

**A SURVEY ON PEDIATRIC EMERGENCY
PREPAREDNESS AMONG HEALTH CLINICS IN
KELANTAN**

By

DR NOOR AZIZAH BINTI ABDULLAH

**Dissertation Submitted in Partial Fulfillment Of The
Requirements For The Degree Of Master Of Medicine
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LIST OF ABBREVIATIONS

AAP	American Academy of Pediatrics
ACLS	Advanced Cardiac Life Support
ALS	Advanced Life Support
APEX	Accelerated Programme for Excellent
APLS	Advanced Pediatric Life Support
ATLS	Advanced Trauma Life Support
BLS	Basic Life Support
ECG	Electrocardiograph
ED	Emergency Department
EMS	Emergency Medical Service
HO	House Officer
HUSM	Hospital University Sains Malaysia
IIUM	International Islamic University Malaysia
IMR	Infant Mortality Rate
MDG	Milleneum Development Goal
MO	Medical Officer
PALS	Pediatric Advanced Life Support
SD	Standard Deviation
SPSS	Statistical Packages for Social Science

UKM	Universiti Kebangsaan Malaysia
UM	Universiti Malaya
UNICEF	United Nations Children's Fund
USM	Universiti Sains Malaysia
WHO	World Health Organization

ABSTRAK

KAJIAN MENGENAI KESEDIAAN TERHADAP KES KECEMASAN KANAK-KANAK DI KLINIK KESIHATAN DI KELANTAN

Pengenalan: Pengamal perubatan di klinik kesihatan atau juga dikenali sebagai penjagaan primer, yang merupakan titik hubungan pertama bagi kebanyakan pesakit dalam masyarakat perlu sewajarnya mahir dan dilengkapi untuk menangani kes kecemasan. Kebanyakan kajian sebelum ini menunjukkan bahawa sebilangan besar pesakit kanak-kanak dengan kecemasan yang berpotensi mengancam nyawa yang hadir ke klinik kesihatan. Walau bagaimanapun, peralatan kecemasan asas dan ubat-ubatan tidak dilengkapi secara optimal. Oleh itu, pesakit tidak menerima rawatan yang optimum yang menyumbang kepada kecacatan dan kematian. Dalam usaha untuk menangani masalah ini, beberapa garis panduan telah diterbitkan dan latihan khusus yang berkaitan diberikan kepada kakitangan. Oleh itu, kajian ini memberi tumpuan kepada kesediaan kecemasan pediatrik dan faktor yang mempengaruhi kesediaan.

Objektif: Secara umumnya objektif kajian ini adalah untuk menilai kesediaan kecemasan pediatrik antara klinik kesihatan di Kelantan. Secara khusus, untuk menentukan ciri-ciri pengamal dan tempat amalan yang berkaitan dengan kesediaan untuk kecemasan pediatrik, untuk menilai adanya peralatan dan ubat-ubatan tertentu untuk kecemasan pediatrik dan untuk mengkaji faktor-faktor yang mempengaruhi kesediaan terhadap kes kecemasan pediatrik.

Kaedah: Kajian ini merupakan satu kajian keratan rentas melibatkan semua klinik kesihatan di Kelantan yang dijalankan pada 1 Julai 2015 hingga 31 Ogos 2015. Hanya seorang pegawai perubatan di setiap klinik kesihatan telah dipilih untuk menjawab soal selidik untuk mengelakkan laporan berganda berkaitan peralatan dan ubatan.

Keputusan: Maklum balas telah diterima daripada 74 responden (92.5% kadar tindak balas) termasuk maklumat mengenai peralatan dan ubatan serta ciri-ciri pengamal dan tempat amalan. 3 skor berasingan telah dikira bagi setiap responden; skor peralatan, skor ubat-ubatan dan skor kesediaan keseluruhan. Analisis regresi berganda telah digunakan untuk mengkaji hubungan antara skor kesediaan keseluruhan dengan ciri-ciri pengamal dan tempat bertugas. Min untuk skor kesediaan keseluruhan adalah 87.22 daripada kemungkinan 148 dengan sisihan piawai 10.345 ($n = 74$). Dalam analisis regresi linear, hanya 4 faktor didapati mempunyai hubungan yang signifikan dengan skor persediaan yang lebih baik. Faktor tersebut adalah umur, sijil asas sokongan hayat, kehadiran pakar perubatan keluarga dan masa tindak balas ambulans.

Kesimpulan: Kesimpulannya, walaupun terdapat beberapa limitasi dalam kajian ini, ia telah menunjukkan bahawa klinik kesihatan di Kelantan kurang bersedia dari segi peralatan dan ubat-ubatan untuk kes kecemasan pediatrik. Terdapat korelasi antara beberapa ciri-ciri pengamal dan amalan dengan persediaan kecemasan pediatrik antara klinik kesihatan di Kelantan.

ABSTRACT

A SURVEY ON PEDIATRIC EMERGENCY PREPAREDNESS AMONG HEALTH CLINICS IN KELANTAN

Introduction: Medical practitioner in health clinic or also known as primary care, as the first point of contact for most patients in the community need to be appropriately skilled and equipped to deal with the emergencies. Most of the previous studies showed that a substantial number of pediatric patients with potentially life-threatening emergencies presented to health clinics. However, the availability of basic emergency equipment and medication was suboptimal. As a result, patient did not receive optimal treatment that results in morbidity and mortality. In order to address the problems, numbers of guideline were published and specific training being established to the staff. Thus, this study focused on the pediatric emergency preparedness and factors influencing the preparedness.

Objectives: Generally the objectives of this study were to assess paediatric emergency preparedness among health clinics in Kelantan. Specifically, to determine the characteristics of practitioners and practice those are related to preparedness for pediatric emergencies, to assess the availability of specific equipments and medications for pediatric emergencies and to study the factors that influence overall preparedness for pediatric emergencies.

Methods: This prospective, cross sectional study was conducted among all health clinics in Kelantan from 1st July 2015 to 31st August 2015. Only one medical officer in each health clinics was chosen to answer the questionnaire to avoid duplicate reporting of practice equipments and drugs.

Results: Responses were received from 74 respondents (92.5% response rate) including information regarding the availability of equipment and medication, practitioners, and practice characteristic. 3 separate scores were calculated for each respondents; equipments score, medications score and overall preparedness score. A multiple regression analysis was used to investigate the relationship between overall preparedness score with the practitioner and practice characteristics. The mean for overall preparedness score was 87.22 of a possible 148 with standard deviation of 10.345 (n=74). In multiple linear regression analysis, only 4 factors were found to have significant association with better preparedness score. They were age, basic life support provider, availability of family physician and paramedic or ambulance response time.

Conclusion: In conclusion, despite of few limitations in this study, it has shown that health clinics in Kelantan are not adequately prepared in terms of equipment and medication for pediatric emergency. There are correlation between few characteristics of practitioners and practice with the pediatric emergency preparedness among health clinics in Kelantan.

BAHAGIAN C

Biodata Abstrak Penyelidikan

**A SURVEY ON PEDIATRIC EMERGENCY PREPAREDNESS AMONG HEALTH
CLINICS IN KELANTAN**

Dr Noor Azizah Binti Abdullah

MMed Emergency Medicine

Department of Emergency Medicine

School of Medical Sciences, Universiti Sains Malaysia

Health Campus, 16150 Kelantan, Malaysia

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Dr. Abu Yazid Md. Noh: Supervisor

1. INTRODUCTION

Pediatric emergency is an injury or illness that is acute and possesses an immediate risk to a child's life and long term health (Angira, 2010). It is one of the common emergencies encounter by family practitioners. Health clinics were choosing by them due to several reasons. Some of the reason they presented to health clinic were underestimation of the seriousness of the illness among caregivers and patient themselves, desire to avoid hospital environment, logistical, social and financial issues (Frush, 2007).

According to the surveys conducted by (Jatana, 2012; Wheeler *et al.*, 2000), the most common emergencies encountered in their health clinics were related to severe or moderate dehydration, febrile illness example infectious diseases, central nervous system infection, seizures, respiratory emergencies example bronchial asthma, croup, bronchiolitis, pneumonia, airway emergency including foreign body aspiration, shock and trauma related injuries.

For the definition, pediatrics is defined as the specialty of medical science concerned with the physical, mental, and social health of children from birth to young adulthood. Pediatric care encompasses a broad spectrum of health services ranging from preventive health care to the diagnosis and treatment of acute and chronic diseases (Pediatrician, April 2015).

The range of pediatric age group is different according to the center of practice. Based on the Malaysian Child Act 2001 or Act 611, a child is defined as a person under the age of 18 years or below 18 years old. It is similar with the definition from UNICEF which regards pediatric to all persons under the age of 18 (UNICEF., 2006). For the purposes of San Mateo County EMS protocols; they define a pediatric patient who is less than 15 years of age or a length-based weight (per Broselow Tape) of 36 kg or less. Patients who are known to be less than 15 years of age but whose weight exceeds 36 kg may still be considered pediatric patients given their chronological age; however weights will then need to be estimated and adult dosages should be used. They classified their pediatric patients into several group to assist prehospital personnel in their assessment and management of pediatric patients. The groups are neonate (newborn up to first 28 days of life), infant (neonatal period up to 12 months), toddler (1-3 years), pre-school (3-5 years), school-age (6-10 years) and adolescent (11-14 years) (San Mateo County EMS Agency).

FDA classified it into preterm neonate (born at less than 38 weeks), neonate (birth to 1 month old), infant/toddler (1 month to 2 years old), child (2 to 12 years old), and adolescent (12 to 16/18 years old) (FDA November 1998). This definition does not imply that pediatricians may not provide services to individuals who are beyond 18 years of age.

Preparedness is defined as knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to

effectively anticipate, respond to and recover from the impacts of likely, imminent, or current hazardous events or conditions (Brian S. S., 2011).

Most injuries in pediatric age group are preventable and treatable. Many illnesses can be prevented from becoming emergencies by early recognition of the ailment and institution; and prompt treatment by family practitioners and first contact care provides in the clinic. Apart from the family practitioners, parents or guardians plays a very important role in this kind of situation. They need to be educated on first aid treatment, recognition of signs and symptoms of serious illness, and knows when and where to seek medical help (Shenoi *et al.*, 2013).

The health clinic is organized to provide well-child care and to care for children with acute problem and chronic illnesses. Though all emergencies in the pediatric age are not immediately life threatening, yet adequate training and equipment are required to treat those who come with such emergencies. Most offices are not optimally prepared to deal with these situations. In these circumstances, the health practitioner in health clinic may need to provide resuscitation (basic and advanced pediatric life support), stabilization and transport to emergency care facilities. Transport of patients after initial stabilization of an emergency should always be done in a manner that provides adequate safety and monitoring.

Family physicians or family practitioners must ensure that their clinic personnel include medical officer, nurses and medical assistant are appropriately trained to recognize and provide initial treatment to critically ill children (Ralston and Zaritsky, 2009). All clinical personnel in the clinic should at least be trained in basic life support. On the other hand, the family physicians should maintain their skills in pediatric resuscitation by valuable resources example Pediatric advanced life support (PALS) or Advanced Pediatric Life Support (APLS). The latest provides a further introduction to the recognition and treatment of common pediatric emergencies. Apart from training, equipment and medication must be routinely checked for availability, proper function and maintenance. The equipment necessary for emergencies varies depending on the location of the clinic, training obtained by the physician/officer in charge and its proximity to emergency medical services and the hospital. Ideally, all emergency equipment and medications should be kept in a centralized, easily accessible location (Wheeler *et al.*, 2000).

The United Nations Millennium Development Goal (MDG4) number four is to reduce the global under-five mortality rate by two-thirds between the baseline in 1990 and 2015. According to Global Health Observatory Data, WHO updated on 8th September 2015, approximately 5.9 million children under age five died in 2015, which means around 16 000 death per day. 83% of deaths in children under age five are caused by infectious, neonatal or nutritional conditions. Globally, under-five mortality rate has decreased by 53%, from an estimated rate of 91 deaths per 1000 live births in 1990 to 43 deaths per 1000 live births in 2015. The average annual rate of reduction in under-five mortality has

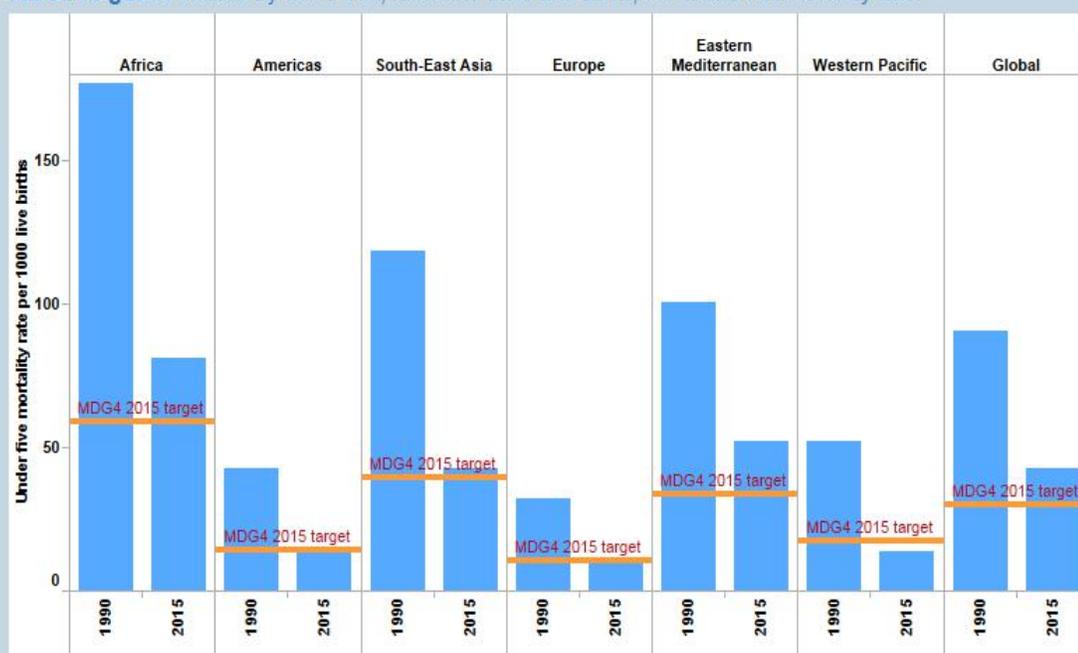
accelerated from 1.8% a year over the period 1990–2000 to 3.9% for 2000–2015 but remains insufficient to reach MDG 4. Overall, substantial progress has been made towards achieving MDG 4. The number of under-five deaths worldwide has declined from 12.7 (12.6, 13.0) million in 1990 to 5.9 (5.7, 6.4) million in 2015. Yet, despite these substantial gains, progress is insufficient to achieve the MDG 4 target. With the end of the MDG era, the international community is in the process of agreeing on a new framework, the Sustainable Development Goals (SDGs) where the target is to end preventable deaths of newborns and children under 5 years of age. The proposal is for all countries aiming reduce under-five mortality to at least as low as 25 per 1000 live births. Currently, 79 countries have an under-five mortality rate above 25, and 47 of them will not meet the proposed SDG target of 25 deaths per 1000 live births by 2030 if they continue their current trends in reducing under-five mortality (who, 2015).

**Global and regional under-five mortality trends, 1990-2015
and gap for achieving the MDG4 target**



Update: 08 September 2015

MDG4 target: to reduce by two thirds, between 1990 and 2015, the under-five mortality rate



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Figure 1.0: Global and regional under-five mortality trends, 1990-2015 and gap for achieving the MDG4 target

The findings of the National Population and Family Development Board (LPPKN) on infant mortality in Malaysia (2011) showed that Infant Mortality Rate (IMR) in Kelantan is among the highest compared to other states in Malaysia. In 2007, it was recorded that Kelantan is the second highest after Terengganu in both under-five and infant mortality rates, which account 8.0 fatalities for every 1000 infants and 11.1 fatalities for every 1000 under-five children, respectively (Table 1.0). Children from indigenous minority groups,

including the Orang Asli, and non-citizens were likely to die from infections such as pneumonia and acute gastroenteritis, aggravated by malnutrition. These conditions are preventable and treatable at relatively low cost.

Table 1.0: Under-five and infant mortality rates by state, 1990 and 2007

	Under-five		Infant	
	1990	2007	1990	2007
Malaysia	16.8	7.9	13.1	6.2
Johor	16.6	7.1	13.4	5.9
Kedah	18.8	9.7	14.6	7.8
Kelantan	17.6	11.1	13.5	8.0
Melaka	13.8	9.6	11.1	7.8
Negeri Sembilan	15.6	8.0	12.7	6.2
Pahang	20.7	10.8	15.9	7.9
Perak	17.7	9.3	13.2	6.7
Perlis	20.7	9.7	16.9	7.4
Pulau Pinang	12.2	7.6	10.2	5.8
Sabah ^a	21.4	3.9	16.3	3.0
Sarawak	12.7	7.9	10.0	5.9
Selangor ^b	14.6	6.4	11.7	5.2
Terengganu	20.2	12.1	15.3	9.9
Kuala Lumpur	12.0	7.2	9.6	6.1

a. Includes Labuan for 2007.

b. Includes Putrajaya for 2007.

Source: Malaysia, Department of Statistics, *Vital Statistics*, various years.

Data references (Malaysia: The Millennium Development Goals At 2010).

A study on under-five deaths in Malaysia showed that for the non hospital death, 4.3% died in the clinic and this might imply that there was delay in seeking care and/or lack of resuscitation facilities or personnel in the clinic. Most of the non-hospital deaths were

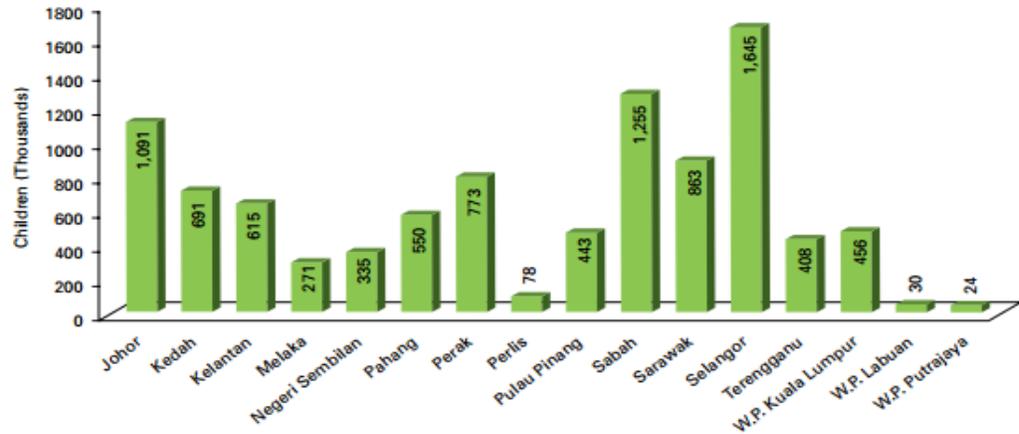
among Orang Asli children and non-citizens, suggesting parents' ignorance of the severity of illness or those socio-cultural and economic factors are preventing parents from seeking medical care for their children. Non-availability of transport was one of the main reasons for not seeing care or for delay in seeking care. It is probable that many of these nonhospital deaths were preventable, if only the parents had brought the children to hospitals early 9.4% of the preventable deaths were thought to be due to peripheral or referral problems. Although the percentage was quite low, it is significant enough to contribute to the mortality rate (Lan and Ismail, 2008).

The under-five mortality rate Malaysia is likely to achieve this target by 2015. Both the under five mortality rate and the infant mortality rate declined from 1990 to 2008: the former from 16.8 deaths per 1,000 live births to 8.1, and the latter from 13.1 deaths per 1,000 live births to 6.4. The under-five mortality rate is a leading indicator of child health and overall development. The MDG target for under-five mortality for Malaysia by 2015 is 5.6 per 1,000 live births, and is likely to be achieved. Under-five mortality declined in all states from 1990 to 2007 (Table 1.0) with declines generally greater in the first decade than in the more recent period. In 1990, Pahang, Perlis, Sabah and Terengganu had the highest under-five mortality; all four states had rates above 20 deaths per 1,000 live births. By 2007, all states in Malaysia had rates below 20 per 1,000 live births, and only Pahang, Kelantan and Terengganu had rates above 10 per 1,000 live births (Malaysia : The Millennium Development Goals At 2010).

Malaysia is home for 9.5 million children (Figure 1.2). It has shown tremendous progress in improving children's well-being. The under-five and infant mortality rates were reduced to 8.5 and 6.8 per 1,000 live births respectively in 2010, half the 1990 rates (Figure 1.3). The proportion of children living in poverty declined significantly since 1989, and more than 90 per cent of children are now enrolled in primary schools. Although significant improvements on children's well-being have been realized over the years, these improvements might not reach all groups due to disparity in gender, age, ethnic group, and geographical locations. National averages fail to convey the significant differences between ethnic groups and across states. For example, the risk of a newborn child in Kelantan to die before reaching the age of five years is twice higher than the risk of a new-born in Kuala Lumpur, the risk of a Malay new-born to die before reaching the age of one year is twice as high as the risk of a Chinese new-born to die by the same age. Boys face slightly higher risk of dying at a young age than girls. Access to health facilities and to qualified doctors' services varies across states; the poor in some states are particularly disadvantaged. In 2010, in Kuala Lumpur one doctor was serving on average 78 children less than 15 years of age, among all patients; in Sabah one doctor had to serve on average 532 children the same age, among all patients. In 2012, in Pulau Pinang, Melaka, W.P. Kuala Lumpur and W.P. Labuan all poor households had access to public health facility within five kilometres from house; in Sarawak this percentage was only 45.0 (UNICEF., 2013).

Malaysia is home of 9.5 million children

Child population, 2010 (Thousands)

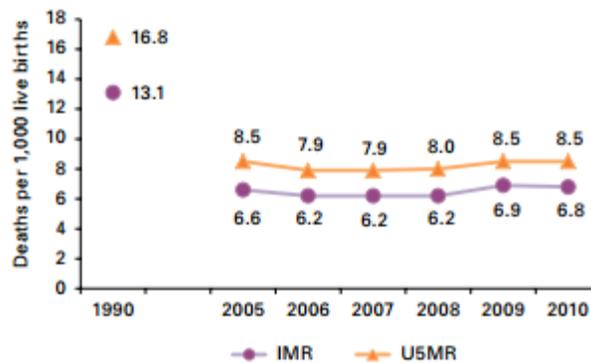


Source: Department of Statistics Malaysia (2011): Population distribution and basic demographic characteristics: Population and housing census 2010. Note: Children include population below 18 years of age. Total child population, adjusted for under-enumeration rate is 9,574 thousand.

Figure 1.1: Child population, 2010 (Thousands)

Child mortality is kept at low levels

Infant and under-5 mortality, 1990 and 2005-2010
(Deaths per 1,000 live births)



Source: 1990: United Nations Country Team Malaysia & Economic Planning Unit, Prime Minister's Department Malaysia (2011): Malaysia: The Millennium Development Goals at 2010; 2005-2006: Department of Statistics Malaysia (2008): Vital Statistics Malaysia 2007; 2007: Department of Statistics Malaysia (2009): Vital Statistics Malaysia 2008; 2008: Department of Statistics Malaysia (2010): Vital Statistics Malaysia 2009; 2009-2010: Department of Statistics Malaysia (2011): Vital Statistics Malaysia 2010. Note: IMR refers to infant deaths per 1,000 live births; U5MR refers to under-5 deaths per 1,000 live births. 2010 - preliminary.

Figure 1.2: Infant and under-5 mortality, 1990 and 2005-2010 (Deaths per 1000 live births)

Emergency and critical care services are often cited as one of the weakest part of health systems and improving such care has the potential to significantly reduce mortality (Baker *et al.*, 2009). Prevention through preparedness is probably the most important phase of response in emergency and disaster management.

As the effect of above issues, it is important for health care provider to understand the services available to desperately ill children outside tertiary care settings. Optimizing health clinic readiness for emergencies requires consideration of the unique aspects of each clinic practice, the types of patients and emergencies that might be seen, the resources on site, and the resources of the larger emergency care system of which the pediatric primary care provider's is a part. Parent education regarding prevention, recognition, and response to emergencies, patient triage, early recognition and stabilization of pediatric emergencies in the clinic, and timely transfer to an appropriate facility for definitive care are important responsibilities of every health care provider. In addition, health care providers in health clinics can collaborate with out-of-hospital and hospital-based providers and advocate for the best-quality emergency care for their patients (Frush, 2007).

My study is to assess the preparedness of health clinics and medical practitioners in charge, whether it is sufficient to deal with paediatric emergencies. I hope this study can look and search for any weaknesses and any variables related with their preparedness level, since there was no similar studies conducted in this country.

2. LITERATURE REVIEW

Despite the prevalence of outpatient emergencies, many health clinics remain unprepared or underprepared to handle these types of problems. Deficiencies include failure to stock proper equipment and medications, provide up-to-date emergency training and certification for staff, participate in regular clinic mock codes, and develop written protocols. Pediatric emergencies may not be common occurrences in all primary care settings; however numerous studies have shown that children continue to be taken to health clinic at the time of an emergency (Altieri *et al.*, 1990; Schuman, 1996).

In the majority of the practice surveyed, medical personnel were both unprepared and ill-equipped to treat clinically ill children. Primary practitioners are required to provide urgent care in their clinic for children with these conditions, at least until the arrival of EMS. The consequences of being unprepared are serious. Therefore, appropriate stabilization of pediatric emergencies and timely transfer to an appropriate facility for definitive care are important responsibilities of every primary practitioner (Al-Anazi, 2012).

The apparent lack of preparedness has been attributed to the perception that emergencies are rare, physicians are busy to prepare, the cost of preparing for emergencies is prohibitive, and hospitals are closest by (Schexnayder and Schexnayder, 1996; Wheeler *et al.*, 2000).

2.1 Medical Practitioner

House officer basically means a medical practitioner who undergoes internship training under the Medical Act 1971. 'Housemanship' or 'Internship' is the period of resident medical practice before full registration as stipulated under the Medical Act 1971. Currently in Malaysia, a house officer needs to complete a six-posting internship training before he can be registered in the Malaysian Medical Council as a fully registered medical practitioner (Council, 2008). In this 6-posting training period, he will be under strict supervision and the training must be done in a training hospital for six major postings including medical, surgical, paediatrics, obstetrics and gynaecology, orthopaedics, and emergency department and/or anaesthesiology department.

During this training period, a house officer needs to consolidate build on the knowledge during undergraduate studies and to apply it in clinical practice, brush up clinical, technical, and professional skills, as well as take increasing responsibility for patient's care (Council, 2008). House officers are also expected to excel in resuscitation knowledge and skills since they deal with medical emergency cases on daily basis. Only after completing the 6 postings he would be entitled to become a fully registered medical practitioner or a medical officer

Medical officer in Malaysia is defined as a doctor who has completed two years of supervised housemanship training. They are involved in a wide scope of health delivery

service especially in examining, diagnosing and treating sick patients, performing procedures, administering and prescribing medication, surgery and alleviating pain and suffering in patients. They are also expected to know resuscitation procedure and practice since they are the ones who encounter most of the cases in the hospitals or any health care centres. As defined under Article 132 of the Federal Constitution, they have to serve a continuous total period of not less than 3 years upon being given full registration (Medical Act 1971 section 40). Medical officers can either choose to work in hospitals or they can work at other government health facility including district hospitals and health clinic. In health clinics, they are running the clinics during office hours with some exception of extended hours to cater for crowd demand. Here in health clinics, they usually see non-critical cases for example simple febrile illness or upper respiratory tract infections but unfortunately, rarely they stumble upon a case of medical emergencies specifically in pediatric patient. This is when they are expected to apply all the knowledge and skills learned during their internship period. The question is whether they still remember everything learned few years back.

Medical officers who are in the Emergency Department or Pediatrics and Anaesthesiology Department who encounter emergency cases on daily basis should be more confident in performing basic life support for them. Questions arise for medical officers who are working in prehospital settings for example in health clinics who rarely come across emergency cases. They have long left the hospital and they are in a very safe zone, seeing non critical patients on daily basis. It is unfortunate if their previous

knowledge and skills of resuscitation and basic life supports fade away. Medical officers in health clinics are expected to have sufficient knowledge regarding basic life support (BLS) after completing their two-year training in housemanship. However, during housemanship period, their knowledge was only average and they had poor confidence in performing CPR, as revealed by a study done in 2011 (Chew *et al.*, 2011)

2.2 Emergency cases and frequency

Studies have shown that emergencies are common in primary care practices that provide care to children. In one study, the authors surveyed 52 pediatric clinic and found that these practices saw a median of 24 emergencies per year. Most of the clinics (82%) reported that they encountered, on average, at least 1 emergency per month (Flores and Weinstock, 1996).

In another study, 62% of pediatricians and family physicians in an urban setting who were asked about emergencies in their clinic reported that they assessed more than 1 patient each week in their clinic that required hospitalization or urgent stabilization (Fuchs *et al.*, 1989). A study of general practitioners in rural Australia found that these physicians saw a median of 8 emergencies per year, and that 95% had seen at least one emergency in the preceding 12 months (Johnston *et al.*, 2001).

Children requiring urgent or emergent treatment often are brought first to their primary-care physician. Pediatric clinic encounter an average of 1 to 38 emergencies per clinic per year. A periodic survey from the American Academy of Pediatrics (AAP) demonstrated that 73% of respondents encountered at least 1 patient per week who required emergency treatment or hospitalization (Bordley *et al.*, 2003).

Airway emergencies are by far the most common events in clinic, accounting for approximately 75% of emergencies encountered in primary-care practice. One study identified the 4 most frequently seen airway emergencies, in order from most prevalent to least prevalent, as bronchiolitis, respiratory distress, asthma, and croup. Dehydration, seizures, and anaphylaxis came next in frequency. Rarer emergencies included respiratory failure, severe trauma, foreign body/obstructed airway, shock, meningitis, sepsis, and apnea (Santillanes *et al.*, 2006).

2.3 Equipment and medication availability

Most health clinics are not fully prepared for pediatric emergencies. In a study, the majority of these practices, doctors and paramedics were not fully prepared and did not have proper equipment to manage childhood medical emergencies. Emergency drugs like epinephrine, oxygen equipment, and disposables like intravenous catheters, bag-valve-mask devices and nebulisers were not available in many clinics. Many reasons were cited by the

physicians for the lack of preparedness. Their perception was that pediatric emergencies were not frequently seen in the clinic through surveys point to the contrary. They were also do not have enough time to attend necessary training and other reason was due to emergency equipment and medication was too costly to purchase (Fuchs *et al.*, 1989). In another study done on 2001 in North Carolina, surveys were done among 187 family physicians and 129 pediatricians practicing in North Carolina with 75% and 86% response rate, respectively. The study was comparing pediatric emergency preparedness among family physician and pediatrician shows that the family physician saw fewer children with medical emergencies than did pediatrician, and they were substantially less prepared for child emergencies in terms of the items recommended for resuscitation and stabilization (Mansfield *et al.*, 2001).

Every clinic should be equipped with emergency equipment and drugs, which can be used in children of various age groups (Jatana, 2012). They can initiate preparedness program by purchasing emergency equipment and medications that reflect the spectrum of anticipated emergencies in their patient populations, the practitioners' skill, and the distance to the nearest emergency department. There are many factors need to be consider when choosing medications and equipment for emergency supplies, particularly in pediatric emergency. The physicians should consider the spectrum of their health clinic's anticipated emergencies (Toback, 2007). Equipment choice should also reflect each health clinic's patient population in which the health clinic with large number of chronically ill children may need to have a more extensive stock of equipment and medication. Apart from that, the

other factors should be based on availability of skilled and experienced emergency medical providers. For medical and legal reasons, no health clinic should be stock equipment that cannot be used safely by their staff. The distance from the health clinic to the nearest emergency department should also be considered in choosing their emergency supplies. In the rural health clinic, physicians may need to purchase equipment and medications that may be beneficial during prolonged resuscitation, in which they need to consider the additional time patients will spend travelling to the closest emergency department (Frush, 2007).

Health clinic often fail to keep on hand a stock of functional, well-organized, and easily accessible supplies for emergencies. Basic equipment to tackle pediatric emergencies in health clinic practice includes oxygen cylinder, masks of various sizes, ambu bag, suction apparatus, airways of different sizes, catheters, feeding tubes, intubation equipment, intravenous fluids, and emergency drugs (Kliegman, 2012). A study of 52 pediatric clinics that saw a total of more than 2,400 emergencies each year found that the following crucial supplies were often unavailable: oxygen (27%), IV catheters (27%), bag-valve masks (29%), and IV fluids (55%) (Flores and Weinstock, 1996).

Recommendations as to the minimum of emergency equipment necessary for a health clinic vary greatly. The list of suggested emergency medications and equipment in table 2.3.1 to 2.3.6 is based on few published guidelines (Feldman, 2009; Frush, 2007).

Table 2.3.1 Recommended Equipments for Pediatric Office Emergencies

Office Emergency Equipment and Supplies	Priority ^a
Airway management	
Oxygen-delivery system	E
Bag-valve-mask (450 and 1000 mL)	E
Clear oxygen masks, breather and nonrebreather, with reservoirs (infant, child, adult)	E
Suction device, tonsil tip, bulb syringe	E
Nebulizer (or metered-dose inhaler with spacer/mask)	E
Oropharyngeal airways (sizes 00–5)	E
Pulse oximeter	E
Nasopharyngeal airways (sizes 12–30F)	S
Magill forceps (pediatric, adult)	S
Suction catheters (sizes 5–16F) and Yankauer suction tip	S
Nasogastric tubes (sizes 6–14F)	S
Laryngoscope handle (pediatric, adult) with extra batteries, bulbs	S
Laryngoscope blades (0–2 straight and 2–3 curved)	S
Endotracheal tubes (uncuffed 2.5–5.5; cuffed 6.0–8.0)	S
Stylets (pediatric, adult)	S
Esophageal intubation detector or end-tidal carbon dioxide detector	S
Vascular access and fluid management	
Butterfly needles (19–25 gauge)	S
Catheter-over-needle device (14–24 gauge)	S
Arm boards, tape, tourniquet	S
Intraosseous needles (16 and 18 gauge)	S
Intravenous tubing, microdrip	S
Miscellaneous equipment and supplies	
Color-coded tape or preprinted drug doses	E
Cardiac arrest board/backboard	E
Sphygmomanometer (infant, child, adult, thigh cuffs)	E
Splints, sterile dressings	E
Automated external defibrillator with pediatric capabilities	S
Spot glucose test	S
Stiff neck collars (small/large)	S
Heating source (overhead warmer/infrared lamp)	S

- Note that some offices are located at a distance from EMS services. Providers in offices that are located more than 10 minutes away from the nearest EMS service need equipment that may not be required in the initial minutes of a resuscitation but will be required as the resuscitation effort extends past 10 minutes.
- E indicates essential; S, strongly suggested (essential if EMS response time is >10 minutes).
- Adapted from: American Academy of Pediatrics, Committee on Pediatric Emergency Medicine. Emergency Medical Services for Children: The Role of the Primary Care Provider. Singer J, Ludwig S, eds. Elk Grove Village, IL: American Academy of Pediatrics; 1992.

Data Reference (Frush, 2007).

Table 2.3.2 Recommended Medications for Pediatric Office Emergencies

	Priority ^a
Drugs	
Oxygen	E
Albuterol for inhalation ^b	E
Epinephrine (1:1000)	E
Activated charcoal	S
Antibiotics	S
Anticonvulsant agents (diazepam, lorazepam)	S
Corticosteroids (parenteral/oral)	S
Dextrose (25%)	S
Diphenhydramine (parenteral, 50 mg/mL)	S
Epinephrine (1:10 000)	S
Atropine sulfate (0.1 mg/mL)	S
Naloxone (0.4 mg/mL)	S
Sodium bicarbonate (4.2%)	S
Fluids	
Normal saline solution or lactated Ringer's solution (500-mL bags)	S
5% Dextrose, 0.45 normal saline (500-mL bags)	S

- E indicates essential; S strongly suggested (essential if EMS response time is more than 10 minutes).
- Metered-dose inhaler with spacer or mask may be substituted.
- Adapted from: American Academy of Pediatrics, Committee on Pediatric Emergency Medicine. Emergency Medical Services for Children: The Role of the Primary Care Provider. Singer J, Ludwig S, eds. Elk Grove Village, IL: American Academy of Pediatrics; 1992.

Data reference (Frush, 2007).

Table 2.3.3 Circulation supplies recommended for physicians' offices

Recommended
Cardiac arrest backboard
Sphygmomanometer (with assorted cuffs)
Intraosseous needles (16 gauge)
Intravenous fluids and tubing
Normal saline (two 500 mL bags)
Desirable
Vascular access
Intravenous butterfly needles (25, 23, 21 gauge)
Indwelling intravenous catheters (24 to 18 gauge)
Normal saline in 5% dextrose (two 500 mL bags)
Extension tubing
Drip chambers (solusets)
Syringes (1 mL, 5 mL, 10 mL) with needles
Tape
Tourniquet (rubber bands, tubing)
T-connectors
Arm boards

Data Reference (Feldman, 2009).

Table 2.3.4 Emergency drugs recommended for physicians' offices

Recommended
Dosing cards or tapes
Epinephrine for anaphylaxis (1:1000 solution: 0.01 mg/mL/kg to a maximum of 0.3 mg/dose) Intramuscular route in the vastus lateralis muscle
Salbutamol solution for nebulization: 0.5 mL (of 5 mg/mL solution = 2.5 mg) diluted to 3 mL in saline for infants and toddlers, and 1 mL diluted to 3 mL in saline for older children
Epinephrine (1:1000) for nebulization for airway compromise (eg, croup) 0.5 mL/kg
Compressor with nebulizer and masks of various sizes
Desirable
Epinephrine (1:10,000) Should be given if intraosseous access is available for paediatric advanced life support. Should not be stocked by non-paediatric advanced life support certified providers if this leads to confusion with 1:1000 concentration
Diazepam (0.1 mg/kg every 5 min, maximum of three doses or 0.3 mg/kg intravenous or 0.5 mg/kg rectally) or lorazepam (0.1 mg/kg intramuscular or intravenous)
Chemstrips and lancets for blood glucose determination
Dextrose (25%: 1 mL/kg to 2 mL/kg and 10%: 2.5 mL/kg to 5 mL/kg)
Dextrose gel
Salbutamol aerosol: three to six puffs

Data Reference (Feldman, 2009).

Table 2.3.5 Trauma and miscellaneous supplies recommended for physicians' offices.

Recommended
Stiff neck collars (large and small)
Dressings, bandages, splints
Emergency equipment container (cart box)
Latex-free gloves
Desirable
Nasogastric tubes (10 F, 16 F)
Steristrips, dressings, bandages, splints

Table 2.3.6 Airway supplies recommended for physicians' offices

Recommended
Bag valve mask (self-inflating with reservoir)
Paediatric volume: 100 mL to 700 mL
Adult volume: 700 mL to 1000 mL
Oxygen masks (adults, children and infants)
Oxygen tank and valve with flow meter
Oxygen tubing
Also refer to Table 2.3.4 (nebulizer and medications for inhalation)
Desirable
Pulse oximeter
Laryngoscope and blades with endotracheal tubes (various sizes) or laryngeal airway masks (various sizes), the choice depending on the level of expertise
Suction machine and catheters
Oral airways, various sizes
Suction tips (Yankauer)
Spacer device for aerosolized medication (adult, infant)

Data References (Feldman, 2009).

2.4 Training and education

Studies have shown that a substantial number of practices are not prepared to manage pediatric emergencies and have documented deficiencies in equipment and training. One study showed that physicians with training in APLS were more likely to have resuscitation equipment and to have conducted a mock code in their clinic (Mansfield *et al.*, 2001).

One study on Knowledge, Attitude and Confidence Level of Adult Cardiopulmonary resuscitation among junior medical officers in Kelantan revealed that more than 85% of them were not confident in the practice of resuscitation. Adding to that statement, only approximately 15% of them were confident to be the team leader of resuscitation. Another interesting point to be noted was that 66% of the junior doctors never handled a defibrillator, a machine that increased patient's survival (Chew *et al.*, 2011). As they are the doctors that will be sent to the health clinic after completing their housemanship practice, this number is rather worrying. They are the front liners who will handle cardiorespiratory arrest cases both in adult and pediatric, although rarely, in the health care settings soon or later.

Furthermore, one study carried out in Karnataka, India revealed that most of the junior doctors had inadequate knowledge and skills to perform CPR. Out of 20 series of questions on basic life support and CPR, almost 50% of them had poor and very poor