

# Anesthesiologists' Training and Knowledge of Basic Life Support

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Anesthesiologists' training and knowledge in one aspect of cardiopulmonary resuscitation (CPR), Basic Life Support, was evaluated by an anonymous mailed questionnaire. Two hundred forty-six of 780 (32 per cent) surveyed responded. A random group of non-respondents was questioned by telephone; 18 of 78 non-respondents contacted completed the questionnaire. After comparison, the respondent and nonrespondent groups were combined as representative of the total population surveyed. Seventy-two per cent of the surveyed anesthesiologists had CPR training during their residency; however, prior to 1960 only 33 per cent had this training, while after 1960 85 per cent were trained. Sixty-two per cent stated they had read the American Heart Association (AHA) Standards, while only 26 per cent had taken an AHA CPR course. Scores on four of six knowledge questions were less than 50 per cent correct. American Board of Anesthesiology (ABA)-certified anesthesiologists scored 54 per cent correct, whereas those not ABA-certified scored 42 per cent ( $P < .002$ ). Those who had read the AHA Standards scored 57 per cent correct, compared with 40 per cent for those who had not read the Standards ( $P < .001$ ). Those who had taken an AHA CPR course scored 62 per cent correct, whereas those who had not scored 46 per cent ( $P < .001$ ). Since most anesthesiologists do not have training and knowledge of current accepted CPR sequences, there is need for CPR training during anesthesia residency and post-residency CPR continuing education. (Key words: Anesthesiologists. Complications, arrest, cardiac. Education: residents. Heart: cardiac massage; cardiopulmonary resuscitation. Organizations: American Board of Anesthesiology; American Heart Association. Ventilation: artificial.)

A CONCERTED NATIONAL EFFORT<sup>1,2</sup> has been made to investigate, develop, and teach cardiopulmonary resuscitation (CPR) since its clinical application in the late 1950's.<sup>3</sup> Although a systematic approach has been devised and guidelines defined,<sup>4</sup> acceptance of standardized CPR by the medical community has been less than universal. With few exceptions,<sup>5</sup> most medical school curricula have not included CPR train-

ing according to the standardized schema. In general, postgraduate medical education has done no better in this regard. House-staff physicians perform CPR poorly,<sup>6,7</sup> and attending staff physicians<sup>7</sup> do not include CPR in their continuing education activities.

Anesthesiologists, in particular, assume they are well trained in CPR because of their expertise in management of the airway and cardiovascular system. Anesthesiology is defined, in part, as a specialty devoted to the clinical and didactic aspects of CPR.<sup>8</sup> Moreover, anesthesiologists have been charged by many other medical specialties with the task of teaching the accepted CPR sequences.

When deficiencies in CPR knowledge and technique were found in our staff's performance in the nationally recognized American Heart Association (AHA) CPR courses, we questioned the validity of the assumption that anesthesiologists are well trained in CPR. Therefore, we undertook a survey to evaluate anesthesiologists' training and knowledge in one aspect of CPR, Basic Life Support.

## Methods and Materials

An anonymous questionnaire was mailed to the entire membership of a state society of anesthesiologists. Returned questionnaires comprise the respondent group. To determine whether non-respondents were similar to respondents, telephone calls were made randomly to every tenth name on the membership list. Questionnaires answered by telephone comprise the non-respondent group.

The basic and specific CPR demographic questions are listed in table 1. Six additional multiple-choice questions were asked to assess knowledge of Basic Life Support. These questions covered the topics listed in table 1. Correct answers to the knowledge questions as determined by the AHA Standards<sup>4</sup> were taken to measure basic CPR knowledge. Cross-tabulations of the respondent and non-respondent demographic data were evaluated with the chi-square test (with Yates' continuity correction in the case of  $2 \times 2$  tables); comparisons of knowledge scores were evaluated with the t test for independent samples. All data manipulations were performed with *Statisti-*

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‡ Harkins JL, Hughes T: Surprise testing of medical and paramedical personnel in basic cardiopulmonary resuscitation (CPR) (abstr). American Society of Anesthesiologists, Annual Meeting, 1976, pp 125-126.

§ The American Board of Anesthesiology, Inc.: Booklet of Information, 1977, p 4.

TABLE 1. Cardiopulmonary Resuscitation Training and Knowledge Survey

1. Basic demographic information
a. Year anesthesia training completed
b. Certification by American Board of Anesthesiology
c. Hospital bed size
d. Type of anesthesia practice
e. Hospital availability of critical care facilities
2. CPR demographic information
a. CPR training during anesthesia residency
b. Reading Standards <sup>4</sup>
c. Taking an AHA CPR course
d. Taking another CPR course
3. CPR knowledge topics
a. Is chest compression ever too hazardous to perform?
b. What is the correct double-rescuer CPR sequence?
c. When is the chest thump indicated?
d. What is the correct single-rescuer CPR sequence?
e. What are the correct ratios for chest compression and rescue breathing?
f. In what sequence should rescue breathing be initiated and cardiac status assessed?

cal Package for the Social Sciences,<sup>8</sup> and  $P < 0.05$  was considered significant.

### Results

Two hundred forty-six of the 780 questionnaires mailed were returned, forming the respondent group. This 32 per cent response rate is expected for a survey conducted under these conditions. Seventy-eight random telephone calls were made to identify and question non-respondents. Eighteen questionnaires completed over the telephone comprise the non-respondent group.

The respondent and non-respondent groups appeared similar in all respects except for type of anesthesia practice and score on question 2 (table 2). In addition, since the total correct scores on the knowledge questions are not statistically different for the two groups (table 3), respondents and non-respondents were combined and the results of the survey were interpreted as representative of the total surveyed population.<sup>†</sup>

Most anesthesiologists surveyed were certified by

<sup>†</sup> Admittedly, if more non-respondents had been contacted more significant differences between respondents and non-respondents might have been apparent. Yet, the expected bias engendered by pooling all responses is in the direction of overstating the amount of CPR training and knowledge in the surveyed population, because response to mailed questionnaires correlates with education,<sup>9</sup> intellectual level,<sup>10</sup> and interest in the topic under study.<sup>11</sup> Besides the non-response bias is the possible error engendered by sampling. In effect, the respondents constitute a sample of the entire population to whom questionnaires were sent. Estimates for this sampling error are provided by confidence limits, which may be calculated via a normal approximation approach.<sup>12</sup> The 95% confidence limits for the scores listed in table 3 are  $\pm 5$ .

the American Board of Anesthesiology (ABA) (68 per cent), were practicing anesthesia with certified registered nurse anesthetists or residents (82 per cent), and were working in hospitals of more than 300 beds (67 per cent) with a full complement of critical care facilities (intensive and cardiac care and emergency room) (72 per cent).

Nearly three fourths of the surveyed anesthesiologists had had CPR training during their residency, and most of this didactic emphasis had occurred in the last 18 years, when mouth-to-mouth rescue breathing and closed-chest cardiac compression became the fundamental CPR maneuvers. Prior to 1960 only 33 per cent had any formal resuscitation training during residency, while after 1960, 85 per cent had CPR training during residency ( $P$  of difference  $< 0.001$ ). Sixty-two per cent stated they had read the Standards.<sup>4</sup> Twenty-six per cent had taken an AHA CPR course, while 20 per cent had taken a CPR course sponsored by some other organization. Although ABA-certified physicians were more likely to have read the Standards,<sup>4</sup> taken an AHA course,

TABLE 2. Demographic Profiles and Knowledge Question Scores

	Respondents (n = 246) (Per Cent)	Non- respondents (n = 18) (Per Cent)	Total (n = 264) (Per Cent)
Anesthesia training completed after 1960	77	59	75
ABA certification	68	72	68
Hospital size > 300 beds	68	61	67
Anesthesia practice			
Solo or group	20*	6*	18
With nurse anesthetists	37*	83*	41
Residency training program	43*	11*	41
Availability of critical care facilities	72	67	72
CPR training during residency	72	61	72
Read Standards <sup>4</sup>	62	72	62
Took an AHA CPR course	26	22	26
Took another CPR course	21	5.6	20
Score (correct)			
Question			
a. (cardiac compression)	79	72	78
b. (double-rescuer CPR)	37*	67*	39
c. (chest thump)	44	39	43
d. (single-rescuer CPR)	32	22	31
e. (compression: rescue breathing ratio)	44	28	43
f. (rescue breathing: pulse sequence)	68	44	66

\*  $P$  of difference  $< 0.03$ .

or taken another course, none of these associations was statistically significant.

Scores on the individual Basic Life Support knowledge questions ranged from 31 to 78 per cent correct (table 2). Total correct scores on the six knowledge questions as they relate to various categories of the surveyed population were higher for ABA-certified anesthesiologists and those anesthesiologists who either had read the Standards<sup>4</sup> or had had CPR training (table 3). Although the score was higher for CPR-trained anesthesiologists, because the size of the group reading the Standards was larger than the size of the group taking an AHA course, multiple regression analysis revealed that the best predictor of score was reading the Standards,<sup>4</sup> although only 10 per cent of variance in scores is explained. Having taken an AHA course increased prediction of the score by 34 per cent, and ABA certification increased prediction by another 19 per cent. The other demographic variables contributed little to prediction of total knowledge score.

### Discussion

A systematic, standardized approach to CPR has been developed by the AHA in conjunction with many other scientific organizations, including the American Society of Anesthesiologists,<sup>1,2</sup> and this nationally accepted program is being taught throughout the United States in a uniform fashion through CPR courses. According to this scheme, the teaching of CPR and its clinical application are divided into two areas. Basic Life Support deals with airway management and circulatory support without adjunctive equipment; that is, rescue breathing and manual external cardiac compression. Advanced Life Support continues Basic Life Support measures and utilizes additional available adjunctive equipment, including endotracheal intubation, electrocardiographic monitoring, defibrillation, and pharmacologic therapy. This format permits efficient delivery of emergency cardiac care with whatever therapeutic modalities are appropriate and available. Once this format is learned, rescuers who have never worked together function in unison, speaking a common language learned during training. Expected benefit to the victim is not only obvious but has been demonstrated.<sup>13-16</sup>

Specialty training in anesthesia provides facility in advanced CPR skills. However, according to this survey, most anesthesiologists do not have training and knowledge of basic CPR skills. Although the AHA CPR sequences have been accepted as standards by many organizations and most anesthesiologists surveyed have read these Standards,<sup>4</sup> three of four anesthesiologists have not reinforced their reading

TABLE 3. Knowledge Score versus Demographic Information

	Correct Total Score (Per Cent)
Non-respondents	45
Respondents	50
Trained prior to 1960	47
Trained after 1960	51
Not ABA certified	42
ABA certified	54*
Hospital size < 300 beds	46
Hospital size ≥ 300 beds	52
Anesthesia practice without residents	47
Anesthesia practice with residents	57*
Working in a hospital without ICU's	50
Working in a hospital with ICU's	49
No CPR training during anesthesia residency	51
CPR training during anesthesia residency	49
Did not read Standards <sup>4</sup>	40
Read Standards <sup>4</sup>	57*
Did not take AHA CPR course	46
Took AHA CPR course	62*
Did not take other CPR course	49
Took other CPR course	54

\*  $P < 0.01$  for difference by t test for independent samples.

by participation in CPR training after residency. Scores were less than 50 per cent correct for four of the six knowledge questions. Overall scores were definitely higher for those who had read the Standards<sup>4</sup> and taken an AHA CPR course.

Formal CPR training for anesthesiologists trained before 1960 is especially important since they have never been exposed to an organized approach to CPR. Anesthesiologists trained after 1960 would also benefit greatly from CPR training to ensure that their performance is in agreement with currently approved standards. Anesthesiologists not exposed to an AHA CPR didactic session in the last two years may not be aware of the many revisions that have been introduced into the sequences.<sup>17</sup> A need may exist not only for initial CPR education but also for annual update and review. As evidenced by this survey, CPR courses other than those provided by the AHA or those based upon the Standards<sup>4</sup> may not enable participants to learn nationally accepted CPR therapy.\*\*

\*\* Basic Life Support training programs sponsored by other organizations such as the American National Red Cross, which utilize the nationally accepted Standards<sup>4</sup> as their fundamental teaching foundation, serve to broaden the scope of high-quality CPR education.

It can only be speculated how these same practitioners actually perform CPR, but the implication of deficiency is clear from the lack of training and knowledge. To ensure that anesthesiologists provide quality CPR in the clinical setting and continue to maintain their leadership role in teaching CPR to their medical and paramedical colleagues, and the lay public, anesthesia residency training and post-residency continuing education must include both Basic and Advanced AHA CPR courses.

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