

ความรู้ในการกู้ชีพขั้นสูงของแพทย์ในโรงพยาบาลมหาวิทยาลัย

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ภาควิชาวิสัญญีวิทยา คณะแพทยศาสตร์ มหาวิทยาลัยขอนแก่น ขอนแก่น 40002

Advanced Cardiac Life Support Knowledge among Medical Staff and Residents in University Hospital

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หลักการและวัตถุประสงค์: ภาวะหัวใจหยุดเต้นเป็นภาวะฉุกเฉินทางการแพทย์ที่สำคัญซึ่งต้องการประสิทธิภาพในการกู้ชีพ แพทย์ที่ทำงานในโรงพยาบาลที่มีความเสี่ยงต่อการเกิดภาวะหัวใจหยุดเต้นสูงจึงควรมีความรู้และทักษะในการกู้ชีพเป็นอย่างดี ดังนั้นจึงต้องการศึกษาระดับความรู้ในการกู้ชีพขั้นสูงของแพทย์ในโรงพยาบาลมหาวิทยาลัยและปัจจัยต่าง ๆ ที่มีผลต่อระดับความรู้

วิธีการศึกษา: ทำการศึกษาแบบไปข้างหน้าในแพทย์ที่ปฏิบัติงานที่โรงพยาบาลศรีนครินทร์ คณะแพทยศาสตร์ มหาวิทยาลัยขอนแก่น ระหว่างเดือนพฤษภาคม ถึงเดือนมิถุนายน 2551 โดยทำการสุ่มแบบแบ่งชั้นภูมิโดยใช้ภาควิชาแพทย์ที่เข้าร่วมวิจัยจะทำแบบทดสอบจำนวน 25 ข้อภายในเวลา 20 นาที ผู้วิจัยทำการเก็บข้อมูลทั่วไปของแพทย์ คะแนนในแต่ละหัวข้อ คะแนนรวมที่มากกว่าร้อยละ 80 ถือว่ามีความรู้ในการกู้ชีพขั้นสูงเพียงพอ และปัจจัยที่มีผลต่อคะแนน

ผลการศึกษา: ผู้เข้าร่วมการศึกษาจำนวน 70 คน โดยมีคะแนนรวมมากกว่าร้อยละ 80 คิดเป็นร้อยละ 15.7 (95%CI 8.1-26.4) ซึ่งคะแนนเฉลี่ย+ค่าเบี่ยงเบนมาตรฐานของคะแนนรวมเป็น 58.4±21.5 ความรู้ในการกู้ชีพขั้นต้นและขั้นสูงเป็น 55.9±26.5 การอ่านผลคลื่นไฟฟ้าหัวใจเป็น 73.4±26.0 การใช้ยาเป็น 51.0±23.5 การประยุกต์ใช้เป็น 57.5±30.3 ปัจจัยที่มีผลต่อความรู้คือ ความถี่ในการฝึกอบรม และความถี่ในการปฏิบัติการ ($p<0.05$)

สรุป: จำนวนแพทย์ที่มีความรู้ในการกู้ชีพขั้นสูงเพียงพอนั้นน้อย โดยที่ปัจจัยที่มีผลต่อความรู้ในการกู้ชีพขั้นสูงคือ ความถี่ในการปฏิบัติการและการฝึกอบรมการช่วยฟื้นคืนชีพขั้นสูง ดังนั้นจึงควรมีการฝึกอบรมแพทย์ในโรงพยาบาลอย่างสม่ำเสมอ

Background and Objective: Advanced cardiac life support (ACLS) is an important knowledge among physicians to deal with cardiac arrest. Medical staff and residents who practice in high risk areas are required to possess ACLS knowledge and skills. To determine knowledge about ACLS in physicians including factors that influence ACLS knowledge in university hospital.

Methods: A descriptive of study of medical staff and residents who have been working at Srinagarind Hospital, Khon Kaen University, Thailand, between May-July, 2008 was performed by stratified random sampling from the participated 12 clinical department. The test questions were modified from Advanced Cardiovascular life support guideline (American Heart Association). The total score more than 80% was classified as being with sufficient knowledge whereas below 80% was lacking sufficient knowledge.

Results: Seventy physicians were enrolled to take the test. Up to 15.7% (95% CI 8.1-26.4) of those participants have scored over 80%. Mean±SD of percent of the total score, concepts of BLS and ACLS score, ECG interpretation score, medication score, and application score were 58.4±21.5, 55.9±26.5, 73.4±26.0, 51.0±23.5, and 57.5±30.3, respectively. The statistical analysis suggests that physicians with higher frequency of ACLS practice and training had more knowledge on the issue than those with lower frequency of ACLS practice and training ($p<0.05$).

Conclusions: The number of physicians who had sufficient knowledge was low. Factors that influence the ACLS knowledge appeared to be the frequency of ACLS

practice and training. From the data gathered, the others recommends that ACLS training program should be incorporated into the routine works of physicians in our hospital in order to increase frequency of ACLS training.

Key words: advanced cardiac life support; knowledge; physicians; university hospitals

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Introduction

Cardiac arrest is one of the most critical conditions found in medical care. It is an emergence, life-threatening conditions which requires rapid responses by an efficient team. Advanced cardiac life support (ACLS) is an important knowledge among physicians to deal with cardiac arrest. ACLS® guideline (American Heart Association guideline 2005 for cardiopulmonary resuscitation and emergency cardiovascular care) was launched in the year 2005.¹ The Guideline, which outlines skill and treatment of arrest ACLS to help performance resuscitation in patients, is our hospital's standard practice for cardiac arrest.

Medical staff and residents who practice in high risk areas are required to possess ACLS knowledge and skills. Physicians who have been taught about ACLS knowledge and skill have shown to perform well and, hence, increase survival rate, decrease morbidity and mortality.²⁻⁴

At our hospital, physicians, especially the new personnel, have been taught about ACLS in terms of information and skill. They are required to pass ACLS program every year. However, from previous study knowledge and skill on ACLS seem to be waning within 3-6 months after ACLS training.⁵⁻⁶

We studied ACLS knowledge among physicians in our hospital. Data were invaluable to improve training process and we are required to look for new strategies to improved patient care. Our primary objective was to determine whether the physician had sufficient ACLS knowledge. Secondary objective was to survey factors that influenced ACLS knowledge.

Materials and Methods

After receiving approval from institution's research ethics board, we conducted a prospective, descriptive study

(between May-July, 2008) at Srinagarind Hospital, Faculty of Medicine, Khon Kaen University. This study aim was to evaluate ACLS knowledge for future use among medical staff and residents working at Srinagarind Hospital during study period using ACLS test.

The authors' team conducted the ACLS test. ACLS instructor evaluated the content validity of the questions. American Heart Association guideline 2005 for cardiopulmonary resuscitation and emergency cardiovascular care was used as a reference. The test (Figure 1), 25 questions, consisted of 4 parts, each aims to evaluate the ACLS knowledge based on the ACLS training program, i.e. 1) knowledge of concept of basic life support (BLS) and ACLS (10 questions), 2) electrocardiogram (ECG) interpretation (5 questions), 3) medication (6 questions), and 4) clinical application (4 questions).

The test has been tested for reliability. Thirty physicians at Khon Kaen provincial center Hospital (tertiary care hospital) have been selected to test the reliability. The data showed that 45% of physician had total score more than 80%. This was the sufficient benchmark for ACLS knowledge.

We included all medical staff and residents who have been working at Srinagarind Hospital during the study period. We enrolled medical staff and residents using stratified random sampling technique by the department. Exclusion criteria were inability to answer the test. After consent has been obtained, the test was given to medical staff and residents to complete within 20 minutes.

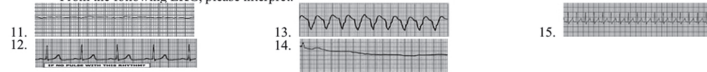
We recorded gender, age, department, working duration as demographic data. We also recorded factors that may influence the knowledge and classified into two groups for comparison, i.e. 1) frequency of participation in ACLS in the previous year (< 3 or ≥ 3 times), 2) frequency of ACLS

Part 1: BLS and ACLS concept

1. When the patient syncope, how do you evaluate respiration system?
2. How many times do you help to breathe after you found patient who doesn't breathe?
3. How many the chest compression/respiratory ratios of the adult patient do you take?
4. In case of cardiac arrest, how many rates do you help to breathe after already endotracheal intubation?
5. Where is the position of chest compression of the adult patient?
6. How many joules does the biphasic defibrillator use in defibrillation?
7. Which of the following drugs is not administered via endotracheal tube during CPR? (epinephrine, amiodarone, atropine, lidocaine)
8. From the knowledge about 6TSH, what are the causes of cardiac arrest? (at least 2 causes)
9. After defibrillation, what should be done first?
10. If the patient has sinus tachycardia rate 100 bpm and pulseless, what should be done first for this patient?

Part 2: ECG interpretation

From the following EKG, please interpret.



Part 3: Medication

11. A patient is in pulseless ventricular tachycardia. Two shocks and one dose of epinephrine have been given. The next drug/dose to anticipate to administer is
 - A) lidocaine 0.5 mg/kg.
 - B) Epinephrine 3 mg
 - C) amiodarone 300 mg
 - D) vasopressin 40 U
12. Which of the following is most accurate regarding the administration of vasopressin during cardiac arrest?
 - A) The correct dose of vasopressin is 40 U administered IV or IO
 - B) Vasopressin is recommended in stead of epinephrine for treatment of asystole
 - C) Vasopressin can be administered twice during cardiac arrest
 - D) Vasopressin is indicated for VF and pulseless VT prior to delivery of the first shock
13. A patient is in refractory ventricular fibrillation and has received multiple appropriate defibrillations, epinephrine 1 mg IV twice, and an initial dose of lidocaine IV. The patient is intubated. A second dose of lidocaine is now called for. The recommended second dose of lidocaine is
 - A) Start infusion 1 to 2 mg/min
 - B) 0.5- 0.75 mg/kg IV push
 - C) 1 mg/kg IV push
 - D) Give endotracheal dose 2 to 4 mg/kg
14. A patient is in cardiac arrest. Ventricular fibrillation has been refractory to an initial shock. Of the following drug and dose should be administered first by the IV/IO route?
 - A) sodium bicarbonate 50 mEq
 - B) atropine 1 mg
 - C) epinephrine
 - D) vasopressin 20 U
15. A patient with possible ACS and a bradycardia of 42 per minute has ongoing chest discomfort. What is the initial dose of atropine?
 - A) atropine 0.1 mg
 - B) atropine 3 mg
 - C) atropine 0.5 mg
 - D) atropine 1 mg
16. Which of the following statements about the use of magnesium in cardiac arrest is most accurate?
 - A) Magnesium is indicated for VF refractory to shock and amiodarone or lidocaine
 - B) Magnesium is indicated for shock - refractory monomorphic VT
 - C) Magnesium is indicated in VF/pulseless VT associated with torsades de pointes
 - D) Magnesium is contraindicated in VT associated with a normal QT interval

Part 4: Clinical application

17. A patient becomes unresponsive and you are uncertain if a faint pulse is present with the above rhythm. You next action is
 - A) Start an IV and give atropine 1 mg
 - B) Consider causes for pulseless electrical activity
 - C) Begin CPR with high-quality chest compression
 - D) Order transthoracic pacin
18. You are monitoring a patient. Chest discomfort has been relieved with sublingual nitrates and morphine sulfate 4 mg IV. He suddenly has the above persistent rhythm. You ask about symptom and reports mild palpitations, but otherwise he is clinically stable with unchanged vital signs. You next action is:
 - A) Give immediate synchronized shock
 - B) Administer amiodarone 150 mg over 10 minutes; seek expert consultation
 - C) Give immediate unsynchronized shock
 - D) Administer magnesium sulfate 1 to 2 g IV dilute in 10 cc D5W given over 5 to 20 minutes
19. You are monitoring a patient with chest discomfort who becomes suddenly unresponsive. You observe the following rhythm on the cardiac monitoring. A monophasic defibrillator is present. What is your first action?
 - A) Establish an IV and give epinephrine 1 mg IV
 - B) Give a single shock with 360 J
 - C) Intubate the patient and give epinephrine 2 to 4 mg via ET tube
 - D) Begin CPR with chest compression for 2 minutes or about 5 cycles of compressions and ventilations
20. A patient was refractory ventricular fibrillation. A third shock has just been administered. Your team looks at you for instruction. Your immediate next order is
 - A) Give epinephrine 1 mg IO
 - B) Give atropine 0.5 mg IV
 - C) Resume high-quality chest compression
 - D) Give amiodarone 300 mg IV

Figure 1 ACLS test Modified from Advanced Cardiovascular Life Support 2005 guideline (American Heart Association).

training within 3 years (< 2 or ≥ 2 times), 3) duration after ACLS practice (< 0.5 or ≥ 0.5 year), 4) duration since the last ACLS training (< 0.5 or ≥ 0.5 year), and 5) working area (low risk area (eye, general practitioner, radiology, rehabilitation, psychiatry) or high risk area (anesthesiology, internal medicine, obstetrics, orthopedics, otorhinolaryngology, pediatrics, surgery).

Total score and score in each part were recorded. Total score of more than 80% was classified as sufficient ACLS knowledge. Data analysis was performed by using STATA for Windows version 8.0 (Stata Corporation, TX, USA). Sufficient ACLS knowledge was reported as percentage and 95% CI. The mean and SD, median and range were used where

appropriated. Chi square's test was used to analyzed the comparison. The sample size required was based on, 1) sufficient ACLS knowledge in pilot study (0.45), 2) a Type I error of 0.05, 3) an absolute precision of 0.11, 4) an 80% power, and 5) population size was 461.

Results

Seventy physicians were included in the study. Return rate of the test was 100%. Demographic data showed (Table 1). Sufficient ACLS knowledge was 15.7% (95% CI 8.1-26.4) (Table 2). Mean \pm SD of total score, concept of BLS and ACLS score, ECG interpretation score, medication score, application score were 58.4 \pm 21.5, 55.9 \pm 26.5, 73.4 \pm 26.0,

Table 1 Demographic data

Demographic data		
Gender (M/F)		33/37
Age (mean±SD; years)		30.9±3.4
Status	Resident	46
	Consultant	24
Working duration (median (range))		3 (0.8, 26)
Department (%)	anesthesiology	10.0
	eye	7.1
	general practitioner	2.9
	internal medicine	14.3
	obstetric	12.9
	orthopedic	8.6
	otorhinolaryngology	5.7
	pediatric	7.1
	radiology	7.1
	rehabilitation	5.7
	psychiatry	2.9
	surgery	15.7

Table 2 ACLS score results.

Variable	percent or mean(SD)) (95% CI)
Sufficient ACLS score	
> 80%	15.7% (95% CI 8.1-26.4)
60 -80%	41.4%
40-60%	24.3%
< 40%	18.6%
Total score	58.4 (21.5) (95% CI 53.3-63.5)
Concept of BLS and ACLS	55.9 (26.5) (95% CI 49.6-62.2)
ECG interpretation	73.4 (26.0) (95% CI 67.2-79.9)
Medication	51.0 (23.5) (95% CI 45.4-56.6)
Application	57.5 (30.3) (95% CI 50.3-64.7)

Table 3 Factors that influence the knowledge

	Sufficiency	Insufficiency	p-value
Status			
Medical staff (24)	16.7%	83.3%	0.85
Resident (46)	15.2%	84.8%	
Working area			
Low risk area	2	16	0.53
High risk area	9	42	
Number of ACLS practice in last year (times) (median (range))	5 (0-10)	1 (0-20)	
< 3 time in last year	3	39	0.02
≥ 3 time in last year	8	20	
Number of ACLS training within 3 year (times) (median (range))	2 (0-15)	1 (0-10)	
< 2 time in 3 year	3	40	0.01
≥ 2 time in 3 year	8	19	
Last time for ACLS practice (year) Median (range))	0.2 (0-1.5)	0.3 (0-18)	
< 0.5 year	6	30	0.82
≥ 0.5 year	5	29	
Last time for ACLS training (year) Median (range))	1 (0.1-5)	1.7 (0-20)	
< 0.5 year	1	11	0.44
≥ 0.5 year	10	48	

51.0±23.5, and 57.5±30.3, respectively. Factors that influence the ACLS knowledge was reported (Table 3). Higher frequency of ACLS practice and training showed more proficiency than those with less frequency in ACLS practice and training ($p<0.05$).

Discussion

Our hospital provides ACLS training program by the CPR unit for medical staff and residents, especially new residents every year. We tested the knowledge and skill after ACLS training. Most of them passed ACLS training program. The program curriculum based on American Heart Association guideline 2005 for cardiopulmonary resuscitation and emergency cardiovascular care. However, the data showed only 15.7% of medical staff and residents in our hospital have sufficient knowledge. Mean±SD in total score is 58.4±21.5. Passing level in our study was 80%, which was higher than previous studies.⁷ Although passing level depends on the table specification of each test. The ECG interpretation part is where examinees score the highest. Mean±SD of that part is 73.4±26.0. Physicians having always been required to utilize knowledge about ECG interpretation in daily practices may be the of this performance.

Medical staff and residents with higher frequency of ACLS practice have more knowledge than those with less exposure to ACLS practice. Previous data also showed that frequency of ACLS practice is an important factor in maintaining knowledge.^{7,9} Those who have been trained on ACLS more frequently had more knowledge on the subject than those who have been trained less often. Previous study showed that frequency of ACLS training can improve CPR knowledge.¹⁰ Six months apart is the most appropriate duration for ACLS training. Re-training should take place within 3-6 months in order to maintain ACLS skills and knowledge.^{2, 6, 10} However, our study showed that the duration between ACLS trainings does not show any significance in improving ACLS knowledge. There are multiple factors influencing ACLS knowledge beside the duration between each ACLS training course. From our result, CPR rapid response teams in university hospital are important for ACLS management by experience personnel required to deal the cardiac arrest condition.

Conclusion

Of all the medical staff and residents taken the examinations, 15.7% (95% CI 8.1-26.4) had sufficient knowledge of ACLS. The factor that influenced the ACLS knowledge was frequency of ACLS practice and training. From our data, ACLS training program should be incorporated into works of all physicians at our hospital and there should be more ACLS trainings organized for staff and residents.

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