

# A One Month Review of the Types of Medical Emergencies and their Treatment Outcomes at Two Urban Public Health Clinics

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## SUMMARY

**Introduction:** Our study was to examine prevalence and treatment outcomes of medical emergencies at two urban public health clinics in the Petaling district, Selangor, Malaysia.

**Methods:** A prospective universal sampling was employed to recruit all emergencies over one month period (12 April to 11 May 2011). A structured case record form was used to capture demographic data, whether the index case was self-presenting or decided by health care workers as a medical emergency, presenting complaints, diagnoses, concurrent chronic diseases and their treatment outcomes at the clinic level. Emergency presentations and diagnoses were classified according to the International Classification of Primary Care, revised second edition (ICPC-2-R).

**Results:** A total of 125 medical emergencies with 276 presenting complaints were recorded. The mean age was 30.7 years old (SD 19.9). The prevalence of medical emergency was 0.56% (125/22,320). Chief complaints were mainly from ICPC-2-R chapter R (respiratory system) and chapter A (general and unspecified), 40.0% and 28.0% respectively. The most common diagnosis was acute exacerbation of bronchial asthma (34.6%). Forty percent were referred to hospitals. After adjusting for age and gender, patients who presented with painful emergency (OR 4.9 95% CI 2.0 to 11.7), cardiovascular emergency (OR 63.4 95% CI 12.9 to 310.4) and non-respiratory emergency were predictors of hospital referral (OR 4.6 95% CI 1.1 to 19.1).

**Conclusion:** There was about one medical emergency for every 200 patients presenting to these urban public polyclinics which were mainly acute asthma. More than half were discharged well and given a follow-up.

## KEY WORDS:

*Prehospital Emergency Care, Medical Emergency, Prevalence, Treatment Outcomes, Primary Care*

## INTRODUCTION

More than 85% of Malaysians access ambulatory care services each year<sup>1</sup>. However, we lack published data on the medical emergencies, its prevalence and treatment outcomes at primary health care setting in this country. Injury, poisoning and the consequences of external trauma (such as inter-personal violence, sporting and recreational activities, and work) constituted the third (8.98%) principal cause of hospitalization and the fifth (5.35%) principal cause of death in public hospitals in Malaysia for the year 2010<sup>2</sup>. An Australian study reported that general practitioners in south-east of Queensland saw a median of 8 emergency cases per year as compared to about 1000 life-threatening cases per year that occurred in primary care medical clinics in the whole city of Ottawa, Canada<sup>3,4</sup>. Both the family physician and the paediatrician practice in North Carolina, United States saw similar childhood emergencies, albeit with fewer cases per year than the former, about 3.8 paediatric emergencies each year<sup>5</sup>. Besides these reports, there was generally lack of data on in-office or health clinics medical emergencies.

A medical emergency is said to have happened when a patient presents with a condition of sufficient severity that requires immediate medical attention, absence of which might result in serious jeopardy to health or body-organ dysfunction. The common emergency cases seen at the health clinics include asthmatic attack, acute exacerbation of chronic bronchitis, unstable angina, myocardial infarction, severe dehydration, stroke, fainting spells, seizure, anaphylaxis, motor vehicle accident, poisoning and parasuicide. The profiles of emergency cases that present to the health clinics may significantly different from those that are brought to the hospital-based emergency departments. The types and frequencies of these emergencies also vary amongst the different health clinics in varied geographical regions<sup>3</sup>. Preparedness of the physicians and their facility were also very much varied amongst them<sup>6</sup>. Generally, effective management of emergency cases requires appropriately equipped facility and trained personnel<sup>7</sup>. This is all the more so in primary care setting where there is often the golden opportunity for the healthcare providers to make

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the first or early contact with the patient. Morbidity and mortality is often dependant on the effective management of these cases. This is aptly illustrated in the concept of the "chain-of-survival" in a case of cardiopulmonary resuscitation<sup>8</sup>.

Our study was designed to find out the prevalence of emergency cases and their outcomes in the public health clinics using the International Classification of Primary Care, revised second edition (ICPC-2-R)<sup>9</sup>. There is a paucity of the number of local studies in this area resulting in a lack of information for the various stakeholders involved in the emergency care services at the level of public health clinics. Such information like the demographic profiles of patients presented with medical emergencies to public health clinics and their outcomes are essentials to help prepare the types of training for doctors and staffs<sup>10</sup>. We hope that the results of this study could serve as a starting point for more future studies as well, as to facilitate better planning of emergency care services and to generate wider interest in emergencies-related researches at the primary care level. Ultimately, we hope that this would then translate into better emergency care with improved patient safety as well as alleviation of staff anxiety when dealing with emergencies<sup>10-12</sup>.

## MATERIALS AND METHODS

This study protocol was registered with the Ministry of Health Medical Research Ethics Committee (NMRR-11-297-8326) and approved by the Universiti Putra Malaysia Medical Ethics Committee.

### Setting

Two public health clinics, namely the Seri Kembangan Health Clinic and the Puchong Health Clinic, in the Petaling District, Selangor were invited to participate in this study. Universal sampling was employed to recruit all emergency cases over one month period, from 14th April to 13th May 2011. The total registered patients attended these two clinics over the study period was 22,320.

### Subjects and data collection

All patients who were deemed to have medical emergencies in these two public health clinics during the stipulated one-month study period were invited to participate. Information regarding this study was made available at the strategic points around the clinics, for instance, at the entrances, in the treatment rooms and at the registration counters. A structured case record form (CRF) was developed to capture the socio-demographic profile of each patient presented with medical emergency. Participating clinics' staffs were briefed on the study protocol prior to commencement. The attending healthcare providers filled up this questionnaire after fully attended to the patient. The attending healthcare providers refer to the assistant medical officers and nurses working at the treatment/emergency rooms; and doctors who diagnosed and managed patients with medical emergencies. The participating family medicine specialist (FMS) at the clinics validated the entry of the questionnaire, confirmed the outcomes of each emergency case treated at the clinics under his/her care and coded them according to the ICPC-2-R. This exercise of questionnaire entry validation was done at the

earliest instance within the same week of patient's visitation. The participating clinics were responsible for safe keeping of the forms. A trained research assistant was placed at each of the participating clinics to coordinate and facilitate filling up the CRF. We checked the patient log books in the treatment/emergency rooms and asked assistant medical officers who were on duty for the periods of time the research assistants was absent from the participating clinics eg. lunch hours, after and before office hours and weekends/public holidays to confirm the total number of medical emergencies captured during the specified periods.

### Variables measured

The CRF captured the date, time and demographic data. We also recorded whether the medical emergency was patients presenting themselves or deemed so by the attending health care providers. All emergency symptoms or health problems, as complained by the patients or identified by the health care providers, respectively, were recorded. Diagnoses were the working clinical diagnoses upon which the health care provider administered medical treatment. The standard form also captured any concurrent chronic diseases the patients were having. Chronic disease was defined as any medical condition that could have been lasted for more than six months with or without resolution. To investigate the treatment outcomes, four options were included in the CRF: 1) passed away in the clinic, 2) referred to hospital, 3) given follow-up appointment and 4) fully recovered and discharged. All these data were obtained from patients' records. The definition of full recovery is that the patient is considered fully treated from his/hers episode of emergency after the medical treatment or intervention, and/or after a period of observation at the clinic and the patient is considered safe to go home for self-care. These emergencies were mostly of the acute and episodic eg. fall with laceration, minor soft tissue injuries with wound dressing, those emergencies that need follow-ups but not with the clinic in the study. Reasons for encounter (RFE) and diagnoses were assessed according to the ICPC-2-R<sup>9</sup>.

### Statistics

Data were handled with Statistical Package for the Social Sciences (SPSS) version 19. The continuous variables were tested for statistical significance using the Student's t-test or ANOVA (analysis of variance) while the  $\chi^2$  tests for nominal variables. Multiple logistic regression was employed to reveal the possible predictors for the treatment outcomes. Test of significance were two-tailed with p value of less than 0.05 is considered as statistically significant at 95% confidence interval.

## RESULTS

No patients opted out of this study. A total of 125 medical emergencies with 276 presenting complaints were recorded over the one month study period. Ten patients presented out of office hours, four were during the lunch break hours and six were between 1700 to 0800 hours. The prevalence of medical emergency was 0.56% (125/22320). The mean age was 30.7 years old (SD 19.9, range 19 days to 76 years). Table I shows the socio-demographic data of patients presented with medical emergency to these two clinics. There were a

Table I: Socio-demographic Data

		Community Polyclinic, n (%)			$\chi^2$	P value
		Total	Seri Kembangan	Puchong		
Case Deems emergency	Patients self present	52 (42.6)	50 (80.6)	2 (3.3)	74.52	< 0.0001
	Provider decision	70 (57.4)	12 (19.4)	58 (96.7)		
Total		122 (100.0)	62 (100.0)	60 (100.0)		
Gender	Female	61 (49.6)	34 (55.7)	27 (43.5)	1.83	0.21
	Male	62 (50.4)	27 (44.3)	35 (56.5)		
Total		123 (100.0)	61 (100.0)	62 (100.0)		
Ethnicity	Malay	68 (55.3)	33 (54.1)	35 (56.5)	2.45	0.65
	Chinese	13 (10.6)	9 (14.8)	4 (6.5)		
	Indian	33 (26.8)	15 (24.6)	18 (29.0)		
	Arborigines	4 (3.3)	2 (3.3)	2 (3.2)		
	Others	5 (4.1)	2 (3.3)	3 (4.8)		
Total		123 (100.0)	61 (100.0)	62 (100.0)		
Educational Level	No formal education	19 (19.8)	10 (18.2)	9 (22.0)	7.84	0.10
	Primary	18 (18.8)	14 (25.5)	4 (9.8)		
	Secondary	41 (42.7)	19 (34.5)	22 (53.7)		
	Tertiary	17 (17.7)	12 (21.8)	5 (12.2)		
	Others	1 (1.0)	0	1 (2.4)		
Total		96 (100.0)	41 (100.0)	42 (100.0)		
Occupation	Employed	32 (32.0)	18 (31.0)	14 (33.4)	10.19	0.04
	Unemployed	38 (38.0)	27 (46.6)	11 (26.2)		
	Student	28 (28.0)	13 (22.4)	15 (35.7)		
	Others	2 (2.0)	0	2 (4.8)		
Total		100 (100.0)	58 (100.0)	42 (100.0)		
Treatment Outcome	referred to hospital	50 (40.3)	15 (24.2)	35 (56.5)	36.10	< 0.0001
	fully recovery and discharge	35 (28.2)	12 (19.4)	23 (37.1)		
	follow up appointment	39 (31.5)	35 (56.5)	4 (6.5)		
Total		124 (100.0)	62 (100.0)	62 (100.0)		

† Chi-square test

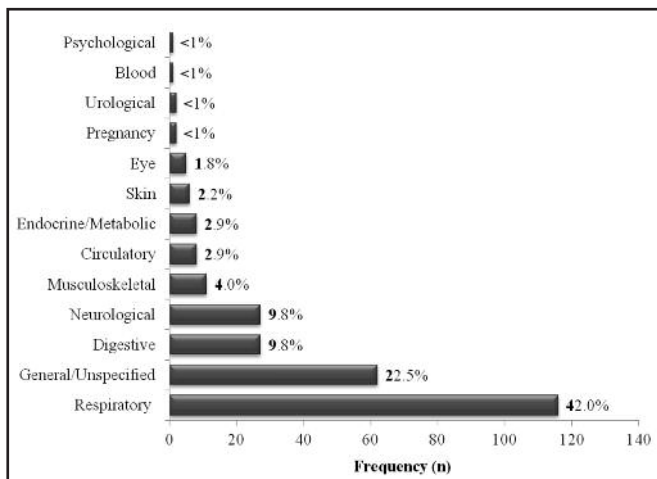
total of 26 mentions of concurrent chronic diseases and the two most common chronic diseases were diabetes mellitus and hypertension with 26.9% (7/26) and 23.1% (6/26) respectively. Other concurrent chronic diseases included gestational diabetes, chronic obstructive pulmonary disease, chronic alcohol abuse, stable angina, hyperthyroidism, iron deficiency anaemia, Glucose-6-phosphatase dehydrogenase (G6PD) deficiency and cerebral palsy. Forty percent were referred to hospitals compared to 31.2% given a clinic follow-up and 28.0% discharged upon full recovery. No mortality was reported at these clinics.

Chief complaints were mainly coded according to the ICPC-2-R Chapter R (respiratory system) and Chapter A (general and unspecified), 40.0% and 28.0% respectively. Similar trend was also observed in the breakdown of all the reasons for contact, from the perspective of the patient, in the chapter on ICPC-2-R classification (Figure 1). There were 75.2%, 37.6% and 10.4% of patients presenting with two, three and four complaints respectively. Figure 2 shows that the three most common presenting emergency symptoms were shortness of breath, cough and fever. There were a total of 133 diagnoses or health problems with seven patients had two and one patient recorded three. The most common diagnoses were acute exacerbation of bronchial asthma (34.6%), viral fever mostly suspected dengue (10.5%) and trauma/injury (7.5%) (Figure 3). Emergency and complications of cardiovascular diseases such as the acute myocardial infarction, hypertension and diabetes mellitus amounted to about 10% of the total diagnoses. Maternal and child emergencies (4.5%) consisted of hyperemesis gravidarum, pre-eclampsia, miscarriages, fetal distress and neonatal jaundice.

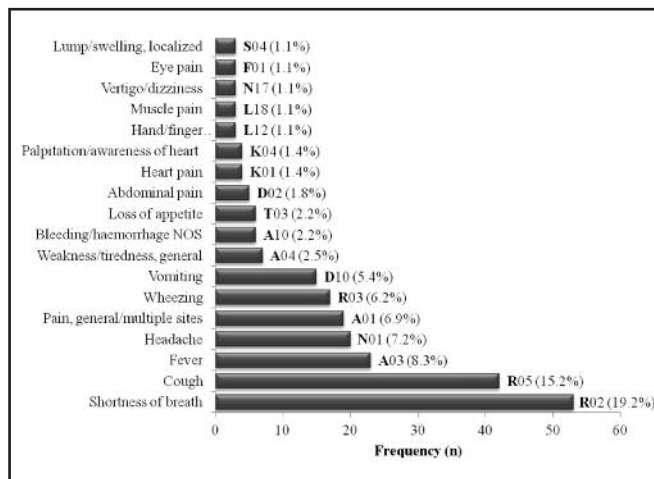
After adjusting for age and gender, patients who were deemed as having emergency by the health care provider (OR 5.4 95% CI 2.2 to 12.9), who presented with emergency conditions that were painful (OR 4.9 95% CI 2.0 to 11.7), those with a cardiovascular emergency (OR 63.4 95% CI 12.9 to 310.4) and those with non-respiratory emergency were predictors of hospital referral (OR 4.6 95% CI 1.1 to 19.1).

## DISCUSSION

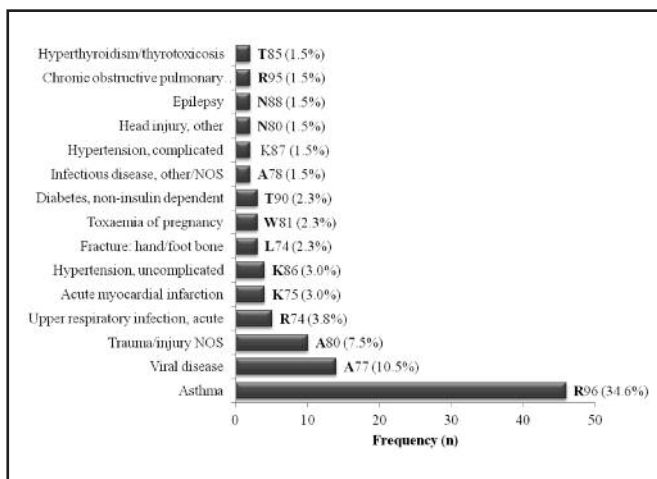
Our study reports the medical emergency prevalence, profiles and treatment outcomes at public community health clinics using the ICPC-2-R. The strength of our study was its prospective design and the use of ICPC-2-R which allows the findings to be compared with other studies. We observed that the prevalence of medical emergencies at these two urban public health clinics was about 0.5% with most occurrences happened during office hours and many more were deemed to have an emergency by the health care providers instead of self-presentation. In other words, most of the medical emergencies could be either asymptomatic or patients were unaware, and they happened mostly among the follow-up patients at these clinics. Campbell reported that in Scotland general practice (GP), patients' heightened sense of medical urgency was associated with perception of doctor unavailability<sup>13</sup>. Our public health clinics' setting was larger with many doctors and allied health services compared to that of the Scotland GP. We are not certain whether there was a better patient's perception of doctor or healthcare provider's availability here or was there another reason for this observation especially the vast difference between the two clinics in this study. Nevertheless, the two most different



**Fig. 1:** International Classification of Primary Care revised second edition (ICPC-2-R) chapter of all patients' problems. Breakdown of the reasons for contact, from the perspective of the patient.



**Fig. 2:** Most frequent symptoms. Distribution and breakdown of the 18 contact reasons, from the perspective of the patient, which were named with a relative frequency of at least 1/100 patient contacts.



**Fig. 3:** Most frequent diagnoses. Distribution and breakdown of the 15 diagnoses with a relative frequency of at least 1/100 patient contacts.

variables between the two clinics had rather logical explanations when considered together: the clinic that had more self-presenting patients with medical emergencies had also more patients recovered fully and discharged or given a follow-up appointment as compared to the other clinic that had more medical emergencies diagnosed by healthcare providers and recorded more hospital referral.

The most common medical emergency treated at these public health clinics was acute exacerbation of bronchial asthma, followed by suspected dengue fever (both contributed 45.1% of the total diagnoses). This was in contrast to Ottawa medical clinics which had most emergencies of the cardiovascular system<sup>4</sup>. However, these two most common reasons for encounter when classified according to the ICPC-2-R chapters corresponded to the Queensland general practice<sup>3</sup> and out-of-hours primary care service demand in

Switzerland<sup>14</sup>. These diagnoses also corresponded to the three most common presenting symptoms which were shortness of breath, cough and fever (together contributed 42.7% of the total RFE). We could not ascertain the incidence rate of these cases because the study was not designed to differentiate each cases as distinctive on its own or merely repeated presentations. A population study in Asia Pacific region in 2003 revealed that almost half (43.6%) of patients with asthma had made unscheduled emergency visits to health care facilities<sup>15</sup>. Patient education and empowerment for self-care in asthma was reported to be low (one third to half) in an urban tertiary hospital emergency department in 2001<sup>16</sup>. Thus, our results indicate that there is a need for future studies to identify the adequacy of patient education/empowerment, appropriateness of asthma management, asthma control assessment, proper use of bronchodilators and inhaled corticosteroid in accordance to asthma severity<sup>17</sup>. In cases of viral diseases, they were mostly suspected dengue fever or dengue haemorrhagic fever which could present with severe dehydration or shock. These conditions demand immediate medical attention in terms of intravenous fluid therapy, haematologic laboratory investigation and referral for in-patient care. The effectiveness of health educations and the emergency management of this deadly viral disease could not be assessed in our study without knowing the ultimate outcome of these patients in the hospitals.

We noticed that trauma/injury from road traffic and general accidents with bone fractures and laceration was the third most common medical emergency presenting to these clinics. Acute cardiovascular diseases such as the acute myocardial infarction, hypertension and diabetes mellitus, and maternal and child emergencies were less common medical emergencies presenting to these public health clinics. Our multivariate analyses, after adjusting for age and gender, showed patients who presented with cardiovascular emergencies were 63 times more likely to be admitted, while those who presented with pain and none-respiratory



diagnoses were about five times more likely in need of hospital care. Managing a suspected acute myocardial infarction was common among the Ireland and Germany GP<sup>18, 19</sup>. These emergency presentations were also most likely to be associated with hospital referral in Nottingham<sup>20</sup>. Chest pain (39%), accident and injury (37%) and abdominal pain (14.9%) were the painful medical conditions in Nottingham GP patients who were sent to hospital. However, we were uncertain of the underlying diagnoses of those presented with shortness of breath in Nottingham, compared to acute asthma here, which constituted the fourth most common presentation to be referred for hospital care<sup>20</sup>. Proper management of these cases required specialized knowledge and skills, availability of special equipments and administered them promptly. Preparedness of the attending health care providers was paramount to the favorable outcomes of patients with these medical emergencies.

About half the patients presenting with medical emergencies to these clinics were referred to hospitals for further management. This was very high compared to the Scotland and Nottingham GP out-of-hours practice who recorded only 6.8% and 12% hospital referrals, respectively<sup>20, 21</sup>. The high hospital referral rate in our study could indicate real medical emergencies at these primary care clinics that required secondary care. This resulted in about two to three hospital trips per day (in a less than 20 working days per calendar month) for the ambulance from these clinics. With this high referral rate, good communication between the clinics and the hospitals is important for patient's treatment outcome at the hospitals<sup>22, 23</sup>. Maintenance and preparedness of the ambulance dedicated to this service has to be a routine service and the driver should be on high alert for a safe journey for both the patient and accompanying staff. With relatively moderate investment and without new personnel employment, the integrated emergency network model within the San Antonio Regional Health Service in Chile had improved ambulance response capacity, patients' and health care providers' perception of the pre-hospital emergency care<sup>24</sup>.

Our study revealed a stark difference in term of psychological emergency prevalence compared to the Europe. We recorded < 1% (Figure 1) of such emergency but it was reported to be 4% in Switzerland and 31% in Scotland<sup>14, 21</sup>. We are uncertain whether there was a real low prevalence of psychological emergency in our community or higher tolerance of psychological symptoms by patient and family; or plain unawareness of the emergency nature in psychological complaints. It was also likely that there were other preferred medical services other than the public health clinics for patients with urgent psychological needs in our community.

#### LIMITATION

The medical emergency profiles reported in this study could not be generalized to other public health clinics at other locations with different community and healthcare services set-up<sup>25</sup>. There were substantial missing data in socio-economic variables of education and employment status that would have influenced their real effect in our statistical analyses, this was also observed in another study<sup>26</sup>. This was expected realizing the clinical difficulties during the data

collection of these non-standard demographic data. The requirement of the attending health care providers to complete the CRF immediately, as one of the quality control measures, might have discouraged recruitment and data collection of the emergency patients in the busy public health clinics<sup>14, 21</sup>. This was observed in this study when research assistants had to help fill up the CRF towards the end of the day and even medical emergencies managed days before. The validation of the CRF by the FMS was occasionally hampered by the lack of clinical information on the patient's health record. This was also reported in a Germany study that up to 70% of medical emergency documentation was classified as insufficient<sup>19</sup>. Future similar studies should be advised to collaborate with the receiving hospitals in order to improve the collection of socio-economic variables as well as an assessment of treatment outcomes. The coding exercise using the ICPC-2-R requires better preparation and training in order to improve the accuracy, confidence and time efficiency amongst the busy clinician-users. These quality issues were restricted to few medical emergencies that presented with vague and undifferentiated symptoms such as dizziness, cough, loss of appetite, weakness/tiredness etc. In addition, ICPC-2-R was noted to be lacking in specific diagnostic codes for some medical emergencies<sup>27, 28</sup>.

#### CONCLUSIONS

There was about one medical emergency for every 200 patients presenting to these urban public health clinics which were mainly acute exacerbation of bronchial asthma, dengue haemorrhagic fever and trauma/injury. An effective management of bronchial asthma would alleviate much of the emergency workload in these clinics. About half of the emergencies needed a referral for secondary care in hospitals. Patients who were deemed to have an emergency by the health care provider, who presented with pain, who presented with cardiovascular emergency or non-respiratory emergency were predictors of hospital referral. Emergency services at the urban public health clinics should be better informed of the types and nature of these common emergency cases. The results of this study could facilitate the allocation of budget and equipments and most importantly, for the purpose of staff preparedness and their training in the hospitals, as well as the FMS trainee during their post-graduate training.

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#### REFERENCES

1. Ministry of Health Malaysia. Health Utilization. In: National Health Morbidity Survey III. Putrajaya, 2006.
2. Health Facts 2010. Ministry of Health Malaysia, 2011. Available at: [http://moh.gov.my/images/gallery/stats/heal\\_fact/health\\_facts\\_2010.pdf](http://moh.gov.my/images/gallery/stats/heal_fact/health_facts_2010.pdf). Accessed December 21, 2011.
3. Johnston CL, Coulthard MG, Schluter PJ, Dick ML. Medical emergencies in general practice in south-east Queensland: prevalence and practice preparedness. *Med J Aust* 2001; 175(2): 99-103.
4. Liddy C, Dreise H, Gaboury I. Frequency of in-office emergencies in primary care. *Can Fam Physician* 2009; 55(10): 1004-1005 e1001-1004.

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5. Mansfield CJ, Price J, Frush KS, Dallara J. Pediatric emergencies in the office: are family physicians as prepared as pediatricians? *J Fam Pract* 2001; 50(9): 757-61.
6. Toback SL. Medical emergency preparedness in office practice. *Am Fam Physician* 2007; 75(11): 1679-84.
7. Pons PT, Haukoos JS, Bludworth W, Cribble T, Pons KA, Markovchick VJ. Paramedic response time: does it affect patient survival? *Acad Emerg Med* 2005; 12(7): 594-600.
8. Part 3: Adult Basic Life Support. *Circulation* 2000; 102(suppl 1): I-22-I-59.
9. WONCA. ICP-2-R: International Classification of Primary Care. Revised Second Edition ed. New York: Oxford University Press; 2006.
10. Dick ML, Schluter P, Johnston C, Coulthard M. GPs' perceived competence and comfort in managing medical emergencies in southeast Queensland. *Aust Fam Physician* 2002; 31(9): 870-5.
11. Bigham BL, Bull E, Morrison M, *et al.* Patient safety in emergency medical services: executive summary and recommendations from the Niagara Summit. *CJEM* 2011; 13(1): 13-8.
12. Atack L, Maher J. Emergency Medical and Health Providers' Perceptions of Key Issues in Prehospital Patient Safety. *Prehosp Emerg Care* 2010; 14(1): 95-102.
13. Campbell JL. Patients' perceptions of medical urgency: does deprivation matter? *Fam Pract* 1999; 16(1): 28-32.
14. Huber CA, Rosemann T, Zoller M, Eichler K, Senn O. Out-of-hours demand in primary care: frequency, mode of contact and reasons for encounter in Switzerland. *J Eval Clin Pract* 2011; 17(1): 174-9.
15. Lai CKW, de Guia TS, Kim Y-Y, *et al.* Asthma control in the Asia-Pacific region: The asthma insights and reality in Asia-Pacific study. *J Allergy Clin Immunol* 2003; 111(2): 263-8.
16. Lee PY, Khoo EM. How well were asthmatic patients educated about their asthma? A study at the emergency department. *Asia Pac J Public Health* 2004; 16(1): 45-9.
17. Rowe BH, Sevcik W, Villa-Roel C. Management of severe acute asthma in the emergency department. *Curr Opin Crit Care* 2011; 17(4): 335-41.
18. Bury G, Prunty H, Egan M, Sharpe B. Experience of prehospital emergency care among general practitioners in Ireland. *Emerg Med J* 2008; 25(7): 450-4.
19. Luiz T, Hees K, Ellinger K. [Prehospital management of emergency patients after previous treatment by general practitioners—a prospective study]. *Anästhesiol Intensivmed Notfallmed Schmerzther* 1997;32(12):726-33. German.
20. Avery AJ, Groom L, Boot D, Earwicker S, Carlisle R. What problems do patients present with outside normal general practice surgery hours? A prospective study of the use of general practice and accident and emergency services. *J Public Health Med* 1999; 21(1): 88-94.
21. Shipman C, Dale J. Responding to out-of-hours demand: the extent and nature of urgent need. *Fam Pract* 1999; 16(1): 23-7.
22. Bost N, Crilly J, Wallis M, Patterson E, Chaboyer W. Clinical handover of patients arriving by ambulance to the emergency department - a literature review. *Int Emerg Nurs* 2010; 18(4): 210-20.
23. Snow V, Beck D, Budnitz T, *et al.* Transitions of Care Consensus Policy Statement: American College of Physicians, Society of General Internal Medicine, Society of Hospital Medicine, American Geriatrics Society, American College of Emergency Physicians, and Society for Academic Emergency Medicine. *J Hosp Med* 2009; 4(6): 364-70.
24. Fuentes RG, Espejo FE, Avila JP, Verdessi DB, Gonzalez JC, Azevedo AC. Pre-hospital care in Valparaiso – an integrated emergency network within the San Antonio Regional Health Service in Chile. *J Eval Clin Pract* 1999; 5(1): 87-91.
25. Altmayer CA, Ardal S, Woodward GL, Schull MJ. Variation in emergency department visits for conditions that may be treated in alternative primary care settings. *CJEM* 2005; 7(4): 252-6.
26. Govindarajan A, Schull M. Effect of socioeconomic status on out-of-hospital transport delays of patients with chest pain. *Ann Emerg Med* 2003; 41(4): 481-90.
27. Spillane IMH, Krieser D, Dalton S, Heinrich L, Babl FE. Limitations to diagnostic coding accuracy in emergency departments: Implications for research and audits of care. *Emerg Med Australas* 2010; 22(1): 91-2.
28. Tan NC, Ang A, Heng D, Chen J, Wong HB. Evaluation of Playground Injuries based on ICD, E codes, International Classification of External Cause of Injury codes (ICECI), and Abbreviated Injury Scale coding systems. *Asia Pac J Public Health* 2007; 19(1): 18-27.