

CPR Skills: Achievement and Retention under Stringent and Relaxed Criteria

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Abstract: The ability to deliver proper basic cardiac life support was evaluated in 33 health professional students immediately and three months post CPR training, the latter assessment unsuspected. Statistically significant declines were noted in psychomotor skills. Performance using American Heart Association (AHA) standards was compared to performance under "relaxed" criteria. Results imply that current lengths of training sessions, duration of recertification, and application of established AHA standards may require re-evaluation. (*Am J Public Health* 1983; 73:1310-1312.)

Introduction

Approximately one million heart attacks occur annually in the United States, claiming 650,000 lives.¹ When properly performed, cardiopulmonary resuscitation (CPR) can reduce morbidity and mortality. Successful resuscitation may occur in approximately 40 per cent of victims when bystander-initiated CPR is combined with the rapid provision of paramedic services.²⁻⁴

Previous studies have focused on the ability of lay persons to retain skills and to perform CPR adequately after various intervals of time.⁵⁻¹² In all studies, a deterioration of psychomotor skills was observed at either 12, 6, or 3 months. This study was designed to determine the extent of CPR skill deterioration, if any, in a group of allied health professional students after three months without prior knowledge of retesting.

Methodology

Forty-one senior pharmacy students participated in a required American Heart Association (AHA) sponsored Basic Cardiac Life Support (BCLS) course.*

Two recording manikins were chosen as assessment instruments based upon their reproducibility of rhythm test strips.** The limitations of the manikins as recording instruments and the absence of published data correlating test

manikin performance and the successful outcome of CPR are recognized. The investigators served as evaluators. Assessment areas were physically isolated from practice or waiting areas in order to eliminate any influence from observing repetitive testing by candidates. In addition, discussion between subjects while awaiting evaluation was not permitted.

Assessment of CPR psychomotor skills took place immediately after the BCLS course. A modification of the method developed by Weaver⁶ in accordance with AHA recommendations was utilized. Only those skills in one rescuer-delivered CPR were evaluated for purposes of this study. The total test time approximated 1.5 minutes.

Retention of CPR skills was assessed three months post training. Participants were unaware of the retesting until immediately prior to examination at which time each subject was asked to give informed consent. Retention of CPR skills was determined by comparing the subject's follow-up psychomotor performance with that achieved immediately post training.

Results

Thirty-three subjects (17 men, 16 women, a distribution similar to the original group) completed the initial and follow-up assessments. No one administered CPR or reviewed course materials prior to testing or during the three-month interval.

Assessment of psychomotor behavioral skills indicated a significant decrease in the performance of the correct sequence of events and deterioration of functional skills (Table 1).

Performing the correct sequence of events and avoiding injurious CPR are common to both stringent and relaxed⁵ criteria (Table 2). The data reflect a significant compromise in the student's ability to perform them correctly three months post training. Differences were also demonstrated between relaxed and stringent criteria in the provision of an adequate number of "effective" ventilations. Under relaxed criteria, students demonstrated a greater ease in achieving and later retaining this level of ventilatory skill performance.

Assuming the provision of ventilations and compressions has the greatest impact upon a successful rescue, the ability to perform both parameters 3 & 4 (Table 2) correctly was evaluated. Significant differences in the student's ability to initially achieve and later retain these skills were noted between performance criteria.

Discussion

Unlike previous studies,^{5,6,11,12} participants had no prior knowledge of retesting, were not allowed a practice session, and had not reviewed CPR-related materials in the

* The content of the CPR course is available on request.

** Recording Resusci-Anne™ manikins (Asmund Laerdale, Stavanger, Norway) were utilized.

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TABLE 1—Psychomotor Evaluation of One-Person CPR

	Percentage of Subjects (N = 33)	
	Immediately Post Training	3 Months Post Training
Sequence of Events		
1. Establishes unresponsiveness	100	97
2. Opens airway	88	52*
3. Establishes lack of breathing	88	49*
4. Provides initial 4 ventilations	100	40*
5. Establishes lack of pulse	94	24*
6. 15:2 ventilation to compression ratio	90	67*
7. 1-6 above correct	73	9*
Functional Skills**		
VENTILATIONS		
1. 1st 4 stairstep	33	24
2. 1st 4 ventilations > 0.8L	79	21†
3. 12 ventilations > 0.8L	88	58‡
4. 8 or more ventilations/minute	55	30‡
5. Herniating ventilation	15	18
COMPRESSIONS		
1. 60 or more > 38mm††	33	18
2. 60 or more compressions/minute	21	9
3. 40 or more > 38mm††	85	39‡‡
4. 40 or more compressions/minute	91	64‡‡
5. <10 injurious compressions	76	30‡‡

*P < .005 using McNemar test for significance of changes.

**Based upon manikin recorded rhythm strips.

†P < .001 using McNemar test for significance of changes.

‡P < .025 using Chi-Square test

††Based upon number of compressions delivered over entire four-cycle time interval.

‡‡P < .05 using Chi-Square test.

interim. Surprise testing may explain the relatively lower performance scores at three months. Since very few people anticipate delivering CPR at a given time, we feel the surprise element more closely resembles the real life situation.

Excluding the establishment of unresponsiveness, there were fewer students at the three-month period who adequately assessed the need for ventilations and compressions. Most were anxious to initiate compressions and moved rapidly through the sequence without satisfying the victim's needs. Although a decline in most parameters was appreciat-

ed, two-thirds of participants still satisfied the requirement of 15 compressions to two breaths.

Evaluation of student's ventilatory skills showed a decline at three months. Inadequate head tilt seemed to account for the poor ventilatory volumes upon retesting. Most participants could not deliver the required eight ventilations per minute established by the AHA, because compressions were not delivered rapidly enough and too much time was taken between ventilations.

Since subjects had difficulty satisfying the goal of delivering 60 or more chest compressions per minute during both testing sessions, we question whether participants are achieving minimum competency by AHA standards in this area of BCLS. In contrast, greater than 90 per cent of students were able to master chest compression skills initially, when evaluated under "relaxed" criteria adapted from work by Berkebile and associates.⁵ When the subjects were re-evaluated at three months post training, a greater percentage of participants retained their CPR skills under "relaxed" criteria.

The delivery of a sufficient number of effective ventilations and compressions would seem to have the greatest impact upon victim survival. Considering only ventilations and compressions, 85 per cent of subjects provided proper BCLS under "relaxed" criteria, initially, versus 21 per cent by AHA standards. When retested, one-half retained their BCLS skills under "relaxed" criteria.

Cobb and associates¹³ could not firmly establish a relationship between an improvement in patient outcome and quality of CPR delivered. They state that even suboptimal attempts at CPR may forestall the onset of anoxic cerebral injury, but caution that the length of resuscitative effort will affect survival considerably. In this study, roughly one-half of the subjects could deliver CPR under the "relaxed" criteria at three months. Whether current AHA standards or "relaxed" criteria represent minimum competencies for support and prolongation of life is yet to be determined.^{14,15}

These students are not unlike the general public in that they usually are not expected to provide CPR as part of their job responsibilities. Unlike the general population, they are young, healthy adults educated in the health sciences. If this group cannot initially master and retain CPR skills outlined by the American Heart Association, can we expect the general public to perform to this level?^{6,13,16}

TABLE 2—Subject Performance Based upon Stringent and Relaxed Criteria

Common to Stringent and Relaxed Criteria	Immediately Post Training %		3 Months Post Training %		
	Stringent Criteria	3 Months Post Training %	Relaxed Criteria*	3 Months Post Training %	
1. Correct Sequence of Events		73		9	
2. No Injurious Performance		55		12	
3. Ventilations (>0.8L) 8 times/minute	52	21	Ventilations (>0.8L) 6 times/minute	82	52
4. 60 or more compressions per minute	21	9	40 or more compressions per minute	91	64
5. Items 3 & 4 correct	21	6	Items 3 & 4 correct	85	49

*Based upon modified criteria developed by Berkebile and associates.⁵

A shorter recertification period should help curb CPR skill deterioration, but may further strain limited manpower resources. Perhaps a re-evaluation of the current standards and the establishment of a minimum competency level are in order. Until such time, it would seem reasonable to view the current standards as goals.

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ACKNOWLEDGMENTS

The authors acknowledge Mr. Patry for his support in data analysis and Ms. Quigley for her technical assistance.

Prescribed Medicines: Findings from the National Medical Care Expenditure Survey

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Abstract: In 1977 the National Center for Health Services Research, US Department of Health and Human Services, undertook a survey of 40,000 individuals in the United States, soliciting information on expenditures and sources of payment for health services including prescribed medicines. Differences in the use of prescribed medicines by age, sex, ethnic/racial background, family income, and perceived health status were found across and within therapeutic categories. More than one-fifth of expenditures were for cardiovascular-renal agents. Sources of payment were similar in all but a few therapeutic categories. (*Am J Public Health* 1983; 73:1312-1315.)

Introduction

Population-based estimates of expenditures for prescribed medicines by therapeutic use category were not available from federal health surveys before the 1977 National Medical Care Expenditure Survey (NMCES). New esti-

mates are presented in the accompanying tables on use and expenditures for prescribed medicines by therapeutic category and selected population groups.

Methodology

The data on prescribed medicines were obtained in five rounds of household interviews. Information supplied by respondents through a standard household questionnaire included expenditures, sources of payment, and names of prescribed medicines. Households kept a record of this information in a calendar provided for this purpose, and interviewers obtained prescribed medicine names from the dispensing package. This information was corrected or amended through a computerized household summary update process, which allowed the respondents to correct or add to the information provided in previous interviews.^{1,2}

Prescribed medicines are defined as any kind of drug or medical preparation reported as being prescribed by a physician and purchased or otherwise obtained, including refills. *Annual expenditures* are defined as the sum of charges for prescribed medicines obtained during the period January 1, 1977 to December 31, 1977.

Therapeutic categories are based on the 20 chapter headings of the *AMA Drug Evaluation (AMADE)*.³ Multiple use drugs were coded based on the name and the reported medical condition.* The original 20 therapeutic categories

*A detailed report of the procedures for coding therapeutic categories is available from the author.

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