The current status and factors affecting the level of knowledge regarding basic life support measured in resident physicians

UZMANLIK ÖĞRENCİSİ DOKTORLARIN TEMEL YAŞAM DESTEĞİ BİLGİ DÜZEYLERİ VE BUNU ETKİLEYEN FAKTÖRLER

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Objective: We aimed to evaluate the current status and factors affecting the level of knowledge regarding basic life support (BLS) measured in resident physicians in Dokuz Eylül University Medical School (DEUMS), Turkey.

Material and methods: Between December 2002 and February 2003, 300 resident physicians working in DEUMS were included to the study. A questionnaire comprising the demographic data and factors that may affect the level of BLS knowledge was given to the subjects. Resident physicians' success levels were measured by acceptable level of performance (ALP) technique. Data collected from each questionnaire were analyzed with chi-square ($\chi 2$) and one-way ANOVA tests.

Results: Three hundred resident physicians from 33 different departments in DEUMS participated in this study. The subjects whose mean age was 27.4±0.3 and were composed of 176 (58.6 %) male and 124 (41.4 %) female resident physicians. Male and female resident physicians' mean number of correct answers was 8.77±0.20 and 9.30±0.23 respectively, and the overall mean was 8.99±0.15. Subjects that answered nine or more questions correctly were regarded as successful according to the mean calculated ALP score which was 8.76. Only 54.7 % (n=164) of the resident physicians were found successful.

Conclusions: BLS success rates of resident physicians in DEUMS showed that although BLS trainings carried out in medical schools in Turkey might be regarded as sufficient, BLS level of knowledge of resident physicians was found insufficient due to the lack of post-graduate or in-service training. Pre- and post-graduate BLS trainings need to be more frequently repeated by resident physicians.

Key words: Basic life support, cardiopulmonary resuscitation, training, university hospital

ÖZET

Amaç: Bu çalışmada Dokuz Eylül Üniversitesi Tıp Fakültesi'nde (DEÜTF) görev yapan uzmanlık öğrencisi doktorların temel yaşam düzeyi (TYD) bilgi düzeylerini ve bunu etkileyen faktörleri değerlendirmeyi amaçladık.

Gereç ve Yöntem: Aralık 2002 ve Şubat 2003 arasında DEÜTF'deki 33 farklı disiplinden 300 uzmanlık öğrencisi doktor çalışmaya dahil edildi. Katılımcılara demografik bilgilerini ve TYD bilgi düzeylerini etkileyebilecek soruları içeren bir anket verildi. Başarı düzeyleri kabul edilebilir performans seviyesi ölçütü kullanılarak belirlendi. Anketlerden toplanan veriler ki-

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kare (χ2) ve tek yönlü ANOVA testleriyle değerlendirildi.

Bulgular: Katılımcıların 176'sı (%58,6) erkek ve 124'ü (%41,4) kadın, ortalama yaşları 27,4

± 0,3 bulundu. Tüm katılımcıların ortalama doğru cevap oranları 8,99 ± 0,15 bulundu. Bilgi sorularından dokuz ve daha fazlasını doğru cevaplandıran doktorlar hesaplanan kabul edilebilir performans seviyesine (8,76) göre başarılı kabul edildiler. Buna göre sadece %54,7 (n=164) uzmanlık öğrencisi doktorun TYD bilgi düzeyleri başarılı olarak tespit edildi. Acil tıp ve Anesteziyoloji AD'larında, klinik AD'larında çalışan ve mezuniyet sonrası TYD eğitimi alan katılımcıların başarı düzeyleri anlamlı olarak yüksek bulunmuştur.

Sonuç: DEÜTF'de görev yapan uzmanlık öğrencisi doktorların TYD bilgi düzeyleri yetersizdir. TYD bilgi düzeyinin iyileştirilmesi için mezuniyet sonrası ve hizmet içi eğitimlerin daha sık aralarla yapılmasıyla iyileştirilebilir.

Anahtar sözcükler: Temel yaşam desteği, kardiyopulmoner canlandırma, eğitim, üniversite hastanesi

The earliest documentation of cardiopulmonary resuscitation (CPR) dates to the Old Testament. Modern CPR began in 1960 with the landmark study by Kouwenhoven et al which reported combining closed chest compression, mouth-to-mouth breathing, and external defibrillation (1). Despite 30 years of extensive training, attempts to improve delivery of these basic techniques, and research into new strategies, these results have been difficult to replicate (2). It is well recognized that CPR alone has limited value in restoring effective circulation and preventing brain death following sudden cardiac arrest. Survival from sudden cardiac arrest is dependant on a rapid series of actions from collapse to stabilization (3). It is also understood that chain of survival should be performed by everyone -especially by health care professionals- in the right order with an accurate training programs (4). Medical education in Turkey lasts 6 years and the sixth grade is so called "internship" that basic practical skills are taught including resuscitation practice. After graduation, medical students are supposed to perform basic life support (BLS) perfectly. In Turkey, until now there is no data whether medical school graduates may succeed in saving lives by applying the chain of survival as early as possible in the correct order when these relatively inexperienced physicians face true emergencies that need BLS. To evaluate this issue, we investigated the current status and factors affecting the level of knowledge regarding BLS among resident physicians in Dokuz Eylül University Medical School (DEUMS), Turkey. We hypothesized that resident physicians' theoretical skills of BLS would diminish after graduation from medical school.

MATERIALS AND METHODS

The study group comprised of 33 different departments' resident physicians (n=387) of DEUMS between December 2002 and February 2003. Data were collected following the approval of the institutional ethical committee. Questionnaires were handled to the resident physicians in a group fashion during their periodic morning or mid-day department meetings. Questions were prepared by the faculty of Dokuz Eylül University, Medical School, Departments of Emergency Medicine and Medical Education from the guidelines for 2000 of cardiopulmonary resuscitation and emergency cardiovascular care-international consensus on science (5,6). Fifteen adult and pediatric BLS multi-choice questions were selected regarding the evaluation of unresponsiveness, scene safety, opening the airway, breathing and circulation.

Acceptable level of performance (ALP) technique (Fig. 1) was used to grade the questions (7). Five assistant and associate professors of DEUMS (three from emergency medicine and two from anesthesiology) different from the questionnaire preparation committee that have at least five years of experience in practice constituted the ALP grading committee. After every question, faculty was asked to omit the choices which could also be eliminated by the resident physicians. Answers given by the faculty formed the Acceptability index (AI) of every question were calculated with the equation shown in Figure 1 (Table I). Finally ALP was

found with the sum of all AIs (Table II). ALP technique was used to evaluate subjects' level of knowledge as accurate and objective as possible.

Resident physicians were questioned in the first part of the questionnaire about their demographic data (age, sex, medical school, specialty (department), BLS course taken during and after medical school, duration of employment). In the second part, an exam consisting of 15 multi-choice test including adult and pediatric BLS questions was conducted and asked to be answered in no more than 20 minutes. At the end, all data forms were screened for unanswered question(s). Any unanswered question was regarded as wrong.

Data were analyzed by using SPSS Version 11.0 software with χ^2 test and distribution of resident physicians and true answers by department were analyzed with one way ANOVA test. $p < 0.05$ was supposed to be significant.

Figure 1. Acceptable level of performance (ALP) calculation formula

AI = 1 : (N - n)
ALP = AI1+ AI2+…+AI15
AI = Acceptability Index
N = Total number of choices in a question
n = Total number of choices that can be eliminated

Number of Choices that can be Eliminated	Acceptability Index
0	q = 1 / 5 (0.20)
1	q = 1 / 4 (0.25)
2	q = 1 / 3 (0.33)
3	q = 1 / 2 (0.50)
4	q = 1 / 1 (1.00)

RESULTS

Although all resident physicians (n=387) working in 25 (75.7 %) pre-clinical and 8 (24.3 %) clinical departments were planned to be included in the study, only 300 of these filled the questionnaire (Table III). Age range and mean age of 176 (41.3 %) male and 124 (58.7 %) female

physicians were 23-45 and 27.4 ± 0.3. Male and female mean age was 27.5 ± 1.2 and 27.7 ± 0.8. Participants were from 18 different medical schools. Only five (27.7 %) of these 18 medical schools had emergency medicine residency programme at the time we conducted our study. ALP score is calculated as 8.76 which means that subjects who answered nine or more questions correctly were regarded as successful. Among all subjects, the lowest number of correct answers was three and the highest 15. Overall mean number of correct answers was found as 8.99 ± 0.15.

Table II.   Acceptability Index (AI) values of each question and Acceptable Level of Performance (ALP) score

Question #	Choice(s) that can be eliminated	Acceptability Index (AI)
1	3	0.50
2	4	1.00
3	4	1.00
4	3	0.50
5	4	1.00
6	2	0.33
7	1	0.25
8	1	0.25
9	2	0.33
10	4	1.00
11	4	1.00
12	3	0.50
13	1	0.25
14	1	0.25
15	3	0.50
Total ALP score		8.76

DISCUSSION

Medical school education lasts six years in Turkey as in the other European countries. At the end of this six-year tough education, the young medical doctor (MD), should be able to immediately recognize and distinguish all emergencies (acute myocardial infarction, stroke, obstructed airway with foreign body, etc) and evaluate every unconscious patient. Besides the young MD should be able to apply BLS and cardiopulmonary cerebral resuscitation

(CPCR) accurately any time. Our population was very heterogeneous and consisted of all pre-clinical and clinical departments' resident physicians. Because of this heterogeneity and the different scoring method of the study, it is really difficult to compare our results with those of published before (8-23). Our study demonstrated an overall success rate of 41%. Besides, Kimaz et al carried out a survey among 53 physicians in rural emergency medical systems in Izmir, Turkey regarding BLS knowledge and found a correct answer rate of 45% (8).

Table III.   Distribution of resident physicians and correct answers by department

Departments (In alphabetical Order)	Physician #	%	True Answers (± SD)
Anesthesiology	27	9.0	10.89 ± 0.05
Biochemistry	6	2.0	9.17 ± 0.32
Cardiology	13	4.3	8.15 ± 0.08
Cardiovascular surgery	5	1.7	8.80 ± 0.24
Dermatology	7	2.3	8.29 ± 0.16
Otorhinolaryngology	4	1.3	8.25 ± 0.54
Emergency medicine	34	11.3	12.21 ± 0.03
Family medicine	6	2.0	6.00 ± 0.39
Forensic medicine	3	1.0	6.00 ± 0.65
General surgery	12	4.0	8.50 ± 0.16
Infectious diseases	6	2.0	6.33 ± 0.23
Internal medicine	23	7.7	9.35 ± 0.11
Histology and embriology	1	0.3	9.00 ± 0.00
Medical biology	2	0.7	7.50 ± 1.02
Medical parasitology	2	0.7	9.50 ± 0.80
Microbiology	5	1.7	6.40 ± 0.22
Neurology	6	2.0	8.33 ± 0.27
Nuclear medicine	4	1.3	8.75 ± 0.25
Pharmacology	8	2.7	7.50 ± 0.18
Physical therapy & rehabilitation	6	2.0	7.17 ± 0.12
Physiology	8	2.7	8.75 ± 0.36
Obstetrics & gynecology	6	2.0	11.67 ± 0.29
Ophtalmology	10	3.3	7.40 ± 0.25
Ortopedics and traumatology	17	5.7	9.12 ± 0.09
Pediatrics	25	8.3	8.16 ± 0.24
Pediatric psychiatry	1	0.3	7.00 ± 0.00
Pediatric surgey	4	1.3	10.00 ± 0.33
Plastic & reconstructive surgery	8	2.7	8.75 ± 0.22
Psychiatry	4	1.3	8.00 ± 0.25
Pulmonology	10	3.3	9.40 ± 0.26
Radiodiagnostics	18	6.8	7.89 ± 0.14
Radiation oncology	3	1.0	7.67 ± 0.73
Urology	6	2.0	6.83 ± 0.36
TOTAL	300	100.0	8.99 ± 0.15

There are conducted studies in other countries which have similar correct answer rate regarding of BLS skills (9-22). Birnbaum et al evaluated advanced cardiac life support (ACLS) knowledge and skill proficiency of 69 physicians in 12 county hospitals and found only 60.6% (n=41) of the physicians to be successful (9). Hollis and Gillespie assessed BLS skill and knowledge of 53 general practitioner principals. In that study, 90.6% (n=48) of the physicians that attended the 1997 United Kingdom Resuscitation Protocols on BLS were not competent enough (10). In another study, only 25% of 78 on-call attending physicians (general surgeon, internist and anesthesiologist) wrote all the BLS and ventricular fibrillation treatment protocols correctly (11).

Sandorini et al searched bystander resuscitation skill and knowledge in 32 different hospitals' wards in Rome and only in 17 (53%) hospitals had their own standard BLS/ACLS protocols (12). Before Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care-International Consensus on Science have published, the doctors from the departments of DEUMS which frequently conduct resuscitation maneuvers routinely (anesthesiology and emergency medicine) did not have any unique BLS/ACLS protocol (5,6). Anesthesiologists who assigned to take care of the cardiac arrest patients in wards were using the protocols of European Resuscitation Council (ERC) and emergency medicine attending and residents physicians were using the protocols of American Heart Association (AHA). After these recent guidelines, both departments are now using the same protocols within the hospital for sudden cardiac arrest victims. As Lowenstein declared, every hospital should have its own BLS/ACLS education programme which is applicable, updated and easy to reach. He stated that these programmes should also be given to the health-care workers of these hospitals regularly (13). AHA and ERC concluded in their updated guidelines that unless BLS educations are repeated in a six-month period, knowledge and skill of the physicians may deteriorate and be lost (5,6,23). Lawrence, who is a member of the academic affairs committee of American College of Emergency Physicians prepared a guideline that explains the emergency medicine curriculum of medical students. He recommended that medical students should be educated by emergency medicine specialists regarding BLS and first aid in their first pre-clinical year, ACLS in the second year theoretically and the same lectures practically in their third and fourth year. This guideline also concluded that resuscitation (BLS/ACLS) trainings must be carried out every 6 months. After this deadline, level of knowledge and skill deteriorate in a timely fashion (4).

According to the present study BLS knowledge of the anesthesiology and emergency medicine resident physicians who conduct CPCR regularly was found better compared to the other resident physicians of the other departments (Table IV and V). This result shows that BLS training was not given frequently as recommended above and resident physicians aim to learn only the obligatory maneuvers of their daily practice.

Table IV. Groups in the study which are statistically significant (p<0.05)

	Unsuccessful		Successful		p
	n	(%)	n	(%)	
BLS course after Medical School (+)	122	(53.0)	108	(47.0)	<0.01
BLS course after Medical School (-)	14	(20.0)	56	(80.0)	
Pre-clinical Departments	22	(62.9)	13	(37.1)	<0.01
Clinical Departments	114	(43.0)	151	(57.0)	
Anesthesiology & Emergency Medicine	5	(8.2)	56	(91.8)	<0.01
Others	131	(54.8)	108	(45.2)	

BLS: Basic Life Support

Table V.   Groups in the study which are not statistically significant (p>0.05)

	Unsuccessful		Successful		p
	n	(%)	n	(%)	
Medical Departments	70	(43.8)	90	(56.3)	> 0.05
Surgical Departments	39	(39.4)	60	(60.6)	
BLS training 2000 & before	58	(43.9)	74	(56.1)	
BLS training 1999 & after	78	(46.4)	90	(53.6)	
BLS course in Medical School (-)	63	(46.7)	72	(53.3)	
BLS course in Medical School (+)	73	(44.2)	92	(55.8)	
EMRP (+)	112	(46.3)	130	(53.7)	
EMRP (-)	24	(41.4)	34	(58.6)	
Anesthesiology	3	(11.1)	24	(88.9)	
Emergency Medicine	2	(5.7)	33	(94.3)	

EMRP: Emergency Medicine Residency Programme, BLS: Basic life support

There are also various types of studies on training methods for medical students and resident physicians. All of these are underlined the same consequence that BLS/CPCR training which is a core skill, have a great deal of variation in the training provided by different centers. To ensure consistency of training, all BLS training should follow the international guidelines already in existence (24-29).

CONCLUSION

There are various unsatisfactory success rates of BLS skill and knowledge from all over the world and present study also has shown insufficient knowledge regarding medical school graduates are incompetent because of lack of standard and accredited BLS/CPCR programme in Turkish medical schools. If medical school graduates neither face with true emergencies nor apply resuscitative interventions, they may not have the ability to refresh and practice their BLS knowledge and skill. It is strongly recommended that post-graduate and in-service BLS/CPCR training courses should be regularly and frequently (every 6 month) be given to every resident physician. There should to be a standard BLS/CPCR training programme in every medical school and also a unique protocol for in-service training in every hospital.

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