

## Original Article



# Utility of an educational video on epinephrine prefilled syringe usage for anaphylaxis: a randomized control trial

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### Conflict of Interest

The authors have no financial conflicts of interest.

### Author Contributions

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## ABSTRACT

**Background:** Anaphylaxis is a serious allergic reaction that needs early administration of intramuscular epinephrine for treatment. Currently, structured education on epinephrine prefilled syringe usage for anaphylaxis does not exist.

**Objective:** This study aimed to examine the effectiveness of the epinephrine prefilled syringe usage video, compared with routine teaching method.

**Methods:** This was a randomized controlled trial. A total of 129 medical students were assigned either to the routine teaching group or the video teaching group. The main outcome is the total number of medical students who passed (>70%) the test. The pre-, posttest, and objective structured clinical examination (OSCE) were used to evaluate the students.

**Results:** At the 2-week follow-up, the individual scores increased significantly after both interventions ( $p < 0.001$ ). The percentages of medical students who passed the exam in the pre-, posttests, and OSCE were not significantly different between the groups. In the routine teaching group and video teaching group, the percentages of students who passed increased from 32.2% to 96.6% and 28.1% to 95.3%, respectively ( $p = 0.99$ ). Using univariate logistic regression analysis, previous knowledge of anaphylaxis was a factor to pass the test (odds ratio, 5.07; 95% confidence interval, 1.93–13.31;  $p < 0.01$ ).

**Conclusion:** The study demonstrated that the scores after the video education intervention were not inferior to the routine teaching group. This technique might be applied for patients in clinical practice. However, the further researches in general population are needed to confirm the efficacy of this method.

**Keywords:** Anaphylaxis; Epinephrine prefilled syringe; Video education

## INTRODUCTION

Anaphylaxis is a severe allergic reaction that occurs in the body systems resulting from immune reactions [1, 2], which requires immediate medical treatment, including an intramuscular injection of epinephrine. Currently, the epinephrine prefilled syringe is widely used for everyone because of the accurate dosage for all age groups, low-cost treatment, and available worldwide [3]. Nowadays, the patients who diagnosed the anaphylaxis should take the medication all times.

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Teaching physicians and healthcare professionals to use epinephrine prefilled syringe correctly are important for saving life of patients. There is also medical evidence to show that video-based learning is beneficial [4, 5]. The video clips in the medical staff study suggest that nursing techniques can be better taught in the classroom than instruction in the classroom [6-8].

As mentioned, the generalized practitioners are important to be well prepared for each patient especially the use of epinephrine prefilled syringes promptly after diagnosed anaphylaxis. If the doctors convey the knowledge to the parents correctly, the severity of the disease and the mortality rate can be reduced. Properly teaching patients and parents about the usage of medication is important. Therefore, it is necessary to educate the physician and the medical official staff.

This study aimed to examine the effectiveness of the epinephrine prefilled syringe usage video, compared with routine teaching method.

## MATERIALS AND METHODS

The study was a prospective, randomized, single-blind trial that conducted from November 2015–April 2017 at the pediatrics department, Faculty of Medicine, Prince of Songkla University. This study was approved by the Ethics Committee and Institutional Review Board (IRB) of Faculty of Medicine, Prince of Songkla University (IRB No. 59-25601-1) and informed consent was obtained from the participants before randomization. The 4th–6th medical students of Faculty of Medicine, Prince of Songkla University were eligible for enrollment and agreed with the study. All participants could decline or withdraw at any time of study. The criteria for discontinuation are decided to leave the project or cannot meet the requirements.

The study began with the posters and social media that invited interested the medical students to participate in the research project. All participants were divided by 2 groups of randomization by block of 4 methods. The intervention consisted of the 8-minute video tutorial by the researcher. The control group was a 30-minute group teaching by the specialty of the allergy and immunology division of the pediatrics department with 2-way communication. The contents of both groups were same. They are consisted of anaphylaxis introduction, the preparation, storage, and demonstration of how to use the epinephrine prefilled syringe usage by themselves.

The pre-, posttest of knowledge, and objective structured clinical examination (OSCE) were used to evaluate the students each group separately. The pre- and posttests are consisted of the criteria of anaphylaxis and epinephrine dosage. The OSCE was used to evaluate the patient education, drug preparation, and epinephrine self-injection. The posttest and OSCE were measured at 2-week postintervention.

The evaluation of the medical skills was used a model for injection into the muscle. The scoring system was evaluated by the standard form. The medical instructors will not know what group of the participants are.

The main outcome is the total number of medical students who passed (>70%) the test, as well as secondary measures that observed the mean differences individual score and their test scoring of pre-, posttests, and OSCE.

### Statistical analysis

Epidata ver. 3.1 (The EpiData Association, Odense, Denmark)) was used for data entry. The statistical analysis was performed using R studio software (R Foundation for statistical computing, Vienna, Austria). Demographic parameters were calculated as mean  $\pm$  standard deviation or median (interquartile range, IQR) depended on distribution of data. The Student *t* test or Wilcoxon rank-sum test was used to compare mean difference between the 2 groups. Chi-square test or Fisher exact test was used to compare the proportion between the 2 groups. As well as Wilcoxon signed-rank test was used to compare the individual scores between pre- and posttests. The multivariate analysis was used to predicting the factors affecting the student's passing exam. When the *p* value was  $<0.05$ , differences were considered as statistically significant.

## RESULTS

The data collection of the 4th–6th medical students, Prince of Songkla University from November 1, 2015 to August 31, 2017, 129 participants were randomly assigned. Blocks of 4 were randomly divided into 2 groups; 64 people in the control group and 65 people in the intervention group. There are 6 dropped out volunteers after research; 5 in the control group and 1 people in the intervention group that represented 5% loss follow-up. A total of 123 participants were analyzed by per protocol analysis.

### Participant characteristics

Demographic characteristics for the 123 participation appear in **Table 1**. Participants were randomized in 2 groups; group teaching and video group. When classified by sex, year, grade point average (GPA), prior learning experience in anaphylaxis except reading and prior instruction in parenting of self-adrenaline injection, they are not meet the statistically significant.

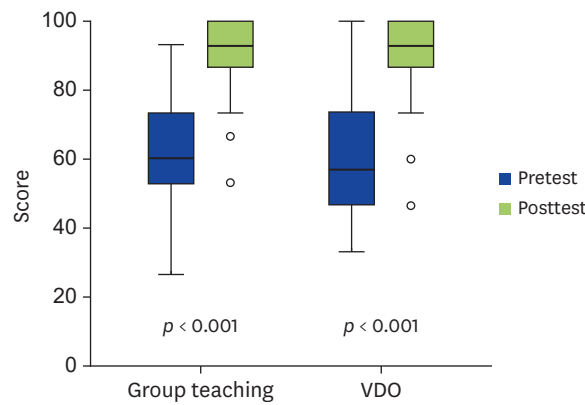
The percentages of medical students who passed the exam (scores  $>70\%$ ) in the pre- and posttests were not significantly different between the groups. In the routine teaching group and video teaching group, the percentages of students who passed increased from 32.2% to 96.6% and 28.1% to 95.3%, respectively ( $p = 0.99$ ).

For OSCE, they were not significantly different between the groups too. The study found that both groups tested equally well, 84.7% of the group teaching, and 78% of the video instructional group ( $p = 0.478$ ).

**Table 1.** Baseline demographics (n = 123)

Characteristic	Group teaching (control group) (n = 59)	Video on the usage of epinephrine prefilled syringe (intervention group) (n = 64)	<i>p</i> value
Female sex	34 (57.6)	36 (56.2)	0.99
Medical students	59 (48.0)	64 (52.0)	0.74
Year 4	14 (23.7)	19 (29.7)	0.38
Year 5	15 (25.4)	16 (25.0)	0.86
Year 6	30 (50.8)	29 (45.3)	0.90
Prior learning experience	41 (69.5)	40 (62.5)	0.53
Lecture	34 (57.6)	33 (51.6)	0.62
Ward	10 (16.9)	8 (12.5)	0.66
Reading	33 (55.9)	23 (35.9)	0.04
Other	2 (3.4)	5 (7.8)	0.45
Prior instruction in parenting	7 (11.9)	3 (4.7)	0.19
Grade point average	3.4 (3.2–3.6)	3.3 (3.2–3.6)	0.48

Values are presented as number (%) or median (interquartile range).



**Fig. 1.** Pre- and posttest scores.

At the 2-week follow-up, the individual scores increased significantly after both interventions ( $p < 0.001$ ) as shown in **Fig. 1**. Overall score from the pre- and posttests, each exam had 100 points.

The scores of the posttest scores were significantly higher than the prestudy score in both groups ( $p < 0.001$ ). The scores of the posttest increased from the pretest of all medical students, as shown in **Table 2**. The scores from the OSCE showed that both groups had no statistically significant difference in the scores.

Using multivariate logistic regression analysis, previous knowledge of anaphylaxis was a factor to pass the test (odds ratio, 5.07; 95% confidence interval, 1.93–13.31;  $p < 0.01$ ) as shown in **Table 3**.

**Table 2.** The scores in the pre- and posttests and objective structured clinical examination (OSCE)

Exam	Group teaching (control group) (n = 59)	Video on the usage of epinephrine prefilled syringe (intervention group) (n = 64)	p value
<b>Pretest</b>			
Year 4	53.3 (40–53.3)	46.7 (40–56.7)	0.82
Year 5	73.3 (56.7–80)	63.3 (58.3–80)	0.59
Year 6	66.7 (60–73.3)	53.3 (46.7–73.3)	0.18
<b>Posttest</b>			
Year 4	96.7 (88.3–100)	86.7 (80–100)	0.18
Year 5	100 (90–100)	93.3 (93.3–100)	0.59
Year 6	90 (86.7–100)	86.7 (80–93.3)	0.58
<b>OSCE</b>			
Year 4	77 (72.5–83.2)	74 (69.5–76.5)	0.26
Year 5	91 (85.5–94)	85.5 (76.2–93)	0.23
Year 6	80 (73.5–85.8)	82 (75–87)	0.40

Values are presented as median (interquartile range).

**Table 3.** Multivariate analysis predicting of medical students who passed objective structured clinical examination (scores >70%)

Characteristic	Crude OR (95% CI)	Adjusted OR (95% CI)	p value
Male sex	0.51 (0.21–1.28)	0.6 (0.23–1.63)	0.32
<b>Medical students</b>			
Year 6 (reference)			0.41
Year 4	0.72 (0.26–2.01)	2.32 (0.62–8.70)	
Year 5	1.55 (0.45–5.33)	1.89 (0.47–7.59)	
Prior learning experience	5.07 (1.93–13.31)	7.11 (2.19–23.1)	< 0.01

OR, odds ratio; CI, confidence interval.

The median (IQR) of GPA of nonattending medical students was 3.4 (3.2–3.6) that was not significantly different ( $p = 0.34$ ) with the median of GPA of medical students attending the study (3.4 [3.1–3.5]).

## DISCUSSION

This study was designed to produce educational video in the anaphylaxis patient. The research revealed that the efficiency of video teaching materials of the epinephrine prefilled syringe of medical students was not inferior to the routine teaching group after 2-week postintervention. Based on the number of medical students who passed the exam and the scores after the interventions, the video education was not inferior to group teaching. Also, each learner gained more knowledge in both interventions with statistically significant. So, the use of video helped the learning of the physician and the medical staff open up. The study aims to verify the effectiveness of the video as an instrument to create a medical education course, easily accessible, save time, reduce equipment preparation, and repeat as often as desired.

When analyzing the factors that affected the passing examination, it found that the medical students used to study in the classroom before had the opportunity to pass the test more than those who had not studied before. So, this study showed that teaching and learning by educational video were equally effective to the group teaching. This is a great way to encourage students to be more effective when using the learning method.

The strengths of this study were its randomized design with an education control and complete follow-up assessment. In addition, the GPA of both groups were not significantly different. This is a good representation of the medical students.

Limitations were relatively small sample size and unable to evaluate efficacy of video on the usage of epinephrine prefilled syringe for anaphylaxis in for retention memory because of short period of observation time. However, the video can repeat as often as desired that make frequent reviews the lessons.

In conclusion, this study showed the information for the effective video on the usage of epinephrine prefilled syringe in the medical students. The study demonstrated that the number of medical students who pass the exam and the score after intervention; video education was not inferiority to group teaching. This technique might be applied for patients in clinical practice. However, further researches in general population are needed to confirm the efficacy of this method.

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## REFERENCES

1. Castells M. Diagnosis and management of anaphylaxis in precision medicine. *J Allergy Clin Immunol* 2017;140:321-33.  
[PUBMED](#) | [CROSSREF](#)
2. Simons FE, Arduzzo LR, Bilò MB, El-Gamal YM, Ledford DK, Ring J, Sanchez-Borges M, Senna GE, Sheikh A, Thong BY; World Allergy Organization. World allergy organization guidelines for the assessment and management of anaphylaxis. *World Allergy Organ J* 2011;4:13-37.  
[PUBMED](#) | [CROSSREF](#)
3. Kerddonfak S, Manuyakorn W, Kamchaisatian W, Sasisakulporn C, Teawsomboonkit W, Benjaponpitak S. The stability and sterility of epinephrine prefilled syringe. *Asian Pac J Allergy Immunol* 2010;28:53-7.  
[PUBMED](#)
4. Liu C, Song X, Hao H. Educational video followed by retelling bowel preparation process to improve colonoscopy bowel preparation quality: a prospective nursing intervention study. *Med Sci Monit* 2018;24:6029-37.  
[PUBMED](#) | [CROSSREF](#)
5. Park JS, Kim MS, Kim H, Kim SI, Shin CH, Lee HJ, Lee WS, Moon S. A randomized controlled trial of an educational video to improve quality of bowel preparation for colonoscopy. *BMC Gastroenterol* 2016;16:64.  
[PUBMED](#) | [CROSSREF](#)
6. Salina L, Ruffinengo C, Garrino L, Massariello P, Charrier L, Martin B, Favale MS, Dimonte V. Effectiveness of an educational video as an instrument to refresh and reinforce the learning of a nursing technique: a randomized controlled trial. Version 2. *Perspect Med Educ* 2012;1:67-75.  
[PUBMED](#) | [CROSSREF](#)
7. Alqahtani ND, Al-Jewair T, Al-Moammar K, Albarakati SF, Alkofide EA. Live demonstration versus procedural video: a comparison of two methods for teaching an orthodontic laboratory procedure. *BMC Med Educ* 2015;15:199.  
[PUBMED](#) | [CROSSREF](#)
8. Minardi HA, Ritter S. Recording skills practice on videotape can enhance learning - a comparative study between nurse lecturers and nursing students. *J Adv Nurs* 1999;29:1318-25.  
[PUBMED](#) | [CROSSREF](#)