

# The Evaluation of Learning and Practicing Cardiopulmonary Resuscitation in the Fundamental Nursing Education

— with special reference to Basic Life Support —

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**Abstract** Nursing skill training for cardiopulmonary resuscitation as part of the basic life support was conducted in the school using dummies for training emergency resuscitation. This training was participated by 70 students of the Department of Nursing, the School of Allied Medical Sciences, Nagasaki University. The effectiveness of learning and practicing by the students and the problems were analyzed on the basis of their nursing practical test and objective tests before and after the skill exercise.

In nursing practical skill test, the instructors evaluated each item on the check list, and more than 90% of the students passed the test for most of the items. In objective test, the average marks after the nursing skill exercise was high. However, knowledge and skill were not integrated in some items, leaving problems for the teaching procedure. In self-evaluation, many students "could not" perform artificial respiration, indicating that keeping airway and mouth-to-mouth ventilation were quite difficult. Basic life support is meaningless if one is unable to perform at an emergency circumstance. Acquisition of the skill by repeated training is considered essential.

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**Key Words** : cardiopulmonary resuscitation, prehospital care, airway keeping, artificial respiration, cardiac massage

## I. INTRODUCTION

Emergency cases may arise in all areas of daily life as well as in hospitals. As medical treatment has been developing highly and widely, nurses are required at various emergency sites to have the ability of judgment to assess nursing problems based on the degree, cause and factor of the injury, and the ability to promptly play their role in emergency procedure. Thus, it is essential to develop basic ability such as skill and playing a role to perform emergency nursing.

Clinical nursing practice plays an important role in fundamental nursing education. However, opportunities for nursing students to experience the method of emergency resuscitation in clinical nursing practice are extremely scarce, and it is impossible for them to actually perform emergency resuscitation even if they encounter such an occasion.

Emergency resuscitation is a skill which is essential in a crisis of life. A variety of trials to provide more practical learning have been undertaken at schools<sup>1)-10)</sup>.

Ever since its inauguration, the Department of Nursing, the School of Allied Medical Sciences, Nagasaki University, has provided lessons of cardiopulmonary resuscitation (CPR) as part of basic life support in nursing skill training of third-year class students using LAERPAL's Recording Resusci Anne (Resusci Anne), a dummy for training of emergency resuscitation. Recently, a review was made on the learning and practicing evaluation and future problems on the basis of nursing practical skill test, objective tests before and after nursing skill exercise and self-evaluation by students themselves.

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**II. OUTLINE of NURSING SKILL EXERCISE**

**1. Purpose**

To understand cardiopulmonary resuscitation (CPR) and to be able to perform emergency procedure including basic life support.

**2. Subjects and Period of Exercise**

1) Subjects

The subjects were 70 nursing students among those registered in the third-year class of the Department of Nursing, the School of Allied Medical Sciences, Nagasaki University, who participated in the exercise and underwent both pretest and post-test in the academic year 1993.

2) Period of exercise

The nursing skill exercise was conducted in January 1994 at the period of "Evaluation and summarization of clinical nursing practice" after the completion of clinical nursing practice.

**3. Content of Exercise**

- 1) Discovery of the injured person and observation of the whole body
- 2) Airway keeping and its maintenance
- 3) Mouth-to-mouth ventilation (artificial respiration)
- 4) External cardiac massage (cardiac massage)
- 5) CPR by two operators

**4. Procedure of Exercise**

1) Orientation

All the students were given a 90-minute lecture on CPR including watching videotape, and then the purpose and procedure of exercise were explained.

2) Actual exercise

The students were divided into 3 groups with 22 to 24 persons each, and they underwent the actual exercise for 180 minutes under the direction of three instructors.

(1) Explanation of how to use Resusci Anne

- ① Pulse simulator
- ② Signal lights

Artificial respiration: The signal light is turned on when the minimum amount of ventilation required for the adult, or 800ml, is attained.

Cardiac massage: The signal light is turned on when the sternum is depressed by 3.8 cm at correct hand position. If the hand position is not correct, "Wrong Hand Position" signal light is turned on.

③Recorder

The length of stroke and wrong hand position at cardiac massage can be recorded, and the results of CPR training in terms of time and sequence can be judged (Fig. 1).

(2) Demonstration by instructors

Following the flow chart of CPR<sup>11)</sup>, two instructors playing the role of a finder and an assistant demonstrated the procedure beginning with the discovery of an injured person, observation of whole body, artificial respiration and cardiac massage.

(3) Exercise by group

Approximately 8 students each per Resusci Anne practiced the followings under the direction of an instructor.

① Each student practiced fundamental skill of airway keeping and its maintenance, artificial respiration (mouth-to-mouth), and cardiac massage.

② A pair of two students practiced artificial respiration and cardiac massage alternating the role, and combined these roles for "CPR by two

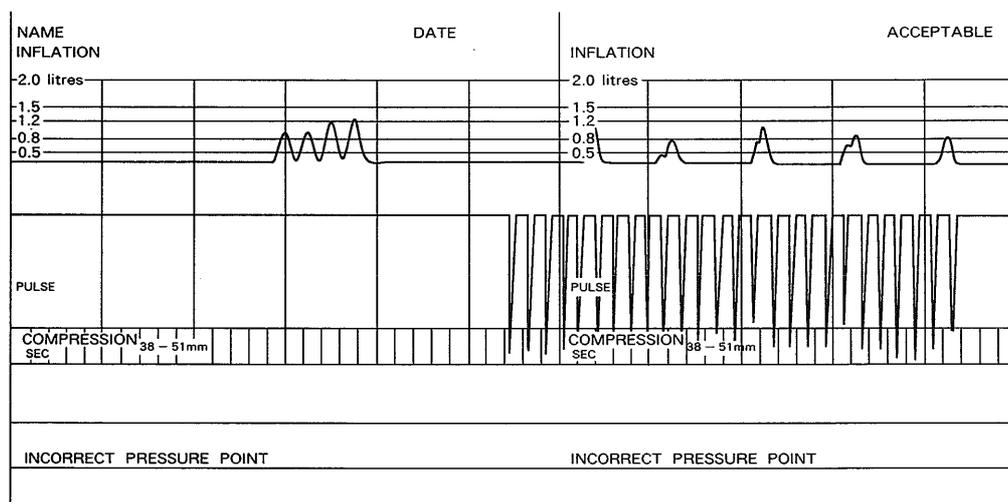


Fig. 1 CPR records

## The Fundamental Nursing Education

**Table 1** Number of students who passed test by item in the check list

Item		Number	%
Observe whole body		69	98.6
Confirm consciousness by patting shoulders		70	100
Call for cooperators (s)		69	98.6
Airway keeping	Tilt head backward	66	94.3
Confirm breathing	Look	67	95.7
	Listen, feel	67	95.7
Artificial respiration	Close nasal cavity	69	98.6
	Confirm expiratory air	65	92.9
	Listen to flow and sound of expiratory air	67	95.7
Maintenance for airway		64	91.4
Is heart beating?	Palpate the carotid	70	100
	Watch the pupil	70	100
Cardiac massage	Proper region of compression	67	95.7
	Apply the weight of upper body by stretching elbows	70	100
	Compress the sternum by 4-5cm	69	98.6
	Stretch fingers and touch no other than the sternum	69	98.6

persons". Group exercise of the above items was performed for 90 minutes each.

### 5. Evaluation

The practical skill and knowledge acquired by the students were tested and the results of exercise were evaluated. Self-evaluation and impression of the students were also taken into consideration.

#### 1) Practical skill test

After the practice in each group, the practical skill of CPR by two operators was performed alternating the role, and the instructor checked the check list (Table 1) and the record sheet (Fig. 1). The three instructors had discussed the standards of evaluation in advance.

#### 2) Pretest and posttest

Before and after the exercise, objective tests on 20 items concerning general knowledge of CPR, airway keeping, artificial respiration and cardiac massage were performed. The full marks were 20 points.

#### 3) Self-evaluation and impression

After the exercise, the students were asked to make self-evaluation of their fundamental skill and to freely describe their impression of the exercise.

## III. RESULTS

### 1. Practical Skill Test

Each item of the check list was checked as either "could" or "could not", and the number and percentage of "could" are shown in Table 1. The items

all the students answered "could" were to confirm the consciousness by patting shoulders, to palpate the carotid artery, to watch the pupil and to apply the weight of upper body, amounting to four items. Almost all the students were evaluated as satisfactory in other items.

#### 1) Airway keeping

Confirmation of breathing was achieved in 67 students, keeping airway by tilting head backward in 66, and maintenance for airway in 64. There were 3 to 4 students who performed artificial respiration without airway keeping or who failed to confirm breathing.

#### 2) Artificial respiration

Confirmation of chest inflation was available in 65 students, and listening to the flow and sound of expiratory air in 67. There were 3 to 5 students who could not observe whether the inserted air volume was appropriate or not.

Resusci Anne turns the signal light on when 800 ml of air is inserted. There was a tendency among the students in the exercise to depend on the signal light rather than to watching the extension of the chest of Resusci Anne.

#### 3) Cardiac massage

"Apply the weight of upper body" was achieved in all the students and "Proper region of compression" in 67 students. Three students were unable to perform cardiac massage in a proper region.

#### 4) Number of items which students "could"

The number of items which students "could"

perform was all the 16 items by 54 students (77.1%), 15 items by 7 students (10.0%), 14 items by 4 students (5.7%), 13 items by 4 students (5.7%) and 11 items by 1 student (1.4%).

**2. Pretest and Posttest**

The average mark of pretest was  $15.3 \pm 1.9$  (11-19), and that of posttest was  $16.3 \pm 1.3$  (12-19), showing a significant increase ( $p < 0.01$ ).

Fig. 2 shows the distribution of marks by individual. The marks of less than 15 points before the exercise were seen in 20 students (28.6%), but the number was reduced to 7 (10.0%) after the exercise.

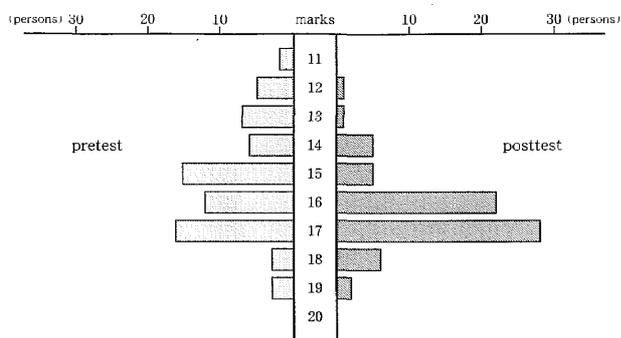


Fig. 2 Frequency distribution of test marks

**3. Self-evaluation by Students after the Exercise**

Concerning the fundamental skills of airway keeping, artificial respiration and cardiac massage, students were asked to answer "could", "so-so" or "could not". The results are shown in Fig. 3.

1) Airway keeping

In holding head, "could" and "so-so" were answered by all the students. In supporting neck, the first two answers were given by 68 students (97.1%).

2) Artificial respiration

In closing nasal cavity, "could" and "so-so" were answered by 69 students (98.6%). In covering mouth, the first two answers were given by 64 students (91.4%). In ventilation, the first two answers were given by 60 students (85.7%). In confirmation of breathing, the first two answers were given by 65 students (92.9%).

3) Cardiac massage

In the region of compression and the strength of pressure, all the students answered "could" or "so-so". In speed, such answers were given by 67 students (95.7%).

As described above, 3 items, i.e., holding head, region of compression and the strength of pressure

were self-evaluated by all the students as "could" or "so-so". The items of relatively high rate of "could not" were "method of ventilation", "covering mouth" and "confirmation of breathing".

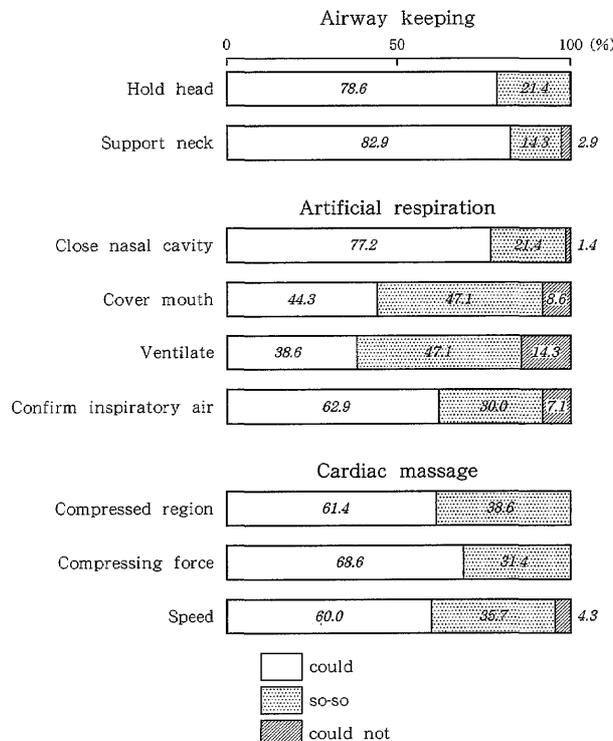


Fig. 3 Self-evaluation after exercise

**4. Impression by Free Description**

The impression which was relatively numerous in the free description after the exercise was as follows. "It was nice to have the exercise of CPR since it is an essential skill for nurses." (27 students). "The effect was indicated by signal light in the exercise, but it is feared as to how the effect can be determined in on-site performance." (17 students). "I think I can make it on site." (16 students). "It was fairly difficult." (15 students). "I did not know that CPR is so tiresome." (14 students).

**IV. DISSCUSSION**

Concerning emergency medical care in Japan, it has been pointed out that the prognosis of DOA (Dead on Arrival) cases is considerably worse compared to Western nations, and the improvement of prehospital care has become a social problem. For substantiation of prehospital care, Emergency Life-saving Technicians Law was promulgated in April 1991 and its effects have been reported<sup>12)</sup>. However, appropriate measures by the family before the

arrival of ambulance are the clue to life-saving in case of sudden change of the aged or the patient with ischemic heart disease under home treatment. In order to spread bystander CPR by general citizens, the course on the method of emergency resuscitation became obligatory in high school physical education and in driving school to obtain driver's license in 1992.

It is a matter of course for nursing students receiving a fundamental nursing education to thoroughly understand and learn CPR in order to fulfill their social task of protecting human life as future professionals in nursing. They are also in a position to educate the general public in this respect.

The content and method of nursing skill training in the school were discussed and future problems were reviewed.

### 1. Situation of Nursing Skill Acquisition

The objective of basic life support is to maintain respiration and circulation. Measures within 3 to 5 minutes after the cease of respiration and circulation are important. Accurate and prompt nursing skill is required.

#### 1) Airway keeping

It was likely that students had a difficulty in airway keeping and its maintenance, since those who "could not" in this item in the practical skill test were more numerous than in other items. The fact that 4 students were regarded disqualified by the instructors indicates the necessity of education and training for definite skill acquisition.

#### 2) Artificial respiration.

"Confirmation of breathing" was not achieved in 5 students. They paid attention only to air insertion without confirming the effect. Students tended to rely upon the signal light. An important point of teaching is to confirm the movement of the chest so that the students may estimate an appropriate volume of air they insert.

Students had a difficulty in "how to cover the mouth" and "how to provide ventilation". Some students could not cover the mouth of the dummy as their mouth was small, and they had a difficulty in ventilation. It was thought necessary to teach students while taking their physique into consideration.

#### 3) Cardiac massage

In cardiac massage, an appropriate volume of output can be maintained by proper region, strength

and speed (number of times per minute) of compression.

In evaluation by the instructors, "proper region of compression" was not achieved in 3 students. Wrong position of hands deviating toward the abdominal region may oppress the xiphoid process causing rupture of the liver. It is important to learn the correct hand position. However, there was a tendency among the students to rely upon the signal light to confirm the correct hand position. It should be taken into consideration in actual teaching to confirm the angle of elbow and the force of compression.

Students learn CPR by actually experiencing artificial respiration and cardiac massage while alternating the role, receiving advice from the instructors and other students in the group concerning the fundamental skill, and by repeatedly practicing the procedure.

In the present exercise by small group, the instructors knowing the individuality of each student devised the teaching method suitable for each student, and conducted training towards skill acquisition. The students being highly motivated could positively participate in the exercise, as they described their impression that they were glad to have participated in the exercise since CPR is an essential skill. The students after the test repeated self-training for their weak items and were rechecked by the instructors, demonstrating their aggressive attitude.

### 2. Future Problems

#### 1) Integration of knowledge and skill

The higher average marks of posttest compared to pretest may indicate that the exercise provided integration of knowledge and skill. In some items, however, what they learned in the practical skill was not integrated with their knowledge. In the conduct of group practicing, it may be required to devise the method of teaching so as to promote self-practicing while confirming important points.

#### 2) Teaching materials

Resusci Anne, equipped with signal lights and a recorder, is effective not only for training of skill but also for evaluation of the effect of training. However, it is for the sake of record and there is a limit to confirm the possibility of resuscitation. Hence, a vital simulator KOKEN RESIM has been developed for the training of resuscitation<sup>8)</sup>. This

simulator with an incorporated micro-computer makes an overall judgment of the performed basic life support and shows vital responses such as opening the eyes in response to calling the name. The students can confirm whether or not resuscitation is made available by the basic life support they performed, and directly evaluate the pertinence of their skill in reference to the rate of successful resuscitation. We have a KOKEN RESIM at school since 1994. We are considering to plan for exercise to be somehow conducted within a limited time by means of combining KOKEN RESIM and Resusci Anne.

### 3) Period of exercise

The importance of CPR is being recognized by the general public and education at an early period is thought to be necessary. However, the nursing skill exercise in our school is conducted at the final stage of three-year course. A national survey of CPR education for medical students<sup>13)</sup> indicates that some universities start education of basic life support only in advanced class. It may be considered that the students acknowledge their role to play as professionals and have a high motivation to protect life, particularly because they are at the stage to have completed the course of clinical practice. It may be necessary to organize a curriculum to conduct skill exercise in the beginners' class and the advanced class, expecting the effects of learning and practicing by repeated training.

The basic life support in the present exercise is a procedure which can be done "anywhere by anybody". It is a skill required not only in the area of medical care but also in daily life. It is also important to note, before the acquisition of skill and knowledge, whether one can help someone who is in need. The willingness with courage will enhance the aggressive attitude of students to learn and elevate the quality of their skill.

CPR is meaningful only when it is actually performed. We would like to study further for the device and improvement of teaching methods.

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## 看護基礎教育における心肺蘇生法の習得状況

—— 一次救命処置を中心として ——

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**要 旨** 長崎大学医療技術短期大学部看護学科学生70名を対象に、救急蘇生訓練用人形を用いて、一次救命処置を中心とした心肺蘇生法の学内演習を行った。実技テスト、演習前後の客観テスト、学生の自己評価などをもとに学習効果および今後の課題を検討した。

実技テストでは、チェックリストにそって、各項目ごとに教官が評価した結果、ほとんどの項目で9割以上の学生が合格できた。客観テストでは演習後の平均点は高かったが、知識と技術の統合がされていない項目もあり、指導上の課題と考えられた。また、学生の自己評価では、人工呼吸法が「できなかった」とする学生が多く、気道の確保および維持、また吹き込みもかなり難しい技術であった。一次救命処置は緊急の現場で実践できなければ意味のない技術であり、反復訓練による習得が必要であると考えられた。

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