Original Article

Management of Anaphylactic Patients by Emergency Medical Services

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Background: Anaphylaxis is a life-threatening condition, and the response to allergens occurs quickly and is severe. The condition is treated by adrenaline administration via intramuscular injection. However, previous studies have shown low rates of adrenaline use, which affected the patient's condition.

Objective: To analyze adrenaline use in anaphylactic patients by the emergency medical services (EMS).

Materials and Methods: This was a retrospective study consisting of patients over 18 years of age assessed and treated through Srinagarind Hospital emergency medical services between January 2013 and December 2018 who fulfilled the diagnostic criteria for anaphylaxis.

Results: One hundred nine subjects were examined, 64.2% of whom were male. The mean age of the patients was 26.6±6.8 years. The severity of patients' signs and symptoms according to the Thai Criteria Based Dispatch for EMS color code was red in 29.4% of cases yellow in 58.7% of cases, and green in 11.9%. Adrenaline was used in 84.4% of cases. The level of operation (with or without a doctor on the EMS team) and discharge disposition at the hospital were factors significantly associated with adrenaline use (p<0.001).

Conclusion: Adrenaline use by the EMS was high. The level of operation (with or without a doctor on the EMS team) and discharge disposition at the hospital were factors significantly associated with adrenaline use.

Keywords: Pre hospital, EMS, Adrenaline, Allergy, Allergen, Emergency medicine

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Anaphylaxis is the life-threatening condition and the response to allergens occurs quickly and severely in multiple organs[1]. There are 5 to 30 cases with severe symptoms per hundred thousand population per year. The mortality rate is 0.1 to 0.3 cases per hundred thousand population[2,3] and this number is increasing[4]. Due to changes in peoples' lifestyles, there is a greater chance of their being exposed to allergens[5]. Diagnosis is performed based on Sampson's criteria[6], and the main treatment is to administer adrenaline via intramuscular injection. A previous study found that adrenaline is administered in the ambulance in only a small percentage of cases (36.3%)[7] which affected the patient's condition[8-13]. The condition may be diagnosed with difficulty based on telephone triaging[14] by the emergency medical services (EMS). This study aimed to analyze adrenaline use in anaphylactic patients by the EMS.

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Materials and Methods

This was a retrospective study consisting of patients over 18 years of age assessed and treated through Srinagarind Hospital emergency medical services between January 2013 and December 2018 who fulfilled the diagnostic criteria for anaphylaxis. The exclusion criteria were missing data and not meeting the diagnostic criteria for anaphylaxis. Ethics approval was provided by the Khon Kaen University Ethics Committee for Human Research (HE621108).

The sample size was calculated based on the prevalence of anaphylaxis cases encountered by the EMS in order to achieve a confidence interval of 0.95 and absolute precision of 0.002. Statistical analysis was performed using SPSS for Windows version 16.0 (SPSS Inc., Chicago, IL, USA). Categorical data were presented as percentages, and continuous data were presented using mean and standard deviation. Univariable analysis was performed using a two-sample t-test for numerical data and a Chi-squared test or Fisher's exact test for data comparison between the two groups.

Results

One hundred nine subjects were examined, the characteristics of whom are shown in Table 1. A total of

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64.2% (n = 70) of them were male. The mean age of the patients was 26.6±6.8 years. The severity of patients' signs and symptoms according to the Thai Criteria Based Dispatch for EMS color code was red in 29.4% of cases yellow in 58.7% of cases, and green in 11.9%. The level of operation was advanced (with a doctor on the EMS team) in 87.2% of cases and basic (without a doctor on the EMS team) in 12.8% of cases.

The authors found that the average time from dispatch to resources being en route (activation time) was 1.56±0.26 minutes, time from 1669 call receipt to unit arrival on scene (response time) was 12.82±5.66 minutes, and on-scene time was 19.43±5.32 minutes.

The first symptoms were respiratory distress in 60.56% of cases and poor perfusion in 28.44%. Adrenaline was used by the EMS in 84.4% of cases. The allergen was food in 66.1% of cases, drugs in 27.5%, and unknown in 6.4%. The discharge disposition at the hospital was admit in 95.41% of cases and discharge in 4.59%.

The present study showed that the level of operation (with or without a doctor on the EMS team) and discharge disposition at the hospital were factors significantly associated with the use of adrenaline by the EMS (p<0.001; Table 2).

Table 1. Characteristics of the subjects

	Anaphylaxis patients (n = 109), n (%)
Sex: male	70 (64.2)
Age ± SD (years)	26.6±6.8
Severity based on the Thai criteria Based dispatch for EMS	
Red	32 (29.4)
Yellow	64 (58.7)
Green	13 (11.9)
Level of operation	
Advanced team (with doctor present)	95 (87.2)
Basic team (without doctor present)	14 (12.8)
Operation time on EMS±SD (Min)	
Activation time	1.56±0.26
Response time	12.82±5.66
Scene time	19.43±5.32
First symptoms	
Respiratory distress	66 (60.56)
Poor perfusion	31 (28.44)
Dysphagia	7 (6.42)
Unconscious	1 (0.92)
Other	4 (3.67)
Adrenaline use by EMS	92 (84.4)
Allergen	
Food	72 (66.1)
Drug	30 (27.5)
Unknown	7 (6.4)
Disposition at hospital	
Admit	104 (95.41)
Discharge	5 (4.59)

Discussion

The present study examined anaphylaxis management in the ambulance via EMS. As in a previous study[15] most of patients were younger adults, probably because people in this group tend to work or study outside the house, where they are more likely to come into contact with allergens. The Thai Criteria Based Dispatch for EMS is a protocol in which emergency medical call takers (EMCTs) and emergency medical dispatchers (EMDs) categorize the signs and symptoms of people who call the 1669 center by color according to severity (red = requires resuscitation, yellow = urgent, green = not urgent). Most of the cases in the present study were classified as yellow.

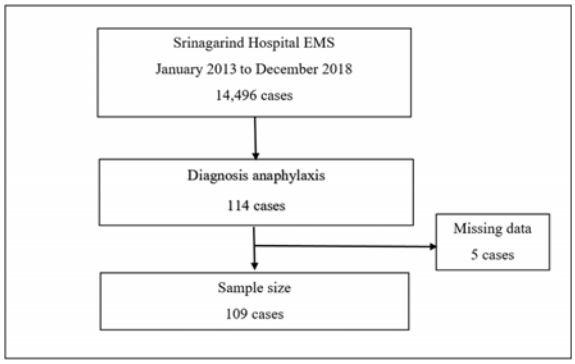

Figure 1. Flowchart of the study.

Table 2. Factors associated with adrenaline use by the EMS

	Adrenaline use n = 92 (%)	No Adrenaline use n = 17 (%)	p-value
Level of operation			<0.001*
Advanced team (with a doctor present)	91 (98.91)	0 (0.00)	
Basic team (without a doctor present)	1 (1.09)	17 (100.00)	
Disposition at hospital			<0.001*
Admit	92 (88.46)	12 (11.54)	
Discharge	0 (0.00)	5 (100.00)	

* Statistical significance

As in previous studies, most of patients identified the cause of anaphylaxis as being food[15,18]. Fewer than 20% of patients could not determine the causal allergens, which is also consistent with the results of previous studies[16,17].

The main treatment for anaphylaxis is adrenaline administration via intramuscular injection because it has the fastest onset of action, causes peripheral vasoconstriction, reduces low blood pressure and tissue swelling, increases the heart rate, reduces bronchial spasms, and reduces inflammatory mediators. These reasons also account for the high rate of use in this study. The EMS in Srinagarind Hospital is divided into two levels of operation: advanced, in which the EMS team includes a doctor, and basic, in which the team does not include a doctor. Having a doctor on the EMS team was an important factor in determining whether or not to use of adrenaline to treat anaphylactic patients in the present study.

Discharge disposition at the hospital in the present study was admitted in most cases, which is similar to the results of a previous study[15] and the discharge disposition was related to adrenaline use.

Conclusion

The rate of adrenaline use by the EMS was high. The level of operation (with or without doctor on the EMS team) and discharge disposition at the hospital were factors significantly associated with adrenaline use.

What is already known on this topic?

The main treatment for anaphylaxis is adrenaline administration via intramuscular injection because it has the fastest onset of action, causes peripheral vasoconstriction, reduces low blood pressure and tissue swelling, increases the heart rate, reduces bronchial spasms, and reduces inflammatory mediators.

What this study adds?

The rate of adrenaline use by the EMS was high. The level of operation (with or without doctor on the EMS team) and discharge disposition at the hospital were factors significantly associated with adrenaline use.

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Potential conflicts of interest

The authors declare no conflicts of interest.

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การจัดการผู้ป่วยแอนาฟีแล็กซิสในระบบการแพทย์ฉุกเฉิน

กรกฎ อภิรัตน์วรากุล, ฐปนวงศ์ มิตรสูงเนิน, แพรวา ธาตุเพชร, กมลวรรณ เอี้ยงฮง, วัชระ รัตนสีหา, วัชรพงศ์ พุทธิสวัสดิ์

ภูมิหลัง: แอนาฟีแล็กซิสเป็นภาวะตอบสนองต่อสารก่อภูมิแพ้ที่เกิดขึ้นรวดเร็วและรุนแรงถึงชีวิต การรักษาใช้อะดรีนาลีนฉีดเข้าในชั้นกล้ามเนื้อ มีการศึกษาก่อนหน้านี้พบว่ามีการใช้อะดรีนาลีนในอัตราที่ต่ำซึ่งส่งผลกระทบต่อผู้ป่วย

วัตถุประสงค์: เพื่อวิเคราะห์การใช้อะดรีนาลีนในการรักษาผู้ป่วยแอนาฟีแล็กซิสในระบบการแพทย์ฉุกเฉิน

วัสดุและวิธีการ: การศึกษาย้อนหลังในผู้ที่อายุมากกว่า 18 ปี ที่ได้รับการวินิจฉัยว่ามีภาวะแอนาฟีแล็กซิสและใช้บริการผ่านระบบการแพทย์ฉุกเฉิน โรงพยาบาลศรีนครินทร์ ระหว่างเดือนมกราคม พ.ศ. 2556 ถึงเดือนธันวาคม พ.ศ. 2561

ผลการศึกษา: มีผู้เข้าร่วมการศึกษา 109 ราย เป็นเพศชายร้อยละ 64.2 อายุเฉลี่ย 26.6±6.8 ปี อาการและอาการแสดงตามเกณฑ์วิธีการคัดแยกและจัดลำดับการจ่ายงานบริบาลผู้ป่วยฉุกเฉินของประเทศไทยเป็นรหัสแดงร้อยละ 29.4 รหัสเหลืองร้อยละ 58.7 และรหัสเขียวร้อยละ 11.9 มีอัตราการใช้อะดรีนาลีนร้อยละ 84.4 ระดับหน่วยปฏิบัติการ (การมีหรือไม่มีแพทย์ในหน่วยปฏิบัติการ) และการจำหน่ายออกจากโรงพยาบาลเป็นปัจจัยที่มีความสัมพันธ์อย่างมีนัยสำคัญทางสถิติกับการใช้อะดรีนาลีน

สรุป: มีการใช้อะดรีนาลีนในระบบการแพทย์ฉุกเฉินในอัตราที่สูงระดับหน่วยปฏิบัติการและการจำหน่ายออกจากโรงพยาบาลเป็นปัจจัยที่มีความสัมพันธ์อย่างมีนัยสำคัญทางสถิติกับการใช้อะดรีนาลีน