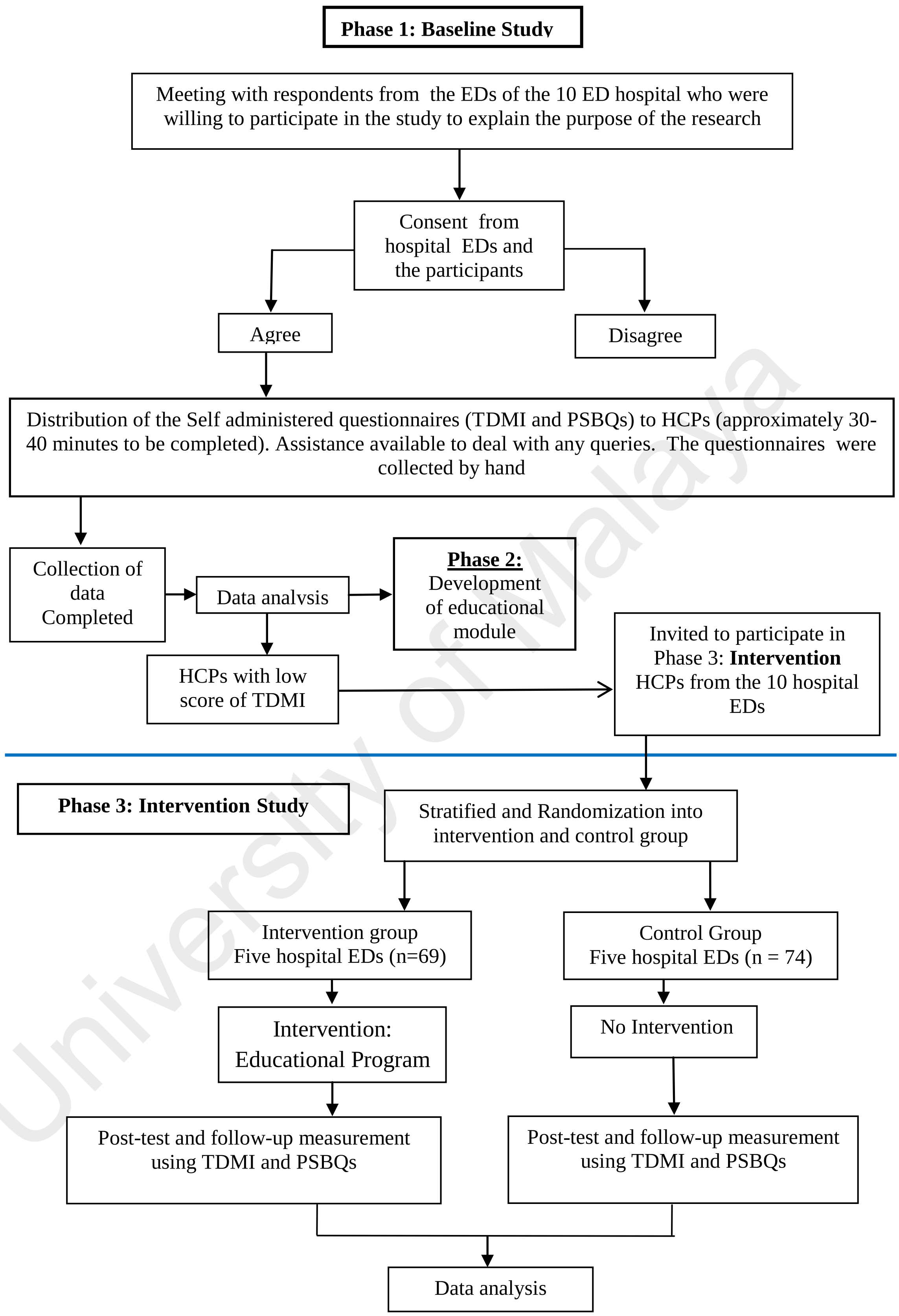

Figure 3.6: Flow Chart for the Entire Study

CHAPTER 4: RESULTS

4.1 Phase 1: Baseline Study

Introduction

This chapter describes the response rate and further details of the ED hospitals involved in the study, demographic characteristic of respondents, their core on TDMI, and accuracy of triage decisions for adult trauma patients among HCPs, including co-relations with TDMI domains. The association between demographic characteristics and TDMI and PSBQs score is explored. Also included, are the results of the effectiveness of the educational intervention on respondents' subsequent TDMI and PSBQs score (post-test and follow-up). Results are described and presented in tables and figures according to the objectives of the study.

4.1.1 Response Rate

A total of 274 questionnaires were distributed to HCPs in the 10 hospital Emergency Departments in Kelantan; 202 questionnaires were returned, after taking into account numbers of HCPs who were on long leave, medical leave, confinement leave, and some who did not want to be involved in the study. From the total population of 274 (N=274) HCPs, 202 (n=202) enrolled in the study, giving a response rate of 73.73%. The remaining 26.27% did not participate for the reasons given above. Details of the response rate and reasons for non-participation for HCPs from the EDs in Kelantan are summarized in Table 4.1.

Table 4.1: Frequency Distribution of Respondent and Refused Rate

Hospital	Participated (n)	%	Refused (n)	%	Reasons
HRPZ II	60	29.7	26	12.9	24- Not keen to participate 1-Study leave 1- Study leave
HTA	9	4.5	3	1.5	Not keen to participate
HUSM	51	25.2	23	11.4	8-Not keen to participate 3-Long leave 1- Medical leave 8 -No triage experience 3- Confinement
HTM	9	4.5	4	2.0	Not keen to participate
HKK	16	7.9	1	0.5	Not keen to participate
HOSMAC	8	4.0	4	2.0	Not keen to participate
HOSIM	21	10.4	6	3.0	4-Not keen to participate 1-Confinement Long leave
HT	12	5.9	1 1	1.0	Long Leave Confinement
HJ	7	3.5	2	1.0	Not keen to participate
HOGUM	9	4.5	1	0.50	Not keen to participate
Total	202	73.73	72	26.27	

4.1.2 Demographic Characteristics

More than half of the participants were male, and aged between 30 to 35 years, with a mean age of 35.71 years (SD=7.42). Nearly two-thirds of participants were medical officer assistants (n= 129, 63.86%) with the rest being registered nurses. The majority were diploma holders (n= 189, 93.6%). More than three-quarters of the participants (n=152, 75.2%) did not have any post basic training. Nearly half (n=90, 44.6%) had experience working in the ED for 5 years and less: the mean length of working experience in the ED was 7.58 years (SD=5.62), and more than half (n= 120, 59.4%) had less than 6√ of triage experience; the mean length of triage experience was 5.63 years (SD=4.94). The majority of respondents felt that 1-2 years' experience was necessary prior to performing triage tasks. Table 4.2 summarizes the demographic characteristics of the participants in the study.

Table 4.2: Frequency Distribution of Socio-demographic Characteristic of Participants (n=202)

Variable	Frequency (n)	Percentage (%)	Mean	± SD
Gender				
Female	69	34.2		
Male	133	65.8		
Age			35.71	(7.42)
≤ 30-35 yrs	104	51.5		
36 – 40 yrs	56	27.7		
41 and above	42	20.8		
Academic level				
Certificate	13	6.4		
Diploma	189	93.6		
Post Basic				
Yes	50	24.8		
No	152	75.2		
Designation				
RN	73	36.14		
MOA	129	63.86		
ED Working Experience			7.58	(5.62)
≤1-5 yrs	90	44.6		
6 – 10 yrs	52	25.7		
≥ 11 yrs	60	29.7		
Triage Experience			5.63	(4.94)
≤ 1-5 yrs	120	59.4		
6 – 10 yrs	46	22.8		
≥ 11 yrs	36	17.8		
Experience needed for Triage Roles			2.01	(1.98)
1-2	153	75.7		
≥ 3 yrs	45	22.3		
No experience needed	4	2.0		

4.1.3 Level of Triage Decision Making Skills (TDMI)

4.1.3.1. Distribution and Level of TDMI Scale among Healthcare Providers

Results of the items for subscale in the four domains investigated by the questionnaire (cognitive characteristics; critical thinking; intuition; and experience) are displayed in Table 4.3. The highest mean score among the items related to the cognitive characteristic domain was: 'If a patient arrests on me, I will know what to do' (M=5.01, SD=0.94), followed by 'I have confidence in my judgment to make good decisions that will improve my patients' outcome' (M=4.88, SD=0.87); the lowest score was for the item 'I can work under pressure and remain organized' (M=4.36, SD=1.08).

Meanwhile, the highest mean score among the items related to the critical thinking domain was 'I can communicate well with the ED staff while working at triage' (M=5.25, SD=0.77), followed by 'I communicate well with patients at triage' (M=5.16, SD=0.82); whereas the lowest mean score was received for two items: 'I get positive feedback about my triage decisions', and 'I can narrow down the information that I need to make decisions about triage patients' (M=4.56, SD=0.93), for both. For the experience domain, the highest mean score among the items was 'I know what questions to ask at triage to get the information that I need' (M=5.07, SD=0.79) followed by 'My past experience makes it easier to make decisions at triage' (M=5.04, SD=1.05). The lowest mean score in this domain was 'I send a lot of patients to the emergent area even when they may not need to go there because I am afraid of making a mistake' (M=3.75. SD=1.35).

The last domain was the intuitive domain, and the highest mean score in this domain was the item ‘I can tell by a person’s appearance whether or not they need immediate care’ (M=4.68. SD=.92), while the lowest mean score was for the item ‘No matter what I’ve learned in books, I follow my gut feelings at triage’ (M=4.10. SD=1.18).

Table 4.3: Descriptive Statistic for TDMI Items

Domain	No	Statement	Frequency (n=202)							
			1	2	3	4	5	6	Mean	SD
cc	1.	I'm knowledgeable about different areas within ED	2	2	21	44	81	52	4.76	1.04
	2.	I feel comfortable making decisions in the ED.	0	4	6	62	94	36	4.75	.85
	3.	I can work under pressure and remain organized.	6	8	15	69	86	18	4.36	1.08
	4.	I can prioritize patient care and get the job done.	0	2	4	56	97	43	4.87	.80
	5.	I have confidence in my judgment to make good decisions that will improve my patients' outcome	0	3	8	47	96	48	4.88	.87
	6.	If a patient arrests on me, I will know what to do.	1	2	8	41	80	70	5.01	.94
	36.	I am someone that my co-workers can rely on to make good decisions.	0	5	4	50	112	31	4.79	.81
		Total							**5.57**	**.091**
ct	13.	I communicate well with patients at triage.	0	2	5	27	93	75	5.16	.82
	21.	I get positive feedback about my triage decisions.	3	4	9	70	93	23	4.56	.93
	24.	I can narrow down the information that I need to make decisions about triage patients.	3	4	18	69	81	27	4.56	.93
	26.	I take responsibility for patients until they are taken to a treatment area.	0	5	13	31	80	73	5.00	1.00
	27.	I can link together the patient's complaints and my assessment findings at triage.	0	2	4	38	105	53	5.00	.79
	28.	When triage is very busy, I can still maintain a calm focus	1	5	12	61	92	31	4.64	.93
	29.	Triage is important because it provides the first impression the patient gets about my facility.	0	0	4	32	81	85	5.22	.78
	30.	I can reorganize my thoughts when it gets busy at triage to prioritize who should be seen next.	1	2	19	53	92	35	4.67	.94
	32.	I relate the mechanism of injury with the history given by the patient at triage.	1	2	9	41	107	42	4.87	.86

cc: cognitive characteristic; ct: critical thinking; int:intuition; exp experience; Likert scale 1: strongly disagree; 2: moderately disagree, 3: minimally disagree, 4: minimally agree, 5: moderately agree; 6: strongly agree

Table 4.3, continued'

	33.	I can communicate well with the ED staff while working at triage.	0	1	4	23	89	85	5.25	.77
	34.	I can sort out the information that I don't need to make a decision at triage	1	6	10	64	91	30	4.62	.93
	35.	I know the right questions to ask while I am working at triage.	0	2	5	31	112	31	5.02	.78
		Total							**4.88**	**0.87**
exp	7.	I can rely on my skills and judgment while working at triage.	0	2	11	38	97	54	4.94	.87
	11.	I send a lot of patients to the emergent area even when they may not need to go there because I am afraid of making a mistake.	4	36	57	40	39	26	3.75	1.35
	14.	I don't know the right questions to ask at triage.	4	24	32	27	25	90	4.56	1.55
	15.	I can make good judgments at triage.	0	19	9	51	90	33	4.54	1.11
	17.	My past experience makes it easier to make decisions at triage.	3	5	5	32	80	77	5.04	1.05
	18.	I feel confident in my skills to triage.	3	2	7	47	99	44	4.83	.94
	19.	I feel comfortable making decisions at triage.	3	3	6	48	108	34	4.77	.92
	22.	I know that I have the skills to make accurate triage decision	0	4	8	68	95	27	4.66	.83
	23.	I can differentiate between critical and subacute patients at triage.	0	1	5	52	96	48	4.92	.80
	25.	I know what questions to ask at triage to get the information that I need.	0	2	2	39	96	63	5.07	.79
	37.	I can talk to patients and get to the point about the reason that they came to the ED.	1	2	3	41	114	41	4.92	.79
		Total							**4.73**	**1.00**

cc: cognitive characteristic; ct: critical thinking; int:intuition; exp experience; Likert scale 1: strongly disagree; 2: moderately disagree, 3: minimally disagree, 4: minimally agree, 5: moderately agree; 6: strongly agree

Table 4.3, continued'

int	8.	When triaging a patient, I can get a good idea of how sick they are just by looking at them.	3	6	16	65	88	24	4.49	1.00
	9.	When I am triaging, I get a gut feeling about critical patients.	0	4	11	47	109	31	4.75	.85
	10.	I can tell by a person's appearance whether or not they need immediate care.	2	5	6	59	100	30	4.68	.92
	12.	I can often tell when something harm is going to happen when I first assess a patient at triage.	1	4	19	84	68	26	4.45	.94
	16.	I get an inner feeling when something bad is going to happen	5	6	31	72	66	22	4.26	1.09
	20.	No matter what I've learned in books, I follow my gut feelings at triage	2	2	21	44	81	52	4.10	1.18
	31.	I have a sixth sense about critically ill patients.	6	6	30	5	74	21	4.28	1.12
		Total							**4.43**	**1.01**

cc: cognitive characteristic; ct: critical thinking; int:intuition; exp experience; Likert scale 1: strongly disagree; 2: moderately disagree, 3: minimally disagree, 4: minimally agree, 5: moderately agree; 6: strongly agree

The cut-off score obtained in the TDMI that was used in this study was 184. This was the score that was used to categorise the summative scores of respondents on the TDMI into two levels, high and low. The results indicated that 29.2% (n=59) of participants had a high level of TDMI (184 or higher), while the remaining 70.8% (n=143) had a low score. Table 4.4 summarizes the results.

Table 4.4: Frequency Distribution of Score (cut-off point) on the TDMI (n=202)

Level	**Frequency (n)**	**Percentage (%)**	**Mean**	**SD**
			175.00	20.21
Low	143	70.8		
High	59	29.2		

4.1.3.2 Level of TDMI Subdomains among Healthcare Providers

Results demonstrated that the highest total score was for the critical thinking, which had 12 items (M=52, SD=7.16) and the lowest was for the intuitive domain with seven items (M=31.01, SD=4.65), while cognitive characteristic had seven items (M=33.43, SD=4.54). Results for the individual domains showed that the lowest was obtained by the intuitive domain ((M=4.43, SD=1.01), and the highest was obtained by the cognitive characteristic domain (M=5.57, SD=0.91). The mean scores between the domains were similar and, except for critical thinking, below an acceptable value. Table 4.5 summarizes the distribution of the scores.

Table 4.5: Distribution of Mean Scores of the Four Domains

Domains	No Items	Individual Score		Total Score	
		Mean	SD	Mean	SD
Cognitive Characteristic	7	5.57	0.91	33.43	4.54
Experience	11	4.73	1.00	52.00	7.16
Critical Thinking	12	4.88	0.87	58.52	6.98
Intuition	7	4.43	1.01	31.01	4.65

4.1.3.3 Distribution and Score Level of the Four Domains

The level of subscale score of the four domains were categorized as low or high based on the cut-off score. Results of frequency distribution showed that more than half of the participants of the study had low summative score for the individual domains; the lowest were for the intuitive domain (n=146, 72.3%), followed by the experience domain; and nearly half of the participants (48%) had low score for the cognitive characteristic domain. Table 4.6 summarizes the distribution.

Table 4.6: Distribution and Level of Mean of the Four Domains (n=202)

Domain	Cut-off point	Level	(n)	%
CC	34	Low	97	48.0
		High	105	52.0
EXP	53	Low	102	50.5
		High	100	49.5
CT	58	Low	80	39.6
		High	122	60.4
INT	34	Low	146	72.3
		High	56	27.7

CC: cognitive characteristic; Exp: experience; CT critical thinking, INT: intuition

4.1.3.4 Correlations among the Four Domains of TDMI

Results of analysis showed that there was a significant and positive correlation between scores for experience and critical thinking ($r = 0.82$, $p < .01$); and between experience and cognitive characteristics ($r = 0.72$, $p < .01$), which were both strong relationships. There was also a significant and positive correlation between cognitive characteristics and critical thinking ($r = 0.70$, $p < .01$), which was a moderate relationship. Analysis results yielded a significant and positive correlation between experience and intuition ($r = 0.6$, $p < .01$) which was a moderate relationship. There was a significant and positive correlation between intuition and the experience ($r = 0.49$, $p < .01$), and between intuition and cognitive characteristics ($r = 0.49$, $p < .01$), both of which were weak relationships. Table 4.7 summarizes the results.

Table 4.7: Correlations between the Four Domains (n=202)

	Cognitive Characteristic Score	**Experience Score**	**Critical Thinking Score**	**Intuition Score**
Cognitive Characteristic Score	1			
Experience Score	.720**	1		
Critical thinking Score	.689**	.823**	1	
Intuition Score	.449**	.499**	.604**	1

**. Correlation is significance at the 0.01 level (2-tailed)

4.1.4 Accuracy of the Triage Decisions for Adult Trauma Patients Measured by PSBQs

4.1.4.1 Accuracy Level of Triage Decisions for ATP

Results of the analysis showed that the highest accuracy level of triage decisions for ATPs (n=191, 94.6% correct) was achieved by item no. 13: ‘A 29 year old man with stab wound at left chest’, followed by item no. 9: ‘A 38 weeks pregnant (G2P1) lady involved in high speed MVA with chest and abdominal pain’ (n=189, 92.1% correct), in which both cases were in the red triage colour code category.

The least accurate triage decision for ATP (n=81, 40.1% correct) was for item no. 8: ‘A 60 year old lady with history of fall with unsure pain score’, which was in the green triage colour code category, followed by item no. 11: ‘A 19 year old girl with injured of right foot in pain, the score is 7 /10’ (n=82, 40.6%), which was in the yellow triage colour code category. Table 4.8 summarizes the frequency distribution for level of accuracy in triage decisions for ATP among HCPs.

Table 4.8: Frequency distribution of the Accuracy Level of Triage decisions of PSBQs for ATP by Items among HCPs (n: 202)

Level	Item	(n)	(%)
High	13	191	94.6
	9	186	92.1
	1	179	88.6
	2	179	88.6
	14	165	81.7
Low	3	152	75.2
	10	149	73.8
	15	149	73.8
	4	136	67.3
	12	129	63.9
	7	127	62.9
	6	118	58.4
	5	103	51
	11	82	40.6
	8	81	40.1

ATP: adult trauma patient; PSBQs patient scenario-based questions

4.1.4.2 Accuracy Level of PSBQs for ATP among HCPs

Results demonstrated that the mean score for PSBQs for all participants as a group was (M=10.52, SD=1.71). Table 4.9 shows that less than quarter of the participants (n= 49, 24.26%) scored 11 correct out of the 15 scenarios. Only one participant scored full marks (15/15), while the lowest number correct (5 out of 15) was also scored by one participant. Figure 4.1 illustrates the results.

Table 4.9: Distribution frequency of PSBQs for ATP among HCPs

		Frequency (n=202)	Percentage (%)	Mean	± SD
PSBQs Score				10.52	1.71
	5.00	1	0.5		
	6.00	2	1.0		
	7.00	7	3.5		
	8.00	15	7.4		
	9.00	27	13.4		
	10.00	40	19.80		
	11.00	49	24.26		
	12.00	40	19.8		
	13.00	16	7.9		
	14.00	4	2.0		
	15.00	1	0.5		

ATP: adult trauma patient; PSBQs: patient scenario-based questions

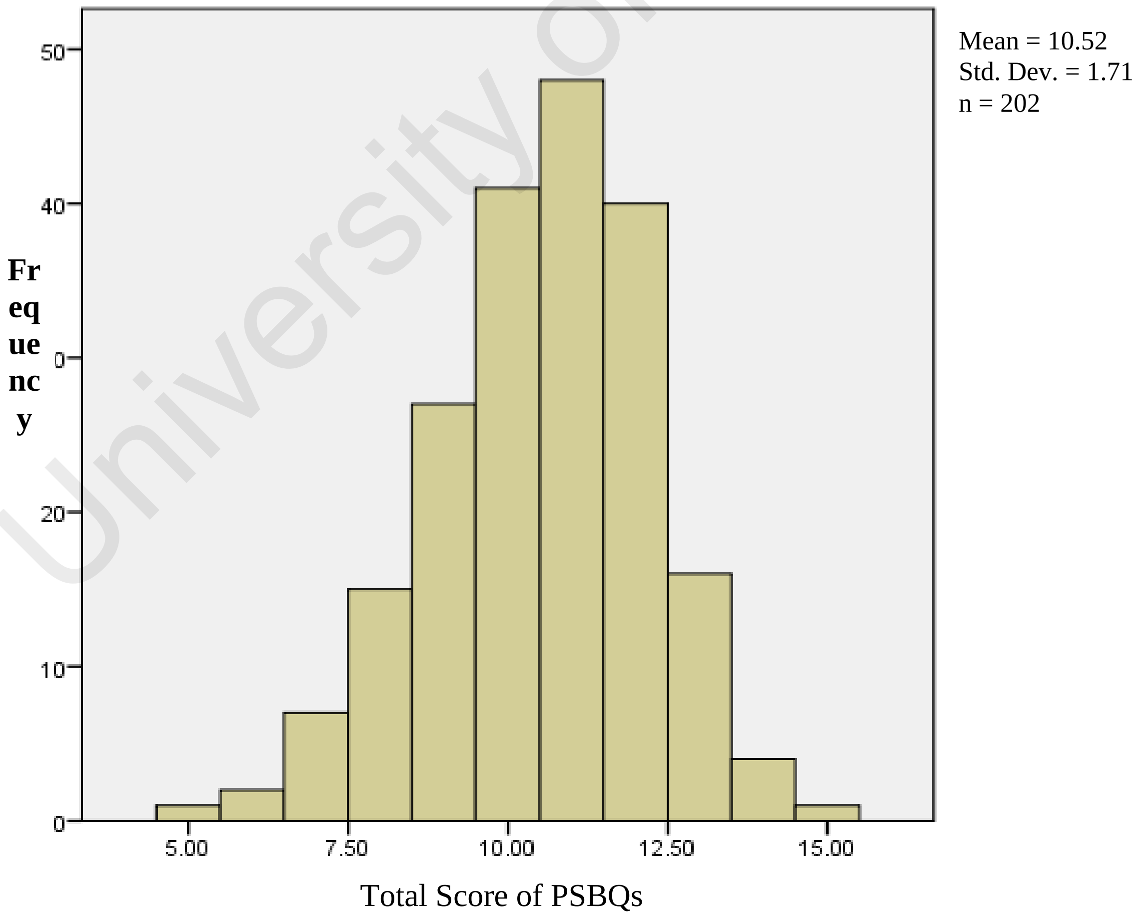

Figure 4.1: Distribution of Triage Decisions Accuracy of PSBQs for ATP
PSBQS: patient scenario based questions; ATP adult trauma patient

4.1.4.3 Accuracy Level of Triage Decisions for Adult Trauma Patient (PSBQs)

There were 15 Patient Scenario Based Questions. One (1) mark was allocated for each correct answer for the triage colour code and zero (0) for an incorrect answer. A score of 12 was taken as the cut-off point between high and low scores: scores of 12 and higher were considered ‘high’, and scores lower than 12 were considered ‘low’. A majority of the participants (n=141, 69.8%) had low scores with a mean of 1.70 (0.46). Table 4.10 summarizes the number and percentage of HCP in each of the two score categories: high, and low.

Table 4.10: Frequency Distribution of the PSBQs for ATP among Healthcare Providers (n=202)

Level	**Frequency (n)**	**Percentage (%)**	**Mean**	**SD**
			1.70	0.46
Low	141	69.8		
High	61	30.2		

4.1.5 Factors Associated with Triage Decision Making Skill (TDMI)

4.1.5.1 Univariate Analysis

The factors considered were gender, age, designation, academic level, post basic course, ED working experience, triage experience, and ED experience requirement. Table 4.11 shows that ED working experience was significantly associated with the TDMI score ($p<.05$). Other factors, except for academic level and ED experience requirement with a significance level at and less than $p \leq .20$, were entered into the multivariate logistic regression analysis.

Table 4.11: Factors Associated with TDMI Categorization (n=202)

Variables	Level	Score of Triage Decisions Skills				χ2	P Value
		Low		High			
		(n)	%	(n)	%		
Gender						2.83	.10
	Female	54	78.3	15	21.7		
	Male	89	66.9	44	33.1		
Age						3.95	.14
	≤ 30-35 yrs	79	76.0	25	24.0		
	36-40 yrs	39	69.9	17	30.4		
	≥ 41 yrs	25	59.5	17	40.5		
Designation						1.93	.19
	RN	56	76.7	17	23.3		
	MOA	87	67.4	42	32.6		
Academic Level						1.93	.20
	Certificate	7	53.8	6	46.2		
	Diploma	136	72.0	53	28.0		
Post Basic						0.25	.72
	Emergency	34	68.0	16	32.0		
	No PB	109	71.7	43	28.3		
ED Working Experience						8.26	.01
	≤ 1-5 yrs	72	80	18	20		
	6 – 10 yrs	36	69.2	16	30.8		
	≥ 11 yrs	35	58.3	25	41.7		
Triage Experience						5.55	.06
	< 1-5 yrs	92	76.7	28	23.3		
	6 – 10 yrs	27	58.7	19	41.3		
	≥ 11 yrs	24	66.7	12	33.3		
ED Experience Requirement						0.98	.69
	1-2	108	70.6	45	29.4		
	≥ 3 yrs	33	73.3	12	26.7		
	No need experience	2	50.0	2	50.0		

4.1.5.2 Multivariate Analysis

Results indicated that participants who had more than 10 years ED working experience were more likely (OR: 3.45, 95% CI:1.05,11.26) to obtain higher scores compared to their counterparts. Other factors such as gender, age, designation and triage experience were not significant in the multivariate model. Table 4.12 summarizes the results. There was no significance association between demographic characteristics with triage decisions making skill among HCPs except for length of ED working experience, so the null hypothesis (H_{o}) is accepted.

Table 4.12: Multiple Logistic Regression Analysis for Factors Associated with TDMI Categorization (n=202)

Variable	**Score of Triage Decisions Skills**				**P Value**	**Multivariate Logistic Regression**
	Low		**High**			**OR (95% C.I)**
	(n)	**%**	**(n)**	**%**		
Gender					.10	
Female	54	78.3	15	21.7		Reference
Male	89	66.9	44	33.1		1.80(0.49-6.60)
Age					.14	
≤ 30-35 yrs	79	76.0	25	24.0		Reference
36-40 yrs	39	69.9	17	30.4		0.81 (0.32-2.08)
≥ 41 yrs	25	59.5	17	40.5		1.18(0.37-3.73)
Designation					.19	
RN	56	76.7	17	23.3		Reference
MOA	87	67.4	42	32.6		0.80(0.22-3.18)
ED Working Experience					.01	
≤ 1-5 yrs	72	80	18	20		Reference
6 – 10 yrs	36	69.2	16	30.8		1.40(0.49-3.97)
≥ 11 yrs	35	58.3	25	41.7		3.45(1.05-11.26)*
Triage Experience					.06	
< 1-5 yrs	92	76.7	28	23.3		Reference
6 – 10 yrs	27	58.7	19	41.3		1.43(0.52-3.92)
≥ 11 yrs	24	66.7	12	33.3		0.49(0.14-1.68)

* significance level $p < 0.05$; OR: odds ratio.

4.1.6 Factors Associated with the Accuracy Level of Triage Decision for Adult Trauma Patient (PSBQs)

4.1.6.1 Univariate Analysis

Factors associated with PSBQs were examined. Results, as displayed in Table 4.13, showed that only post basic training was significantly associated with PSBQs score ($p<.05$). whilst other factors such as gender, age, designation, academic level, ED working experience, triage experience and ED experience requirement had no significant association with PSBQs score ($P>.05$), and were more than $P\leq .20$. Therefore, only post basic training was carried forward for logistic regression analysis.

Table 4.13: Factors Associated with PSBQs Categorization (n=202)

Variable	Level	Score of PSBQs				$\chi 2$	P Value
		Low		High			
		(n)	%	(n)	%		
Gender						0.45	.34
	Female	45	65.2	25	34.8		
	Male	96	72.2	37	27.8		
Age						0.20	.91
	≤ 30-35 yrs	74	71.2	30	28.8		
	36-40 yrs	38	67.9	18	32.1		
	≥ 41 yrs	29	69.0	13	31.0		
Designation						1.59	.26
	RN	47	64.4	26	35.6		
	MOA	94	72.7	35	27.1		
Academic Level						0.45	.53
	Certificate	8	61.5	5	38.5		
	Diploma	133	70.4	56	29.6		
Post Basic						6.00	.02
	Emergency	28	56.0	22	44.0		
	No PB	113	74.3	39	25.7		
ED Working Experience						1.68	.45
	≤ 1-5 yrs	67	74.4	23	25.6		
	6 – 10 yrs	34	65.4	18	34.6		
	≥ 11 yrs	40	66.7	20	33.3		
Triage Experience						1.04	.60
	< 1-5 yrs	87	72.5	33	27.5		
	6 – 10 yrs	30	65.2	16	34.8		
	≥ 11 yrs	24	66.7	12	33.3		
ED Experience Requirement						0.78	.77
	1-2	107	69.9	46	301		
	≥ 3 yrs	32	71.1	13	28.9		
	No need experience	2	50.0	2	50.0		

4.1.6.2 Multivariate Analysis

The results indicated that participants who had post basic training in Emergency were less likely (OR:0.44, 95% CI:0.23-0.86) to register a lower PSBQs score compared to their counterparts. Table 4.14 summarizes the results. There was no significance association between demographic characteristics with accuracy of triage decisions among HCPs except for emergency post basic training, so the null hypothesis ($H_{o)}$ is accepted.

Table 4.14: Binary Logistic Regression for Factors Associated with PSBQs Categorization (n=202)

Variables	**Score of PSBQs**				**P Value**	**Binary Logistic Regression OR (95% C.I)**
	Low		**High**			
	(n)	**%**	**(n)**	**%**		
Post Basic					.02	
Emergency	28	56	22	44		0.44(0.23-0.86)*
No PB	113	74.3	39	25.7		Reference

* significance level $p < 0.05$; OR: odds ratio

4.2 Phase 3: Intervention Study

The intervention phase of the study was conducted in Emergency Departments in 10 hospitals in State of Kelantan. The purpose was to determine the effect of an educational intervention on healthcare providers' level of triage decision making skills and the accuracy of their triage decisions for adult trauma patients. This section describes the response rate, compares the demographic characteristics of the control and intervention groups, compares the level of triage decisions making skills (as measured by the TDMI) and the accuracy of triage decisions (as measured by the PSBQs) before (at baseline) and after the educational intervention, to assess whether the intervention had any effect on improving triage decision making skills and accuracy of triage decisions among the HCPs who participated.

4.2.1 Response Rate

All HCP participants who obtained a low score on the TDMI assessment (n=143) were invited to enrol in the third phase of the study, and they all consented to do so; the 59 participants who obtained a high score on the TDMI were excluded. The 143 participants were randomized to intervention and control group on the basis of the hospital in which they were working. The intervention group comprised 69 HCPs from the EDs of five hospitals, while the control group comprised 74 HCPs the EDs at the other five hospitals. Altogether there were 49 nurses (34.3%) and 94 MOAs (65.7%). Table 4.15 summarizes this information.

Table 4.15: Frequency Distribution Response Rate of Phase 3 (n=143)

	Frequency (n)	**Percentage (%)**
Group		
Intervention	69	48.3
Control	74	51.7
Total	**143**	**100**
Designation		
RN	49	34.3
MOA	94	65.7
Total	**143**	**100**

4.2.2 Demographic Characteristics of the Control and Intervention Groups

Table 4.16 summarizes the demographic characteristics of the control group (n=74) and the intervention group (n=69). There was no significant difference in demographic characteristics between the two groups, except for designation and attendance in continuous professional development (CPD).

Table 4.16: Descriptive Statistics of Demographic Characteristics Control and Intervention Groups

Variable	Level	Control Group		Intervention Group		χ^2	P Value
		n=74	%	n=69	%		
Gender	Female	18	40.9	26	59.1	2.99	.10
	Male	56	56.6	46	43.4		
Age Groups (years)	≤ 30-35 yrs	32	49.2	33	50.8	3.22	.20
	35-40 yrs	29	61.7	18	38.3		
	≥ 41 yrs	13	41.9	18	58.1		
Designation	RN	16	32.7	33	67.3	10.88	.001
	MOA	58	61.7	36	38.3		
Post Basic	Emergency	37	55.2	30	44.8	0.61	.50
	NO	37	48.7	39	51.3		
ED working Experiences	≤ I- 5 yrs	27	55.1	22	44.9	1.87	.40
	6 - 10yrs	20	43.5	26	56.5		
	≥ 11 yrs	27	56.2	21	43.		
Triage Experiences	≤ I- 5 yrs	31	48.4	33	51.6	2.96	.24
	6 - 10yrs	29	61.7	18	38.3		
	≥ 11 yrs	14	43.8	18	56.2		
Attend CPD	YES	37	84.1	7	15.9	26.62	< .001
	No	37	37.4	62	62.6		

CPD: continuous professional development

4.2.3 Homogeneity of the Research Variable at Baseline for Intervention and Control Groups

Before further data analysis was carried out, an assumption of the homogeneity of both groups was evaluated. According to Table 4.17, there was a significant difference in TDMI score (t=8.65, p=<.001) between the two groups, whereas for PSBQs the scores of both groups at baseline were similar.

Table 4.17: Comparison TDMI and PSBQs between Control and Intervention Group at Baseline

Variable	n	Control Group (74)		Intervention Group (69)		t value	P value
		Mean	SD	Mean	SD		
TDMI		170.18	13.18	189.57	13.60	8.65	<.001
PSBQs		10.32	1.88	10.39	1.67	0.22	.82

TDMI: Triage Decision Making Inventory; PSBQs: patient scenario based questionnaire

4.2.4 Preliminary Test of Assumptions for Repeated Measure ANOVA/ANCOVA

In this section, the statistical assumptions of data analysis method were evaluated. According to the main statistical method, which was Repeated Measure (RM) ANOVA/ANCOVA, testing of related assumptions were obtained and presented.

4.2.4.1 Normality Test

According to Stevens (2012), before using any statistical method, especially for inferential statistics, it is necessary to determine the normality of all continuous variables. Normality is described by means of the normal distribution of the value of the variables. Skewness and kurtosis within the range of -2 and +2 was applied for the purpose. Table 4.18 shows that skewness and kurtosis of the data was within normal range.

Table 4.18: Normality Test for Research Variables

	Control Group		**Intervention Group**	
Variables	**Skewness**	**Kurtosis**	**Skewness**	**Kurtosis**
Baseline: TDMI	.471	.547	.512	-.872
Post test: TDMI	-.039	-.397	-1.154	.251
Follow up: TDMI	-.247	1.21	-1.061	1.08
Baseline: PSBQs	-.245	.239	-.358	-.094
Post test:: PSBQs	-.404	1.185	-.713	.351
Follow up: PSBQs	-.288	1.108	-.641	.175

TDMI: triage decision making inventory; PSBQs: patients scenarios based questions; post test: at two weeks; follow up: at four weeks

4.2.4.2 Homogeneity Test of Variances

Assumption of homogeneity of the variances was evaluated to ascertain that the variance within each of the groups is equal. Homogeneity of variances for each group is essential. The assumption in SPSS statistics was examined using Levene's test for homogeneity of variances. Table 4.19 summarizes the results of the Levene's test. The results indicated the error variance was equal at pre-test (baseline) for PSBQs. Meanwhile TDMI at pre-test was a covariate.

Table 4.19: Levene's Test of Equality of the Error Variance

	F	**df1**	**df2**	**Sig.**
Baseline: PSBQs	1.899	1	141	.17

PSBQs: patients scenarios based question

4.2.4.3 Homogeneity of Regression Slope (Linear)

One assumption of ANCOVA is homogeneity of regression lines and a linear relationship between the covariate and dependant variable. Homogeneity of regression slopes are identified by the existence of an interaction between the covariate and the groups. The regression slope of the covariate and dependant variables (outcomes) must be the same if the single pooled regression slope can be used with all groups. A significant interaction between the covariate and outcomes indicates that differences of the dependant variable among groups varies as a function of the covariate. A significant interaction shows that the ANCOVA results were not meaningful and the test should not be used. In this study, the linear relationships were fulfilled. Refer to Appendix H. According to Chua (2009) when no peculiar shape is noticed in the scatter plot; that is, data points are scattered along the line, it means the homogeneity of regression is fulfilled, and an ANCOVA test can be applied to analyse the data.

4.2.5 Distribution of Participants' Achieving a High Score for Triage Decisions Making Skills and Accuracy of Triage Decisions for Control and Intervention Group

The level of triage decision making skills (measured by TDMI) and accuracy of triage decisions (measured by PSBQs) among the HCPs were measured at two points of time after exposure to the educational intervention: at two weeks ("post-test") and four weeks ("follow-up") interval. Results of the frequency distribution indicated there were significant differences ($p<.001$) between the control and intervention groups at both points of measurement, for the TDMI and PSBQs.

The highest level of TDMI score for the intervention group was at two weeks after exposure to intervention when 92.8% (n=64) of those tested scored a high score, compared to 45.9% (n=34) of participants in the control group. On the other hand, for PSBQs, the highest proportion of the intervention group achieving a high score was at a four-weeks interval after the intervention was carried out, which was 98.6% (n=68), compared to only 9.5% (n=7) participants of the control group at the same time (Table 4.20).

Table 4.20: Frequency Distribution of HCPs Achieving High Score for TDMI and PSBQs for Control and Intervention Group Post Intervention

Variables	**Control Group (n=74)**		**Intervention Group (n=69)**		**P Value**
	n	%	n	%	
Post test:TDMI	34	45.9	64	92.8	<.001
Follow up:TDMI	32	43.2	56	81.2	<.001
Post test:PSBQs	12	16.2	67	97.1	<.001
Follow up:PSBQs	7	9.5	68	98.6	<.001

TDMI: triage decision making inventory; PSBQs: patients scenarios based questions; post test: at two weeks; follow up: at four weeks after Intervention

4.2.6 Effectiveness of the Educational Intervention

The outcomes of the intervention were measured in terms of the level triage decision making skills and the accuracy levels of the triage decisions at intervals of two weeks and four weeks after exposure to the educational intervention.

4.2.6.1 Triage Decision Making Skills (TDMI) at Two Weeks (Post-test) and Four Weeks (Follow-up) After Intervention

The results showed (Table 4.21) that after exposure to the educational intervention both groups had improved TDMI score at two weeks (post-test) and four weeks (follow-up), however for both groups, mean scores were higher at post-test than at the follow-up. In addition, the mean scores for the intervention group the score were above the cut-off point scores, while for the control group the mean scores were below the cut-off point scores for both points of measurement.

Table 4.21: Descriptive Statistic of TDMI

Variables	**Control Group (n=74)**		**Intervention group (n=69)**	
	Mean	SE	Mean	SE
TDMI				
Baseline	170.19	1.53	189.58	1.64
Post test	181.13[a]	1.76	207.80[a]	1.85
Follow up	178.07[a]	2.33	197.93[a]	2.44

TDMI: triage decision making inventory; post -test: at two weeks interval; follow- up: at four weeks interval. a: adjusted mean; adjusted mean to the TDMI at baseline, designation and continuous nursing/medical education covariates

Results showed that within subjects effects (post-test and follow-up) for TDMI was significant ($F_{(1,138)}$= 4.60**,** p= .03**,** η^2**=** .03). There was also significant interaction between group and time ($F_{(1,138)}$= 3.85, p= .05, η2= .03). Which mean the two groups had changes in TDMI score for post-test and follow-up for both times. There was a significant difference between control and intervention groups ($F_{(1,138)}$ =60.72, p <.001, η^2 **=** .31). Table 4.22 summarizes the results.

Table 4.22: Summary of RM ANCOVA for TDMI

Source Variation	**df**	**MS**	**F**	**Sig.**	**η2**
Test	1	491.59	4.60	.03	.03
Test* Group	1	411.96	3.85	.05	.03
Group	1	19235.21	60.72	.000	.31

df: degree of freedom; MS: mean square; η2:partial eta square; covariates appearing in the model are evaluated at the following values: TDMI score (pre-test) = 179.555; designation = 1.66;attending continuous nursing education/ continuous medical education = 1.6923

The results in Table 4.23 show the mean difference of TDMI was 23.26 (CI:17.36, 29.17). This indicates that by controlling the covariate factors such as TDMI at pre-test, designation, and attending continuous nursing education/continuous medical education, the intervention still had positive impact on TDMI score, regardless of time. This result demonstrated that there was a significant difference of TDMI score among HCPs before and after execution of educational intervention, therefore the alternative hypothesis (H_A) was accepted.

Table 4.23: Comparison of Mean Difference for TDMI between Control and Intervention Groups (Regardless of Time)

	Mean (95% CI)	**MD (95% CI)**	**F**	**P value**	**η^2**
Control	179.60[a] (176.07, 183.13)	23.26 (17.36, 29.17)	60.72	<.001	.31
Intervention	202.86[a] (199.16, 206.56)				

MD: Mean difference; η^2: partial eta square; a:adjusted mean TDMI score at pre-test = 179.5455; Designation = 1.66 and , attending continuous nursing education/ continuous medical education = 1.6923.

Results in Table 4.24 (Pairwise Comparison of TDMI) results showed there was a significant difference of TDMI mean score between intervention and control groups at post-test and follow-up (p<.001). Furthermore, there was difference in mean score of TDMI between post-test and follow-up only for the intervention group (p<.001), while there was no significant difference between post-test and follow-up test in the control group (p=.14). These results reveal that intervention group had higher TDMI scores at post-test and follow-up compared to the control group. Figure 4.2 shows the changes of TDMI at post-test and follow-up for both groups.

Table 4.24: Pairwise Comparison of TDMI for Control and Intervention Group

	Post-test			Comparison Between group	Follow-up		Comparison Between group	Comparison within test
	n	**Mean**	**SE**	**P value**	**Mean**	**SE**	**P value**	**P value**
Control	74	181.13	1.76	<.001	178.07	2.33	<.001	.14
Intervention	69	207.79	1.85		197.93	2.44		<.001

significant level p< 0.05; Post-test: at two weeks interval; follow- up: at four weeks interval; SE:standard error

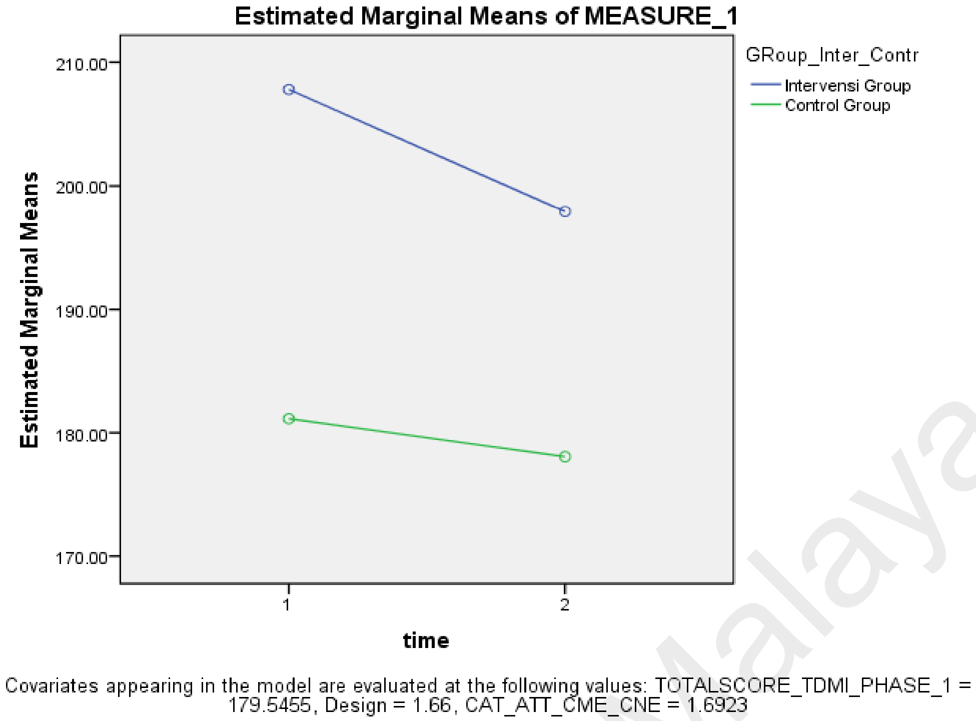

Figure 4.2: Adjusted Mean of TDMI for Control and Intervention Group Across Time

1: two weeks interval (post-test); 2 four weeks interval (follow-up), TDMI: Triage Decision Making Inventory; Design: designation; CAT_ATT_CME_CNE: attending continuous medical education or continuous nursing education

4.2.6.2 Accuracy of Triage Decision for PSBQs (ATP) at Two Weeks (Post-test) and Four Weeks (Follow-up) Post Intervention

The results in Table 4.25 show that both of the groups have improved scores for the PSBQs at two weeks (post-test) and four weeks (follow-up) after the Intervention group was exposed to the educational intervention, although the scores were higher at post - test compared to two weeks later at the follow-up test. In addition, for the intervention group the mean score were above the cut-off point (minimum score of 12 to be categorised as a 'high' score) for both points of measurement, whereas for the control group the mean scores were below the cut-off point, for both points of measurement.

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Table 4.25: Descriptive Statistic of PSBQs for ATP

Variables	**Control Group (n=74)**		**Intervention group (n=69)**	
	Mean	SE	Mean	SE
PSBQs				
Baseline	10.30^a	0.22	10.41^a	0.23
Post-test	9.64^a	0.17	14.25^a	0.18
Follow-up	9.48^a	0.18	13.83^a	0.19

PSBQs: Patient scenario based questions; ATP: adult trauma patients; post-test: two weeks interval; follow-up: four weeks interval; SE: standard error: a: adjusted mean to designation and attending continuous nursing education/ continuous medical education covariates

According to Table 4.26, the results demonstrate that for within-subjects (pre-test, post-test and follow-up) effects for PSBQs were not significant ($F_{(1,139)}$= 0.39**,** p= .68**,** η^2**=** .00). The results indicate that there was a significant interaction between group and time ($F_{(1,139)}$= 80.46, p= <0.001, η2= .37), which means that the two groups had changes in PSBQs score for pre-test, post-test and follow-up. There was a significant difference between control and intervention groups ($F_{(1,139)}$ =270.31, p <.001, η^2 **=** .66).

Table 4.26: Summary of RM ANCOVA for PSBQs

Source Variation	**Df**	**MS**	**F**	**Sig.**	**η2**
Test	1.83	0.85	0.39	.68	.00
Test* Group	1.83	175.97	80.46	<0.001	.37
Group	1	754.15	270.31	<0.001	.66

df: degree of freedom; MS: mean square; η2:partial eta square; covariates appearing in the model are evaluated at the following values: designation = 1.66; attending continuous nursing education/continuous medical education = 1.6923

According to Table 4.27, the results showed the mean difference was 3.02 (CI: 2.66, 3.39). It indicated that by controlling the covariate factors such as designation and attending continuous nursing education/ continuous medical education, the intervention had a positive impact on PSBQs score, regardless of time. This result demonstrated that there was a significant difference of PSBQs score among HCPs before and after execution of educational intervention, therefore the alternative hypothesis (H_A) was accepted.

Table 4.27: Comparison of Mean Difference for PSBQs between Control and Intervention Groups (Regardless of Time)

	Mean (95% CI)	**MD (95% CI)**	**F**	**P value**	**η^2**
Control	9.81[a] (.09.57, 10.05)	3.02 (2.66, 3.39)	270.31	<.001	.66
Intervention	(12.83[a]) (12.58, 13.08)				

MD: Mean difference; η2: partial ETA square

According to Table 4.28, Pairwise Comparison of PSBQs results showed there was a significant difference in PSBQs mean scores between the intervention and control group at post-test and at follow up ($p<.001$), while there was no significant difference at pre-test ($p=.75$). The results of mean comparisons between results of the three tests over time for each group (control and intervention), indicate that there was a significant mean difference between pre-test and post-test and follow-up test ($p<.001$).

Meanwhile, for within-time there was no significant difference between post-test and follow-up test scores ($p=.21$) in the intervention group. These results also showed that for the control group, there was a significant difference between pre-test and post-test ($p=.04$) and pre-test and follow-up test ($p=.01$), while there was no significant difference between post-test and follow-up test ($p=1$) (Table 4.29). Figure 4.3 summarizes the mean score of PSBQs for both groups across time.

Table 4.28: Pairwise Comparison of PSBQs for ATP between Groups at Three Points of Time

	Pre-test				Post-test				Follow-up			
	N	Mean	SD	P value	N	Mean	SD	P value	n	Mean	SD	P value
Control	74	10.31	.22	.75	74	9.64	.17	<.001	74	9.48	.18	<.001
Intervention	69	10.41	.23		69	14.25	.18		69	13.83	.19	

Table 4.29: Pairwise Comparison of PSBQs for ATP within Time for Both Groups

Group	(I) time	(J) time	Mean Difference (I-J)	SE	P value
Intervention	PRE	POST	-3.84	0.28	<.001
	PRE	FOL	-3.42	0.30	<.001
	POST	FOL	0.41	0.23	.21
Control	PRE	POST	.67	0.27	.04
	PRE	FOL	.83	0.29	.01
	POST	FOL	0.16	0.22	1

PSBQs: Patient scenario based questions; ATP: adult trauma patients; PRE: pre-test; POST: post-test; FOL:follow-up; SE:standard error; I: intervention group; J control group

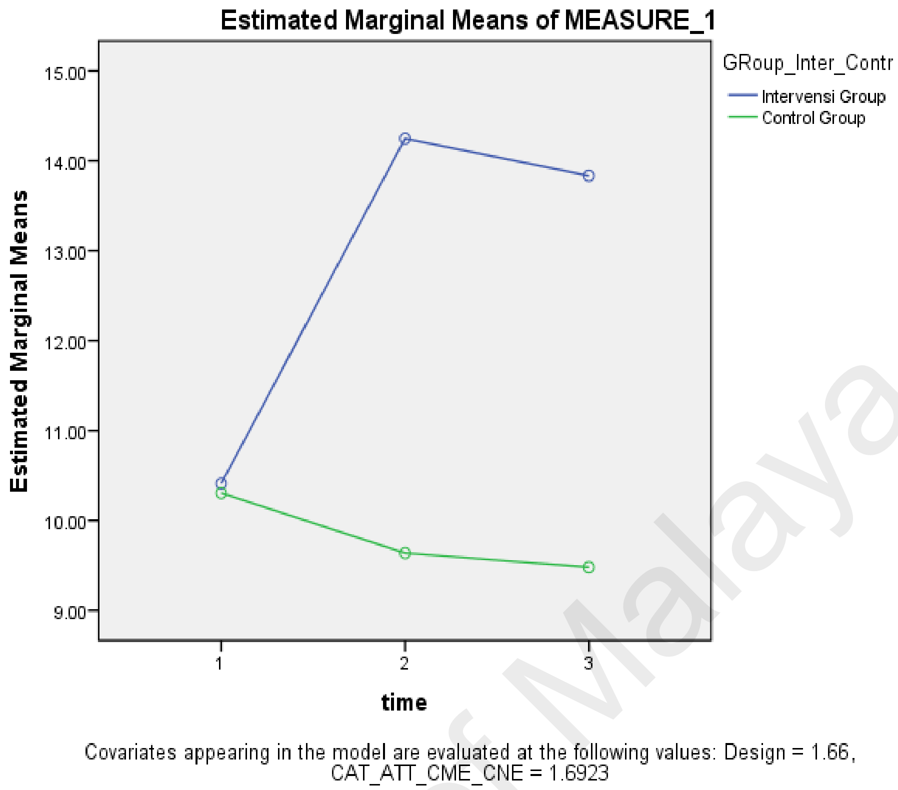

Figure 4.3: Adjusted Mean of PSBQs for Control and Intervention Group Across Time

1= pre-test; 2= two weeks interval (post-test); 3= four weeks interval (follow-up); Design: designation; CAT_ATT_CME_CNE: attending continuous medical education or continuous nursing education

4.3 Summary

The ability to making triage decisions accurately in the Emergency Department is crucial to save life and limb, simultaneously to prevent negative impacts on patients' health. As Brown and Clarke (2014) emphasized clinical decisions made in Emergency Departments can involve risks to limbs and jeopardize live. As a gatekeeper in the ED, healthcare providers have to equip themselves with knowledge and skills of triaging to enable them to perform triage roles that reflect the quality of health service provided in the institution. The baseline study showed that more than two-thirds (70.8%) of the participants in this study obtained summative score of less than 184 for the TDMI test and 69.8% of HCPs scored low accuracy levels for the PSBQs, and only 1 participant (0.5%) correctly answered all (15 questions) of the PSBQs.

A total of 143 'low-scoring' participants from the EDs of the 10 hospitals were invited and enrolled into phase 3 of the study. The hospitals were stratified to specialist and non-specialist hospitals, and then were randomized to the control group and the intervention group by balloting. HCPs in the hospitals were deemed to be members of the respective groups. Results indicated that the mean score for triage decision making skills (TDMI) and accuracy level of triage decisions for ATP (PSBQs) among the HCPs in the Intervention group increased after exposure to educational intervention, when tested at two weeks and four weeks' interval after completing the intervention. However, the mean score for triage decision making skills (TDMI) and accuracy level of triage decision for ATP (PSBQs) declined between the post-test at two weeks and the follow-up test at four weeks after exposure to the educational intervention.

Overall triage decision making skills and the level of triage decision accuracy among HCPs increased after exposure to an educational programme. This is a positive sign, providing evidence supporting the need for continuous education for HCPs in this clinical area, specifically, to enhance their competence in making accurate triage decision while at the same time delivering better emergency care for patients to reduce mortality and morbidity.

CHAPTER 5: DISCUSSIONS

5.1 Introduction

This chapter begins with a brief review of phase 1 and phase 3 of the study, looking at the overall response rate and demographic characteristics of the participants in the study. The four domains of Triage Decisions Making Inventory, the level of triage decision making skills as measured by TDMI and the correlations of the domains of TDMI will subsequently be discussed. The accuracy level of triage decision making for adult trauma patients as measured by PSBQs, including factors that are associated with the triage decision making skill and the accuracy of triage decisions, which was measured in phase 1 will also be discussed. In addition, phase 3 findings, which were designed to measure the effectiveness of the educational intervention on participants' skills and accuracy of triage, as measured by their scores the TDMI and PSBQs will also be discussed. Some limitations of the study conclude this chapter.

5.2 Phase 1: Baseline Study

5.2.1 Response Rate and Demographic Characteristics of Participants

A total of 274 HCPs who participate in triage roles in the EDs of ten hospitals in the state of Kelantan were selected to take part in the study, of whom 202 HCPs were enrolled in phase 1 of study, giving a high response rate (73.73%). This result showed the readiness of the participant to participate in the current in the current study and in line with one of the principle of the Knowles' theory. While those who did not participate included HCPs who were on long leave, medical leave, confinement leave and those who did not wish to be involved in the study. In terms of the demographic characteristics of the sample, more than half of the participants were male, and the mean age was 36 years old. The majority of participants were medical officer assistants, and the rest were registered nurses and diploma holders. More than three quarters of the participants did not have any post-basic training. Nearly half of the participants had 5 years and less working experience in an emergency department. These demographic characteristics were similar in terms of age and ED working experiences to the characteristic of participants in a baseline study conducted by Kaakinen et al. (2016).

5.2.2 Items of the Domains of Triage Decisions Making Inventory (TDMI)

The item for the subscale domain 'cognitive characteristic' in the TDMI obtained the highest mean, demonstrating that HCPs know what they are supposed to do when patient arrests at ED, while the lowest mean was for the item that indicated they couldn't remained organize when they are under pressure. Since HCPs at triage are front liners for the treatment and services offered at the hospital, they are supposed to know and be able to respond and act appropriately when required in order to save lives.

However, many HCPs at triage admitted they were not able to organize their thoughts steadily when they are under pressure, and this is not a good sign because it can lead to improper judgment at triage.

Disorganized thought can mean HCPs are less effective at work and unable to deliver appropriate emergency care for patients who present at the EDs (Wolf, Perhats, Delao, & Clark, 2016). The HCPs need a conducive working environment that is able to encourage them to make accurate decisions at triage. According to Wolf, Perhats, Delao, Moon, et al. (2016), a dynamic emergency environment is a big challenge that can cause mental distress among HCPs, possibly leading to under performance and jeopardising patient safety as well. HCPs at triage are supposed to be vigilant and alert all the time in any situation, since EDs are well known to be a dynamic and challenging environment, with unpredictable patients' condition that required high concern and care in most circumstances to ensure patient safety and protect ED HCPs (Yu & Green, 2009).

For the critical thinking domain, the item that HCPs are able to communicate well among staff at triage obtained the highest mean, while the lowest mean scores on the TDMI questionnaire were for the items 'obtaining positive feedback in regard to triage decisions made at triage' and 'ability in narrowing down the information obtained for triage decision making at triage'. This finding suggests that HCPs at triage are able to communicate well among staff at triage but still lack the ability to critically link up the important data collected to reach a conclusive and accurate triage decision. This finding reinforces that of Toloo, Aitken, Crilly, and FitzGerald (2016) which proposed that the triage process itself involves commitment and two-way communication among staff, patients and accompanying persons in order to come to accurate triage decisions.

Critical thinking is a cardinal element in making appropriate triage decisions and suggests HCPs need sufficient knowledge preparation prior to performing triage roles. According to Oermann (1997, cited in Cone & Murray, 2002), critical thinking is a necessary aspect in the process of decision-making skills. Due to low capability in this area, therefore, they were less likely to receive positive feedback from their counterparts on their triage decisions. Possession of critical thinking skills among front-liners in the dynamic ED environment is crucial to ensure information from cues obtained was able to be analysed and transformed into accurate triage decisions for positive impact on the patients (Noon, 2014).

Meanwhile, for the experience domain, the item confirming that HCPs knew what questions to ask at triage to get the information they required for triage decisions attained the highest mean; the lowest was for the item regarding sending a patient to the emergent area even when they may not need to be assigned there due to being afraid of making a triage mistake. This result suggests that although HCPs are able to communicate and acquire the information they need to make triage decisions, they are still unable to make accurate triage decisions by sending patient to inappropriate area unnecessarily because they are lack of confidence.

These results highlight the fact that HCPs at triage lack knowledge and confidence in their own judgement while performing the triage process; therefore proper measures should be undertaken to change this situation. Sending a patient into an inappropriate area for treatment may waste resources and jeopardize the life of other patients who really need immediate emergency care. Vatnøy et al. (2013) in their study, suggested that to ensure an adequate patient assessment and accurate triage decisions, HCPs need more experience to recognize cues and then make conclusions. Lack of confidence in making triage decisions may stem from insufficient knowledge. In this case, knowledge needs to be boosted to ensure confidence and enhance the accuracy of triage decisions. Garbez et al. (2011) in their study suggested that both experience and education were significant factors in performing triage. However, a study by Arslanian-Engoren (2005) and Stanfield (2015) showed that experience had only a small influence in making accurate triage decision

For the intuitive domain, the item that demonstrating that HCPs were able to recognize patient's urgency for treatment by seeing their appearance while attending in the ED yielded the highest mean, suggesting that HCPs apply their previous experience in understanding a patient's condition. The lowest mean score in the intuitive domain was for the item that HCPs follow their gut feelings at triage, no matter what they have learned in books. This suggests that HCPs preferred to apply what have been read and learnt in books rather then follow their instinct, which means they depended upon knowledge to assist them in making triage decisions.

The findings of the study imply that HCPs use intuition or follow their instincts selectively. At triage HCPs are able to recognize a patient's urgency needs by looking at them through their clinical cues, which mean HCPs are able to apply intuitive cognition as described by Pyles and Stern (1983); what have seen, they remember, thereby unconsciously gaining the benefit of experience about the particular thing, which is later used in clinical decision making practice (Cioffi, 1997). This is also in line with Lyneham et al. (2008) who concluded that intuitive feelings can occur prior to the initiation of clinical signs in patients, allowing HCPs to forecast the signs via intuitive clues to make decisions on the patient's urgency for care (Hassani, Abdi, et al., 2016b).

Nevertheless, it is still uncertain whether HCPs at triage follow their intuition appropriately when it comes to certain situations. This issue can possibly relate to years of experience attained in this field of practice, or lack of confidence among HCPs. In line with Hassani, Abdi, et al. (2016b), lack of confidence and doubts about the decision made among HCPs at triage can be reduced by enhancing clinical knowledge or gaining more experience in practice of triaging, and in this way accuracy of the decisions will increase. A combination of intuition and critical thinking may increase HCPs ability to make accurate triage decisions. As Miller and Hill (2017) found, HCPs have an option to use intuition to assist in making an accurate decision; and intuition increases as the HCPs gain more experience. Thompson (2014) argued that the decision-making ability of a person was related to high quality and accuracy of intuitive judgments during the triage process, that leads to accuracy of triage decisions. With increasing years of clinical practice, HCPs at triage will gain more confidence to use their intuitive feelings to make judgments and decisions in a range of complicated conditions (Hassani, Abdi, & Jalali, 2016).

5.2.3 Level of TDMI and the Domains at Baseline

Results of current study demonstrated that 70.8% of HCPs obtained what was deemed to be a 'low' score of TDMI, when the cut-off point for high/low score set for this study was a score of 184 minimum to qualify as a 'high' score. For the subscales of cognitive characteristics, experience, critical thinking and intuitive domains, the results showed that mean scores were similar for all four subdomains and below the acceptable value, except for critical thinking. Findings in the present study were similar to the findings of a study conducted in Africa by Aloyce et al. (2014), which revealed a lack of knowledge and skills among healthcare provider at triage. Fathoni, Sangchan, and Songwathana (2013) conducted a study on triage nurses' knowledge and skills, which found a low level of knowledge of triage and moderate skill in triaging. A study carried out by Kaakinen et al. (2016) on telephone triaging at an ED had similar results, which indicated that the nurses tested had low triage accuracy and skills in making triage decisions while triaging via telephone.

From these results it appears that HCPs require education and more experience to improve their ability to make triage decisions. Smith and Cone (2010) suggest the findings within the subscales on the TDMI identify areas in which a nurse needs further education or training, or should be kept in orientation longer, to provide the necessary time in the practice area as appropriate to improve skills of triage decision making. Aloyce et al. (2014) proposed setting up an educational platform in the emergency department to improve triage decision making skills among HCPs.

It has been recognized that knowledgeable members of staff are aligned with good decision making and positive impacts on the patients (Considine et al., 2012). A skilful triage nurse is one who is knowledgeable and has vast experience in the emergency area (Cone & Murray, 2002). The need for education was supported by Dateo (2013) who emphasized that triage officer needs a broad knowledge in areas such as assessment skills, experience and intuition for the purpose of performing the role effectively. Stanfield (2015) pointed out that skilful HCPs in making clinical decisions at ED triage have an impact on many aspects: patients' health outcome, time for treatment, length of stay, and patients' level of satisfaction. Cone and Murray (2002) suggested that cognitive characteristics, critical thinking, intuition and experience were the cardinal elements needed to assess triage decision making skills among HCPs. Because critical thinking was one of the cardinal element in making triage decisions accurate, according to Noon (2014), critical thinking and decision making are also possibly attained through education,. In the current study the mean score of the subscale of critical thinking was at an acceptable value.

5.2.4 Correlation between TDMI Domains

Results indicate that there was a significant, positive and strong correlation between the domains of experience and the critical thinking ($r = 0.8$, $p < .01$); between experience and cognitive characteristic ($r = 0.72$, $p < .01$); and a significant, positive, moderate correlation between cognitive characteristics and critical thinking ($r = 0.70$, $p < .01$). There was also a significant and positive correlation between intuition and experience ($r = 0.49$, $p < .01$) and between intuition with cognitive characteristics ($r = 0.49$, $p < .01$), although it was a weak relationship for both. Accoding to Piaw (2009), the value of the Pearson correlation (r) ranging from .71. to .90 is considered to be strong; avalue from .51 to .70 is moderate; and .31 to .50 is weak.

These results indicate that there was a strong correlation between experience and critical thinking and cognitive characteristics, respectively, in term of their influence on triage decision making among HCPs. Findings of current study suggest that the more experience HCPs acquire, the greater their ability to think critically and the higher the level of cognitive charactecrics they attain. These results are in line with Smyth and McCabe (2017), who found HCPs with vast experience made much use of cognitive and critical thinking and were able to improve patients' outcomes in the EDs. Findings of a study conducted by Feng, Chen, Chen, and Pai (2010) indicated that experience is positively related to critical thinking, and skill in making triage decisions resulted from an integration of both. A study on nursing students' critical thinking skill conducted by Kalantarimeibidi, Yadollahi, and Esfandiari (2014) demonstrated that there was a link between critical thinking and clinical experience. However it was inconsistent with Hicks et al., (2003) who found no significant correlation between experience and critical thinking.

Results of this present study showed only a moderate correlation between cognitive characteristics with ability to think critically, which is inconsistent with Fancione (1990) who found that critical thinking was highly correlated with cognitive characteristics (cited in Facione, Sánchez, Facione, & Gainen, 1995). As well as Nair and Stamler (2013), they indicate that the higher the critical thinking the higher the cognitive characteristic.

The present study also demonstrated that lower intuition was associated with both less experience, and the lower the intuition the lower the cognitive characteristic. The majority of previous studies showed a high correlation between experience and intuition. These results are inconsistent with those of previous studies, such as those of Pretz and Folse (2011), they found experience was highly associated with intuition and Lyneham et al. (2008), who suggested that intuition is a feature of an experienced expert emergency nurse. In the current study, 44.6% of participants had five years and less ED working experience, compared to 25.7% who had more than 5 years but less than ten years ED working experience, and 29.7% who had more than 10 years of ED working experience. This show that slightly more than 55% of the participants had more than five years of emergency experience, which might explain the current finding. Overall, however, results of the current study found that intuition was not correlated with length of ED working experience.

5.2.5 Triage Accuracy for Adult Trauma Patients (PSBQs)

PSBQs were used to measure the accuracy of triage decisions for ATPs made by the HCPs in the study. Results showed the most accurate triage decisions were for the red triage colour code category, that involved injury to the chest and abdomen which could have life threatening consequences. The least accurate triage decisions were for the green triage colour code category, for a patient aged 60 years who came into the ED with an indeterminate pain score; this was followed by the yellow triage colour code category for a patient who sustained pain due to a fall, with a pain score of seven out of ten.

These results demonstrate that HCPs had a tendency to triage patients with pain and older patients inaccurately. However, HCPs at triage are alert to the possibility of life threatening conditions, when a patient suffering from trauma comes into ED with complaint of pains in the chest and abdomen. A study by Howard et al. (2014) found similar results for the triage process, when patients who presented into the emergency department with a main complaint of chest pain were given the highest priority to receive treatment. It was also similar to a study conducted by Van der Wulp, Van Baar, and Schrijvers (2008) that discovered HCPs responded to high sensitivity categories most appropriately, but less appropriately to the elderly and less urgent categories, and to a study reported by Smits, Hanssen, Huibers, and Giesen (2016) who found that HCPs were able to identify accurately triage patients with a highly urgent problem, but less accurately for less urgent conditions.

However, for aging patients and patients who presented with a complaint of pain (even if the pain was rated at seven out of ten) HCPs at triage were unable to assigned them accurately. A study by Alavi et al. (2016) had similar result when HCPs at triage inadequately managed patients who were suffering from pain. The results of the current study are supported by those of Hadorn, Comte, Foucault, Morin, and Hugli (2016) who also found that patients who presented to the ED with acute trauma pain were usually categorized as less urgent by triage officers and were treated inadequately. Goldhill et al. (2004, cited in Aloyce et al., 2014) found HCPs at triage pay less attention to patients suffering from pain who come to the ED, and triage them inaccurately. In a study by Goldstein et al. (2017), the researchers discovered that patients in the green category were most commonly triaged into an inaccurate category.

According To Emergency Medical and Trauma Services Policy (2012), elderly patients who show no alteration of ABCDE or physiological changes are classified in the green triage colour code category. However, a study on elderly trauma patients by Lutze et al. (2015) discovered that elderly patients with minor trauma who reached the ED by ambulance were allocated into a higher triage category because they were less likely to have a companion accompanying them. As Platts-Mills et al., (2010) suggested, elderly patients frequently are inaccurately categorized due to some difficulty in identifying their urgency for immediate intervention, compared to younger patients.

Furthermore, the findings of the present study suggest HCPs at triage lacked knowledge regarding patients' pain and had difficulty making good judgements at triage to reach accurate triage decision. This may possibly be due to the fact that pain was only recognized as the fifth vital sign in Malaysia with the first guideline published in 2012. Therefore, ED nurses at triage stations need to be educated about pain management to ensure patients were triaged accurately and treated accordingly (Alavi et al., 2016; Ucuzal & Doğan, 2015). According to El-Rahman et al. (2013) and Young et al. (2006, cited in Ucuzal and Doğan, 2015) knowledge deficits in area of pain may yield negative attitudes and affect accuracy of triage decision making in EDs. Moceri and Drevdahl (2014) in a study on nurse's knowledge of pain management in EDs has demonstrated that adequate knowledge of pain, regardless of years of experience in the ED, was an important factor that ensuring accurate triage decisions and pain management.

5.2.6 Level of Triage Accuracy for Adult Trauma Patient at Baseline

Results of the study demonstrated less than a quarter of the participants (n= 49, 24.26%) scored 11 out 15 of PSBQS and only one participant scored full marks (15/15. On the other hand, only one participant scored five out of 15 (n=1, 0.5%), which was the lowest score. The results indicated that more than half of HCPs (69.8%, n=141) registered low accuracy of triage decisions for adult trauma patients; the mean score was 10.52, with a standard deviation of 1.71.

The results show that the triage decisions, measured in terms of how HCPs categorized adult trauma patients into the correct triage colour code category, were below expectations. The result indicated that appropriate measures needed to be undertaken to improve the accuracy of the triage decisions. Inaccuracy of triage decisions has several negative impacts and can jeopardize patients' health. Although the result in this study was unexpectedly poor, it was similar to that found in the study carried out by Alexander, Abbott, Zhou, and Staff (2016), in which 70% of ED nurses missed triage accuracy. Rominski et al. (2014) in their study also found that HCPs in the ED categorized patients into inappropriate triage categories, and they suggested that training was the key factor in improving efficiency in triage and reducing morbidity and mortality. Several studies examined the role of knowledge and awareness in prioritizing patients' need, and Aloyce et al.'s (2014) findings supported the view that nurses' knowledge has a direct relationship with accuracy of triage decisions. Kalantarimeibidi et al. (2014) also concluded that one of the best ways to improve triage accuracy is to provide triage training to HCPs who are assigned for the triage roles in the ED.

Cognitive error, which means lack of knowledge among the HCPs, was the main reason identified by Källberg et al. (2015) contributing to inaccuracy of triage decisions and treatment in ED. The essential skills of a triage officer is to make a high quality assessment, judgement, and accurate triage decisions either by using a structured algorithm or by the ABCDE triage system to prevent unnecessary negative impact to patient's health (Noon, 2014). Goransson et al. (2005) supported the importance of knowledge in order to make accurate triage decisions. Lack of knowledge may cause delays in triaging and will put patient at risk due to inaccuracy of triage decisions (Aloyce et al., 2014).

5.2.7 Factors Associated with Triage Decision Making Skills

The results showed that there is no significant association between demographic characteristics with triage decision making skill among HCPs, which mean the null hypothesis is accepted, except for ED working which is significantly associated with triage decision making skill among HCPs. HCPs who had acquired more than 10 years of ED working experience more likely to attain a higher score compared to their counterparts with less ED working experience. This finding suggests that HCPs who have many years of working experience in the ED are more skilful compared to those who have less experience.

Results of the current study were similar to those obtained in a study conducted by Rahmani et al. (2018), which demonstrated skilful ED nurses that made accurate triage decisions was influenced by length of time working in the ED. This reinforced the findings of a study which tested accuracy of use of the Glasgow Coma Scale among nurses by Mattar et al. (2015), which found that experienced nurses were able to use the GCS skilfully and accurately, while nurses with less experience and training demonstrated a lack of skill and lower accuracy. Gerdtz et al. (2012) found that possession of experience in the particular field was the critical factor for skilful HCPs that impacted the accuracy of triage decisions and patient safety. In the same way, Benner, Hooper-Kyriakidis, and Stannard (2011) and Ferrario (2003) found that nurses with extensive experience were able to recall information faster, more skilfully and with less cognitive strain. Hoffman et al., (2009, cited in Bucknall et al., 2016) agreed that HCPs who had vast ED experience were more skilful at analysing cues obtained from patients at triage, thus resulting in appropriate triage decisions compared to HCPs with less experience.

However, not all studies have found a positive relationship between experience and skill in triage decision-making. A study by Van der Linden, Meester, and Van der Linden (2016) discovered nurses with more experience were less skilful and more inefficient at triage compared to triage nurses with less experience, and Esmailian, Zamani, Azadi, and Ghasemi (2014) found that skilful HCPs were not influenced by their experience in the EDs. This was also the finding of Martin et al. (2014), whose study suggested there was no significant relationship between HCPs' experience and their skill in making appropriate and safe triage decisions in the EDs. Similarly, Jelinek and Little (1996, cited in Göransson et al. 2006) asserted that there was no association between experience and skilful HCPs that lead to greater accuracy of triage decisions. It was supported by Goransson et al. (2006), finding of their study indicate that accuracy of triage decisions is not related to triage officer's length of ED experience.

5.2.8 Factors Associated with the Accuracy of Triage Decisions for Adult Trauma Patient (PSBQs)

The results of the present study showed that there is no significant association between demographic characteristics with accuracy of triage decisions for adult trauma patient triage among HCPs, which mean the null hypothesis is accepted, except for post basic training in emergency nursing which is significantly associated with accurate triage decisions for adult trauma patient triage. HCPs who had undergone emergency post basic training were less likely to gain lower PSBQs scores compared to HCPs who had not had the training. This result was in line with Kalantarimeibidi et al.'s (2014) finding that demonstrated increased ability to accurately categorize patients for triage among HCPs who had undergone triage training for a specific period of time. Lim et al. (2013)

also found that trained HCPs were able to evaluate and reach an accurate triage assignment for patients in a critical situation.

In addition, this result of the study is in accordance with Esmailian et al. (2014), who acknowledged that training was the key factor in enhancing HCPs' knowledge so as to increase the accuracy of their triage decisions. A study by Hosseini et al. (2014) showed convincingly that training was a tool that could change and improve knowledge and skills. According to Happell, Summers, and Pinikahana (2003), triage education and training can assist triage officers to make triage decisions accurately in the emergency room. In a study on shared decision making, Diouf et al. (2017) found that undergoing a related training program had great potential to improve shared decision making.

Dateo (2013) recommended that HCPs assigned for triage roles should be selected for their expert characteristics and receive essential triage and assessment education and training to ensure accuracy of triage decisions and boost emergency care. Forsberg, Ziegert, Hult, and Fors (2014) claimed that HCPs who had special training were able to attain skills through lectures and seminars instantly; furthermore, trained HCPs were able to integrate what they had learned into actual practice, unlike those who had not undergone any training. Gerdtz et al., (2008; 2012) noted the importance of adequate resources and training to support HCPs in the EDs to make accurate triage decisions.

5.3 Phase 3: Intervention Study

5.3.1 Response Rate and Demographic Characteristics of Participants

In phase 3 there was 143 HCPs were recruited after excluded 59 of HCPs of the 10 EDs who obtained good score (184 and above) of TDMI. We postulated high rate of response was due to HCPs' awareness of the necessity of conducting research or getting involved into it to gain new knowledge for self and service improvement simultaneously enhance nursing and medical professionalism. In overall demographic characteristic of the participants of the study for both groups of intervention and control group was similar in term of gender, age, possession of post basic training, ED working experience and triage experience, except for designation and attending continuous nursing education or continuous medical education.

In term of academic level majority of HCPs who working in clinical areas in the hospitals in Malaysia were diploma qualification holder. Whereby slightly higher number of medical officer assistant (MOA) compared to registered nurses (RN), however this was not generally represent the distribution of MOA and RN in ED hospitals in Malaysia. This disparity of distribution may probably due to some ministry of health hospitals deployed more MOA in the ED as a front-liner and presently MOA is a male-majority discipline.

5.3.2 High Score of the Triage Decisions Making Skills and Accuracy of Triage Decisions for Adult Trauma Patient among HCPs of Control and Intervention Group

There was a significant difference ($p<.001$) between control and intervention groups in the proportion of HCPs who attained high and low scores at both points (post-test and follow-up test) on both instruments, TDMI and PSBQs. The proportion of HCPs in the intervention group who obtained high scores on TDMI on the post-test was 92.8% (n=64) compared to only 45.9% (n=34) of HCPs in the control group. An even higher percentage of HCPs in the intervention group attained a good score on the PSBQs four weeks after the educational intervention (on the follow-up test) which was 98.6% (n=68), compared to only 9.5% (n=7) of participants in the control group on the same test. This result mirrors that obtained in a study conducted by Aghababaeian et al. (2013), which showed that HCPs' ability to make accurate triage decisions improved after two weeks of an educational training session.

However, there was little difference between the post-test and follow-up test in terms of the number of HCPs who obtained high scores on the TDMI and PSBQs. For TDMI, a total of eight HCPs (n=8) scored higher on the post-test than on the follow-up test, which was held four weeks after the educational intervention. While for the PSBQs, one (n=1) more person scored higher after four weeks compared to the post-test that was held after a two weeks' interval. In conclusion, there was not much difference in the number of HCPs who achieved high scores between the post-test and the follow-up test for the intervention group.

5.3.3 Triage Decision Making Skills at Pre-Test (Baseline), Post-Test (Two Weeks) and Follow-up (Four Weeks)

The results of ANCOVA in the current study indicate that the adjusted mean score of TDMI for the intervention group increased at both test points. At two weeks after exposure to educational intervention, the mean was 207.80 [a] with a standard error of 1.85, while at four weeks after the educational intervention the mean was 197.93[a] with a standard error was 2.44. These can be compared to the mean and standard error at baseline of 189.58, and S.E 1.64, respectively. The adjusted mean at four weeks declined, but it was above the cut off-point set for the study. For the control group, the adjusted mean score of TDMI increased at both points: at two weeks the adjusted mean was 181.13[a], (S.E.1.76), while at four weeks the adjusted mean was 178.07[a] (S.E. 2.33), compared to the baseline (170.19: S.E. 1.53). Somehow, the increment of adjusted mean of TDMI score was below the cut-off point set for the current study. These results demonstrate that the knowledge and skill of triage decision making among HCPs in the intervention group improved significantly at both post-test and follow-up, compared to the control group.

The results of the current study were similar to those obtained in a study conducted by Kaakinen et al. (2016), who reported a statistically significant difference in skills of triaging between the baseline and post-test measurements among HCPs after exposure to an intervention. It was in line as well with the study conducted by Merchant et al. (2015) which found that an educational program improved knowledge as well as skills of triage decisions among HCPs.

Results of the present study showed a decline in the TDMI score at four weeks which may due to reduced retention of knowledge after a period of time. Results of current study were consistent with reviews on the educational impact of Advanced Trauma Life Support by Driscoll and Wardrope (2005), and Maier (1992, cited in Mohammad, Branicki, and Abu-Zidan, 2014) supports the explanation that HCPs lose some of their knowledge with the passage of time. Ali, Howard, and Williams (2003) also found that cognitive skills deteriorate after a period of time following the completion of a course. However, a controlled randomized study design using student direct learning strategy has demonstrated that nursing students were able to retain knowledge and skill of basic life support and automated external defibrillator over a relatively long time frame (Hernández-Padilla, Suthers, Granero-Molina, & Fernández-Sola, 2015).

The gradual decline in the score of TDMI skills may be due to a low memory retention about the the particular domains within the measurement time. According to Ericsson and Charness (1994, cited in Fraser, Ayres, and Sweller, 2015) skill derives from the storage of immeasurable specific knowledge held in long-term memory and therefore it can last longer. Jordi et al. (2015), their study finding demonstrated the duration of time between training and testing may have had a large influence on HCPs' skill of triage decision making over a period of time.

Meanwhile for the control group, TDMI score showed an increase at both test points, although the increment was still below the cut-off for a high score. These results may possibly due to longer hours of exposure to the role of triage in the ED. Repeated performance of similar roles in the actual situation may enhance HCPSs; skill by recalling or reflecting from memory; the more they repeat, the better the retrieval. The benefits of repetition of the same item of knowledge and long-term retention clearly depend on the processes learners engage in during repetition (Karpicke & Roediger, 2008). Over time, experiences gained in clinical practice may enhance HCPs in making triage decisions accurately and skilfully (Pearson, 2013). With the experience HCPs possessed at baseline and as situations became more familiar, they were able to act appropriately and skilfully at triage (Alba, 2016). All these factors may have helped raise HCPs' skill in making triage decisions.

5.3.4 Accuracy of the Triage Decisions for Adult Trauma Patient (PSBQs) at Pre-Test (Baseline), Post-Test (Two Weeks) and Follow-up (Four Weeks)

The results of ANCOVA in the current study indicate that the adjusted mean score of PSBQs for the intervention group increased at both test points. The mean and standard error was (14.25^a: 0.18) at two weeks (post-test) and (13.83^a: 0.19) at four weeks (follow-up) after exposure to the educational intervention, compared to the adjusted mean at baseline of (10.41^a: 0.23). However, for the control group the adjusted mean score of PSBQs decreased at both points: the adjusted mean and standard error of PSBQs score at two weeks (post-test) was (9.64^a: 0.17), while at four weeks (follow-up) it was (9.48^a: 0.18), compared to the baseline mean and standard error of (10.30^a: 0.22).

The results of this study show clearly that the accuracy of triage decisions, in terms of assigning patients into the correct triage colour code category, by HCPs in the intervention group increased significantly compared to the baseline (pre-test). Meanwhile, there was decrease in the mean score of the control group at both points of measurement (post-test and follow-up) when compared to pre-test, when the mean score was slightly higher. The accuracy of triage decisions made by HCPs in the intervention group were higher at two weeks and at four weeks after exposure to the educational intervention, compared to those of the control group, which was not exposed to any educational intervention. Although, the results for the follow-up test for the intervention group were not as high as for the post-test, it is clear that the accuracy of triage decisions on adult trauma patients by members of the intervention group improved after exposure to the educational intervention.

The results of the current study are similar to those of studies carried out by Kalantarimeibidi et al. (2014) in which HCP participants demonstrated increased ability to categorize patients into accurate triage categories after a period of triage training. As well as in a study by Aghababaeian et al. (2013), they found that HCPs'ability in making accurate triage decision using patient scenarios have increased after exposure to educational session over a period of time. A more focused study conducted by Mitchell et al. (2017) on ED nurses' knowledge and attitudes on alcohol and other drugs that involved trauma patient in the emergency department, similarly showed that an intervention increased knowledge and attitude among nurses in the ED.

Meanwhile the reduced accuracy of triage decisions at four weeks after the intervention for participants in the intervention group may be due to decreased knowledge retention after a period of time. A review of a randomized controlled trial of final year medical students participating in a simulation based education, demonstrated that their knowledge and memory declined after a period of time (Fraser et al., 2015). It is also possible that knowledge retention may be adversely affected by frequent interruptions that occur in everyday working life, as found by the study of Berg et al. (2013), who discovered that the frequent interruptions in the EDs themselves may have negative effects on the nurses' and clinicians' memory, such as decreased retention ability.

While the accuracy of triage decisions on adult trauma patients in control group was low at the pre-test, the trend was for scores to continue to decrease as time passed, with lower scores in the post-test, and even lower scores in the follow-up test. This probably occurred because most of HCPs in this control group were not exposed to any learning program and there was a possibility of reduced memory retention about what they have experienced in the clinical practice due to many and frequent interruptions. It also may be due to work load or changing situation that caused reduced ability in making accurate triage decisions among HCPs in the ED. Lack of knowledge, lack of experience, anxiety and environmental barriers such as changing situation may reduce ability to make accurate triage decisions over time (Bucknall et al., 2016). Pelaccia et al. (2011, cited in Hassani, Abdi, et al., 2016b) suggested a conducive environment was one of the factors that may induce learning and clinical reasoning among HCPs in the clinical area. Overwork, tiredness, and lack of any break in unpredictable and demanding ED environment may have lowered the HCPs' ability to focus and make accurate triage decisions (Wolf, Perhats, Delao, Moon, Clark, & Zavotsky, 2016).

5.3.5 Effectiveness of Educational Intervention on Triage Decision Making Inventory Score

Results demonstrated that there was a significant interaction between the group and time ($p=.05$), which means the two groups had changes in TDMI score for the post-test and follow-up, while the main effect of the group was significantly different between control and intervention groups ($p <.001$), with a mean difference of 23.26 (17.36, 29.17) and a large effect size ($\eta^2 = 0.31$). By controlling the covariate factors such as TDMI (at pre-test), designation, and attending continuous nursing education/ continuous medical education, the intervention was shown to have significantly improved the TDMI score of the intervention group across the period of time. The alternative hypothesis accepted, whereby there is a significant difference of TDMI score among HCPs before and after execution of educational intervention

In addition, a separate comparison of mean scores using the Bonferroni test also revealed a significant difference of TDMI mean score between the intervention and control group at post-test and follow-up ($p<.001$). There was difference of mean score of TDMI between post-test and follow-up only for the intervention group ($p<.001$); there was no significant difference of mean score between post-test and follow-up test for the control group ($p=.14$). There was also a significant difference in mean scores within the intervention group ($p<.001$).

These results reveal that the intervention group had higher TDMI scores at post-test and follow-up after exposure to educational intervention, compared to the control group which had no intervention. These results confirm the proposition of the current study that the educational intervention which was implemented would bring about an increase in TDMI scores among HCPs, thereby increasing their ability to make triage decisions.

These results of the current study is accordance with a previous study by Toubasi, Alosta, Darawad, and Demeh (2015) which discovered that HCPs improved their skills after exposure to an educational program on basic life support. As well, the result was similar to those of a study conducted by Ali et al. (1996) that demonstrated the effectiveness of educational intervention concerning an advanced trauma life support program on knowledge and skill of trauma management for a group of ED HCPs who completed the educational program, compared to the groups that did not complete the program. The study conducted by Merchant et al. (2015) demonstrated improvement in the triage skills among a group of lay persons and healthcare personnel after exposure to educational intervention for trauma patients. There was support for belief that the use of evidence-based data to develop continuing educational programs improves HCPs' ability or skill in the EDs and is more likely to be valued and attended by them (Bolin et al., 2011). However, a finding by Smits et al. (2016) indicated that triage training was not sufficient to enhance the skill of triage decision among the HCPs they studied.

In addition, a systematic review of the educational and clinical impact of advanced trauma life support courses carried out by Mohammad et al. (2014), discovered that any educational intervention reported in previous studies significantly improved the knowledge, clinical skills, and decision-making skills of the healthcare providers involved. However, according to Blumenfeld, Ben Abraham, Stein et al. (1998, cited in Mohammad et al., 2014), cognitive knowledge decreased over time and even decline faster, in some cases. Other research studies on the effectiveness of educational intervention by McCrow, Sullivan, and Beattie (2014) revealed that acute care nurses knowledge of delirium improved after exposure to intervention, and a study by Wunder (2016) demonstrated the effectiveness of interventional education on improving student registered nurses' skill in the critical area.

5.3.6 Effectiveness of Educational Intervention on Accuracy of Triage Decisions Score for Adult Trauma Patients (PSBQs)

Results of the ANCOVA analysis demonstrated that there was significant interaction between group and time ($P<.010$), which means there was a significant change in PSBQs scores between the intervention and control groups at post-test and follow-up, with a large effect size ($\eta^2 =0.37$), while the main effect of the group was significantly different between control and intervention groups ($p <.001$), and mean difference was 3.02 (CI: 2.66, 3.39) with a large effect size ($\eta^2 = 0.66$). Results of the study showed that, after controlling the covariate factors of designation and attending continuous nursing education/ continuous medical education, the intervention significantly improved the PSBQs score of the intervention group across the period of time. The alternative hypothesis accepted, whereby there is a significant difference of PSBQs score among HCPs before and after execution of educational intervention

In addition, a separate comparison of mean scores using the Bonferroni test also revealed a significant difference of PSBQs mean scores between the intervention and control groups at post-test and follow-up ($p<.001$). Indeed, a comparison of means between the three time periods for the intervention group results, showed there was a significant difference of means between pre-test and post-test and follow-up test ($p<.001$). The comparison produced similar results for control group as well. However, in the case of the control group, the mean score of PSBQs, which was low at the point of the pre-test, decreased at each subsequent time; whereas for the intervention group, the mean score increased in the subsequent test compared to pre-test, although it decreased at the four weeks point (follow-up test). Though the mean deceased at four weeks, it remained above the cut-off point set for this study. These results indicate that, after exposure to the educational intervention, the intervention group produced a better PSBQs mean score compared to the control group.

In conclusion, results of the current study confirm that the educational intervention was able to increase the PSBQs score among HCPs. We firmly postulate that this educational intervention has improved HCPs' ability to make accurate triage decisions for adult trauma patients, at triage. Results of current study are consistent with a study by Nilsson et al. (2015) in which one hour of triage training that included a lecture and PSBQs improved triage accuracy among groups of firemen, and the skills were sustained over a period time. Similarly, Hosseini et al. (2014) contended that training was proven as a tool to change and improve knowledge and skills and simultaneously able to increase the accuracy level. The present result was similar to that of Jelinek, Fahje, Immermann, and Elsbernd (2014), who conducted a study using created trauma nurse reports. Participants who were exposed to a one-hour course demonstrated improvement in the accuracy of their triage decisions. Results of current study are also similar to Weatherspoon, Phillips, and Wyatt (2015) who showed that an educational intervention using patient scenarios improved the accuracy of triage decisions among nursing students in the intervention group after exposure, compared to a control group. Smyth and McCabe (2017) found that knowledge and clinical experience among HCPs have a positive impact on HCPS' ability in clinical decisions; however continuing education and training is better able to improve HCPs ability to find solutions for any problems, including making accurate decisions in the clinical practice. Conversely, however, in a study in Belgian by Bergs, Verelst, Gillet, and Vandijck (2014), a locally developed educational program did not improve the accuracy of triage decisions among HCPs in the ED.

5.4 Strength and Limitation

This study has a number of strengths that are worthy of attention. First, the strength of the present study is that it was a randomised controlled trial study that reduced contamination and bias. To our knowledge, this is the first study to measure skill and accuracy of triage decision-making among healthcare providers in ED hospitals using randomization, whereby the hospital EDs (n=10) whose HCPs were among the participants who obtained a low score on TDMI pre-test were randomly assigned by ballot to the intervention and control groups. Secondly the educational intervention used was developed based on an earlier survey that identified HCPs' needs and areas of weakness, and not merely based solely on a review of the previous literature. Thus, the module that was developed can be implemented to assist and improve HCPs ability in skills and accuracy of triage. It is recommended that this education module be implemented as CNE/CME every two weeks to ensure knowledge retention so that the skill and accuracy of the triage decisions among HCPs can be sustained.

Nevertheless, the study did face some limitations. There was a limitation in that the duration of data collection for phase 1 took longer than planned due to a serious flood that affected Kelantan State and the hospitals (and nearby areas) that were involved in the study. For this reason, the gap between phase 1 and phase 3 was lengthened as well. During this extended period of time, participants may have learned and gained experience and skills of triaging, which could have influenced their level of skill and the accuracy of their triage decisions. To overcome this matter, the researcher added a question 'Have you attended any continuous nursing education/seminar/ short course/ that provided knowledge about triaging' in section A of the questionnaire used in phase 3.

The duration of the educational intervention session implemented in the current study was 140 minutes, however it was longer compared to the sixty-minute educational intervention of triaging training for firemen carried out in a study conducted by Nilsson et al. (2015), which resulted in a significant improvement of triage accuracy that was sustained over a period of time.

Another limitation of the study was that participants were tested on their triaging knowledge, skills, and decision-making accuracy in hypothetical test situations. This may not reflect their ability to perform in an actual on-the-job environment. Although the written patient scenario-based questionnaires used in the study included adequate and precise assessment of patient's condition as in the triage process (when the patient first presents at the ED), the limited information may restrict HCPs ability to fully assess the real situation of the patient's condition, and that may affect their ability to make accurate triage decisions. Furthermore, the size of the sample of participants used in the study was just adequate, due to limitations in the overall number of HCPs placed in the EDs of hospitals in Kelantan. With adequate support and resources, the study could be expanded to the EDs of more hospitals in other states of Malaysia; in this way the results could be generalised. In future, when adequate resources and appropriate technology are available, an observational study should be conducted to evaluate HCPs; skills and their performance in executing triage in clinical practice. With this method the exact areas of weakness or insufficiency at triage can be identified and appropriate measures can be undertaken to overcome them.

5.5 Summary

The current study has examined the level of skills and accuracy of triage decision making among HCPs in the emergency department. From the pre-test it was found that 70.8% of HCPs working in ten hospitals obtained a low score on the TDMI, while 69.8% scored a low accuracy of triage decisions for adult trauma patients when tested on patient situation-based questions. However, after exposure to the educational intervention, the level of skill and accuracy of triage decisions among the intervention group showed significant improvement over a period of time compared to the control group. This indicates that the educational intervention had a positive impact on HCPs' skill and accuracy in making triage decisions. It is recommended that the educational intervention that was developed in phase 2 should be implemented on a continuous basis to improve and sustain HCPs' skills and enhance their accuracy of triage decision making. This can contribute to positive impact on patients' health and boost the HCPs' performance as a triage officer. Furthermore, results of the study showed that HCPs who have many years of working experience in the ED are more skilful compared to those who have less experience of working in the emergency department, and HCPs who have undergone emergency post-basic training were less likely to gain lower PSBQs score compared to those who had no post-basic training. In conclusion, it is clear that education and training play a big role in increasing HCPs' skill and ability to make accurate triage decisions.

CHAPTER 6: CONCLUSION

6.1 Introduction

This chapter syntheses the findings of the study on the level of triage decision making skills and the accuracy of the triage decisions among HCPs in the emergency department of the hospitals, including the effectiveness of the educational intervention on the HCPs' skill and accuracy of triage decisions, and outlines the implication of the study's results for nursing practice and education. Recommendations for future practice, education, and future research are also presented. A summary of the whole study concludes the chapter.

6.2 Level of Triage Decision Making Skill and Accuracy of Triage Decisions for ATP and the Factors Associated with Them

The results of the baseline study indicated that 70.8% (n=143) HCPs at the ten hospital EDs that constituted the sample obtained low scores on the Triage Decision Making Inventory (TDMI), while 69.8% (n=141) obtained low scores for the Patients Scenario-based Questions (PSBQs). The mean score for each of three of the four sub-domains of the TDMI – cognitive characteristics, experience, and intuitive domains were similar and below an acceptable value: the exception was the domain of critical thinking. Meanwhile, an analysis of the factors associated with triage decision making skill (TDMI) showed that HCPs who have more than 10 years' ED working experience were more likely to obtain a higher score compared to their counterparts. Other factors such as gender, age, designation, and triage experience were not significant in the multivariate model. These results indicated that null hypothesis is accepted except for ED working experience.

In terms of the accuracy of triage decisions for adult trauma patient, results of the PSBQs, indicated that null hypothesis is accepted except for post basic training in emergency. HCPs who had been given post basic training in emergency were less likely to gain a lower PSBQs score than their counterparts who had not undergone such training. In other words, it was found that HCPs with extensive ED working experience and those with emergency training were more skilful in making triage decision and accurately categorizing patients into the correct triage category than HCPs without this experience and training. Given the inadequate performance of HCPs on the baseline pre-test, low-scoring HCP's from the ten EDs were invited to enrol into phase 2 and 3 of the study, which included an interventional phase and subsequent post-test and follow-up test. The 10 EDs were randomized into an intervention group and a control group.

6.3 The Effectiveness of the Educational Intervention on the Triage Decisions Making Skill and Accuracy of Triage Desicions for ATP

After exposure to the educational intervention, the skill of triage decision making among HCPs in the intervention group improved substantially at two measurement points after the intervention was delivered: at two weeks (post-test) and at four weeks (follow-up), while the control group which did not receive the educational intervention showed minimal improvement compared to control group. The triage decision making skills among HCPs in the intervention group were higher at two weeks compared to at four weeks, however they remained above the cut–off point set for the current study. While the adjusted mean score of TDMI for the control group increased at both points as well, but despite the increment the score remained below the cut-off point set for the study. The increment of the adjusted mean score in the control group may possibly be explained by longer hours of exposure to triage roles in the period of time between the phase 1 and phase 3, which may have enhanced the skills of triage decision making among HCPs in the control group. Accuracy of triage decisions on adult trauma patients in the intervention group was higher at two weeks (post-test) and at four weeks (follow-up) after exposure to the educational intervention, although the accuracy scores declined slightly between the post-test and the follow-up test, possibly due to a reduction of knowledge retention among HCPs after two weeks' of exposure to the educational intervention. Meanwhile, for the control group, the mean score for accuracy decreased at both points of measurement (post-test and follow-up) when compared to pre-test, however at post-test the mean score was slightly higher.

Overall, the intervention group showed a more significant improvement in skills of triage decision making and accuracy of triage decisions after exposure to educational intervention than did the control group, which was not exposed to the intervention. It can be concluded that there is a significant difference of TDMI and PSBQs score among HCPs before and after execution of educational intervention. The educational intervention had a positive effect on HCPs' skills in making triage decisions and the accuracy of their triage decisions for adult trauma patients. We suggested that the educational program could be delivered to all HCPs to enhance their skill and accuracy of triage decisions, and further suggested the program be scheduled as part of continuous nursing and medical education every two weeks to ensure they retain the triaging skills and ability to make accurate decisions.

6.4 Implications for Nursing Practice and Education

The data obtained from the present study provides useful information about the level of triage decision making skill and accuracy of triage decisions on ATP made by HCPs in the EDs of the 10 hospital. These data constitute an evidence base that measures HCPs skills and accuracy in making triage decisions that require fast and appropriate measures, such as providing appropriate continuous education or training. It was further suggested that HCPs who are assigned to perform triage roles need to be monitored for their skill and accuracy of triage decisions regularly, to ascertain that they are efficient enough to execute the roles. Kamrani et al. (2013, cited in Rahmani et al., 2018) has suggested that one of the best interventions to reduce inaccuracy of triage decisions was to provide the necessary triage training to triage officers followed by continuous monitoring of their performance. In the current study, it was discovered that educational intervention through a combination of a lecture and discussions on patient scenario-based questions which were similar to the everyday tasks performed at triage had a significant positive effect on improving participants' skills in triage decision making and accuracy of triage decisions for adult trauma. Basing the educational intervention on the HCPs requirements and according to the results of the baseline study appears to have been effective in improve the HCPs' skills. Therefore, instead of merely relying on an available program such as advanced life support and basic life support, the current educational intervention program which was adapted to this specific context can recognized as a tool that is able to bring about significant improvements in HCPs' triaging skills, and should be continued. Improving HCPs' skills and accuracy of triage decisions may enhance emergency care, speed up the flow of the patients, and improve resource management in the EDs, while at the same boosting the professionalism of the nursing and medical staff. Furthermore, the current study had positive impacts on the practice of triage in a few of the emergency departments, which responded to the focus given to triaging by improving the triage facilities and staffing. It is most important to deploy skilful HCPs who are able to provide the best quality of emergency care, thus improving the quality of life of the patients and changing public perceptions of HCPs' capability at triage in the EDs. As Rankin et al., (2013) concluded, skilful and accurate triage assessment accomplished at triage leads to good impacts on patients' health, hospital accreditation, resources and funding.

6.5 Recommendations

6.5.1 Practice

In the present study, an effective means of improving HCPs' ability to make accurate triage decisions was achieved by developing a structured educational intervention that identified areas of weakness and was tailored to deal with the specific needs for improvement. All HCPs require the necessary knowledge prior to performing triage roles. The educational program should be carried out on a regular basis to ensure the knowledge is retained. Appropriate and consistent guide lines on triaging should be provided so that the practice of triaging can be standardised. Existing emergency medical and trauma services policy in Malaysia should be upgraded: since it was published in 2012, it is time to revise and upgrade the policy to ensure better practice according to contemporary needs and demands.

There is also a need for appropriate orientation of new HCPs who are posted in the EDs prior to their assignment as a triage officer. New member of staff who are posted in the EDs should be provided with an adequate orientation prior to performing their roles, depending on individual capabilities and experience. It is important to expose them to the roles undertaken at triage and the triage process itself for the purpose of gaining clinical knowledge, which can then be integrated with existing factual knowledge for better and more accurate triaging. Furthermore, newly appointed HCPs should be monitored consistently to ascertain their performance abreast to the current standard and demand.

6.5.2 Education

Since the ED is a gatekeeper controlling access to hospital services and HCPs act as front-liners promoting services to the community consistent with the demand for good quality of service and emergency care, the ED ward manager or unit manager must play their role to ensure HCPs at triage deliver emergency care that reflects their efficiency and professionalism by making accurate triage decisions through well-established triage process. Recently, there has been a trend for an increasingly large number of patients with a wide diversity of emergency and non-emergency conditions to come into EDs for treatment. Thus, HCPs at triage should prepare themselves with a high level of knowledge and skill to handle both high risk and low risk patients entering the ED. For this reason, HCPs assigned to triage must be knowledgeable, skilful personnel who are able to triage patients accurately into the appropriate triage category.

Continuous medical and nursing education should be provided as a routine to maintain a high level of skill and knowledge among the HCPs at triage, and throughout the ED as a whole. Evaluations and surveys should be carried out continuously to identify HCPs' triage skills and areas that need to be improved. Any weakness or areas of knowledge and practice among HCPs should be pinpointed so that appropriate measures can be planned and implemented. Any delay in overcoming identified weaknesses or gaps will jeopardize patient safety and HCPs could face claims of being negligent in carrying out their duty. In addition, the training provided in EDs should ensure HCPs maintain a high level of skills and accuracy, and not merely rely on Basic Life Support and Advanced Trauma Life Support; rather it should focus on specific topics or areas that need to be improved. A series of surveys could be carried out to identify areas of HCPs' practice or knowledge that need improvement.

It is recommended that in future, trained HCPs should be deployed as front-liners in EDs as well-trained nurses are able to triage accurately, to assist in resuscitation and to perform a high standard of emergency care and hence increased treatment efficacy. For this reason, nurse educators and unit managers should play a role and work together to encourage and provide appropriate continuous education to prepare HCPs for triage roles, instead of depending solely on the usual Advanced Trauma Life Support and Basic Life Support courses. The method of continuous education should include scenario-based questions or vignettes in order to improve HCPs' efficacy in carrying out assessments and making accurate triage decisions. Multiple methods and a range of educational program can be introduced, such as KirkPatric . As a starting point, the researcher strongly suggests that module of triage decision making for adult trauma patients that was developed in the study should be implemented.

6.5.3 Research

The present study has showed convincingly that interventional education had a positive effect on triage decision making skills and the accuracy of triage decisions among HCPs in the EDs. The demographic characteristics that may be associated with effective triage decision making skills and accurate triaging decisions on adult trauma patients have been identified. In future, the study could be expanded by using different educational interventions to identify the most effective method for ensuring the skills gained are retained for longer periods. For example, the use of a combination of problem-based methods for gaining skills could be compared to the efficacy of attending a lecture and discussion using patient scenarios, as in the present study. A bigger sample size would help generalised the findings and enable subgroup analysis.

Another approach would be to adopt a different research design in future research: for example, an observational design. Close-circuit television technology can be mounted for the purpose of observing the actual practice of how HCPs at triage go through a triage process with the patients who attend the ED, without the Hawthorne effect that is often brought about when an observer enters the actual environment, however it need to comply with the local Privacy Ordinance or Policy. It is suggested that a qualitative research study be conducted in future to identify HCPs' perceptions of triage roles and the existing triage system. Through this method, the unit manager and nurse educator will be able to identify which area needs to be improved during the proses of triage to ensure the best service and care is provided to the patients. Lastly in future with adequate logistic resources and funding this study can be extended to other states in Malaysia and other countries to extrapolate the outcomes. The benefits of trauma triage education on mortality and morbidity and the effects of incorrect trauma triage in the ED also need to be examined.

6.6 Summary

In summary, the baseline study carried out at the beginning of the current study demonstrated that the existing level of triage decision making skills among the HCP participants and the accuracy of their triage decision was unsatisfactorily low. However, after exposure to a specially tailored educational intervention, there was significant improvement in triage decision making skills and the accuracy of triage categorization among members of the intervention group, while the control group, which received no intervention, showed minimal improvement across the duration of the study. This finding indicates that the educational intervention would have a positive impact on the HCPs' skill and ability to make accurate triage decisions in the workplace environment of the emergency departments. Therefore, based on the evidence produced by this study, the researcher strongly suggests that the educational module developed for this study should be employed as a tool to enhance and sustain HCPs'skills and ability to make accurate triage decisions. The educational intervention (module) can be applied in the HCPs continuous nursing education/medical education or added as an extra element to the classroom teaching of nursing students in their critical nursing course. According to Hosseini et al. (2014) educational program was proven as a tool to change and improve HCPs knowledge and skills simultaneously able to increase the accuracy of triage decisions.

LIST OF PUBLICATIONS AND PAPERS PRESENTED

Type	Title	Journal/Venue	Status

Level of skills and accuracy of triage decisions and factors associate with triage decisions among emergency healthcare providers at hospital emergency departments in Malaysia: a cross-sectional study, submitted **Nurse Education Today**

Effect of educational intervention on triage decision making skills and accuracy of triage decisions for adult trauma patients among emergency healthcare providers at hospital emergency departments in Malaysia, submitted **. Journal of Emergency Nursing.**

Ghazali, S. A. (2017). *Triage decision making skills and accuracy of triage decisions for adults trauma patients among healthcare providers at Emergency Department Hospital in Kelantan.* Paper presented at Nursing Seminar, Department of Nursing Science, Faculty of Medicine University of Malaya, Kuala Lumpur.

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