KNOWLEDGE REGARDING CARDIOPULMONARY RESUSCITATION AND ITS ASSOCIATED FACTORS AMONG PRIMARY CARE DOCTORS IN OUTPATIENT CLINICS IN MELAKA, MALAYSIA

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LIST OF ABBREVIATIONS

AED – automated external defibrillator

ACLS- Advance Cardiac Life Support

BLS- Basic Life Support

CPR – cardiopulmonary resuscitation

CCR – chest compression only resuscitation

HUSM – Hospital Universiti Sains Malaysia

JKNM- Malacca State Department of Health

OHCA – Out hospital cardiac arrest

UKAPS – Private Practice Control Unit

ABSTRAK

Latar Belakang: Pelaksanaan awal resusitasi kardiopulmonari,(CPR) dan difibrilasi awal adalah antara faktor penting di dalam rantaian kelangsungan hidup (Chain of survival) dan doktor memainkan peranan penting sebagai responder awal dalam kes serangan jantung di luar hospital. Kajian ini bertujuan untuk menilai pengetahuan dan sikap terhadap CPR di kalangan doktor-doktor di klinik kesihatan awam di Melaka dan faktor-faktor yang mempengaruhi tahap pengetahuan yang baik dalam CPR di kalangan doctor-doktor tersebut.

Kaedah: Kajian ini adalah kajian keratan rentas selama 12 bulan antara 10 Oktober 2018 sehingga 9 Oktober 2019 menggunakan soal selidik yang diolah daripada kajian sebelumnya. Pengamal perubatan yang memenuhi kriteria inklusi telah ditemuramah dan di minta mengisi borang kaji selidik yang menguji pengetahuan dan sikap para peserta terhadap CPR

Keputusan: Daripada 250 responden, 59.6% mempunyai tahap pengetahuan yang baik dan 20% mempunyai sikap positif terhadap CPR. Daripada faktor-faktor yang dikaji, umur ($p = 0.007$), tempoh di dalam perkhidmatan ($p= 0.004$) dan mempunyai pengalaman melakukan CPR ($p= 0.034$) telah didapati mempunyai perkaitan dengan tahap pengetahuan yang baik dalam CPR.

Kesimpulan: Kebanyakan doktor di klinik kesihatan di Melaka mempunyai pengetahuan yang baik mengenai CPR tetapi bersikap negatif terhadapnya. Usia, tempoh perkhidmatan, dan pengalaman melakukan CPR adalah faktor-faktor yang

mempengaruhi pengetahuan yang baik tentang CPR. Kesemua faktor-faktor ini menekankan kepentingan pendedahan dan latihan untuk memperbaiki tahap pengetahuan berkaitan CPR dalam kalangan doktor-doktor penjagaan kesihatan primer kerajaan di Melaka.

Keywords: Advanced Cardiac Life Support, Cardiopulmonary Resuscitation, Emergencies, out-of-hospital cardiac arrest, Primary health care.

ABSTRACT

Introduction: Early cardiopulmonary resuscitation (CPR) and early defibrillation are important factors in the chain of survival and doctors play crucial role as early responders in cardiac arrest cases outside of the hospital. This study aims to assess knowledge and attitude towards CPR among primary care doctors in Melaka and factors associated with having good knowledge among the doctors.

Methods: This is a 12 months cross sectional study that was conducted between 10th October 2018 until 9th October 2019 using a modified questionnaire involving all Primary Health Clinics in Melaka. All doctors who fitted the inclusion and exclusion criteria were invited to participate and required to fill up the self-administered questionnaire that test their knowledge and attitude towards CPR.

Results: Out of 250 respondents, 59.6% had good knowledge and 20% had positive attitude towards CPR. Among the factors studied, age (p= 0.007), duration in service (p= 0.004) and have experience performing CPR (p= 0.034) have been found to have association with good knowledge in CPR.

Conclusions: Most primary care doctors in outpatient clinics in Melaka have good knowledge of CPR but have negative attitude towards it. Age, duration in service, and having performed CPR were factors that associated with good knowledge on CPR. These highlights need of exposure and training to improve knowledge of CPR among government primary health care doctors in Melaka.

Keywords: Advanced Cardiac Life Support, Cardiopulmonary Resuscitation, Emergencies, out-of-hospital cardiac arrest, Primary health care.

CHAPTER 1: INTRODUCTION

Cardiac event is a medical emergency that required emergency intervention to save life. Without intervention, after 3 minutes the global cerebral oedema (due to lack of blood flood to the brain) will set in which will lead to neurological sequalae later and by 8 minutes without cerebral blood flow, irreversible brain damage is highly likely. Patients admitted to an intensive care unit will be in comatose state in 80% of the patients and about 70 percent will die due to withdrawal of life support following hypoxic-ischemic brain injury (Sandroni *et al.*, 2018).

One of the emergency interventions is cardiopulmonary resuscitation (CPR) which is a lifesaving technique that consist of chest compression and artificial ventilation. The main objective of CPR is to preserve coronary and cerebral oxygenated blood flow (Atkins *et al.*, 2015). CPR consist of 3 components: Chest compression, securing airway and ventilation as per recommended AHA Guidelines 2015 (Neumar *et al.*, 2015). Training and certification for CPR in the form of BLS and ACLS are conducted by AHA and its affiliate worldwide.

1.1 OVERVIEW OF OUT OF HOSPITAL CARDIAC ARREST

Out of hospital cardiac arrest (OHCA) is a major cause of mortality and serious morbidity throughout many regions of the world, and the outcomes for patients after an OHCA has been poor over many decades. The incidence of out-of-hospital cardiac arrest

in 2016 is more than 350,000 with CPR performed out of hospital accounting up to 46.1% of cases and the survivor rate is only 12% based on the statistics from The Resuscitation Outcome Consortium Cardiac Epistry (Consortium, 2017). A local teaching hospital in Klang Valley published a figure of 22 cases of OHCA within 1 year (Ismail *et al.*, 2016).

Early initiation of cardiopulmonary resuscitation, initial rhythm of ventricular fibrillation and the use of an automatic external defibrillator (AED) are amongst the positive factors associated with the short term survival after OHCA as described in two systematic reviews (Boyce *et al.*, 2015). In accordance to the guideline by American Heart Association, the usage of an automated external defibrillator outside the hospital can offer effective CPR for victims of cardiac arrest (Field *et al.*, 2010). Furthermore, it would reduce the rate of severe disability caused by hypoxia of the brain for those who survive.

The provision of early cardiopulmonary resuscitation (CPR) and early defibrillation are important links in the chain of survival concept, hence basic CPR should be started immediately upon recognition of a cardiac arrest together with the effort to alert the emergency medical service (Cummins *et al.*, 1991).

Previous researches have shown that the survival of the OHCA patients are greatly improved with early CPR, early defibrillation and early advanced care (Chalkias *et al.*, 2011). The doctors may be the first to witness a cardiac arrest in primary health care clinics. Previous study by Colquhoun described the results of 555 self-reported resuscitation attempts by primary care doctors who had been trained and equipped with

defibrillators, in which 27% of patients were discharged alive from hospital.(Colquhoun, 2002).

The availability of AED (Automated External Defibrillator) in public places are a good trend recently. It is a simple battery operated portable electronic device that can give voice-driven simple commands to its users pertaining to delivering defibrillation to cardiac arrest patient. Since its introduction in 1979, the device can be found in different public areas, and with bystander rescuer who are trained in the usage of AED will provide lifesaving intervention (Witt and Chambers, 2006). As such, knowledge of basic life support, the key component of the chain of survival is crucial. Provision of the most advanced technology will not be able to save the life of a patient if the service provider does not have basic knowledge about it. Hence knowing the level of knowledge possessed by the primary service provider is important in order to improve survival rate among those needing emergency care.

Malaysia has approximately 3259 government-run clinic in 2015 as stated by the Department of Statistics Malaysia in December 2016 (Department of Statistic Malaysia, 2016). The number of primary care doctors working in the government sector is 1438 in 2009 (Abdullah *et al.*, 2011). The number improved to 2992 in the year 2014 as per National Medical Care Statistics Primary Care 2014. The numbers of doctors to populations' ratio was 1:671 with the median number of doctors per public clinic was 4.5 doctors and 1.0 doctor per private clinic based on National Healthcare Establishment and Workforce Survey for Primary Care 2011 (Hwong WY *et al.*, 2014). All these doctors were required to undergo basic life support training before they graduate. However, some of them had been in service for long period of time and had not been exposed to the

emergency situations needing their competency in cardiopulmonary resuscitation tested. One of the main points of entry for patient with OHCA in Malaysia is the primary care settings. As such, the primary care doctors in Malaysia play a vital role in the management of OHCA.

In Malaysia, the training for resuscitation is governed by National Committee on Resuscitation Training (NCORT) which is a committee under the Ministry of Health since 2006, and it has published a guidelines on resuscitation training among Ministry of Health staff in 2016 which was based on International Liaison Committee on Resuscitation latest consensus (National Committee on Resuscitation Training, 2016). In terms of Basic Life Support (BLS) and ALS (Advance Life Support) training both emphasize on steps of activation of chain of survival, early defibrillation, and good quality chest compression for both in-hospital arrest and out of hospital arrest. In ALS, however further focus are given on pharmacological and electrical therapy (National Committee on Resuscitation Training, 2016). Several private medical institutions including universities also provide training in ALS and BLS including our renowned National Heart Institute. In addition, several government agencies like Fire and Rescue Department (JBPM), Civil Defence Agency (APM) and NGOs like Red Crescent Society of Malaysia and St. John's Ambulance Malaysia also provide training in BLS among their members with collaboration with the Ministry of Health.

Unfortunately, the studies on knowledge and attitudes regarding cardiopulmonary resuscitation in Malaysia have been carried out only among secondary school children (Rahman *et al.*, 2013), medical and dental students (Chew and Yazid, 2008) and junior

doctors (Chew *et al.*, 2011).Thus far, there is no data available that assess the knowledge and attitude of primary care doctor in handling OHCA in Malaysia.

A small study by Chew et al in 2006 which focused on the outcome of OHCA, found that only 2 out of 23 patients (8.7%) with OHCA received CPR before presentation to the hospital. Both of the patients, however, did not survive (Chew *et al.*, 2008). This may be due to several independent factors. However, it is vital to ensure that this mishap was not due to lack of knowledge and skills of the care provider.

1.2 MAGNITUDE OF CPR

The rates of patients presenting with shockable rhythm among Asian countries ranged from 4.1% to 19.8% according to countries, with the rate of Emergency Medical Service (EMS) CPR varied from 59.1% to 89.5% (Ong *et al.*, 2015). The rate of prehospital defibrillation varies between 2.6%- 35.8% (Ong *et al.*, 2015). In Malaysia, only 2.6% of patients with OHCA received pre-hospital defibrillation which is mainly delivered by our EMS service with 20% of the patients receiving advance airways (Ong *et al.*, 2015). These can be attributed to the fact that only 7.7% of OHCA were witnessed by EMS provider in Malaysia when compared with those who were witnessed by bystander (47.0%) (Ong *et al.*, 2015).

The information regarding OHCA incidence including its outcome in Malaysia especially in primary care settings is limited and fragmented. There are few studies that

deal with EMS performance (healthcare worker), unfortunately, these studies mainly focused on the response time which is a poor indicator of good performance (Karim and Abdul, 2015). Previous studies which looked into knowledge on CPR among doctors in Malaysia found that 30% of junior doctors have poor knowledge in CPR (Chew *et al.*, 2011). Unfortunately, studies that looked into the factors associated with the knowledge of CPR among the doctors were limited. This information is crucial in further planning related to the training of BLS and ACLS in Malaysia.

In term of attitude among primary care doctors, Chalkias et al (2011) stated that although only 67% of primary care doctors were trained in CPR, almost all physicians or specialists were willing to use AED, even though some of them did not know how to use it. This showed that most of them have positive attitude towards defibrillation (Chalkias *et al.*, 2011). There were no correlations found between the intention to use AED with the number of patient examined per day, the annual number of arrest or place of work (Chalkias *et al.*, 2011). Previous study conducted in Kota Bharu by Chew et al (2011) mainly described that 98.6% agree that junior doctors must have Basic Life Support (BLS) before practice and agreed that BLS should be taught during undergraduate years (Chew *et al.*, 2011). However, it is not clear if the BLS course during undergraduate years is enough to prepare the doctors in handling cardiac arrest cases. A study in a tertiary hospital in Sri Lanka showed that among the medical officer, only 15.8% felt that their internship training was adequate to handle emergency cases confidently (Ralapanawa *et al.*, 2016).

Training in CPR is one of the great factors influencing the attitude of a CPR provider. A study conducted by Hamasu et al among college students demonstrated that the proportion of students showing willingness to perform CPR increased from 13% to 77% after BLS training when the collapsed person is a stranger (Hamasu *et al.*, 2009). In addition, Lynch and Einspruch manage to demonstrate that even brief exposure to CPR training with or without instructor will show significant attitude change among three groups of lay person (Lynch and Einspruch, 2010). A study by Kanstad et al among secondary school children in Norway demonstrated that student with BLS training in school and self-reported confidence in their own BLS skills reported stronger willingness to perform CPR (Kanstad *et al.*, 2011). Although these studies were done among those not in health services, we can gather that training and previous exposure to CPR which inadvertently improve knowledge will in turn improve the attitude towards CPR. Good attitude will predispose a person to be more willing to perform CPR when faced with the emergency situations.

1.3 ASSOCIATED FACTORS FOR KNOWLEDGE ON CPR

Aranzabal-alegria et al stated that number of years serving emergency service and regular training or prior attendance to a CPR course contributed to the level of knowledge for successful CPR in hospitals in Peru (Aranzábal-Alegría *et al.*, 2017). Other factors that might be associated with good level of knowledge includes re-certification period and whether the doctors have actually performed CPR or defibrillation on a real cardiac arrest victim (Aranzábal-Alegría *et al.*, 2016). This finding was corroborated by Garcia et al who found that being a physician is associated with better knowledge when

compared to being residents or nurses (García *et al.*, 2015). In addition, Chalkias et al also mentioned that training and re-certification may probably be the most significant parameters for a primary care doctor in order to be efficient during management of cardiac arrest victims. Despite the confidence that the primary care doctors might feel, a decline in skills retention is observed after some times (Chalkias *et al.*, 2011)

This knowledge on life saving management in emergency situations should be present in everybody, more so in all personnel associated with frontline health care. However, this is not so as shown by Baduni et al who found that most of the dental practitioners in India have poor knowledge on CPR and those who scored higher mean score had had clinical experience between 1-5 years (Baduni *et al.*, 2014). Weji et al, had similarly found that anesthetist in Ethiopia also had poor knowledge of the current American Heart Association CPR guidelines. Those who scored higher were those participants who were trained by CPR specialists, trained very recently, have higher degree and more experience (Weji *et al.*, 2017). This further highlighted that training, experience, level of graduation and recent exposure have a positive influence on the knowledge of a health personnel with regards to CPR.

1.4 RATIONALE/JUSTIFICATION FOR STUDY

In emergency situations, the first priority is to save the patient. Since most cardiac arrest occurred outside of hospital, the first responder knowledge and skills in handling the situation is very crucial. However, a local study cited before that showed that out of 23 patients with OHCA, only 2 received CPR before presentation to hospital and both

did not survive (Chew *et al.*, 2008) highlighted that the knowledge and skills of the front liners need to be assessed. Although the misfortune may be due to other factors, it is important to ensure that the mishap was not due to lack of knowledge and competencies of the primary care responders Thus far, local studies among the paramedics and those dealing with emergency services tend to focus on response time which does not reflect good performance (Ong *et al*, 2015). Hence, there is still a need to assess the knowledge and attitude of primary care doctor in handling cardiopulmonary resuscitation in Malaysia since they are among the most important population that may change the outcome of OHCA.

The information gathered from this study will be useful in planning future educational and training activities to encourage CPR and defibrillation by primary care doctors, thus increasing the quality of care received by the patients nationwide. On top of that, by conducting this study we can collect epidemiological data and measure the preparedness of primary care doctors in Melaka in dealing with cardiac arrests patients.

CHAPTER 2: OBJECTIVES AND HYPOTHESES

2.1 RESEARCH QUESTIONS

1. How good is the knowledge on CPR among primary care doctors in Melaka?
2. What are the factors that influence the knowledge on CPR among primary care doctors in Melaka?
3. Is there any association between knowledge and attitude on CPR among primary care doctors in Melaka?

2.2 OBJECTIVES

General Objectives

To determine the proportion of good knowledge, its association with attitude on CPR and to identify the factors associated with good knowledge on CPR among primary care doctors in health clinics in Melaka.

Specific Objectives

1. To determine the proportion of good knowledge on CPR
2. To identify the factors associated with good knowledge on CPR
3. To determine the association between knowledge and attitude score on CPR

among primary care doctors in health clinics in Melaka.

2.3 HYPOTHESIS

1. Sociodemographic (age, sex, race, qualification,), duration of service experience in handling CPR, previous experience in CPR, training (BLS, ALS) and availability of AED facility are significantly associated with good knowledge of CPR.
2. There is association between knowledge and attitude on CPR among primary care doctors in health clinics in Melaka.

2.4 OPERATIONAL DEFINITION

1. Cardio pulmonary resuscitation (CPR) knowledge used in this study is based on AHA guidelines 2015.
2. Assessment of the knowledge and attitude on CPR is based on an adapted questionnaire by Chew et al (2011). The proportion of good knowledge is taken as score of more than 80% of the total score of that domain.
3. Assessment of the attitude on CPR is based on an adapted questionnaire by Chew et al (2011). The proportion of good attitude is taken as score of more than 80% of the total score of that domain.

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CHAPTER 3: MANUSCRIPT

TITLE PAGE

Full title: KNOWLEDGE REGARDING CARDIOPULMONARY RESUSCITATION AND ITS ASSOCIATED FACTORS AMONG PRIMARY CARE DOCTORS IN OUTPATIENT CLINICS IN MELAKA, MALAYSIA

Running title: KNOWLEDGE ON CPR AND ITS ASSOCIATED FACTORS

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ABSTRACT

Introduction: Early cardiopulmonary resuscitation (CPR) and early defibrillation are important factors in the chain of survival and doctors play crucial role as early responders in cardiac arrest cases outside-of-the-hospital. This study aims to assess knowledge towards CPR among primary care doctors in Melaka and factors associated with having good knowledge among the doctors.

Methods: This is a 12-months cross sectional study that was conducted using a modified questionnaire on knowledge and attitude towards CPR. All government primary care doctors working in Primary Health Clinics in Melaka who fulfilled the inclusion and exclusion criteria were invited to participate and required to fill up the self-administered questionnaire. Descriptive and logistic regression analyses was carried out using SPSS version 24.

Results: Out of 250 respondents, 59.6% had good knowledge on CPR. Those who were older (p= 0.007), have longer duration of service (p= 0.004), and have experience performing CPR (p= 0.034) were shown to have positive association with good knowledge of CPR.

Conclusions: Most primary care doctors in outpatient clinics in Melaka have good knowledge of CPR. Factors which influence good knowledge on CPR includes older age, longer duration of service, and have experienced performing CPR. These highlights need of exposure and training to improve knowledge of CPR among government primary care doctors in Melaka.

Keywords: Advanced Cardiac Life Support, Cardiopulmonary Resuscitation, Emergencies, Out-of-hospital cardiac arrest, Primary health care.

INTRODUCTION

Out-of-hospital cardiac arrest (OHCA) is a major cause of mortality and serious morbidity throughout many regions of the world, and the outcomes for patients after an OHCA has been poor over many decades [(1)]. According to The Resuscitation Outcome Consortium Cardiac Registry, the incidence of OHCA in 2016 is more than 350,000 with bystander CPR accounting up to 46.1% and survivor rate is only 12%. Providing early cardiopulmonary resuscitation (CPR) and early defibrillation are important links in the chain of survival concept, hence basic CPR should be started immediately upon recognition of a cardiac arrest together with the effort to alert the emergency medical service.

Early CPR, initial rhythm of ventricular fibrillation and the use of an automatic external defibrillator (AED) are amongst the positive factors associated with the short-term survival after OHCA [(2)]. There is the notion that chances of survival could decrease 7-10% for every minute without CPR [(3)]. Since most of the patients tend to present to the nearest health care facilities, primary care doctors may be among the first to witness the event in the clinic and thus play a vital role in the management of OHCA. Previous researchers have shown that the survival of the OHCA patients were greatly improved with early CPR, early defibrillation and early advanced care. In a study among GPs who had been trained and equipped with defibrillators, 27% of cardiac arrest patients were able to be discharged alive from hospital [(4)].

In Malaysia, there were 1438 doctors working in the government sector in 2009 [(5)] and the number increased to 2992 in the year 2014 [(5)] . In terms of facilities, there were more private primary care clinics with overall density of 2.09 per 10000 population and the number of private clinics outnumbered the public by 6.3 to 1. Nonetheless, none of the private primary care clinics provide emergency transportation service while about 70% of the primary care

clinic does. In addition, the burden of patients is also higher in public health clinics compared to private clinics. Cardiac event had been identified as the number one cause of mortality in the country. In 2017 alone, there were 3142 cases of cardiac arrest cases that were admitted to Coronary Care Unit in Hospital Melaka [(6)]. This highlighted the importance of attending primary care doctors in government outpatient clinics to have good knowledge in CPR as the ambulance services will be activated if an emergency cases occur within their locality.

Although the role of primary care doctors to manage out-of-hospital cardiac arrest are acknowledged to be crucial, there was no study that assessed their core knowledge of CPR in the field. Studies on knowledge and attitudes about cardiopulmonary resuscitation in Malaysia so far have been on secondary school children and medical and dental students. Thus, it is vital to assess the knowledge of these doctors towards CPR compared to other population. Hence, this study takes the task to assess the knowledge towards CPR amongst government primary care doctors in Melaka and to assess the factors associated with good knowledge of CPR. The association between knowledge score and attitude will also be assessed. It is crucial to identify these factors for further planning related to the training of BLS and ACLS in Malaysia and to encourage CPR and defibrillation by primary care doctors, thus increasing the quality of care received by the patient.

MATERIALS AND METHODS

This study was a cross sectional study held from 10 October 2018 till 9 October 2019 in all government-funded outpatient clinics in Melaka. The study received ethical approval from Human Ethics and Research committee USM (USM/JEPeM/17050267).

Sample size

Sample size was calculated based on single proportion formula for estimation of good knowledge and comparing two proportion formula for its possible associated factors using PS Software version 3.1.2. The correlation between knowledge and attitude was calculated using simple linear regression. The biggest sample size yield was on calculation of associated factors where $\alpha = 0.05$; power = 0.8; P0 = 0.38; P1 = 0.58 and m = 1. After considering 20% non-response rate, the calculated minimum sample size required for this study was 232.

Participants

The participants for this study were 250 primary care doctors who practiced in Health Clinic and their name lists were taken from Bahagian Kesihatan Primer, Jabatan Kesihatan Negeri,Melaka, Malaysia. Convenience sampling was applied for the purpose of this study. However, to ensure fair exposure, doctors on contract scheme and House officers were excluded from the study. In addition, those who were on leave during data collection day were also excluded.

Measurement tool

Data collection was done using a modified questionnaire adapted from Chew et al (2009) on the knowledge and attitude towards cardiopulmonary resuscitation and defibrillation amongst junior doctors in Kelantan [7]. The knowledge domain was based on a 3-point Likert scale (1 = true answer, 0 = don't know and wrong answer) with the score ranging from 0 to 10. The cut-off score of 80% and above was considered good knowledge. The attitude domain was based on a 5-point Likert scale where score of 4 or 5 constituted positive attitude and score of 1 to 3 constituted negative attitude. Due to the poor internal consistency, a revised version of