Original Article

Awareness and attitude about basic life support among medical school students in Jeddah University, 2019: A cross-sectional study

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Abstract

Objectives: To measure the level of knowledge and awareness towards basic life support (BLS) among students in preclinical years at Jeddah University (JU), and to determine their willingness to participate in BLS training in the near future. **Subjects and Methods:** A cross-sectional study was conducted among first-, second-, and third-year medical students of JU. A 27-item questionnaire measured the level of awareness and knowledge about BLS, including: 1) basic Information (seven items); 2) rescue reflex (eight items); and 3) CPR technique and process (12 items). Demographic and academic data, experience and exposure to BLS, and attitude regarding BLS (six items) were analysed as factors of adequate knowledge. **Results:** One hundred and four male students participated and 65 (62.5%) of them were in the second academic year. The correct answers varied from 10.6% to 67.3%, with eight items having <30% correct answers; and seven items showed >50% correct answers. Mean (SD) and median (P75) overall knowledge scores were 37.86 (13.92) and 37.04 (44.44) out of 100, respectively. Twenty-four (23.11%) participants attended a training course in BLS and 13 (12.5%) have ever performed BLS, either voluntarily or not voluntarily, and 18 (17.3%) felt that their current knowledge was sufficient. Knowledge level showed no statistically significant association with any of the investigated factors. **Conclusion:** There is an urgent need to integrate BLS courses to medical students to enrich their knowledge and improve resuscitation skills and ensure implementation of correct resuscitation techniques.

Keywords: Awareness, basic life support, cardiopulmonary resuscitation, knowledge, medical student, professional, Saudi Arabia

Introduction

Basic life support (BLS) is a life-saving method that includes instant recognition of cardiac arrest, initiation of the emergency response systems, adopting adequate cardiopulmonary resuscitation (CPR), and implementing rapid defibrillation. It can be effective in reducing mortality and morbidity in several medical emergencies, notably in out-of-hospital cardiac arrest (OHCA), which is responsible for >49.1% of all deaths. Thus, a rapid intervention, 3–5 min after the onset of OHCA, is crucial for the outcome.[1-3]

In Saudi Arabia, few studies about CPR knowledge were conducted, denoting inadequate awareness and knowledge about BLS and CPR both among healthcare workers[4–6] and in the community.[7,8]

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Received: 26-12-2020 **Revised:** 17-02-2021
Accepted: 17-03-2021 **Published:** 30-07-2021

Access this article online

Quick Response Code:

Website: www.jfmpc.com

DOI: 10.4103/jfmpc.jfmpc_2557_20

How to cite this article: Alghamdi YA, Alghamdi TA, Alghamdi FS, Alghamdi AH. Awareness and attitude about basic life support among medical school students in Jeddah University, 2019: A cross-sectional study. J Family Med Prim Care 2021;10:2684-91.

In this context, we sought to measure the level of knowledge and awareness towards BLS among students in the pre-clinical years at JU. Moreover, this study also aimed at determining their willingness to participate in BLS training in the near future.

Subjects and Methods

Design and setting

A cross-sectional study was conducted at the Medical College of JU, Jeddah, Saudi Arabia, between 1st of July to 30th of October 2019. Previously annexed to King Abdul-Aziz University, JU is one of the recently established universities in Saudi Arabia, which was recognized as an independent institution in 2014. It contains more than ten colleges, including the Medical College, where the first graduated patch was in 2015.

Population and sampling

This study involved preclinical medical students of JU, including first, second and third year students. Students from other levels were excluded. The total number of eligible students during the study period was 108, all of them were targeted.

The names of the eligible participants were retrieved from the electronic list of the students, as provided by the Department of the Academic Affairs. All 108 students were contacted via their email and or telephone numbers and were invited to participate.

Data collection tool

A semistructured questionnaire was designed by the authors for the purpose of this study. It contained four parts. The first part explored demographic and academic data such as age, level, parent's education, family income, etc. The second part explored experience and exposure to BLS, including any past training, whether the participant ever performed BLS, and self-assessed knowledge about BLS. The third part assessed participant's attitude regarding BLS including six items such as opinion about the necessity of BLS, attitude regarding performing mouth-to-mouth ventilation for a person of same and opposite gender, opinion about including BLS in the curriculum. The fourth part assessed the awareness and knowledge about BLS using a set of 27 multiple choice questions, which were divided into three subscales: 1) basic information, which assessed participant's awareness of some basic notions such as the meaning of the abbreviation BLS, signs of severe airway obstruction, body part where pulse check should be performed for an unconscious person, etc., (seven items); 2) rescue reflex, which assessed the participant's first response to assist a person in need of urgent assistance and his or her attitude to deal with the situation in accordance with the BLS standard guidelines (eight items); 3) CPR technique and process, which assessed knowledge about the technical aspects of BLS such as location of chest compression in adults and infants, depth of compressions in adult and infants, rates of compressions, etc., (12 items).

The questionnaire underwent content and face validity to assess relevance of all the items and clarity of the content. Further, internal consistency was analysed by calculation on Cronbach's alpha (see Results section).

Data collection technique and ethical clearance

Responding students were invited for a face-to-face interview through a text message on their personal phones, where the objectives of the study were presented and the importance of the study was exposed. During the interview, verbal content was obtained and the interview was carried out by one of the investigators.

Data were collected in an anonymous fashion, by exclusion of any identifying item. The study protocol was approved by the institutional review board of JU and the scientific committee of the Saudi Board of Community and Family Medicine Residency Program.

Statistical methods

Statistical analysis was performed with the Statistical Package for Social Sciences version 21.0 for Windows (SPSS Inc., Chicago, IL, USA). Descriptive statistics were used to present the demographic data and patterns of answers to the different questionnaire items; categorical variables are presented as frequency and percentage, whereas numerical ones were presented as mean ± standard deviation (SD). Overall knowledge score was calculated as the sum of correct answers of all the knowledge-related items (raw score range = 0–27), and was scaled as a 0–100 score by using the following formula: scaled score = 100×raw score/27. Likewise, scaled scores were calculated for the three subscales including basic information, rescue reflex, and CPR technique (range = 0–10). Kolmogorov–Smirnov and Shapiro–Wilk tests were used to analyse the distribution of overall knowledge score. Chi-square test and independent *t*-test were used to analyse the factors associated with knowledge level, by comparing the percentage of adequate (overall knowledge score ≥40) versus inadequate (score <40) levels in each factor category. A *P* value of <0.05 was considered to reject the null hypothesis.

Results

Participants' characteristics

One hundred and four male students agreed to participate (response rate = 96.3%); their mean (SD) age was 19.96 (0.91) and 65 (62.5%) were in the second academic year. Other sociodemographic data showed high educational level (university+) among 68.3% and 44.2% of participants' fathers and mothers, respectively [Table 1].

Knowledge about BLS

The percentage of correct answers varied from 10.6% to 67.3%, depending on the item, with eight items having <30% correct answers, whereas only seven items showed >50% correct answers [Table 2]. Regarding overall knowledge score, distribution showed a bell shape-like graph with a

Table 1: Participants' characteristics

Parameter	Category	Frequency	Percentage
Gender	Male	104	100.0
Age (years)	Mean, SD	19.96	0.91
Level (academic year)	1	1	1.0
	2	65	62.5
	3	36	34.6
Marital Status	Single	104	100.0
Smoking status	Smoker	35	33.7
	Nonsmoker	68	65.4
	Ex-smoker	1	1.0
Father's educational level	Not educated	1	1.0
	Primary	1	1.0
	Secondary	31	29.8
	University	62	59.6
	Postgraduate	9	8.7
Mother's educational level	Not educated	12	11.5
	Primary	11	10.6
	Secondary	35	33.7
	University	39	37.5
	Postgraduate	7	6.7
Father's professional status	Employed	99	95.2
	Unemployed	4	3.8
Mother's professional status	Employed	43	41.3
	Unemployed	61	58.7
Household income	Up to 10k	39	37.5
	>10k-20k	50	48.1
	>20k	15	14.4

Because of missing data, all frequencies do not sum up to the total

right-skewed histogram [Figure 1], and normality tests, including Kolmogorov–Smirnov (statistics = 0.174, $P < 0.001$) and Shapiro–Wilk (statistics = 0.910, $P < 0.001$), concluded that the variable was not normally distributed. Reliability of overall knowledge scale showed Cronbach's alpha = 0.616 (27 items). Mean, range, median and centiles of overall knowledge score as well as the three subscale scores are presented in Table 3, and confirmed low levels of knowledge notably mean (SD) and median (P75) overall knowledge score of 37.86 (13.92) and 37.04 (44.44), out of 100, respectively.

Previous experience and attitude towards BLS

Of the total participants, only 24 (23.11%) declared that they have attended a training course in BLS and, 13 (12.5%) have ever performed BLS, either voluntarily or involuntarily, and 18 (17.3%) felt that their current knowledge about BLS was sufficient. Regarding attitude, majority (86.5%–88.5%) believed BLS is necessary and opined that BLS course should be mandatory and that BLS training should be part of the curriculum. Furthermore, 16.3% of the students declared that they were either unfavourable or hesitant in performing mouth-to-mouth ventilation for a person of same or opposite gender [Table 4].

Factors associated with knowledge about BLS

Knowledge level showed no statistically significant association with any of the investigated sociodemographic factors; however, although not statistically significant, we observed a higher

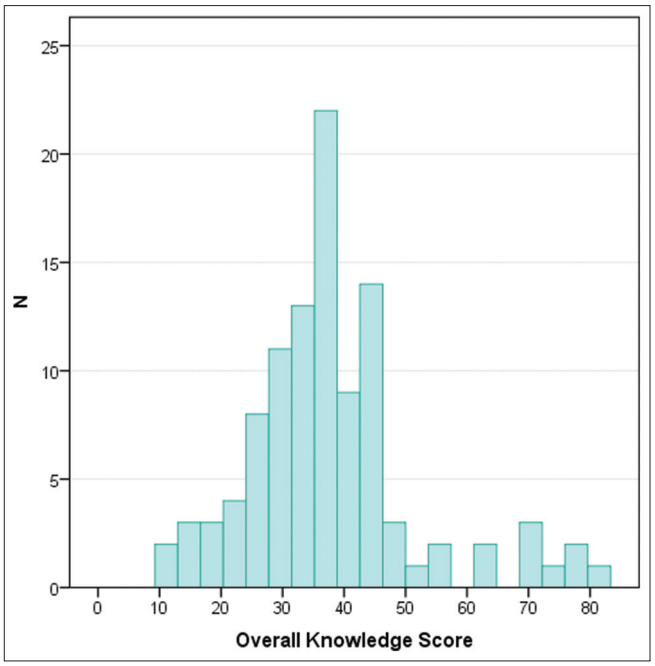

Figure 1: Distribution of overall knowledge score

percentage of adequate knowledge level among third year students (44.4% versus 32.4%), nonsmokers (40.6% versus 28.6%), and those from high-income households (42.0%–46.7% versus 25.6%) compared to their counterparts, respectively. On the other hand, 50.0% of the students who attended BLS training had adequate knowledge, versus 31.6% of those who have never attended such training but the comparison was not statistically significant ($P = 0.101$) [Table 5].

Discussion

Sudden cardiac death (SCD) is the leading cause of 15%–20% of all deaths worldwide,[9,10] in which out-of-hospital SCDs are responsible for >49.1% of all deaths.[2] One of the major issues with SCD is, majority of OHCA occurs in patients as first clinical presentation of the underlying disease or who is already identified but categorized as low risk. Globally, around 250,000–300,000 patients experience an OHCA per year.[11] However, survival rates among OHCA patients receiving bystander-initiated CPR have a better chance of survival than those who do not. Approximately, 350,000 people in Europe die each year because of OHCA.[12] In the United States, >96,000 people die of OHCA,[13] and it is predicted to increase in the upcoming years. In Saudi Arabia, cardiovascular diseases represent the major causes of death, accounting for 37% of all mortalities in 2016.[14] Coronary heart disease constitutes one of the main health problems in Saudi Arabia, representing the third most common cause of hospital-based mortality second to accident and senility.[15]

Thus, basic knowledge of emergency care is a necessary skill for every medical student and graduate to manage emergency situations effectively. This would help to maintain the viability

Table 2: Knowledge about BLS (*n*=104)

Subscale	Items	Correct answer	Correctness rate	
			n	%
Basic information	11. What does the abbreviation BLS stand for?	Basic life support	67	64.4
	27. What does abbreviation AED stands for?	Automated external defibrillator	15	14.4
	28. What does abbreviation EMS stands for?	Emergency medical services	50	48.1
	37. The 5 links in the adult chain of survival include all of the following EXCEPT	Advanced airway placement	32	30.8
	40. Where should you attempt to perform a pulse check in adult?	Carotid	53	51.0
	44. Signs of severe airway obstruction include all of the following EXCEPT	May wheeze between coughs	19	18.3
	46. The critical characteristics of high-quality CPR include which of the following	All of the above	61	58.7
Rescue reflex	18. When you find someone unresponsive in the middle of the road, what will be your first response? (Note: You are alone there)	Look for safety	49	47.1
	19. If you confirm somebody is not responding to you even after shaking and shouting at him, what will be your immediate action?	Activate EMS	15	14.4
	29. If you and your friend are having food in a canteen and suddenly your friend starts expressing symptoms of choking but responsive, what will be your first response?	Confirm foreign body aspiration by talking to him	16	15.4
	39. The initial basic life support (BLS) steps for adults are	Assess the victim, activate EMS and get AED, check pulse and start CPR	58	55.8
	47. You witness an infant who suddenly starts to choke while playing with a toy. You have confirmed that he is unable to cry and/or cough. What should your first response be?	Back blows and chest compression of five cycles each then open the mouth and remove foreign body only when it is seen	39	37.5
	48. You witness an adult unresponsive victim who has just been removed from submersion in fresh water. He has spontaneous breathing, but is unresponsive. What should your first response be?	Keep him in recovery position	11	10.6
	49. You notice that your colleague has suddenly developed slurring of speech and weakness of the right upper limb. Which one of the following should be done?	Possibly stroke, he may require thrombolysis and hence activate emergency medical services	35	33.7
	50. A 50-year-old gentleman presents with retrosternal chest discomfort, profuse sweating and vomiting. What is the most appropriate course of action?	Probably myocardial infarction, hence activates EMS, give an aspirin tablet and allow him to rest	56	53.8
CPR technique and process	20. What is the location for chest compression?	Centre of the chest on lower half of breast bone	70	67.3
	21. What is the location for chest compression in infants?	One finger breadth below the nipple line	40	38.5
	22. How do you give rescue breathing in infants?	Mouth-to-mouth and nose	50	48.1
	23. Depth of compression in adults during CPR	At least 2 in	37	35.6
	24. Depth of compression in Children during CPR	2 in	25	24.0
	25. Depth of compression in neonates during CPR	Approximately 1½ in	34	32.7
	26. Rate of chest compression in adult and children during CPR	100-120/min	55	52.9
	38. How often should rescuers switch roles when performing 2-rescuer CPR?	After 5 cycles	40	38.5
	41. The compression to ventilation ratio for the lone rescuer giving CPR to victims of ANY age is	30:2	24	23.1
	42. The proper steps for operating an AED are	On the AED, attach electrode pads, analyze the rhythm, clear the patient and deliver shock	30	28.8
	43. The 2010 AHA Guidelines for CPR recommended BLS sequences of steps are	Chest compressions, airway, breathing	41	39.4
	45. In an adult with an advanced airway in place during 2-rescuer CPR, breaths should be administered how often?	Every 6-8 s	41	39.4

of the cardiopulmonary system before it could be fully resuscitated. In the present study, we showed that medical students in Jeddah had low knowledge levels regarding BLS as indicated by an overall score of 37.04 and percentages of correct answers ranging between 10.6%–67.3% for different domains. While a small proportion of medical students (23.11%) had attended a BLS-related training course, the majority of them declared that they have marked deficiencies in their personal knowledge (82.7%) and that implementing a specialized course is necessary as a part of the curriculum (86.5%–88.5%).

The outcomes of the current study were in agreement with other national and international investigations. On the international level, poor knowledge levels were apparent in Iran,[16] India,[17] Egypt,[18] and the United Kingdom.[19] Locally, similar to the mean score obtained in our study (37.9 ± 13.9), female medical

Table 3: Overall and specific knowledge about BLS

Subscale	Scale	Range	Mean	SD	Median	P75	P95
Overall knowledge score	100	11.11, 81.48	37.86	13.92	37.04	44.44	70.37
Basic information score	10	0.00, 10.00	4.08	1.94	4.29	5.71	7.14
Rescue reflex score	10	0.00, 10.00	3.35	2.01	2.50	3.75	8.44
CPR technique Score	10	0.00, 7.50	3.90	1.77	4.17	5.00	6.67

Table 4: Previous exposure and attitude regarding BLS

Item	Response	*n*	%
Previous exposure			
Did you attend any training course in basic life support before?	Yes	24	23.1
	No	79	76.0
When was the training course?	1.00	12	11.5
	2.00	8	7.7
	3.00	2	1.9
	4.00	1	1.0
Where was the training course held?	Specialized centre	4	3.8
	Hospital	9	8.7
Have you ever voluntarily performed BLS?	Yes	9	8.7
	No	91	87.5
	Yes, but not voluntarily	4	3.8
Do you feel your knowledge about BLS is sufficient?	Yes	18	17.3
	No	86	82.7
Attitude			
Do you think a BLS course should be mandatory?	Yes	92	88.5
	No	12	11.5
Do you think BLS is necessary?	Yes	92	88.5
	No	10	9.6
	Cannot say or not sure	2	1.9
Would you perform mouth to mouth ventilation for person of same gender?	Yes	87	83.7
	No	11	10.6
	Hesitant	6	5.8
Would you perform mouth to mouth ventilation for person of opposite gender?	Yes	87	83.7
	No	4	3.8
	Hesitant	13	12.5
Would you like to undergo BLS training in a workshop/center with hands on practice under supervision?	Yes	95	91.3
	No	6	5.8
	Not sure	2	1.9
Do you think that BLS training should be part of your curriculum?	Yes	90	86.5
	No	10	9.6
	Not sure	4	3.8

Because of missing data, all frequencies do not sum up to the total

students at Princess Nourah bint Abdulrahman University had a mean knowledge score of 34.3 ± 14.1, and the knowledge level was <50% among 87.4% of them.[20] Likewise, 60.8% of medical students at Tabuk University scored less than 5 (out of 17), and their knowledge levels were judged as "insufficient".[21] In addition, although medical students have achieved higher knowledge scores that those of other allied health colleges at Qassim University, the average score of all grades in the medical college was 10.4 (out of 20).[15] Medical students at Jazan University had higher scores (10.8 out of 14), and having previous CPR training was significantly associated with higher knowledge scores.[22] Almost half of medical students had poor knowledge about first aid in Abha[23] and Riyadh[24] and in an online survey targeting Saudi medical students across the Kingdom.[25]

The reported findings indicate low knowledge levels in our settings, even when compared with other local universities. This can be explained by multiple reasons. First, there is a lack of BLS training at our medical college and other national institutions. The problem is more significant among students of the preclinical years of study; only 23.1% of our students declared that they had previously received a BLS training. Actually, BLS training was deficient despite the critical role of these approaches in saving lives, particularly in a country with a high frequency of injuries due to road traffic accidents.[26,27] Ultimately, knowledge acquisition is significantly affected. Second, it seems that there are significant problems in knowledge retention (educational reinforcement), which should be addressed to promote the knowledge of medical students. Third, significant gender-based

Table 5: Factors associated with knowledge about BLS

Factor	Category	Knowledge level (score)				*P*
		Inadequate (<40)		Adequate (≥40)		
		n	%	*n*	%	
Age (years)	Mean, SD	19.91	0.91	20.05	0.93	0.443
Level	1 or 2	46	67.6	22	32.4	
	3	20	55.6	16	44.4	0.223
Current smoking status	Current Smoker	25	71.4	10	28.6	
	Non-smoker	41	59.4	28	40.6	0.229
Father's educational level	Up to secondary	18	54.5	15	45.5	
	University+	48	67.6	23	32.4	0.198
Mother's educational level	Up to secondary	39	67.2	19	32.8	
	University+	27	58.7	19	41.3	0.369
Mother's professional status	Employed	25	58.1	18	41.9	
	Unemployed	41	67.2	20	32.8	0.344
Household income	Up to 10k	29	74.4	10	25.6	
	>10k-20k	29	58.0	21	42.0	
	>20k	8	53.3	7	46.7	0.192
Ever attended BLS training course?	Yes	12	50.0	12	50.0	
	No	54	68.4	25	31.6	0.101
Self-assessed knowledge about BLS	Sufficient	10	55.6	8	44.4	
	Insufficient	56	65.1	30	34.9	0.444

Because of missing data, all frequencies do not sum up to the total

differences have been noted in other studies, where males were more reluctant regarding performing CPR on another person.[28,29] This explains the low scores obtained in our analysis (male students) compared to other female-based or mixed-cohort investigations. All these barriers should be considered while tailoring effective and targeted interventions to increase BLS knowledge.

In the current study, 16.3% of male medical students were hesitant to perform mouth-to-mouth breathing, which is an essential element of BLS to support ventilation. Indeed, mouth-to-mouth and nose resuscitation is a vital BLS approach in infants, where there is a narrow space between the mouth and the nose. However, it seems that preclinical students had some concerns about fear of infection while performing such a technique; these concerns were previously reported among school teachers in Riyadh.[30] Besides, the majority of medical students may lack the knowledge regarding the alternative technique to the mouth-to-mouth CPR.[4,28]

In Saudi Arabia, the national CPR guidelines are regularly updated by the Saudi Heart Association, targeting healthcare providers and instructors as well as community members through specific skilful programs.[31] These evidence-based guidelines should be emphasized in the provided undergraduate programs to encourage students to depend on reliable resources. This is because some students may acquire inaccurate information from other sources, leading to medical errors and decreased self-confidence.[32] In addition, education in preclinical years seems to be highly effective given the initial low levels of basic knowledge that the students possess. On the other hand, there are significant barriers after graduation, such as lack of resources and time constraints due to busy residency schedules, which inhibit effective education to acquire resuscitation skills. Although doctors can still have the capacity to learn BLS skills in the clinical practice, they would not be able to correct faulty techniques.[33]

Based on all the aforementioned factors, and the fact that a significant proportion of junior doctors are not efficient in conducting CPR,[34] students in the current study have largely acknowledged the importance of BLS courses during preclinical years. The students believed that their cognitive perceptions and time can still allow receiving educative materials pertinent to CPR. Therefore, the integration of organized BLS courses should be a standardized and mandatory element of undergraduate academic curricula in all Saudi medical colleges. Such courses could be additionally supported by other undergraduate resuscitation courses, such as basic trauma life support as well as advanced neurologic, paediatric and cardiac life support. The acquired basic and advanced resuscitation skills via these courses may need to be regularly refreshed as indicated by Cooper *et al.*,[35] who have found high levels of knowledge and significantly improved resuscitation skills among healthcare professionals who have completed BLS courses six months after an earlier immediate life support course. Another proposed solution is to implement peer-led BLS training (by senior medical students), which has proven as equally effective as professional-led training.[36] Finally, a special emphasis on the quality, simplicity and cost-effectiveness of training should be warranted. These would improve students' perceptions, ensure high efficacy of training and yield high technical competency.

The present study had some limitations. Although, we investigated BLS knowledge and the willingness of medical students regarding BLS training, we could not assess the basic skills required to implement their techniques. The obtained self-reported data did not allow definitive confirmation of the level of knowledge and

skills. Future studies are required to evaluate BLS training and its prospected effects on the real skills. Noteworthy, only male medical students were investigated, a matter which could be resolved in future surveys. The inherent limitations of the survey design, such as the variation in understanding and interpretation, may reduce the reliability of the obtained outcomes and thus explain lack of significant differences in BLS knowledge in students who have attended educational courses.

Conclusion

In conclusion, medical students studying in preclinical years had low levels of BLS knowledge as a small proportion of them had attended relevant training. However, majority of them had positive attitudes regarding the requirement to integrate the BLS basic knowledge in the academic curricula. There is an urgent need to integrate BLS courses as educative materials to medical students to enrich their knowledge and improve resuscitation skills, update their acquired knowledge on a regular basis and ensure the implementation of correct resuscitation techniques. This would ultimately improve the future practice of medical students during emergencies and help mitigate the burden of OHCA deaths. More research is required to assess knowledge levels on a large scale in the Kingdom, considering the involvement of both male and female medical students in preclinical years to obtain deep insights into the possible factors that could be further used to set appropriate and efficient BLS course designs.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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