Title: Capability of Emergency Medical System on first response team for stop bleeding from road traffic accident patients

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ABSTRACT

Background: Road traffic accident (RTA) is one of highest cause of mortality in the world. Ninety one percent of the world's fatalities on the roads occur in low-income and middle-income countries, even though these countries have approximately half of the world's vehicles and will increasing every year. Emergency Medical System (EMS) is the main unit for save victims from emergency accidents. In that situation an effective of emergency medical service (EMS) can improve the consequence of injury, reduce mortality related to accidents and other emergency situations. First response team (FR) as one of four teams of EMS unit in Thailand and has the highest amount. Staff in first response team is only responders, who just pass basic first aid training at least 24 hour. It never has reported the capability from first response team for stop bleeding from s road traffic accidence patient.

Objective: To evaluated performance of first response team in stop bleeding patients from road traffic accident case

Methods: This study designs is cross sectional study and use data from Thai Emergency Medical Service database and use data only in first response team. All case of road traffic accident in this study was conducted from January 2012 to December 2012. Multiple logistic regression was use to quantify and test performance of stop bleeding for first response team and presented by Odds ratio adjusted, 95% Confidence Interval, and p-value.

Results: Total cases for take care by First response team (FR) in one year period (January 2012 to December 2012) are 761,359 cases. Especially road traffic accidence cases (RTA) was take care by first response team are 190,316 cases and 94,623 cases was treat patients by stop bleeding. By multivariate analysis it has two factors was statically significant with stop bleeding appropriate were region and type of wound. West region was 2.10 times for stop bleeding appropriate higher than South region (Adjust OR: 2.10; 95%CI: 1.34 to 3.28; p-value = 0.001). Other wound (laceration/ Penetrating/Stab/ Gunshot wound) was 1.75 times for stop bleeding appropriate higher than abrasion wound (Adjust OR:1.75; 95%CI: 1.39 to 2.17; p-value <0.001). However there was no statically significant relationship between time of accidence and performance of stop bleeding appropriate.

Conclusions According to results, first response team in every region has high capability for stop bleeding in any type of wound and any time of accidence.

Key words: first response team, emergency medical system, road traffic accident, stop bleeding

INTRODUCTION

Road traffic accident (RTA) related injuries are top causes of injuries worldwide especially 91% of the world's fatalities on the roads occur in low-income and middle-income countries, even though these countries have approximately half of the world's vehicles and will increasing every year (1)(2) (3)(4) . About 1.24 million people die each year as a result of road traffic crashes. Road traffic injuries are the leading cause of death among young people. According to the World Health Organization for the year 2012 indicates that mortality rate from traffic accidents in Thailand is 6th of the world's 42.9 per 100,000. Thai Road Safety Culture (Thai RSC) has reported in BE.2556 Thailand has patients from road traffic accident are 246,398 injuries and fatalities 3,442. (5) (6)

Therefore, emergency medical systems (EMS) are able to reduce the mortality and morbidity of injuries by prompt provision of essential life-saving measures such as maintenance of patent airway and controlling external bleeding of a trauma patient. (7) (8) (1). In all, 90% of deaths from injury occur at the scene or enrooted to a healthcare facility.

Thailand has adopted the Anglo-American model providing Emergency Medical System (EMS) through hospital service which incorporated into the health care system in 1994 (9). When patients or witness who dials to 1669 it connect to dispatch center and dispatcher will get information from caller. After that dispatcher will triage and send appropriate team to accidence scene. The response team assessed, cared and manages the patients according to their needs. After mission EMS team had to fill out a case record form. The results of team care and management were evaluated by whether they were appropriate by emergency department staff. Traumatic injuries and medical emergencies can be managed appropriately and skillfully by ambulance technicians and medical staff who have trained in prehospital course. (8) (10) An effective emergency medical service system which could save lives of those who got injured from accidents or critical illness requited an assessment and rapid and appropriate care for each individuals. (11) (12)

Emergency medical service teams in Thailand come along in 4 categories of care and each of them has at least 3 staff including the ambulance driver who is usually trained as first responder (FR). The advance life support team (ALS) is highest efficiency of all EMS team. ALS team has medical doctor or nurse and emergency medical technician-intermediate (EMT-I) and FR. The Intermediate life support team (ILS) team includes two EMT-I and one FR. The Basic life support team (BLS) team has one or two person with EMT-Basic training and FR, and First response team (FR) has two or three staff that passed training for first responder.

According to report from National Institute for Emergency Medicine (NIEM) indicated that first response team has a number of teams compared to most other teams (69.8%) for cover all region of Thailand, but never had reported on capability from first response team before.This study aim to evaluated performance of first response team on stop bleeding patients from road traffic accident case in Thailand.

MATERIALS AND METHODS

Study design A cross sectional study design was performed. Data in this study was used from Thai Emergency Medical System database, and it from all province of Thailand, but except Bangkok. Emergency Medical System database was collected one year period (January 2012 to December 2012) from case record form (CRF) and contains 761,359 cases. The dataset contain information of patients and accidence time, response time, type of trauma and trauma management condition etc. In this study were used 190,316 cases from road traffic accident case that take care from First response team and excluded other accident event. The ethical issues will be approved by the committees of The Ethics and Research Institutional Review Board of Khon Kean University.

Study outcome

The primary outcome was capabilities of First response team in manage and care patient from road traffic accidence (RTA) in stop bleeding cases. The capability of team on stop bleeding care was classified into 2 types as inappropriate and appropriated. Stop bleeding outcome (appropriate and inappropriate) was defined by medical staff at emergency room. Percentage of road traffic accident case amount of case in regions and type of wound from RTA's patients was secondary outcome.

Statistical analysis

- Methods for describing baseline characteristics of the sample: Demographic characteristics of the participants were described using frequency and percentage for categorical data and mean and standard deviation for continuous data.
- The logistic regression was used to identify the association variables, the statistics including Adjust Odds Ratios, 95% Confidence Intervals (95% CI), and p-value. All analyses were performed using Stata version 12.0 (StataCorp, College Station, TX). This project was approved by the Ethics and Research Institutional Khon Kaen University.

RESULTS

Total cases for First response team (FR) in one year period (January 2012 to December 2012) are 761,359 cases. Especially road traffic accidence cases (RTA) was take care by first response team are 190,316 cases and 94,623 cases was treat patients by stop bleeding (Fig1)

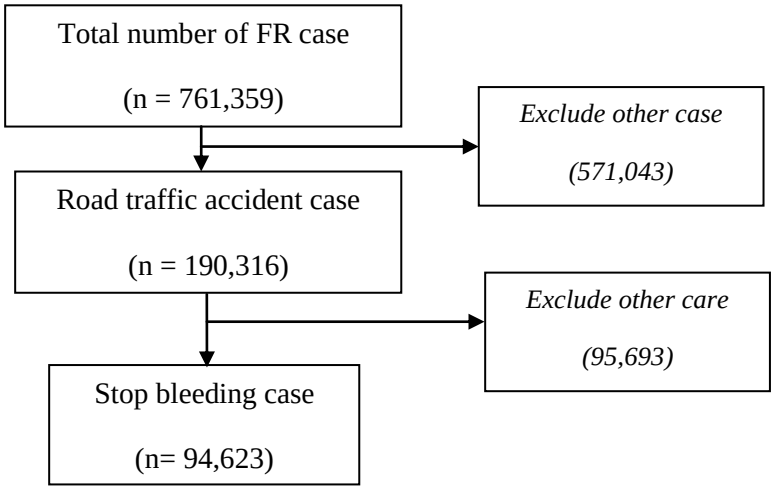

Fig. 1 The consort diagram of this study

Demographic Characteristics

Road accidence patients had a median age was 30 years (range < 1 to 99 years) with a peak between > 15 to < = 60 years (82.99%). Most of patient's cases were male 153,605 cases (80.71%). Time of road traffic accidence case peak between 18.01 to 24.00 was 67,573 cases (35.53%). Most of road traffic accidence case occurs at Northeast of Thailand 64,890 cases (34.10%) and most type of wound for stop bleeding is abrasion 62,136 cases (46.98%) show in table 1.

Table 1: Demographic characteristics of RTA case from First Response team

Characteristic	Number (n)	Percent (%)
First response team cases		
Road Traffic Accidence case	190,316	25.00
Other case	571,043	75.00
Total	761,359	100
Road traffic accidence case age (year)		
< = 5	1,995	1.13
> 5 to < = 15	17,090	9.65
> 15 to < = 60	146,925	82.99
> 60	11,039	6.23
Mean ± standard deviation		32.8± 16.1
Median (Min:Max)		30 (< 1 to 99)
Road traffic accidence time		
00.01 to 06.00	20,672	10.87
06.01 to 12.00	41,476	21.81
12.01 to 18.00	60,478	31.80
18.01 to 24.00	67,573	35.53
Total	190,199	100
Road traffic accidence case gender		
Male	153,605	80.71
Female	36,711	19.29
Total	190,316	100%
Road traffic accidence case regions		
South	21,587	11.34
East	37,216	19.56
Northeast	64,890	34.10
North	16,685	8.77
West	19,121	10.05
Middle	30,803	16.19
Total	190,302	100%
Road traffic accidence case wound		
Abrasion	62,136	46.98
Laceration	50,442	38.14
Penetrating	195	0.15
Stab	41	0.03
Gunshot	28	0.02

Characteristic	Number (n)	Percent (%)
Contusion	19,409	14.68
Total	132,251	100%
Road traffic accidence case stop bleeding condition		
Inappropriate	396	0.42
Appropriate	94,227	99.58
Total	94,623	100%

From bivariate analysis data is explore in table 2. Road traffic accidence case for first response team it has two statistically significant with stop bleeding appropriate, region and type of wound. West region was 2.22 times for stop bleeding appropriate higher than South region (reference group) (Crude OR: 2.22; 95%CI: 1.45 to 3.41; p-value <0.001). For type of wound, other wound (laceration/ Penetrating/Stab/ Gunshot wound) was 1.72 times for stop bleeding appropriate higher than abrasion wound (Crude OR: 1.72; 95%CI: 1.38 to 2.16; p-value <0.001)

Table 2. Crude odds ratios of stop bleeding appropriate and their 95% confidence intervals for each factor.

Characteristic	Number	Event (%)	Crude OR	95% CI	P-value
Road traffic accidence case age (year)					0.309
< = 5	1,995	99.32	1		
> 5 to < = 15	17,090	99.64	1.86	0.77 to 4.47	
> 15 to < = 60	146,925	99.59	1.64	0.73 to 3.70	
> 60	11,039	99.47	1.27	0.53 to 3.05	
Mean (SD)	32.8± 16.1				
Median (Min:Max)	30 (< 1 to 99)				
Road traffic accidence time					
00.01 to 06.00	10,409	99.57	1		0.857
06.01 to 12.00	20,023	99.57	1.01	0.70 to 1.44	
12.01 to 18.00	29,339	99.57	1.00	0.71 to 1.40	
18.01 to 24.00	34,796	99.61	1.02	0.78 to 1.54	
Road traffic accidence case gender					
Female	4,368	99.75	1		0.060
Male	90,255	99.57	1.69	0.93 to 3.13	
Road traffic accidence case regions					<0.001
South	8,576	99.32	1		
East	23,376	99.67	2.03	1.44 to 2.86	
Northeast	29,235	99.60	1.71	1.25 to 2.34	
North	8,899	99.43	1.18	0.81 to 1.72	
West	10,795	99.69	2.22	1.45 to 3.41	
Middle	13,735	99.56	1.55	1.08 to 2.23	

Characteristic	Number	Event (%)	Crude OR	95% CI	P-value
Road traffic accidence case wound					<0.001
Abrasion	40,406	99.71	1		
Other wound (laceration/ Penetrating/ Stab/ Gunshot)	45,477	99.49	1.72	1.38 to 2.16	

By logistic regression explore in table 3, factors still statistically significant with stop bleeding appropriate were region and type of wound. West region was 2.10 times for stop bleeding appropriate higher than South region (Crude OR: 2.10; 95%CI: 1.34 to 3.28; p-value = 0.001). Other wound (laceration/ Penetrating/Stab/ Gunshot wound) was 1.75 times for stop bleeding appropriate higher than abrasion wound (Crude OR:1.75; 95%CI: 1.39 to 2.17; p-value <0.001)

Table 3. Crude odds ratios and odds ratios adjusted of stop bleeding appropriate and their 95% confidence intervals for each factor adjusted for all other factors presented in the table using logistic regression

Characteristic	Number	Event (%)	Crude OR	Adj OR	95% CI	P-value
Road traffic accidence time						
00.01 to 06.00	10,409	99.57	1	1		0.835
06.01 to 12.00	20,023	99.57	1.01	0.97	0.66 to 1.44	
12.01 to 18.00	29,339	99.57	1.00	0.96	0.67 to 1.38	
18.01 to 24.00	34,796	99.61	1.02	1.04	0.73 to 1.48	
Road traffic accidence case regions						0.001
South	8,576	99.32	1	1		
East	23,376	99.67	2.03	1.97	1.38 to 2.81	
Northeast	29,235	99.60	1.71	1.91	1.36 to 2.70	
North	8,899	99.43	1.18	1.09	0.74 to 1.62	
West	10,795	99.69	2.22	2.10	1.34 to 3.28	
Middle	13,735	99.56	1.55	1.41	0.97 to 2.50	
Road traffic accidence case wound						<0.001
Abrasion	40,406	99.71	1	1		
Other wound (laceration/ Penetrating/ Stab/ Gunshot)	45,477	99.49	1.72	1.75	1.39 to 2.17	

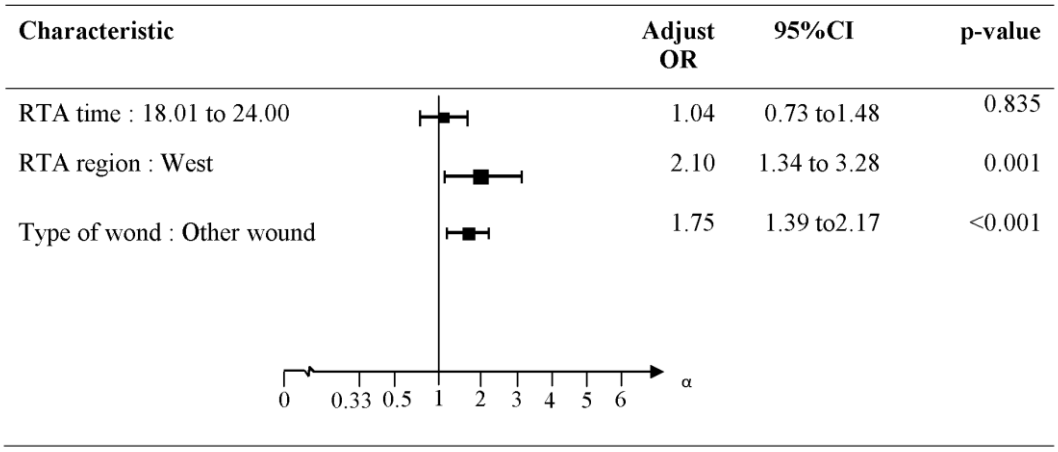

Fig. 2 Factors effecting with stop bleeding appropriate, was presented as odd ratio adjusted 95%CI and p-value RTA time accidence, region and type of wound by using logistic regression.

DISCUSSIONS

Our study was shown that gender of patients form RTA case was male higher than female that result as in the studies of Al-Shaqsi et.al , Tavris et.al (13) and van Beeck EF et.al(14). Baker SP et.al (1998) demonstrated that female patients were not safer than male counterparts when exposure was considered; however, they have lower fatal crash involvement rates. (15) This higher incidence has been mostly attributed to aggressive driving in men, mostly in the younger age groups (16) (17).
In this study found that age of patient peak between 15 to 60 years old that result as in studies of WHO (18) has demonstrated age of road traffic accident patients between 15 - 45 years old.

Even though West region had higher stop bleeding appropriate other region but not much different from any other region. From result show that first response team at north region had a few stop bleeding inappropriate more than other region. Because landscape features had different from other regions thus causing difficulties in accessing the accidence scene even harder and affecting stop bleeding inappropriate, but also still in high level (99.43%).

For time of accidence the result shown that 18.01 to 24.00 has more accidence cases because that period is off hour and night time that may be lost visibility for driver, but nevertheless first response team has good capability to stop the bleeding as well, all the time.

According to report from National Institute for Emergency Medicine (NIEM)(23) indicated amount of first response staff in Thailand has sufficiently but only half of them take real take care patients. Also training for all first response team for every trauma management is important and it can improve capability for take care patient from road traffic accidence. The result shown that a few case of stop bleeding inappropriate this result as in the report from National Confidential Enquiry into Patient Outcomes and Death(17) shown that half of trauma injury doesn't have a good care. In fact it should be concern because every EMS team should not mistake in first aid. Therefore training trauma management course it can improve EMS staff (19)and need to be improved content reconstruction and accurate while it can improve performance of EMS staff and they must retraining usually (20)(21)(22). Because Høyer CB et.all explained the experiences of the effect of training on the quality of

performance in the real world are differing (24) and De Vries. et.all (25) found that high performance in training correlates to high performance in real life that are all reason why all related organizations should retrain all staff regularly.

Strength of the study

This study is the first to our knowledge to analyze data that is a nationally representative sample from the real practice. And the result shown the higher number of stop bleeding appropriate by first response team that may also be the reason can improve or upgrade first response team to basic life support team (higher level of EMS team).

Limitation of the study

First, case record form in EMS doesn't generate for research thereby that might missing some data or value and has duplicate in each variables. A second limitation is the possible loss of information from unrecorded by staff in first response team or staff at emergency room.

Conclusions

According to results, first response team in every region has high capability for stop bleeding in any type of wound and any time of accidence. Moreover we found duration time of road traffic accidents peak between 18.01 to 24.00 should be intensive careful at this duration time.

Recommendations

Should evaluate the capability on other trauma management in patients from other case and other EMS team. Should assess accuracy in EMS documentary, because EMS case record form is often performed in chaotic and complex settings: in the dark, rain, and cold, under time pressure, and sometimes under threat to personal safety that maybe error in data record (26).

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