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EVALUATION OF DIFFERENT APPROACHES TO TEACHING BASIC
RESUSCITATION

BY

GERALYN ANNE WYNNE

A thesis submitted for the degree of

MASTER OF PHILOSOPHY

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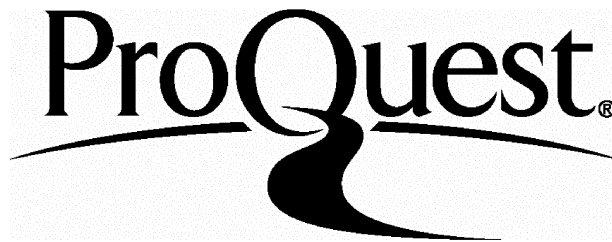
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ABSTRACT

Basic resuscitation skills have been taught using a variety of methods. In general, acquisition of these skills is not good. Furthermore, retention of skills is also poor (over all intervals of time tested). The aim of the current study was to assess the effectiveness of feedback and two methods of teaching upon skill acquisition and retention. A group of third year clinical medical students (n=84) were taught basic resuscitation by two different approaches to teaching: 1) traditional didactic approach or 2) self-paced approach. Half of each group received assessment with feedback, the other half did not receive feedback on their performance. Students were assessed prior to and immediately after the course to determine acquisition of skill. Performance was assessed by recording strips from the manikin and rated by trained assessors using a checklist. The basic resuscitation skills of mutually exclusive randomly selected groups of students were measured for retention of skill at 2 weeks (n=29), 15 weeks (n=24), 26 weeks (n=20) and the whole group at 1 year (n=67). Self assessment of confidence, knowledge, attitudes to further training and outcome expectancy from cardiac arrests were measured using questionnaires. There was an overall increase in basic resuscitation skills for students who received assessments with feedback from pre training to immediately after training. This tended to be greatest for the

self taught group when feedback of performance was given, although this was not statistically significant. The resuscitation skills for all the groups deteriorated over a six month period. However, basic resuscitation skills were still greater at one year compared with pretraining levels. There were no significant differences at one year in skills between the groups taught by the different methods. During the year of the study confidence to perform basic life support increased as did basic resuscitation skills. Confidence was related to the number of arrests attended: the more arrests attended, the more confident the students felt they were at performing basic resuscitation. Prior to the initial assessment, students' judgments of their basic resuscitation skills were accurate. One year later, prior to assessment of skills, there was no relationship between confidence at performing resuscitation and actual skill. However immediately after the assessment, the students' judgments were more accurate.

In conclusion, teaching method did not influence the initial acquisition of skill, and had little effect on retention of skill over a six month or one year period. Skills deteriorated for all groups over a six month period but not to the pretraining level.

The results of this study suggest the importance of focusing upon initial acquisition of skills as a pre requisite to

better retention.

with love
to
William
and
My Parents

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CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

Resuscitation training is essentially a practical skill and students need practical training to acquire this skill. The combination of expired air resuscitation (mouth to mouth respiration) and external chest compression forms the basis of modern basic life support.

The teaching of basic resuscitation for medical and nursing students is haphazard. It is perhaps taught only once during their training by an enthusiast, lecturing to large groups with minimum manikin practice. There is no statutory requirement for resuscitation to be included in the curricula. The General Medical Council syllabus (1980) for medical students states that they must be instructed in the principles of resuscitation. The English National Board (1985) for part 1 of the register for Registered General Nurse training, states that nurses are expected to be able to deal with accidents and emergencies. It is the responsibility of each individual medical and nursing school to decide the frequency and time devoted to resuscitation training within the curriculum. In 1987 a Report of the Royal College of Physicians recommended that every pre clinical medical student, clinical medical student and doctor should be trained in basic resuscitation and tested in the professional

qualification examination.

Several studies in the USA and the UK have investigated the basic resuscitation skills of junior doctors and trained nurses (Skinner et al.(1985), Casey (1984), Lowenstein et al.(1981), Webb et al.(1982), Jakobson et al.(1985), Goucke et al.(1986), Wynne et al.(1987), Morris et. al.(1991)). These were all small scale studies. All the groups were tested without warning and asked to perform basic resuscitation on the manikin provided. Their skills were measured by observation of the investigator and/or analysis of the recording strip from the manikin. The conclusion of these studies is that the basic life support skills of both doctors and nurses are poor. 50% of pre-registration house officers were unable to maintain a patent airway and ventilate the manikin; 72% were unable to perform basic life support competently (Casey (1984)); none of the trained nurses could perform basic life support competently (Wynne et al.(1987)). The question that arises from these studies is : did the doctors and nurses acquire these resuscitation skills in the first instance? Clearly given the poor performance of resuscitation techniques by these health professionals a study of acquisition and retention of skills is important. This state of the art review covers the different factors which may affect acquisition and retention of basic resuscitation skills.

1.2 ACQUISITION OF BASIC RESUSCITATION SKILLS

Numerous factors which may affect the acquisition of basic resuscitation skills will be reviewed below;

1.2.1 TEACHING METHOD

Several methods of teaching basic resuscitation skills have been investigated to see whether this affects the acquisition of skills. All the study designs are different, using different variables to look at acquisition of skills.

a) traditional didactic approach

This includes lecture, demonstration of resuscitation skills, manikin practice, assessment of skills and subsequent certification. The American Heart Association course is taught using this format but encompasses one and two person resuscitation, infant resuscitation and the management of the obstructed airway (Kaye et al.(1986), Webb et al.(1982), Gulliford et al.(1983), van Kalmthout et al.(1985), Mowbray et al.(1982), Watson (1982), Ramirez et al.(1977), Yakel (1989)). This is the traditional way of teaching basic life support (McKenna et al.(1985), Friesen et al.(1984), Weaver et al. (1979), Nelson et al.(1984), De Baca (1983), Braun et al. (1965), Weingarten et al.(1964), Corne et al.(1984), Speilman

et al.(1983), Gass et al.(1980)). There are variations on this theme, some of the courses review the aspects of sudden cardiac death (Dalen et al.(1980)), use videos to demonstrate the skills (Braun et al.(1965), Corne et al.(1984)), and advise the subjects to refer to textbooks (Gombeski et al.(1982)). Certification is usually by instructor observation plus a checklist of performance. This is not reliable because the instructors may have different standards with regard to pass/fail criteria.

To examine the concept of acquisition of skill a group of Canadian policemen were deliberately overtrained in one person basic resuscitation and were required to master their performance at the end of the course (Tweed et al.(1980)) before they were certificated. They were taught by the traditional didactic approach. This was a large sample study which comprised 900 Canadian Policemen. Emphasis was placed on perfection of basic resuscitation skills by repetitive practise. The recording strips from the manikin were used to provide both feedback and pass/fail criteria.

b) self paced approach

The main aim of student centred learning is to enable learners to take responsibility for their learning and become highly motivated to achieve the highest standards. The advantage of a self taught course is that it reduces instructor time, is

self paced, enabling those students with prior experience to finish more quickly, while those students who need more time can work without fear of holding others back and occasionally poor instructor performance is limited (Nelson et al.(1984), Marteau et al.(1989), Burns (1982), Rogers (1983)). Some potential disadvantages of this approach are that students prefer to be taught by the didactic approach because they find it difficult to discipline themselves to work on their own and there may be poor communication between instructor and student which may result in lack of motivation.

Self training systems have been developed so that students may learn the basic resuscitation skills at their own pace (Herrin et al.(1980), Meijer 1984, Anon (1983), Martin et al.(1983), Kaye et al.(1983), Safar et al.(1981), Breivik et al.(1980), Mandell et al.(1987), Schulger et al.(1987)). Examples of these systems are the interactive video disc which has been developed in the USA (Kaye et al.(1983)) and the video basic life support training programmes (Anon (1983), Schulger et al.(1987)). There are several audiovisual aids available on the market which can be incorporated into self training systems eg. videos, flip charts, posters, tape/slide presentations, flash cards, text books and the training manikins (Meijer (1984), Safar et al.(1981), Breivik et al.(1980)). The different methods appeared to be successful in improving knowledge. Safar et al.(1981) found that knowledge tests revealed a significant increase in the number of correct

answers. The pass/fail ratio improved in the study by Breivik et al.(1980). Schulger 1987, suggested that the use of film/video tape may be a valuable inexpensive tool for teaching cardiopulmonary resuscitation to large numbers of lay people.

Self training programmes need not be elaborate: in the USA Grogono et al.(1982) tested the hypothesis that exposure to posters displayed on lavatory walls containing essential information of basic resuscitation would improve theoretical knowledge and the performance of basic resuscitation. There was a significant increase in both knowledge and performance of basic resuscitation. This technique is inexpensive, simple and warrants more widespread use as a means of maintaining knowledge and proficiency in basic resuscitation. However, the limitations to this study could be that the students discussed the information displayed and may have read more about it or have been involved in resuscitation attempts. Alternatively some of the students may have been exposed to the posters more than others or did not even notice them.

A considerable amount of research has been undertaken to investigate the effectiveness of different teaching methods over the last twenty years, but the majority of studies have attempted to measure success in terms of the amount of information retained, rather than focus on initial acquisition

of skill.

1.2.2. ASSESSMENT OF KNOWLEDGE AND SKILL

Knowledge of basic resuscitation was assessed using multiple choice questionnaires in a large proportion of the studies. One study gave the students a pretest multiple choice questionnaire (Breivik et al.(1980), Ramirez et al.(1977)) but the majority of the studies only tested students' knowledge after the course (Friesen et al.(1984), Weaver et al.(1979), Dalen et al.(1980), Tweed et al.(1980), Gulliford et al.(1983), Wilson et al.(1983), Safar et al.(1981), Breivik et al.(1980), van Kalmthout et al.(1985), Gass et al.(1980), Goucke et al.(1986), Watson (1982), Ramirez et al.(1977)).

Learning evaluation is important as part of an effective assessment of a training programme (Kirkpatrick, 1975). This involves collection of data about the principles, facts and techniques which are acquired from the training by the participants. In order to achieve this in basic resuscitation training programmes, skills should be assessed pre and post training so that specific gains resulting from the learning experiences can be measured ie. acquisition of basic resuscitation skills.

To assess the level of skill acquired in basic resuscitation training subjects have been tested prior to training (Banasik et al.(1976), Kortilla et al.(1979), Breivik et al.(1980), van

Kalmthout et al.(1985), Gass et al.(1980), Watson (1982), Marteau et al.(1990). In a large proportion of studies psychomotor skills are tested only after training (McKenna et al.(1985), Gombeski et al.(1982), Friesen et al.(1984), Weaver et al.(1979), Dalen et al.(1980), Editorial (1984), Banasik et al.(1976), Tweed et al.(1980), Gulliford et al.(1983), De Baca (1983), Martin et al.(1983), Wilson et al.(1983), Safar et al.(1981), Breivik et al.(1980), van Kalmthout et al.(1985), Corne et al.(1984), Gass et al.(1980), Goucke et al.(1986), Watson (1982), Marteau et al.(1989), Marteau et al.(1990), Kaye et a.(1986), Thrasher (1987), Yakel (1989)). Therefore the level of skill acquired from the training programme cannot be measured accurately because the pre course skill level was not known.

1.2.3. COURSE CONTENT

a. Length of course

The length of basic life support courses for traditional and self paced methods of teaching vary from a minimum of 2 hours (Kortilla et al.(1979), Herrin et al.(1980), De Baca (1983)) to one day (Nelson et al.(1984), Gass et al.(1980)). The majority of courses are 4 hours eg. American Heart Association (Gombeski et al.(1982), Weaver et al.(1979), Banasik et al.(1976), Ornato et al.(1981), van Kalmthout et al.(1985), Weingarten et al.(1964), Weinberg et al.(1977), Ramirez et

al.(1977)). The length of the course may be a factor which affects acquisition of skills. There are no studies documented in the literature which compare the length of course and acquisition of basic resuscitation skill.

b. Use of manikins

The psychomotor skills of mouth to mouth ventilation and external chest compression cannot be taught on live subjects for ethical and practical reasons. Genuine life threatening situations rarely occur at a time or place where teaching is possible, so practical training has to be simulated. This has been made possible since 1960 with the development of resuscitation training manikins. In all the studies the length of time devoted to manikin practice was variable. The time varied from 3-5 minutes (Kortilla et al.(1979)) to 5 hours (Gombeski et al.(1982)). A study by Breivik et al. (1980), suggests this is an important variable. He compared 4 different methods of instruction for basic life support, 1)self training at home with the observer present, but no manikin, 2) self training at home with no observer, no manikin, 3) self training courses at driving schools with manikin practice, and 4) control group unexpectedly tested for practical skills performance. This is a good example of analysis. He found that the self teaching systems were equally effective in providing the theoretical first aid knowledge but the course using the training manikin was superior in teaching

practical skills.

At the time of the study there were three types of training manikins available, the Ambu manikin, the non recording Resusci Anne and the recording Resusci Anne. The advantage of the recording Resusci Anne is that it automatically generates a recording strip of paper of frequency and amplitude of ventilation and chest compression, thus providing a reliable assessment of the students' performance.

These training manikins are the only pieces of equipment available for testing the psychomotor skills of ventilation and chest compressions. These manikins can be said to have face validity and have been approved by a census panel of the American Heart Association and the National Academy for Sciences. It is extremely difficult to assess skills in genuine life threatening situations.

A large proportion of the studies have used recording manikins to test psychomotor skills (Gombeski et al.(1982), Banasik et al.(1976), Tweed et al.(1980), Kortilla et al.(1979), Herrin et al.(1980), Gulliford et al.(1983), Martin et al.(1983), Safar et al.(1981), Breivik et al.(1980), Jakobson et al.(1985), Corne et al.(1984), Gas et al.(1980), Lorson et al.(1977), Mowbray et al.(1982), Watson (1982), Nelson (1981), Ramirez et al.(1977), Yakel (1989)). Two studies used the non recording manikin for training (van Kalmthout et al.(1985),

Yakel (1989)). Another study used the Ambu manikin for testing the psychomotor skills (Skinner et al.(1985)). It is difficult to correlate the objective data from the manikins because only the recording manikin produces a printout. The only way data can be correlated is if the same checklist was used but this does not provide a valid measure of resuscitation skills.

1.2.4. FEEDBACK

The notion of feedback was brought into specific use by Weiner (1948), who defined it as a method of controlling a system by reinserting into it the results of its past performance. It is seen most clearly in the form of a feedback loop.

Feedback plays a critical role in regulating both internal and external processes. External feedback (generated by comparing discrepancies between already executed movements and the desired goal state) provides the individual with important information in the form of error messages which help to make performance smooth and accurate. Moreover, if this error information can be used productively (ie.in reducing and finally eliminating the discrepancy between current and target performance), (Weinman, 1981) then it almost always has a motivating function as well. If the individual is able to see performance improving, this provides a strong motivation to continue, but if no such information is available or if no

improvement occurs then the opposite will be likely. This point emphasizes the importance of not only making feedback clear but also making it realistic to the individual in the sense that he is able to make use of the information to move towards the goal state.

Feedback of performance of basic resuscitation can be given to the student either from the signal box on the manikin or recording strips or by the instructor. Psychomotor skills are not generally acquired without the learner knowing something at least about the effectiveness of his efforts. The importance of information feedback was illustrated in an experiment where subjects working without knowledge of the results failed to show any improvement. They also became exceedingly bored with the whole procedure. Those who knew the accuracy with which they hit the target, improved rapidly as practice continued. When knowledge of results was withdrawn, this was followed by a deterioration in performance (Munn, 1966).

Munn (1966) stated that improved performance with knowledge of results has three principal explanations, 1. good motivation is fostered in that subjects working with information feedback usually find the task more interesting than it would otherwise be, hence work at it enthusiastically and try to improve their performance, 2. because the individual knows when he is making errors, he can attempt to correct them and his improved

performance shows the extent to which he is, and 3. if successful acts can be identified efforts may be made to repeat them.

A further example of how important feedback is in learning psychomotor skills is discovery learning. This is a general approach to teaching in which the emphasis is on student participation and problem solving. The discovery method was used to teach basic principles of electricity to men who mostly had only the vaguest theoretical knowledge of the subject. The training was practical, using equipment. Therefore instead of listening passively to an instructor who told them how a circuit works or who drew it on a blackboard trainees actually constructed a circuit themselves: they saw from their own experience how the circuits worked. The results of this teaching method were that discovery trainees had higher scores on tests than those trained by conventional classroom teaching. They also did so in half the time. The advantages of this method, are that the learner does not have to make special efforts to memorize, because people remember things more easily when they have been actively involved in them. This method of learning illustrates how important feedback is on the acquisition of practical skills. It also limits verbal instruction and demonstration by the instructor, hence freeing up more time for individual practice. It also allows for the fact that people start with different kinds of knowledge and work at different speeds. The disadvantages of

this method are such that some teachers may reject it because they like to feel in complete personal control in the classroom. Similarly there will always be some students who like to be "told" (Rogers, 1989).

Maguire et al.(1986) reassessed five years later the 36 doctors who as medical students had been randomly allocated to either video feedback training or conventional teaching in interviewing skills. They found that both groups had improved since their fourth year clerkship, but those given feedback training had maintained their superiority in the skills associated with accurate diagnosis.

Mandel et al.(1987) tested employees prior to basic resuscitation training, without manikin practice, on a recording manikin but gave them no feedback during or after the test. Their performance was reviewed after they were tested at the end of the course. They were allowed to correct their mistakes. The pretests results indicated poor performance for all subjects. There was a marked improvement of basic resuscitation skills after the course prior to correcting their mistakes. This illustrates the importance of assessing skills with feedback pre and post training in basic resuscitation, not only for the student but also the instructor.

1.2.5. PREVIOUS EXPERIENCE

A small proportion of studies have sought information from lay people (Friesen et al.(1984)) and nurses (Wilson et al.(1983), Watson (1982), Yakel (1989)) regarding previous resuscitation training or certification in basic resuscitation and examined this in relation to their psychomotor skills. These variables have not been found to be related to retention of skills for nurses, education, practice of skills/ current position, years in the profession, previous resuscitation training, motivation and felt level of competence (Yakel (1989)).

Prior to training courses several studies highlighted the fact that medical students (Nelson et al.(1984)) and lay people (Schulger et al.(1987), Eisenberg et al.(1985)), had not had any previous training in resuscitation. Wilson et al.(1983) found that lay people with an average age of 35 years with previous first aid training including resuscitation had better psychomotor skills.

Previous experience in resuscitation and how confident the subjects feel at performing basic life support has been assessed by multiple choice questionnaires in several studies looking at doctors and nurses (Gass et al.(1980), Curry et al.(1987), Wynne et al.(1987), Nelson (1981), Marteau et al.(1989), Marteau et al.(1990)). The results of these studies have shown that trained nurses and pre-registration house

officers are confident that they can perform resuscitation but when practical skills are tested they are not competent. Experience was associated with an increase in confidence but not practical skill (Wynne et al.(1987), Marteau et al.(1989), Marteau et al.(1990)).

Gass et al. (1983) looked at experience of attending cardiac arrests prior to the training course. He found that doctors and nurses had taken part in resuscitation incidents and performed both basic and advanced resuscitation skills. After the training course the roles changed dramatically. The nurses concerned themselves with basic resuscitation while the doctors concerned themselves with advanced resuscitation procedures.

In another study doctors scored marginally higher than nurses on a knowledge test prior to training. There were no significant differences between the physicians and the nurses in the number of errors made in simulating resuscitation. When the amount of participation in basic resuscitation before training, the amount of prior training in basic resuscitation and age were controlled for, there were no significant differences between the 2 groups in knowledge or skill levels. The amount of knowledge before training did not predict the number of errors made in simulating basic resuscitation for the doctor or the nurse. Immediately after training nurses scored significantly higher than doctors on the knowledge

test and made fewer errors than the doctors in simulating basic resuscitation (Curry et al.(1987)).

1.2.6. a.Trainers

The trainers for basic resuscitation courses vary from American Heart Association instructors (Kaye et al.(1986), Gulliford et al.(1983), Mancini et al.(1985), Mowbray et al.(1982), Watson (1982), Gombeski et al.(1982), Weinberg et al.(1977)) to lay instructors (Weaver et al.(1979), Ramirez et al.(1977)), doctors (Trafford (1985), Banasik et al.(1976), Braun et al.(1965)) nurses (Matson et al.(1985), Banasik et al.(1976), Wilson et al.(1983)) and Canadian police force instructors (Tweed et al.(1980)). While it is assumed that they are competent at basic resuscitation this is seldom tested.

Studies in the USA evaluated the performance of trainers. It was found that deviations from the standard training programme by the instructors may be another reason for poor acquisition of skills and hence poor retention. Studies showed that despite stringent curricula set by the American Heart Association (AHA), many instructors do not teach in the prescribed way, time spent on manikin practice is limited and errors in performance are not consistently corrected during training. Often the instructors consistently rate the students overall performance as acceptable, whereas experienced

investigators using the same checklists, consistently rated the same performance as unacceptable. The American Heart Association checklist for basic resuscitation needs to be questioned, as it was found in this study not to be a valid tool for evaluating performance. This was because different instructors observed different behaviours and used different criteria for the skills assessment (Kaye et al.(1991)).

Braslow (1985 unpublished) described similar results with a survey of 700 randomly selected basic resuscitation instructors from two American Heart Association affiliates. Of the 83% of instructors that responded, 99.5% taught basic resuscitation to the public. Although all rated their knowledge and skills highly, Braslow concluded that their competence was low. The instructors did not have an understanding of the content and objectives of the CPR course as described in the manual for American Heart Association instructors and did not conform to practices recommended by the AHA. 28% did not agree with the AHA course content and 30% of the instructors deleted a portion or modified the course when teaching. 42% of the instructors had never read the manual, 67% had not referred to it since the instructor course when they were first trained as instructors.

There is one study in the literature which examines the relationship between who trained who and basic resuscitation skills. Ramirez et al.(1977) evaluated lay instructors to

assess the effectiveness of such trainers on the acquisition of basic resuscitation skills of volunteer adults. They were all AHA certified instructors. The results of the study showed that the percentage of trainees responding correctly to the cognitive measures of assessment, airway, breathing, compression and ventilation ratio questions increased from pre to post test. Only 2.8% of trainees performed the practical skills adequately (8 ventilations in one minute >0.8 litres, 60 compressions in one minute >38mm deflection) according to AHA criteria. However, 94% trainees rated the instructors performance as effective in teaching resuscitation as excellent or very good. This study raises questions about lay basic resuscitation education because the trainees did not acquire the skills from the training course, although the trainers were certified instructors.

1.2.6. b. Trainees

The studies which appear in the literature focusing on resuscitation training since 1960 have concentrated on: 1. Doctors, pre-registration house officers, (Skinner et al.(1985), Casey (1984), Lowenstein et al.(1981), Kaye et al.(1986), Webb et al.(1982), Banasik et al.(1976), Ornato et al.(1981), Safar et al.(1981), Jakobson et al.(1985), Stross (1983), Mancini et al.(1985), Gass et al.(1980), Goucke et

al.(1986), Smith et al.(1987), Curry et al.(1987), Marteau et al.(1990), Thrasher (1987)),

2.Registered nurses, (Gass et al.(1983), Kaye et al.(1986), Matson et al.(1985), Banasik et al.(1976), Catellani et al.(1984), Sommers (1982), Mishkin et al.(1982), Safar et al.(1981), Jakobson et al.(1985), Gass et al.(1980), Goucke et al.(1986), Watson (1982), Curry et al.(1987), Wynne et al.(1987), Marteau et al.(1989), Yakel (1989)),

3.Lay persons (Kaye et al.(1986), Gombeski et al.(1982), Weaver et al.(1979), Wilson et al.(1983), Braun et al.(1965), Kaye et al.(1983), Breivik et al.(1980), van Kalmthout et al.(1985), Breivik et al.(1980), Schulger et al.(1987), Ramirez et al.(1977), Eisenberg et al.(1985)),

4.Occupational first aiders, (McKenna et al.(1985)),

5.Emergency medical technicians, (McManus et al.(1976), Safar et al.(1981), Latman et al.(1980)),

7.Canadian police force, (Tweed et al.(1980), Weingarten et al.(1964)),

8.Conscripts, (Kortilla et al.(1979)),

9.Medical students, (Hunskaar et al.(1983), Nelson et al.(1984), Smith et al.(1987), Mowbray et al.(1982), Nelson (1981)),

10.School children, (Safar et al.(1981), Corne et al.(1984)) and other groups of lay persons and hospital workers(Friesen et al.(1984), Banasik et al.(1976), Grogono et al.(1982), Gulliford et al.(1983), Kaye et al.(1983), Weingarten et al.(1964), Jakobson et al.(1985), Clark et al.(1988),).

There is little evidence to suggest that any one particular group acquire skills in basic resuscitation to a greater or lesser extent than another group of trainees. Banasik (1976) compared acquisition of resuscitation skills for, doctors, nurse orderlies and secondary school students. The results showed that there were no significant differences between the groups with regard to acquisition of skill.

1.2.7. AGE

The age of the subjects who have attended a resuscitation course vary widely from 10 years (Corne et al.(1984)), to 70 years (Schulger et al.(1987)). It is probable that the minimum age for basic life support training is 10-11 years (Corne et al.(1984)). Kalmthout et al.(1985) concluded that women were as proficient as men and that age made no difference to the acquisition of skills.

1.2.8. CONFIDENCE

Nelson et al.(1981) found that 78% of medical students and residents felt confident in their ability to perform basic resuscitation but only 2.9% performed it correctly. This large discrepancy between imagined and actual ability may result in these people being unlikely to attend additional training in the future because they assume they know what to do.

Trained nurses at a sister/charge nurse level felt significantly more confident than staff nurses at performing basic resuscitation but they were no more competent. Nurses who had attended more arrests were more confident about performing basic resuscitation but they were no more competent (Wynne et al.(1987)). When lay people were asked how confident they felt in performing resuscitation after a basic resuscitation course, 88% of the trainees felt confident, although only 1% could perform basic resuscitation correctly (Ramirez et al.(1977)).

1.2.9. ATTAINING A COMPETENT LEVEL OF PERFORMANCE

One key factor which may affect acquisition and ultimately retention of basic resuscitation skills is that the students do not attain a competent level of performance at the end of a training session. Only a few studies have concentrated on the mastery of the performance of basic resuscitation before subjects pass the course (Gombeski et al.(1982), Friesen et al.(1984), Tweed et al.(1980)). For example, members of the Canadian police force were trained in one rescuer resuscitation. At the end of the course they were allowed 3 attempts with remedial training until they could produce mastery in the performance (Tweed et al.(1980)). Friesen et al.(1984) trained baccalaureate nursing students in basic resuscitation using two different teaching methods. The students were allowed more than one attempt to achieve mastery

in performance. The criteria for certification for lay people following an eight hour course in a study by Gombeski et al.(1982) was complete mastery of one and two person basic resuscitation, infant resuscitation and management of the obstructed airway. For the four hour course the lay people had to achieve 75% mastery of one person basic resuscitation.

Trained nurses had to achieve 100% accuracy following AHA criteria of one person resuscitation Yakel (1989). In this study two different training courses were compared. One consisted of pre course reading material, 30-45 minutes course which included discussion of risk factors, signs ,symptoms of a heart attack, demonstration of 1 person resuscitation, redemonstration by the student until 100% accurate using a non recording manikin. The second course was 6-8 hours including 1 and 2 person resuscitation, management of the obstructed airway and infant resuscitation. The nurses had to achieve 100% accuracy in psychomotor skills using a recording manikin and 84% for the written examination.

It is therefore necessary for subjects to achieve mastery in performance at the end of the training course. However, several different measurements are used to assess competent performance at basic resuscitation. There is a need to examine the criteria which are used to determine a total skill score for what is termed 100% mastery in performance. The studies in the literature used different criteria to determine a total

skill score. Nobody has determined the correct sequence and minimum psychomotor skills necessary to save a life. Consensus from a panel of experts in basic resuscitation needs to be sought, so that standards can be applied to determine universal pass/fail criteria for basic resuscitation. This would allow for greater comparison of acquisition of skills for the different groups assessed.

1.2.10. Summary: Acquisition of basic resuscitation skills

1. In the USA and UK basic resuscitation skills of doctors and trained nurses have been found to be poor. The question arises from these : did the doctors and nurses acquire the skills in the first instance?

2. The teaching of basic resuscitation for medical and nursing students is haphazard. It is the responsibility of each individual medical and nursing school to decide the frequency and time devoted to resuscitation training within the curricula.

3. Basic resuscitation has been taught to, health professionals and lay people using a variety of methods. Numerous factors which may affect the acquisition and retention of basic resuscitation skills which have been reviewed are :-

1. Teaching method a. traditional didactic approach
 b. self paced approach
2. Assessment of knowledge and skill
3. Course content
4. Feedback of performance
5. Previous experience
6. a. trainers
 b. trainees
7. Age
8. Confidence
9. Attaining a competent level of performance

I.3. RETENTION OF BASIC RESUSCITATION SKILLS

Retention of basic resuscitation skills are poor for health professionals and lay people over all intervals of time tested. Factors which may contribute to this are:

a. Assessment of basic resuscitation skills.

van Kalmthout et al.(1985) asked lay people to complete a multiple choice questionnaire on diagnosis, pulmonary ventilation and cardiac massage. They had to estimate their own level of knowledge and practical performance on a scale 0-10. In addition they had to perform a practical test on the recording manikin which was judged subjectively by the instructor. A large discrepancy between self, subjective and objective assessment of resuscitation knowledge and performance was found. When the percentage of participants performing adequate basic resuscitation was assessed by themselves, the instructors' subjective scores were high. But when AHA criteria were applied using the recording strip, only 7% after training were able to perform basic resuscitation adequately. The most reliable and valid method of assessing basic resuscitation skills is by using recording strips, because subjective criteria have been shown to grossly over estimate the actual practical performance level not only in this study but others too (Kaye et al.(1991)).

b. Experience of attending cardiac arrests

There is no evidence to suggest that experience of attending cardiac arrests following training improves retention of knowledge or skills in resuscitation (Marteau et al.(1990)). Pre-registration house officers' experience of attending cardiac arrests was associated with increased confidence but not competence. Attendance at cardiac arrests was examined in general terms. It was not ascertained whether the subjects performed any particular role in the resuscitation process.

c. Expectation of assessment

Retention of basic resuscitation skills can be measured in two ways, either the trainees are aware of the forthcoming assessment or they are assessed without prior warning. The results of the studies showed that the skills were below the American Heart Association standards (Kaye et al.(1986), and Wilson et al.(1983) concluded that only 40% of the sample were able to perform adequate ventilations and chest compressions.

In three studies resuscitation skills were assessed without prior warning (Kaye et al.(1986), Kortilla et al.(1979), Wilson et al.(1983)). It is important to test basic resuscitation skills without prior warning because this makes for more realistic training. In real life, one cannot predict when one is going to come across somebody in cardiac arrest. Therefore this surprise test determines the level of basic

resuscitation for the student and instructor thus identifying correct and/or incorrect areas of performance. One of the disadvantages of incorporating surprise testing into training programmes is that students may feel threatened and it has been shown that adults learn best when not under threat (Moore, 1991). Kortilla et al.(1979), informed the instructors of one group that the trainees were going to be tested but not the trainees. Better results were obtained by this group compared to the group who knew that there was no test at the end of the course. Therefore the awareness and concomitant intensive training of the instructors in the group might have contributed to the better results obtained by this group.

1.3.1. INITIAL SKILL

Several studies have used different approaches to teaching resuscitation to see if there was an effect on retention of skills. These studies used the same criteria for certification, which was mastery, 100% accuracy in performance at the end of the training course (Gombeski et al.(1982), Friesen et al.(1984), Tweed et al.(1980), Yakel (1989)).

Tweed et al.(1980) deliberately over trained Canadian policemen in basic resuscitation to instructor level of performance in psychomotor skills by repetitive manikin practice. This was because at that time there was no published research on techniques of teaching, retention of skills or

necessity for retraining. The authors of this paper have now indicated that this practise has since been abandoned as impractical, for virtually all basic resuscitation training (Tweed et al.1991 personal communication). The reasons the authors gave for ceasing to research further retention of skills was that it became evident to them that these skills deteriorate rapidly after training. Perfect skills or not is not wholly accountable for the success or failure of resuscitation in terms of citizen CPR. But it is likely that the ability to recognise an emergency situation and access emergency help quickly may make the difference in outcome of the patient. In Canada and the USA a shift is occurring in terms of skills practice to perfection, to a view that where we will make the greatest impact in the long term, is reducing individuals' risk of developing cardiovascular disease, short term educating people about the signals of heart attack and how to enter the emergency care system quickly. When tested 12-18 months following initial training, no decrements in performance of ventilation or chest compressions were found. The characteristic of the training which may have led to better retention of skill, was that of initial training which concentrated upon one rescuer resuscitation only for eight hours. Participants had to achieve mastery in the technique before they were certified as competent.

Gombeski et al.(1982) tested lay people who had been taught by two different approaches to teaching. He compared an eight

hour course which required complete mastery of skill to a four hour course, with only 75% mastery of skill. He found that when they were tested at twelve months both groups performance were below the American Heart Association standards. Similarly Friesen et al.(1984) trained nurses by two different teaching methods, traditional and self paced using AHA instruction material. When they were tested at eight weeks following initial training there was a decrease in skills for both teaching methods. A further study showed that different approaches to teaching basic resuscitation did not affect retention of skill (Nelson et al.(1984)). This study compared a self taught modular course with the standard lecture course. There were no significant differences in performance between teaching methods found when the subjects were tested at 12 months.

A study by Yakel (1989) examined the relationship between method of instruction and the quality of retention of one person resuscitation at four and eight months following the initial course. The trainees were nurses. Resuscitation skills at eight months were significantly higher than at four months. The group who were taught using a recording manikin scored higher at both four and eight months than the group who were taught using a non recording manikin. Retention of skills was unrelated to the area of work of the nurse or the potential use of skills. The most common errors in the skill breakdown for retention was in the sequence steps (ie. assessment,

airway, breathing and circulation), for example, the nurse checked for breathing before opening the airway and frequently had their hands in the incorrect place for chest compressions.

In studies where subjects have been tested at the end of the initial training in basic resuscitation following an AHA four hour course (Kaye et al.(1986), Weaver et al.(1979), Gulliford et al.(1983), Martin et al.(1983), Corne et al.(1984)) or the Canadian Heart Association eight hour course (Wilson et al.(1983), Gass et al.(1980), Curry et al.(1987)) and certified as competent, their skills at three months (Gulliford et al.(1983), Martin et al.(1983)) and six months (Gass et al.(1980)) have shown a decrement.

In certain studies subjects are tested some time after the initial training but not immediately at the end of the course. A problem with the design of these studies is that it is not known what skills the subjects had acquired during initial training (Kortilla et al.(1979)). Further more, whether different assessors used different criteria for assessment, at different time points, different assessment conditions or if they had received further training. Braun et al.(1965) in the USA trained 220 rescue squad members, all men, in basic resuscitation using lecture, video, discussion and manikin practice. The subjects were not tested immediately after the course but two weeks later. They were asked to perform one rescuer resuscitation on the manikin and 58% passed the test.

Two thirds' of the group who initially passed were tested eight months later and 92% passed. The improved retention of skills could be due to the fact that the first test acted as a method of refresher training. Other studies have shown that refresher training increases retention of basic resuscitation skill (Nelson et al.(1984)).

1.3.2. TIME SINCE INITIAL TRAINING

Retention of basic resuscitation skills tends to be poor when tested from two weeks (Friesen et al.(1984)) up to three years (McKenna et al.(1985)). When subjects have been tested one year after training their skills are back to pre-training levels in these two studies (Gass et al.(1980), Curry et al.(1987)). The different approaches to teaching basic resuscitation do not affect retention of skills (Friesen et al.(1984), Editorial (1984), Nelson et al.(1984)). The only group who retained their skills at 12-18 months were the Canadian policemen. The characteristic of their training which may have led to better retention of skills was the concentration on one person basic resuscitation only instead of one and two person, infant resuscitation and management of the obstructed airway. So by simplifying the course to one person resuscitation only with repetitive learning has been shown to maximise recall for the subjects in this study.

When doctors and nurse were assessed twelve months following training their psychomotor skills were below AHA criteria (Kaye et al.(1986)). The same result was found for the lay public who were randomly selected: their skills had decreased to 40% of the post training level (Wilson et al.(1983)). A large proportion of studies testing retention of skills have shown deterioration over different time intervals (Gass et al.(1983), Gombeski et al.(1982), Gulliford et al.(1983), Nelson et al.(1984), van Kalmthout et al.(1985), Gass et al.(1980)).

There was no difference in retention of psychomotor skills for basic resuscitation when different groups were compared eg. doctors (Kaye et al.(1986), Banasik et al.(1976), Safar et al.(1981), Gass et al.(1980), Curry et al.(1987)), nurses (Kaye et al.(1986), Friesen et al.(1984), Banasik et al.(1976), Safar et al.(1981), Gass et al.(1980), Curry et al.(1987), Yakel (1989)), lay public (Kaye et al.(1986), Gombeski et al.(1982), Weaver et al.(1979), Banasik et al.(1976), Nelson et al.(1984), Wilson et al.(1983), Safar et al.(1981), van Kalmthout et al.(1985)), and school children (Corne et al.(1984)).

1.3.3. REFRESHER TRAINING

Regular refresher training has been shown to facilitate retention of psychomotor skills. Several different methods

have been used to examine this; (Gombeski et al.(1982), Weaver et al.(1979), Gulliford et al.(1983), Nelson et al.(1984), van Kalmthout et al.(1985), Gass et al.(1980)); however, not all achieved it.

Gulliford et al.(1983), compared two groups of allied medical professionals. They were both taught the standard AHA training course and certified. The experimental group received by mail self evaluation/review examination at two points after certification. They were instructed to practice simulated basic resuscitation at home regularly using pillows. When tested three months later the experimental group had higher knowledge. These results suggest that reinforcement enhanced retention of the proper sequence of resuscitation behaviours but did not improve retention of psychomotor skills (23% of the control group, 28% of the experimental group performed technically correct basic resuscitation) on re-testing. No significant difference was shown in resuscitation technique between the groups.

There was no significant difference in retention of basic resuscitation skills based on initial teaching method, when students were tested 12 months following training (Nelson et al.(1984)). They were then divided into two groups, one received refresher training the other group did not. Two years later, the group that attended the refresher course was significantly better at basic resuscitation, than the group

that did not. But at four years the skills of both groups were poor. There was however, a significant difference on the written test, the group that took the refresher course scored higher. One explanation of the findings is that psychomotor skills deteriorate more rapidly than cognitive skills.

The Canadian policemen showed good retention of skill at 12-18 months following initial training. This group were not allowed access to manikins prior to retention testing. This suggests that if skills are acquired to a mastery level by repetitive learning at initial training, there may be no need for refresher training to aid retention of psychomotor skills.

An alternative method which improved retention of skill without manikin practice, was illustrated by (Mandel et al.(1987)). Lay people were divided into two groups following retention testing at twelve months. One group was shown a videotape, the other received a written review on one person resuscitation. They were tested immediately after the course, and both groups showed significant improvement on checking the carotid pulse, correct hand position and ventilation volume. Students who had watched the video performed better on compression rate, but there was virtually equivalent improvement on the other skills regardless of treatment.

I.3.4. RETENTION OF KNOWLEDGE

Knowledge of basic resuscitation was included in some of the retention studies. This was assessed using multiple choice questionnaires (Gombeski et al.(1982), Friesen et al.(1984), Weaver et al.(1979), Tweed et al.(1980), Gulliford et al.(1983), Nelson et al.(1984), Braun et al.(1965), Safar et al.(1981), van Kalmthout et al.(1985), Corne et al.(1984), Gass et al.(1980)). In one study subjects were asked to write an essay (Braun et al.(1965)). The results of the knowledge retention tests showed in one study, that lay people achieved a score of >70% when tested six months after training. The score prior to training was <20%. There was no difference in scores between older and younger people (van Kalmthout et al.(1985)). When school children were tested at six months it was found that they had retained 50% of their theoretical knowledge (Corne et al.(1984)). Doctors and nurses were asked to provide self assessment of their knowledge and skills by completing a multiple choice questionnaire six months following training. The physicians had a significant decrease in knowledge and skill after six months. However the nurses had a significant decrease in knowledge only after six months. After twelve months the levels of knowledge and skill in both groups were similar to the pretraining levels (Gass et al.(1980)).

Similarly in another study (Curry et al.(1987)), doctors'

resuscitation knowledge had deteriorated to a level not significantly different from pretraining at six months. The doctors correctly perceived their level of knowledge but not the quality their resuscitation skills. The doctors felt they were more competent than they actually were at performing basic resuscitation. The nurses did not accurately perceive either the level of their knowledge or of their skills after initial training. They thought they were more competent than they actually were in practice. Staff who participated more frequently in arrests did not retain their knowledge or skills to any greater degree than those who participated less frequently. It can be concluded from this study that attendance at cardiac arrests is not a substitute for formal practical training.

These studies suggest that neither doctors, nurses or the lay public can predict accurately their knowledge or skill at basic resuscitation. This raises the question of how one can judge when refresher training is required.

1.3.5. SUMMARY: Retention of basic resuscitation skills

1.The most reliable and valid method of assessing basic resuscitation skills is by using the recording strips from the manikin. Subjective assessment has been shown to over estimate the actual practical performance level.

2. There is no evidence that experience of attending cardiac arrests improves knowledge or skills in resuscitation.

3. Initial training in general does not aid retention of skills even when criteria for certification was 100% accuracy at the end of the training course.

4. Simplifying the training course to one person resuscitation only with repetitive learning is the only method in the study which has been shown to maximise recall for the subjects.

5. There is poor retention of basic resuscitation skills for all groups, doctors, nurses and lay people when tested from two weeks up to three years. When subjects have been tested one year later their skills are often back to pretraining levels.

6. Repeated refresher training has been shown to facilitate retention of psychomotor skills.

7. Doctors, nurses and lay people cannot predict accurately their level of knowledge or skill at basic resuscitation.

The studies in the literature examining acquisition and retention of basic resuscitation skills have not explicitly applied educational theories to teaching methods and forms of evaluation. However looking more closely at the study designs it is evident that they incorporate educational theories taking into account the adult learning process, albeit implicitly.

Andragogy is the term used for the "art and science of teaching adults" (Knowles, 1984). The andragogical approach is to use a process model whereby the teacher provides the means whereby the student can teach herself (Quinn, 1980). Andragogical theory requires an open approach to education where teachers and students enter into a partnership for learning. This has been illustrated in the literature by the development of self training systems (Herrin et al.(1980), Kaye et al.(1983)) and the use of resuscitation training manikins which provide feedback of the students performance. They can use this feedback for self assessment of correct or incorrect performance and thereby identify the need for self improvement. Students therefore develop the ability to accept responsibility for their own learning.

Knowles (1984) characterised the main principle of adult learning as distinct from child education. There are four important guidelines for teaching adults which must be taken into consideration. Firstly changes in self concept: Knowles

argues that the point at which an individual reaches a need for self direction is when psychologically they are adult. This is important for basic resuscitation training because being self-directed to acquire more skills and perform them well has motivational consequences. The adult learner is more likely to want to learn. Secondly, adults bring a wealth of personal experience to the learning situation. This personal experience can act as a source of new learning. Students who can integrate the knowledge and skills acquired through resuscitation training into their own practice environment may be more likely to retain information. Thirdly, readiness to learn: an individual's readiness to learn is more likely to be a product of requirements for adequate performance of social and work roles than of biological development. Thus the timing of learning experiences should coincide with perceived need. The training of health care professionals should coincide with their need to use the skills in the clinical environment where they are more likely to see a cardio-respiratory arrest and put these skills into practice. Fourthly, orientation to learning: adults learn with a more immediate perspective. Thus knowledge and skills must have immediate and obvious relevance to the adult learner.

When teaching adults, instructors should be familiar not only with the materials they are demonstrating and teaching but also with some knowledge of the needs and expectations of the adult learner. Appropriate teaching methods should be selected

to enable learners to use previous knowledge as resources. Adults like to participate in the learning process. Hence teaching methods should be facilitative rather than didactic. Facilitative teaching or self-paced learning involves more student participation and performance, hence the teacher's role will be that of facilitator. The teacher needs to create an environment where no adult feels threatened, that of friendliness and approachability. Adults learn at differing speeds and some will find the learning process more difficult than others. Some may have disabilities that may affect learning eg. reduced hearing/sight or limb deformities. This in itself can create anxieties for the adult learner, it may instill a feeling of inadequacy. Therefore teachers should aim to reduce anxiety levels (Moore, 1991).

Hilgard et al.(1966), emphasized principles in the stimulus-response theory of adult learning. These principles support the issue of over-training by repetitive learning which lead to initial acquisition and subsequent retention of skills (Tweed et al.(1980)). These are that the learner should be active, rather than a passive viewer or listener which is essential to resuscitation training as psychomotor skills have to be acquired. Frequency of repetition is important in acquiring skill and for retention through over learning. Reinforcement is important, that is repetition of desirable or correct responses should be rewarded. In the study by Tweed et al.(1980) the sample was allowed three attempts and remedial

training was given before they were given a certificate of competence.

In most medical schools considerable attention is given to defining the content of the curriculum, to the organization of teaching, and to the conduct of assessments and examinations. However students approach their study in different ways. Three main learning styles have been identified. Firstly the surface approach: students are motivated by a concern to complete the course or by fear of failure. They intend to fulfil assessment requirements by the reproduction of factual material. The process by which to achieve this is rote learning; the outcome, a knowledge of factual information and a superficial level of understanding. Secondly the deep approach: such students are motivated by an interest in the subject matter and its vocational relevance. Thirdly the strategic approach: involves using processes which at any point in time may be similar to those used by both the surface and deep learner. Such students are motivated by the need to achieve high marks and compete with others (Newble et al.(1986)).

A considerable amount of research has been undertaken to investigate the effectiveness of teaching methods upon skill acquisition and retention (Kaye et al.(1989)). Much has attempted to measure success in terms of the amount of information retained. But no clear picture has emerged of any one best method of teaching.

Educational theory (Knowles 1984), points to the importance of incorporating the following into a successful resuscitation skills training programme for adults:

- 1.They learn best when the self is not under threat
- 2.They need to feel treated as adults
- 3.They need to participate in the learning process and be involved in evaluating their own progress
- 4.They bring a life time of experience to the learning situation
- 5.Motivation increases by identifying the competency requirements for their occupational roles
- 6.Adult education needs to be problem centred rather than theoretically orientated
- 7.Readiness to learn

1.5. SUMMARY

The basic resuscitation skills of junior doctors and trained nurses have been found to be poor. A review of the literature, has illustrated that basic resuscitation has been taught to health professionals and lay people using a variety of methods. Despite this, in general, acquisition of these skills is not good. Numerous factors which may affect the acquisition and retention of basic resuscitation skills have been discussed. Evidence from adult learning theories suggests that adults may acquire skills to a greater extent from the self paced approach rather than the traditional didactic method,

taking into account that adults learn at different rates, respond to a more problem solving approach and like to actively participate in learning.

Feedback has been shown to be an important component of teaching programmes as it not only highlights proficiencies but also deficiencies in skills thus encouraging students to practice further to improve their performance. Simplifying training courses to one person resuscitation only with overtraining by repetition learning, is the only technique which has been shown to maximise recall for the subjects. Although, this has since been abandoned primarily because there is no evidence that skills practice to perfection will make the greatest impact on survival. Poor retention of skills has been well documented for: doctors, nurses and lay people when tested from two weeks up to three years post initial training. There is no evidence to suggest that experience of attending cardiac arrests improves levels of knowledge or skills in resuscitation. However, regular refresher training has been shown to facilitate retention of these psychomotor skills.

The most significant factor affecting retention is poor initial acquisition. If initial acquisition is better there is an increased chance that retention will be better. The focus of this study is therefore upon developing and evaluating different methods of acquiring skills. While there have been

numerous studies of resuscitation skills training, few of these have been guided by educational theories. The purpose of the proposed study is therefore, to incorporate into resuscitation training two key principles from educational theories. The principles selected are self paced learning and feedback. These principles have not been used in previous studies, when investigating acquisition and retention of basic resuscitation skills.

CHAPTER 2

METHOD

2.1. AIM OF THE PROPOSED STUDY

The aim of the proposed study was to compare the effectiveness of two methods of teaching and feedback of results upon the acquisition and retention of basic resuscitation skills of third year clinical medical students.

2.2. HYPOTHESES

1) Medical students taught by the self paced method acquire better basic resuscitation skills than traditionally taught students.

2) Retention of resuscitation skills is greater in medical students whose skills are assessed with feedback than students who are assessed but not given feedback on their performance.

2.3. STUDY DESIGN (Figure 2.1)

A group of third year clinical medical students (n=84) were assessed unexpectedly in basic resuscitation. They were then divided into two groups and taught basic resuscitation by two different approaches to teaching: 1)traditional didactic approach (n=43) or 2)self paced approach (n=41). Basic

FIGURE 2.1.STUDY DESIGN

October

PRETRAINING ASSESSMENT

n=84

initial
skill

October

TEACHING METHODTRADITIONALSELF PACED

(n=43)

(n=41)

October

PRACTICAL TRAINING SESSIONSTRADITIONALSELF PACED

FEEDBACK

25

14

Acquisition
of skill

NO FEEDBACK

18

27

Assessment

All students were then assessed over
the proceeding six months either at:

October

2 weeks post training (n=29)

Retention of
skill

January

15 weeks post training (n=24)

April

26 weeks post training (n=20)

October

REFRESHER TRAINING

All available students were assessed 12
months post initial training (n=67)

Retention of
skill

resuscitation skills were assessed and feedback of performance was given to 25 of the traditional taught and 14 of the self paced taught students. The remaining 45 students from both groups received no assessment or feedback of their performance. The basic resuscitation skills of mutually exclusive randomly selected groups of students were measured for retention of skill at 2 weeks (n=29), 15 weeks (n=24), 26 weeks (n=20) and at one year (n=67) following refresher training.

2.4. SUBJECTS

Consent for participation in the study was sought from the medical school and the students.

The sample comprised 84 third year medical students who were at the beginning of their first clinical year at one medical school. This represented 93% of the total students in the year. 76 of the medical students commenced their medical training at the medical school in September 1985. They were all trained in their first term of medical school in first aid and basic resuscitation by St John Ambulance instructors. Their basic resuscitation skills were assessed using a non recording Resusci Anne manikin. Eight of the students joined the group at the beginning of the 3rd clinical year from other medical schools. They all attended a one hour lecture on Resuscitation which was part of the third year clinical

introductory course. Eighty four medical students completed the initial assessment and resuscitation teaching. Sixty seven of these students were assessed at the end of the year for retention of basic resuscitation skills. The reasons for the drop out of the students was lack of attendance at scheduled lectures due to illness.

2.5. MEASURES

The usefulness of any measure depends upon its reliability and validity.

A reliable measure refers to the consistency, stability, accuracy and dependability with which the scale or instrument is able to measure.

A valid measure is one that measures what it purports to measure. There are various types of validity:-

1.Content validity is concerned is concerned with the study sampling adequacy.

2.Face validity is the extent to which the instrument (checklist, scale, system of classification) appears to be logically appropriate.

3.Predictive validity is the ability of the instrument to measure and predict.

4.Concurrent validity is derived from the ability of the

instrument or design to measure and present observable behaviour.

5. Construct validity, the validity of concepts, judges the extent to which the research tool measures the concept or variable that the researcher wants it to measure (Seaman 1987).

2.5a. Resuscitation skills

Resuscitation skill was assessed in the current study using performance on a manikin, data from recording strips, observation and checklist.

The students were taken into a room and told "you have found this person collapsed on the floor. Please demonstrate what you would do using the manikin." After two minutes they were asked to stop." Trained assessors used a checklist to determine the correct sequence ie. assessment, airway, breathing and circulation. The recording manikin automatically recorded frequency and amplitude of ventilations and compressions.

2.5b. Recording Resusci Anne

The recording Resusci Anne manikin was evaluated in 1981 by using fundamental criteria derived from the published standards and guidelines of the National Conference on

cardiopulmonary resuscitation and emergency cardiac care (American Heart Association, (1980)). This states that manikins must provide: 1) airway obstruction when the neck is flexed, 2) appropriate chest movement with proper ventilation via both the mouth and nose and 3) appropriate resistance and movement of the manikins sternum with properly applied external chest compression. Criteria were also based on the recommendations of the AHA and the National Academy of Sciences on the work performed for the National Centre for Health Services Research (Evaluation of Emergency Devices and Systems Sept 1976 revised) and an input from a variety of consultants. It can be concluded that it has face validity. The advantages of the manikin are that it had good lung compliance characteristics, realistically soft facial tissues, good anatomic features, most realistic head/neck area and the most accurate chart recorder. The disadvantages are that the arms were poorly connected, bulky heavy case when packed, the indicator lamp box connection was too short and the eyelids, mouth and chest pieces were delicate and could tear (Anon, (1981)).

The recording strips from the manikin are the most reliable measures for assessing resuscitation skills because measurement of ventilations and chest compressions yields consistent observations of the same facts on different occasions.

2.5c. Observation and checklists

Although the use of checklists may not be so reliable because different instructors may observe different behaviours and may use different criteria for skills assessment, this measure is necessary to determine sequence of performance because this information is not recorded on the strips. Inter-observer reliability is estimated by having two or more trained observers watching an event simultaneously and independently recording relevant variables according to a predetermined plan or coding system. The resulting records can then be used to compute an index, equivalence or agreement. However evaluation of basic resuscitation skills of ventilation and compression using a checklist do not correlate with evaluation using an objective strip chart recording (Kaye et al.(1989)). The use of a checklist therefore does not provide a valid measure of resuscitation skill. Adequacy of ventilation and compressions cannot be evaluated using the subjective checklist.

The validity of skills assessments derived from performance with a manikin is not clear. One study examined the predictive validity of this measure for resuscitation ie. the extent to which an individuals performance on a manikin is related to their performance in real life. Kaye et al.(1987) evaluated the performance of team leader during 10 actual cardiac arrests. It was found that the problems identified in the clinical setting were the same as those in the classroom

during Mega Code testing (simulated cardiac arrest) (Kaye et al.(1986)).

The minimum amount or level of knowledge and skills required to sustain life with basic resuscitation has not been defined.

Curry et al.(1987) examined the effect of resuscitation training on mortality. It was found that the probability of survival was greater when basic resuscitation was begun within four minutes of arrest than when it was begun after four minutes, regardless of whether advanced resuscitation was begun within ten minutes. As long as basic resuscitation was started within four minutes there was no evidence that death rates were lower when the resuscitation was begun by a trained person rather than an untrained person in resuscitation skills.

Different ways of determining reliability are test related, ie. does the same subject get the same score on separate occasions assuming no training in the intervening period, do different instructors give the same subjects a similar score.

2.5d. Assessment used in the current study

In the current study basic resuscitation skills were measured using data from the recording strips and observation and

a checklist. They were analyzed by a trained assessor using the recommendations of the Resuscitation Council (UK) 1984 guidelines for basic life support (Evans, 1986) (Table 2.1). A random sample (n=28) of the results were re-analysed by another trained assessor using the same format and they were found to be 99% reliable. Seventeen variables were analyzed for 28 students and the level of agreement between the sets of scores was 471/476.

TABLE 2.1 BASIC RESUSCITATION SKILL SCALE

1.ASSESSMENTS AND INITIAL VENTILATION TOTAL SCORE 7

Assessment	A	= 1
Open airway)	AB	= 1
Check breathing)		
4 initial ventilations		= 1
Each ventilation =>0.8 litre		= 1
Check pulse	C	= 1
Call for help		= 1
Correct sequence		= 1

2. EXTERNAL CHEST COMPRESSIONS TOTAL SCORE 6

CYCLE 1

15 Compressions		= 1
Adequate (=>38mm)		= 1
Rate (10 - 15 secs)		= 1

CYCLE 2

15 Compressions		= 1
Adequate (=>38mm)		= 1

Rate (10 - 15 secs) = 1

3. VENTILATION

TOTAL SCORE 4

CYCLE 1

2 Ventilations = 1

Adequate (\Rightarrow 0.8 litre) = 1

CYCLE 2

2 Ventilations = 1

Adequate (\Rightarrow 0.8 litre) = 1

Total score for the correct sequence, chest compressions and ventilations = 17.

thus a total of 17 points could be scored, whereby 0 represents "completely ineffective attempt to resuscitate" and 17 represents "competent one person basic resuscitation" ie. correct sequence AABC (A=assessment, A=airway, B=breathing, C=circulation), correct chest compressions, number, rate, and adequacy and correct ventilations, number and adequacy.

Following statistical advice, only total scores are used to assess basic resuscitation skills. Scores on individual skills are considered too small and hence insufficiently robust for statistical analysis, given the small sample size.

2.5e. Outcome expectancy

Perceived effectiveness of resuscitation in general was determined from the medical students' estimates of the percentage of cardiac arrests at the hospital which were successful in 1986, defined as the patient subsequently being discharged from hospital. In 1986 the true value was 10%. This was the only year where data were available from a retrospective study of in hospital cardiorespiratory audit. The data were analyzed in terms of outcome ie. the percentage of patients discharged from hospital.

2.5f. Self assessment

This was determined using a rating of one aspect of performance:-

1. Confidence in being able to resuscitate a patient:- a nine point rating scale was used, marked at one end : 0 = not at all confident and at the other end 8 = extremely confident (appendix 2.1, 2.2, 2.3).

2.5g. Attitudes to further training

The medical students were asked whether they would like any further resuscitation training during the next 12 months in which they had to reply YES or NO (appendix 2.2, 2.3).

2.5h. Experience

A self report questionnaire elicited the following information, time since last attended a basic resuscitation training course and the number of arrests attended (appendix 2.1, 2.2).

2.6. ACQUISITION OF BASIC RESUSCITATION SKILLS

This was measured by comparing the effects of different approaches to teaching basic resuscitation, using a traditional didactic and a self paced approach, and by comparing assessment of basic resuscitation skills with feedback by the trained assessor pre and post practical training with those of no feedback. Resuscitation skills were not assessed and no feedback was given immediately after practical training for forty five students because this was over looked in the original study design.

2.6.1. TEACHING METHOD

a. Traditional didactic approach

Students attended a one hour lecture on basic resuscitation. The content of the lecture included the history and importance

of resuscitation, demonstration of basic resuscitation skills on the manikin by the lecturer and management of the airway. Students were given the opportunity to ask questions. At the end of the lecture they were told that they would have time to practice their basic resuscitation skills under supervision at a later date.

b. Self paced approach

The time allocated to this session was one hour. During this session the students read a booklet called "CPR for the citizen" which contained essential information about basic resuscitation (Resuscitation Council (UK) 1984). They were then shown a video which lasted for twenty minutes called "CPR for the citizen" (Laerdal Medical Ltd 1987). This included causes of cardiac arrest, techniques of basic resuscitation, one and two rescuers, infant resuscitation and the management of choking. The instructor was present in the room throughout the session and time was allocated for questions. At the front of the room ABC posters were displayed and a recording manikin was present. The instructor explained the features of the manikin ie. chest movement, compression depth, the signal box and the recording paper. At the end of the session students were told that they could have a look at the manikin and that they would have time to practice basic resuscitation skills at a later date.

The instructors who gave the lectures were different but the study design had been fully explained to them.

2.6.2 PRACTICAL TRAINING SESSIONS IN BASIC RESUSCITATION

The same instructor was present for all the practical training sessions who was well aware of the study design. Different trained assessors assessed the medical students performance of one person basic resuscitation.

There were six trained assessors who rated 10 sequence steps of assessment, airway, breathing and circulation by observation and checklist of students performance on the manikin. These were compared with 10 ratings by an instructor. The agreement was above 90% overall .

The time allocated to the practical sessions was one hour for groups of ten medical students. The format of the practical sessions for both teaching methods was either pre and post practical training assessments with feedback or no assessment or feedback.

a. Traditional didactic approach

i. pre and post practical assessments with feedback

As the students entered the training room, they were taken individually without warning into another room and their basic resuscitation skills were assessed. They were given feedback of their performance by the trained assessor by verbal analysis of the checklists and recording strips. A demonstration of the correct technique of one rescuer resuscitation was given to the group by the instructor. There were 10 students in each group, who were divided into 2 groups of five. The students practised one rescuer basic resuscitation for approximately forty minutes in these groups. One recording manikin was provided per group for practice of these psychomotor skills due to limited resources. The instructor was present in the room giving help and advice. The students were encouraged to give feedback of each others performance in the group, and to use the objective data provided by the manikin to analyze individual performance. At the end of the session they were assessed individually on a recording manikin and given feedback of their performance by the assessor. There was no time at the end of the session for remedial training due to the time constraints of the medical students timetable.

ii. practical training session, no assessment or feedback of basic resuscitation skills

At the beginning of the session a demonstration of the correct technique of one rescuer basic resuscitation was given to the group by the instructor. There were 10 students in each group and these were subsequently divided into 2 groups of five. One non recording manikin was provided for each of the two groups. They were asked to practise one person basic resuscitation only for forty minutes. The instructor was present throughout the session giving help and advice to the students. They received no assessment or feedback of their basic resuscitation skills.

b. Self paced approach

i. pre and post practical assessments with feedback

As the students entered the training room, they were taken individually without warning into another room and their basic resuscitation skills were assessed. Feedback of their performance was given by the trained assessor by verbal analysis of the checklist and recording strip. There were 10 students in each group who were subsequently divided into 2 groups of five. One recording manikin was provided for each of the groups. The students were advised to practice one person basic resuscitation only for approximately forty minutes. They were encouraged to give feedback to each other in the group, and to use the objective data provided by the manikin to analyze individual performance. In the practical training

room, ABC of resuscitation posters were displayed on the walls and copies of the booklet CPR for the citizen were available. The students were encouraged to use these as reference material. The instructor was present in the room during the session but sat in a corner reading a book and was only available for questions. At the end of the session the students skills were assessed and feedback of their performance was given by the assessors. There was no time at the end of the assessments for remedial training due to the time constraints imposed by the medical school timetable.

ii. practical training session, no assessment or feedback of basic resuscitation skills

For this practical training session, in the room, ABC of resuscitation posters were displayed on the walls, copies of CPR for the citizen were available for the students to use as reference material. The students were divided into groups of 10 and these were subsequently divided into 2 groups of five. One non recording manikin was provided for each of the two groups. They were asked to practice one person basic resuscitation only for forty minutes. The instructor was present in the room, sat in a corner reading a book and only available for questions. They received no assessment or feedback of their basic resuscitation skills.

2.7. PROCEDURE

Each medical student participated in the study while attending a two hour teaching session in the clinical introductory course at the beginning of the third year allocated to resuscitation. The medical students were divided in alphabetical order by the medical school into ten groups. Five of the groups were randomly allocated according to the timetable endorsed by the medical school to traditional didactic approach (Group 1 n=43) and five into self paced approach (Group 2 n=41).

Group 1 (n=43) were assigned to Lecture Theatre 2. Group 2 (n=41) were assigned to Lecture Theatre 1. All the medical students completed a questionnaire (appendix 2.1). Each medical student was taken in turn to another room for baseline assessments of basic resuscitation skills. When this was completed, Group 1 was given a one hour lecture on basic resuscitation by the traditional didactic approach. At the same time but in a different lecture theatre Group 2 were taught basic resuscitation by the self paced approach.

The practical training sessions were attended by the medical students in groups according to the timetable devised by the medical school. Group 1 was divided into traditional with feedback n=25 and traditional without feedback. The first group received assessments with feedback pre and post

training. The traditional group with no feedback n=18, had no practical assessments during initial training. Group 2 was divided into self paced learning with practical assessments and feedback pre and post training (n=14) and 27 students who received no assessments or feedback.

2.8. RETENTION OF BASIC RESUSCITATION SKILLS

Basic resuscitation skills were measured by practical assessments on the recording manikins. The students were given no feedback of their performance or remedial training.

The skills of a mutually exclusive randomly selected group of students from each of the four study groups were assessed without feedback at the following time periods: 1. two weeks n=29, 2. fifteen weeks n=24 and twenty six weeks n=20 post initial practical training because this correlated with access to the students during their clinical allocations. They had received no formal resuscitation training during these time periods. There was however, a possibility of contamination between the groups. This may have occurred if they discussed the study with their colleagues or maybe read posters containing essential information on resuscitation displayed throughout the hospital.

At the end of the third clinical year all the medical students attended a mid- course block which comprised a series of

lectures. At the end of a lecture, an additional Cardiology lecture was timetabled. This time was used for assessing the medical students' basic resuscitation skills without any prior warning. Two research assistants interrupted the lecture and asked the students to complete a questionnaire (appendix 2.2). The students were then taken individually without warning into another room, where their basic resuscitation skills were assessed but no feedback was given. After the practical assessment the medical students were asked to complete a short questionnaire (appendix 2.3). This assessment took place at 56 weeks post practical training for 28 medical students and at 57 weeks for 39 medical students. There was a possibility that the first group who were assessed at 56 weeks, may have warned and thus prepared the next group for the assessment.

All retention assessments took place without prior warning and they were assessed individually but no feedback of performance was given. At 2, 15, and 26 weeks post practical training the students had received no additional practical resuscitation training to that at the beginning of the study. But at one year the students had received formal practical training in basic and advanced resuscitation during the anaesthetic and cardiothoracic modules.

The content of this training is stipulated by the medical school curriculum. During the anaesthetic module they are formally taught and assessed in one and two person basic

resuscitation, the use of airway adjuncts and the techniques of intubation and intravenous cannulation. The content of the cardiothoracic module comprises six hours of training. This includes revision of basic resuscitation, and the use of airway adjuncts, identification and management of life threatening arrhythmias, how to use a defibrillator effectively and safely, post-resuscitation care, leadership skills, and integrated practice of the skills using clinical scenarios by means of simulated cardiac arrests. The formal training is undertaken by the resuscitation training officer, in the resuscitation training room which is equipped with all the necessary training aids for basic and advanced resuscitation.

The method of analysis used in this study was multivariate, and the level of significance set was $P < 0.05$. Analysis of variance was used to test the significance of differences between means of three or more groups at different time intervals for resuscitation skills. Pearsons Product moment correlation coefficient was used to assess associations between confidence and resuscitation skill.

2.9 SUMMARY

1.84 clinical medical students were assessed unexpectedly in basic resuscitation.

Measures: a) resuscitation skills were assessed using performance on a manikin, data from recording strips, observation and checklists. b) self report questionnaires elicited the following information, outcome expectancy, self assessment, attitudes to further training and experience.

Acquisition

2.The students were divided into two groups and taught basic resuscitation by two different approaches to teaching, traditional didactic and self paced learning.

3.Basic resuscitation skills were assessed and feedback of performance was given to 25 of the traditional taught and 14 of the self paced taught students.

4.The remaining 45 students from both groups received no assessment or feedback of their performance.

Retention

5.Basic resuscitation skills of mutually exclusive randomly selected groups of students were measured for retention of skill at 2 weeks (n=29), 15 weeks (n=24), 26 weeks (n=20) and at one year (n=67) following refresher training.

CHAPTER 3

RESULTS

The main questions addressed in the analyses are:-

1. What effect did the initial teaching have upon the acquisition of basic resuscitation skills? (2 way analyses of variance, repeated measures, MANOVA).

2. Did the method of teaching affect retention of skills within a six month period? (3 way analyses of variance, ANOVA).

3. Did the method of teaching affect retention of skills one year after initial training? (3 way analyses of variance, repeated measures, MANOVA)

3.1. ACQUISITION AND INITIAL RETENTION OF BASIC RESUSCITATION SKILLS

There was an overall increase in the basic resuscitation skills for students who received feedback from prior to the course (T1), after teaching (T2) and after initial practice with feedback on the manikin (T3), ($F(2,72) = 73.16; P < 0.0001$). (Table 3.1, Figure 3.1)

The acquisition of basic resuscitation skills was not statistically significant for the self paced approach with feedback group when compared with the traditional didactic approach with feedback ($F(2,72) = 2.92; P < 0.06$).

Table 3.1

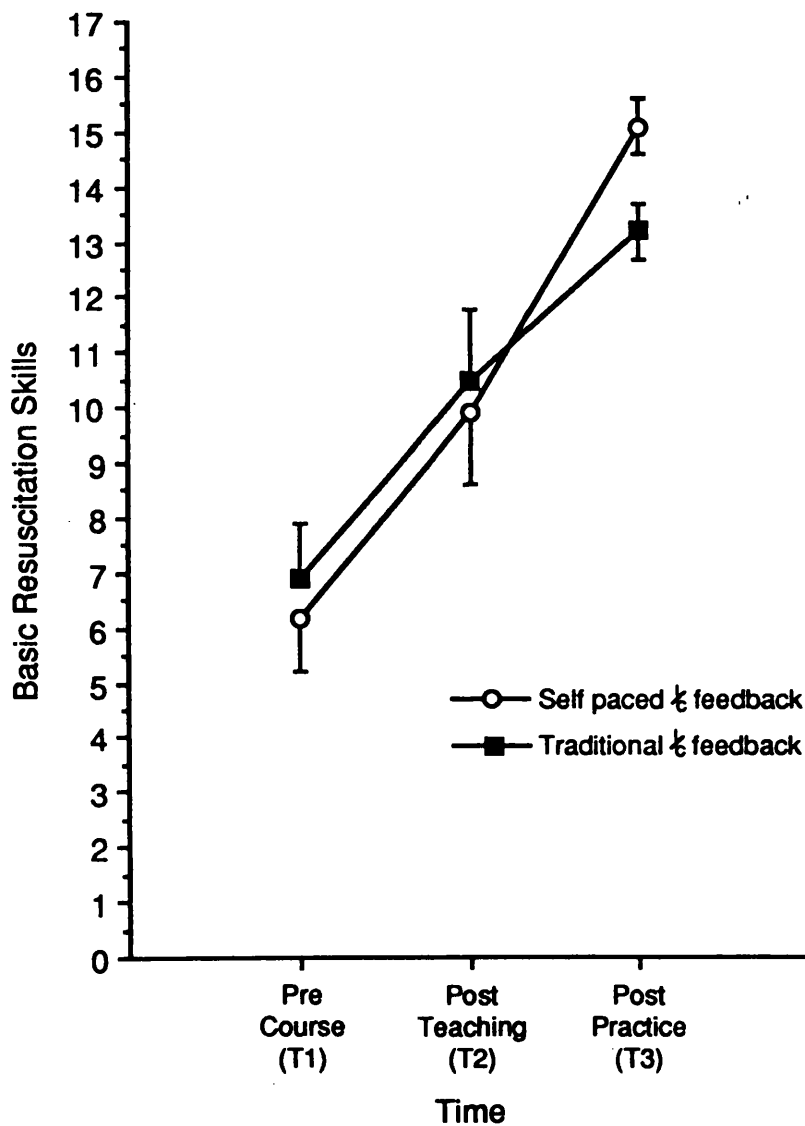
Basic resuscitation skills pre and post teaching
for those taught traditionally and given feedback
and those by self paced with feedback
(mean score (s.e.))

Method of Teaching

	Traditional with Feedback n=25	Self Paced with Feedback n=14
Skills pre course (T1)	6.9 (0.7)	6.2 (1.0)
Skills post teaching (T2)	10.5 (0.6)	9.9 (1.3)
Skills post practice (T3)	13.2 (0.4)	15.1 (0.5)

Figure 3.1

Basic resuscitation skills pre and post teaching for those taught traditionally and given feedback and those taught by self paced learning with feedback (mean score (s.e.))



3.2. RETENTION OF RESUSCITATION SKILLS OVER A SIX MONTH PERIOD

Resuscitation skills deteriorated for all the groups from two weeks post initial training (T4) to twenty six weeks (T6) ($F(4,2) = 7.9$; $P < 0.001$) (Table 3.2, Figure 3.2)).

There was a tendency, although it did not reach statistical significance, for the resuscitation skills of the medical students who had received feedback to deteriorate less than those who had no feedback ($F(1,4) = 3.65$; $P < 0.06$). (Table 3.3, Figure 3.3)

Table 3.2

Basic resuscitation skills of students taught
by the different approaches over a
six month period (mean score (s.e.))

Method of Teaching

	Traditional		Self Paced	
	Feedback	No Feedback	Feedback	No Feedback
T4	12.9 (1.4) n=7	10.4 (1.3) n=8	12.0 (1.0) n=5	12.2 (0.8) n=9
T5	11.9 (0.8) n=10	7.3 (1.8) n=3	9.2 (1.6) n=5	8.7 (2.0) n=6
T6	8.6 (1.1) n=4	6.6 (1.5) n=5	8.3 (3.5) n=3	8.0 (1.4) n=8

T4=2 weeks post initial acquisition

T5=15 weeks post initial acquisition

T6=26 weeks post initial acquisition

Figure 3.2

Basic resuscitation skills of students taught by the different approaches over a six month period (mean score (s.e.))

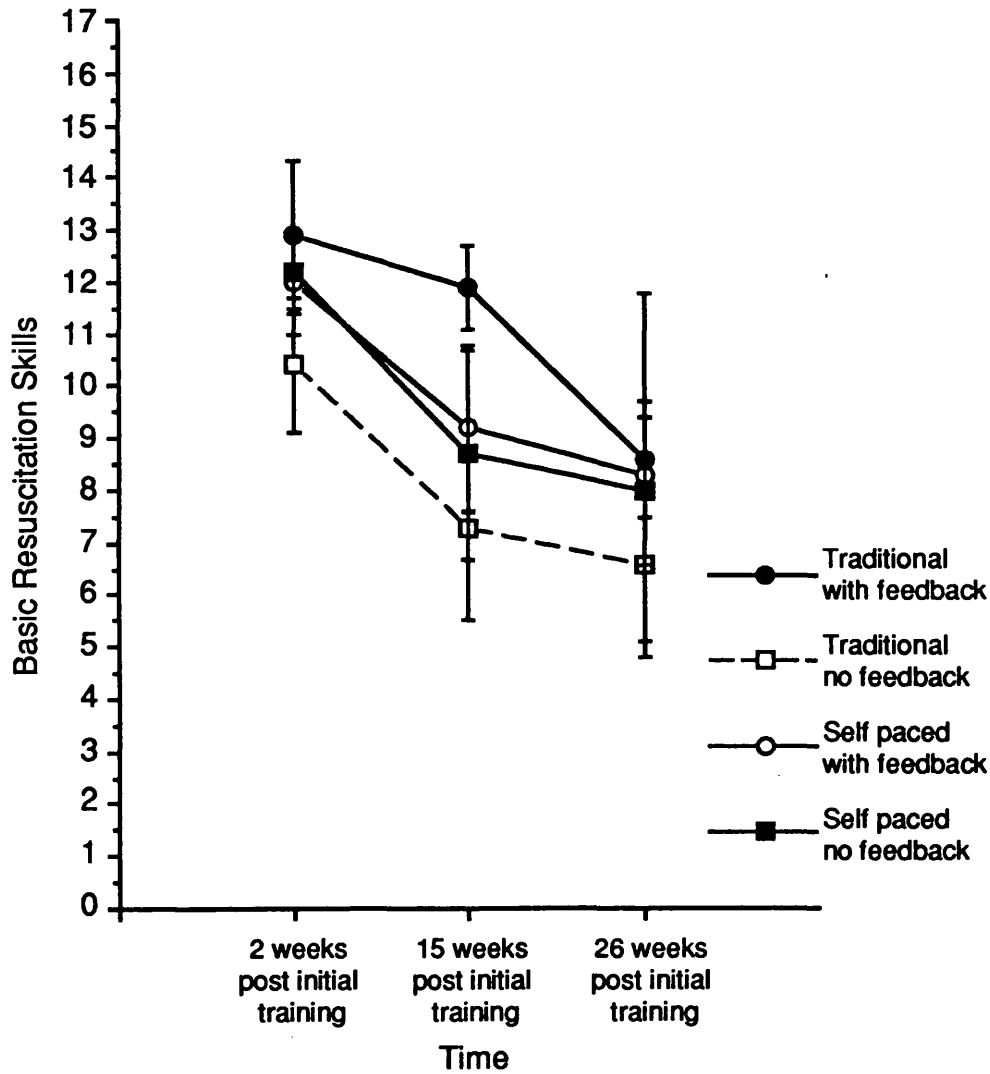


Table 3.3

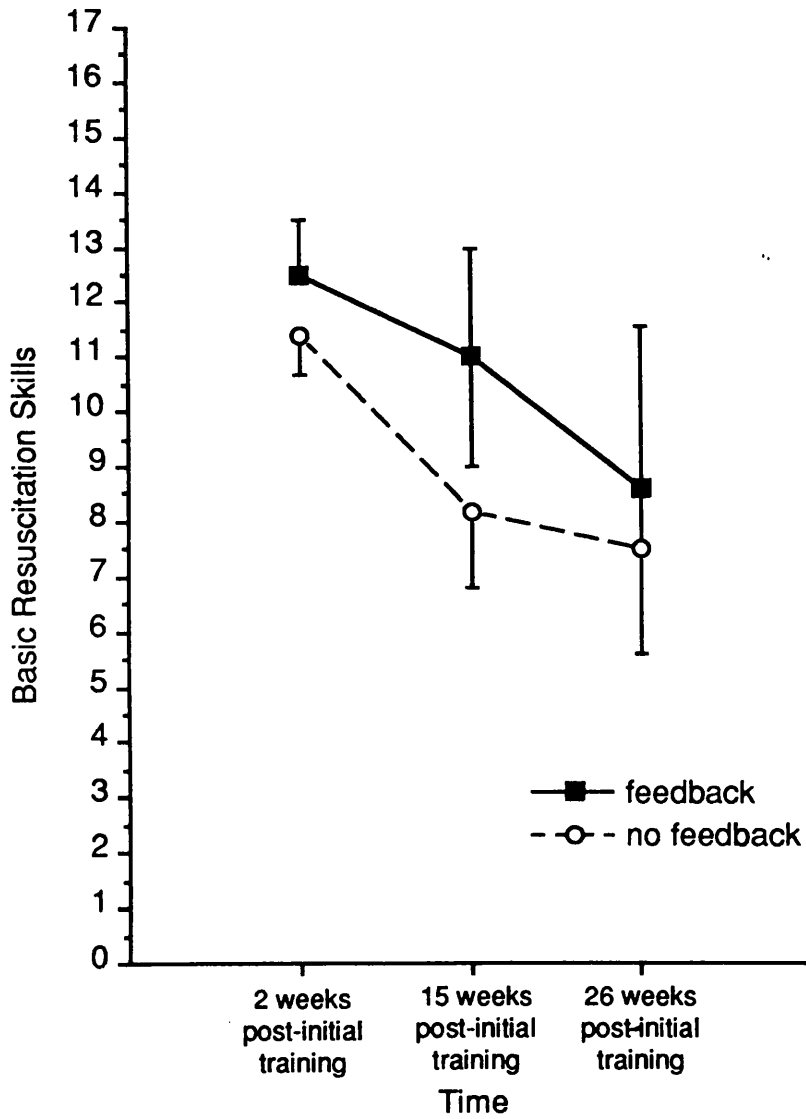
Basic resuscitation skills of those who received feedback
and no feedback over a six month period
(mean score (s.e.))

Assessment of Skill

Resuscitation skills post training	Feedback	No Feedback
2 weeks	12.5 (0.9) n=12	11.4 (0.7) n=17
15 weeks	11.0 (0.8) n=15	8.2 (1.4) n=9
26 weeks	8.6 (1.5) n=7	7.5 (1.0) n=13

Figure 3.3

Basic resuscitation skills of those who received feedback and no feedback over a six month period (mean score (s.e.))



3.3. RETENTION OF BASIC RESUSCITATION SKILLS ONE YEAR AFTER INITIAL TRAINING

At the end of one year, assessment of basic resuscitation skills was performed on 67 medical students. To determine if they were representative of the whole group, their skills prior to the course (T1) were compared with those of the 17 students who had not attended for the 12 months assessment. No significant differences were observed in the initial resuscitation skills (T1) (mean score 5.7, sd(2.8)) of the medical students who attended at the end of the year (T7) (mean score 6.2, sd(3.6)) and those who did not. ($F(37,27) = 1.6$; $P < 0.5$).

There was a significant increase in basic resuscitation skills for the whole group from prior to the course (T1) (mean score 6.3) to one year later (T7) (mean score 11.8). ($F(1,60) = 110.85$; $P < 0.0001$).

There was no significant difference in the improvement of basic resuscitation skills when considering either the teaching methods used or levels of feedback of performance . However, there appeared to be an interaction between method, feedback and time ($F(1,60) = 3.5$; $P < 0.06$) (Table 3.4, Figure 3.4) although not statistically significant.

The combination of the traditional didactic approach without feedback and the self paced approach with feedback showed a greater improvement of resuscitation skills at the end of the year than the traditional method with feedback and the self paced with no feedback (Table 3.5), although this was not statistically significant.

Table 3.4

Basic resuscitation skills prior to teaching and one year later of students taught by different methods (mean score)

Method of Teaching

	Traditional		Self Paced	
	Feedback	No Feedback	Feedback	No Feedback
Skills prior to course (T1)	6.9 n = 25	5.8 n = 18	6.2 n = 14	6.2 n = 27
Skills at 1 year (T7)	11.5 n = 23	12.5 n = 14	12.9 n = 11	10.8 n = 19

Figure 3.4

Basic resuscitation skills prior to teaching and one year later of students taught by different methods (mean score)

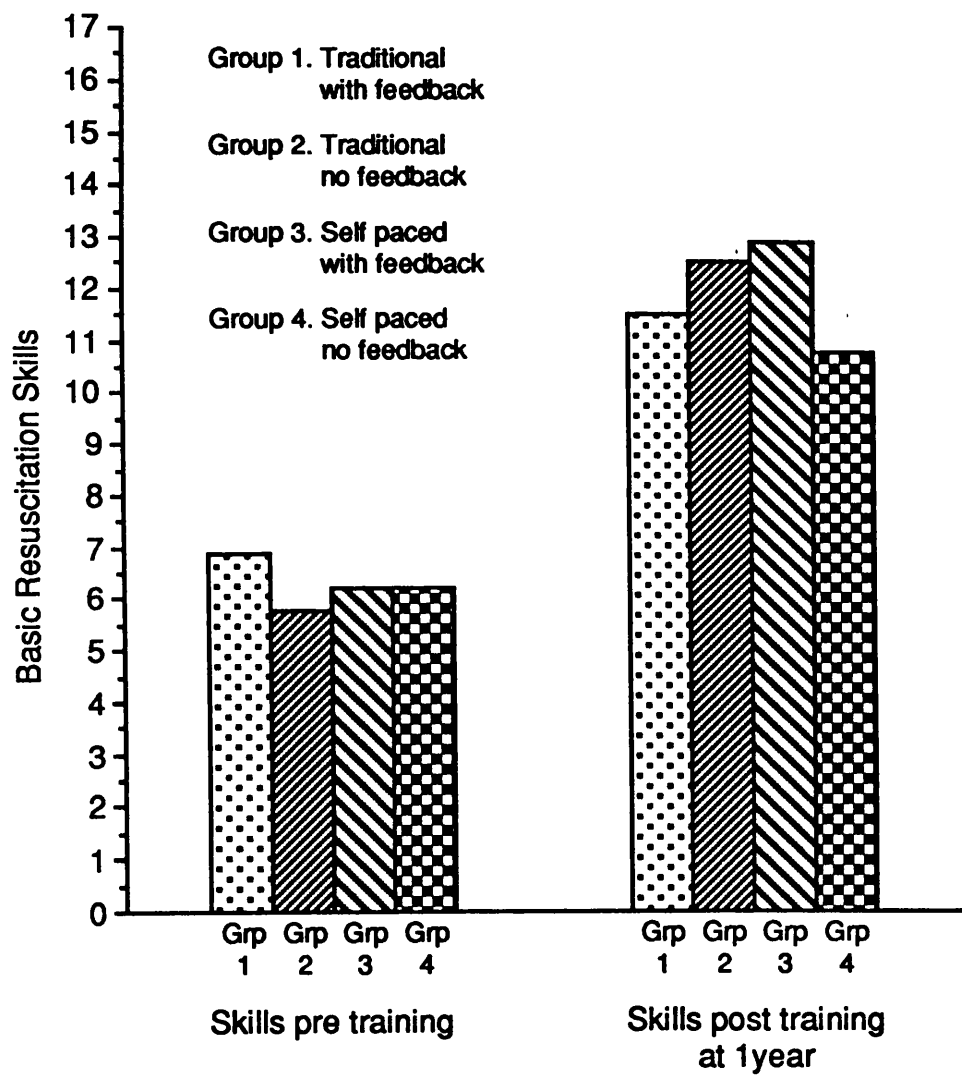


Table 3.5

Change in mean basic resuscitation skills scores
from before the course to one year later for
each teaching method

Method of Teaching

	Traditional	Self Paced
No Feedback	+6.7 (s.e. 1.0) n=14	+4.6 (s.e 1.3) n=19
Feedback	+4.6 (s.e. 0.7) n=23	+6.7 (s.e.1.4) n=11

3.4. PERCEPTIONS OF RESUSCITATION SKILLS - CONFIDENCE

The statistical test used to assess associations between confidence and resuscitation skills was Pearsons Product Moment correlation coefficient.

During the year of the study, confidence increased as did the basic resuscitation skills. Confidence prior to the course (T1) (mean score 3.0), prior to assessment one year later (mean score 4.3) and after the assessment one year later (mean score 4.2) however, this did not reach statistical significance. There were no significant differences in confidence at performing resuscitation between students who had been taught by the different approaches to teaching.

Prior to assessment and training of basic resuscitation skills (T1), there was a positive correlation between the students confidence to perform resuscitation and their actual skills at performing basic resuscitation on a manikin. ($r = + 0.34$, $P < 0.001$).

One year later (T7) prior to assessment of resuscitation skills on the manikin, there was no relationship between confidence at performing resuscitation and actual practical skill ($r = 0.14$).

However confidence had a tendency to be related to the number of arrests attended during the previous year although this did not reach statistical significance ($r=0.17$ $P<0.08$). The number of arrests attended were unrelated to skill ($r=0.15$).

Immediately after skill assessment at one year (T7) there was a positive correlation between the medical students' confidence to perform resuscitation and their basic resuscitation skills. ($r=0.41$ $P<0.0001$)

At the beginning of the year, prior to exposure to the clinical environment and attendance of cardiac arrests, the mean score of students' estimations of the survival from cardiac arrest was 41.6%. At the end of their first clinical year following attendance at cardiac arrest, their mean estimation of survival was 17.4%. Survival was defined as the patient being discharged from hospital alive and the true value for 1986 was 10%.

3.5. SUMMARY OF THE MAIN RESULTS

1. There was an overall increase in the basic resuscitation skills for students who received feedback from pre training to immediately after training.
2. The acquisition of basic resuscitation skills tended to be greater for the self paced approach with feedback group than

the traditional method with feedback although this was not statistically significant.

3. Resuscitation skills deteriorated for all groups from 2 weeks to 26 weeks post initial training.

4. There was a tendency for the resuscitation skills of the medical students who had received feedback to deteriorate less than those who had no feedback over a six month period.

5. There was a significant increase in basic resuscitation skills for the whole group from pre training to when they were tested at one year.

6. There was no significant difference in the improvement of basic resuscitation skills when considering either the teaching methods used or levels of feedback of performance at one year.

7. The combination of the traditional method without feedback and the self paced with feedback showed a greater improvement of resuscitation skills at one year than the traditional method with feedback and the self paced method with no feedback, although this was not statistically significant.

3.5.1. CONFIDENCE

1. During the year of the study confidence increased as did skill. There were no significant differences in confidence at performing resuscitation between the students who had been taught by the different methods.

2. Confidence showed a tendency to be related to the number of arrests attended: the more arrest attended, the more confident the students felt they were at performing basic resuscitation.

3. Prior to the initial assessment, students' judgments of their basic resuscitation skills were accurate. One year later, prior to assessment of skills, there was no relationship between confidence at performing resuscitation and actual skill. However immediately after the assessment, the students' judgments were more accurate.

CHAPTER 4

DISCUSSION

In summary, teaching method did not influence the initial acquisition of basic resuscitation skill, and had little effect on retention of skill over a six month or one year period. Skills deteriorated for all groups over a six month period but not to pretraining level. Compared with prior to training, basic resuscitation skills had improved one year after the initial training course. During the year of the study confidence increased as did resuscitation skill. This had a tendency to be related to the number of cardiac arrests attended. Time and experience in the clinical setting were associated with medical students' judgements of confidence in their actual ability to perform resuscitation.

There was an overall increase in the basic resuscitation skills for students who received feedback from pretraining to immediately after training. It is an advantage to assess the level of skill prior to training, so that acquisition can be measured. In several studies in the literature skills are not always assessed prior to or at the end of the course, therefore the level of acquired skill from training is unknown. Assessment of skill post training allows for the student to receive feedback of performance, so that if necessary mistakes can be corrected. It provides useful information for the trainer to evaluate their performance and that of the course. It has been documented in the literature

that students need practical training on a manikin, whether by the self paced approach or traditional didactic approach to teaching, in order to acquire basic resuscitation skills (Breivik et al.(1980)). It was concluded that self teaching systems were equally effective in providing the theoretical first aid knowledge but the course using training manikins was superior in teaching practical skills. For the two different approaches to teaching in this study, equal time was allowed for practical training using the manikins.

Acquisition of basic resuscitation skills tended to be greater for the self paced approach with feedback group than the traditional method with feedback, although this did not reach statistical significance. Mandel et al.(1987) found that there was a marked improvement of basic resuscitation skills after the course, following tests post training with feedback and time allowed for correction of mistakes. The importance of practice with feedback during training programmes for both lay and professional people in the acquisition of such skills would suggest that feedback could be a major determinant of retention of such skills rather than the characteristics of previous professional training or knowledge (Vanderschmidt et al.(1975), Berkebile et al.(1973)).

If more time had been available for practical training during initial skill acquisition, the students may have reached a 100% mastery in performance. Furthermore time could also have

been allocated for remedial training immediately after the assessment post training. This therefore may have led to better retention of skills over the six month period. But due to the time constraints authorised by the medical school this idea could not be fulfilled. Within the initial practical training sessions it may also have been beneficial to have more training manikins available for individual practice. The students would then have had more time to practise their individual skills and receive feedback of their performance. But there were limited resources available at the time of the study and so this was not practical.

Unfortunately no comment can be made on the initial acquisition of skill for the groups who experienced traditional and self paced teaching with no feedback. This was because it was over-looked in the study design, therefore their skills were not assessed after training or after initial practice on the manikin.

Resuscitation skills deteriorated for all groups over a six month period, although they did not decline as far as pre-training levels. This fact is well documented in the literature on resuscitation skills for both health professionals and lay people; retention of skills tends to be poor over all intervals of time tested, from two weeks (Freisen et al.(1984)), to up to three years (McKenna et al.(1985)). This is despite different approaches to teaching

resuscitation.

Resuscitation skills are complex and students need over training and practice. In order to fulfil these two conditions students require more initial training. One study reported after initial training Canadian Policemen retained their skills in 12-18 months. One explanation for this improved retention of skill, could be the characteristic of the training. The course was simplified to one person resuscitation only with repetitive learning (Tweed et al.(1980)). This is the only study in the literature which has been shown to maximise recall for the subjects. In the present study the students were taught one person resuscitation only during the two hour course compared to eight hours in the previous study. The length of course may be a factor which affects acquisition and retention of skill. There are no reported studies which compare the length of course to initial acquisition and retention of skill.

The deterioration of basic resuscitation skills tended to be less in the groups who had received feedback of their performance over a six month period. Feedback of performance of basic resuscitation skills should be incorporated into training programmes as it has been shown to influence not only acquisition but also retention of skill. In an experiment, subjects working without knowledge of results failed to show any improvement. They also become exceedingly bored with the

whole procedure. Subjects who know accurately their performance, improve rapidly as practise continues (Munn, 1966). Feedback should be provided for the students in training courses using information provided by the signal box and recording strips from the manikin plus observation from the instructor and checklists. This method of assessment is both reliable and valid. The students can then use this data for self assessment of their performances and thus identify the need for self improvement. They may thereby develop the ability to accept responsibility for their own learning (Quinn, 1980). Unfortunately in the study design due to time constraints from the medical school, there was not time for remedial training post assessment with feedback.

These results support the hypotheses that medical students taught by the self paced approach acquire better basic resuscitation skills than traditionally taught students, and that retention is greater in students who receive feedback of performance than in those who receive none. But this did not reach a statistically significant level, although it was approaching it. However, it is not known if the marginally superior performance of those given feedback would be of any clinical significance. The results do however suggest that emphasising feedback may lead to better retention.

There was an increase of basic resuscitation skills for all the groups when they were tested one year after the initial

training course. One year post training the level of acquired skill was likely to reflect more strongly refresher training than initial teaching. Following the skills assessment at six months, all medical students received training in basic and advanced resuscitation as part of the medical school curriculum. This was unavoidable as they are routinely taught resuscitation during the anaesthetic and cardiothoracic modules. The students during their third clinical year also have varying clinical experience when attending cardiac arrests. Several studies have shown that refresher training can have an important influence on retention of skills (Weaver et al.(1979), Gombeski et al.(1982), Nelson et al.(1984)). This observation was not confirmed in just one study (Tweed et al.(1980)) in which following initial training, skills acquired were retained at twelve to eighteen months, even though subjects received no refresher training or exposure to cardiac arrests.

There were no significant differences in the skills of the students who had received feedback compared to those who had received no feedback one year later. While feedback tended to have an influence on initial acquisition of basic resuscitation skills during the first six months following training, at one year any advantages of the use of feedback in initial training were no longer apparent.

The combination of the traditional didactic approach without

feedback ,which approached statistical significance and the self paced approach with feedback showed a greater improvement in basic resuscitation skills at the end of the year than the traditional method with feedback and the self paced approach without feedback. The initial teaching method seems to be less important in influencing retention of skills at one year post training. These effects are most likely due to the stronger additional influence of the refresher resuscitation training the students routinely received as part of their clinical training.

Only 48% of pre registration house officers tested eighteen to twenty four months following basic resuscitation training, could perform effective ventilation and external cardiac massage (Morris et al.(1991)). The question arises of whether the doctors acquired the skills in the first instance? If they did, this reflects poor retention of skills and highlights the need for more frequent refresher training during medical school, continuing once they are qualified. One possible explanation for doctors poor basic resuscitation skills, is that they lack the opportunity to practise this skill in the clinical setting (Gass et al.(1980)). However, the experience of attending cardiac arrests does not seem to improve skills in resuscitation (Marteau et al.(1990)). Regular practice with feedback using manikins may be necessary to maintain sufficient skills to perform resuscitation competently, and should be investigated further.

The sample size of this study was relatively small and medical students from just one medical school only took part in the study. The small sample was probably too weak to detect a real effect of training. To see how representative these results are of the population as a whole, a multicentre study should be carried out and different populations sampled eg. student nurses. This would then identify if the same trends apply in a larger multi- disciplinary population. But at the time of the study with limited resources access was only available at this particular medical school with this sample of students.

During the year of the study confidence increased as did basic resuscitation skill. There were no significant differences in confidence at performing resuscitation between the students who had been taught by the different approaches to teaching. The medical students in the present study during the year received refresher training which may have helped to improve their skills and therefore increased their confidence to perform basic resuscitation.

Confidence had a tendency to be related to the number of cardiac arrests attended. The more arrests attended, the more confident the students felt they were at performing resuscitation. This accords with previous studies in which, sister/charge nurses and pre registration house officers who had experience of attending cardiac arrests had increased confidence when performing basic resuscitation. This was not

matched by an increase in skill (Wynne et al.(1987), Marteau et al.(1990)). Time and experience in the clinical setting seemed to influence the medical students' judgements of confidence in their ability to perform basic resuscitation. One explanation for this is that exposure to cardiac arrests increases confidence. Alternatively, confidence in being able to perform basic resuscitation may lead people to attend more arrests. Attendance at cardiac arrests by the medical students was defined in general terms. The term was not analyzed further to see if they actually took part in any particular aspect of the resuscitation process or whether they just observed a cardio-respiratory arrest. Further studies will need to assess in more detail the actual role students played at the arrests they attend.

At the beginning of the study, prior to exposure to the clinical environment, the students' assessment of confidence was an accurate predictor of their skills. One explanation for this may be that the students had not practised their basic resuscitation skills for some time prior to this training course. The most recent formal training which they had received was in the first term of medical school. Another explanation is that the fear of being exposed to the clinical environment for the first time, where there is a possibility that they might have to perform basic resuscitation led the students' to judge their skills accurately. These factors may have contributed to the fact that the students were not

confident that they could perform basic resuscitation adequately. This was shown to be an accurate perception when their practical skills were assessed prior to the course. Alternatively, clinical experience generally leads to over confidence.

One year later prior to assessment there was no relationship between confidence and skill. During this time the students had received refresher training and been exposed to cardiac arrests. But, regular experience with resuscitation does not seem to help retention of resuscitation skills. Doctors and nurses perceptions' of their knowledge and skills are generally inaccurate and thus not helpful in determining the need for retraining. In general physicians and nurses do not accurately perceive their knowledge and skills. They generally have an illusion of continuing competence in resuscitation knowledge and skills long after these have deteriorated (Gass et al.(1983)).

However, immediately after assessment there was a positive correlation between the students assessment of confidence and basic resuscitation skill. Feedback of performance of basic resuscitation skills seemed to help students to make a more accurate assessment of them and basic resuscitation skill. No feedback can lead to an inaccurate perception of skill, as seen in this study (page 100). This result therefore supports the findings in the literature that regular practice of this

skill is necessary to ensure high levels of retention of both knowledge and skills. Medical students, doctors and trained nurses feel confident in their ability to perform basic resuscitation but there is a large discrepancy between perceived and actual ability to perform basic resuscitation (Wynne et al.(1987), Marteau et al.(1990). There is a well described tendency for people to invoke competence after success but not question it after failure (Miller et al.(1975)). When questioned doctors thought that their resuscitation skills and those of the cardiac arrest team were much less important when the patient died than when the patient survived (Marteau et al.(1990)).

It is important to consider not only why retention is poor but also why initial acquisition is poor. In several studies resuscitation skills are not measured at the end of the initial training. It is therefore not known whether the subjects acquired the skills in the first instance. In the current study acquisition of skill was measured for two groups after initial training. One reason which may cause decline in skills is a natural decrement without reinforcement of newly acquired skills as time since initial training increases. This may be improved by initial over training with feedback (Tweed et al.(1980)) or as suggested in the current study, periodic refresher training.

From the findings of this study, future research in this area,

should concentrate on initial skill acquisition. More emphasis should be placed on longer time periods for initial practical training with greater availability of manikins, coupled with feedback and remedial training if necessary following post course assessment. Therefore the ideal length of course and content needs to be determined to aid not only skill acquisition but ultimately retention. A further factor to incorporate into training is that it needs to be more realistic. This can be made possible using different scenarios and simulation. Alternatively the training could take place in the clinical environment ie. wards and departments by qualified medical and nursing staff to further increase the reality of training.

A further issue, not addressed by this study concerns the minimum level of skill critical in determining survival rates. To determine this it would be necessary to measure and evaluate performance during actual resuscitation, and to determine the association between skill and patient outcome. On review of death rates following resuscitation, there was no overall change in mortality after staff training in resuscitation (Curry et al.(1987)). Nobody has defined the minimum body of knowledge and skill required to sustain life with basic resuscitation. This is extremely important when trying to define a competent performance of basic resuscitation.

Given that there were few significant findings from this study, few practical recommendations are possible. The results, taken together with the principals of educational theory suggest the importance of spending more than a one hour session on initial skills acquisition. Self paced learning must be more widely advocated taking into account adult learning theories as people learn at different rates. There is a need for regular practical refresher including feedback training. as skills deteriorate over all time intervals and confidence is unrelated to skill following exposure to cardiac arrests. Emphasis must be placed on learning one person basic resuscitation initially because this is a complex skill. There is a tendency to include too much information, in too short a time in the initial training session, thus leading to poor initial acquisition and ultimately retention of skill.

In conclusion the results of the current study suggest the importance of focusing upon initial acquisition of skills, regular feedback and periodic refresher training to improve retention of basic resuscitation skills. Competent resuscitation requires proficiency with a complex range of skills, including assessment of patient, ventilations and compressions. Like all complex skills, acquisition is more likely to occur by over learning coupled with feedback and frequent practice.

APPENDIX

APPENDIX 2.1RESUSCITATION QUESTIONNAIRENAME:

As part of an evaluation of the effectiveness of different approaches to teaching basic life support skills, all third year medical students are being asked to complete this questionnaire. There are no right or wrong answers to any of the questions. Your answers will be treated in the strictest confidence.

1. When did you last attend a course in basic resuscitation?

2. There were 362 arrests at the Royal Free Hospital in 1986. What percentage of these do you think were successful (i.e. the patient was subsequently discharged from hospital)?

3. In a test of basic resuscitation skills, how many points out of 10 do you think you would get (the average is 5)?

-----/10.

4. How confident do you feel in being able to resuscitate a patient?

Not at all
confident

Extremely
confident

0 1 2 3 4 5 6 7 8

Please circle your answer.

5. How many times have you been present at a cardiac arrest in the last 12 months?

0 5-10 20+

1-5 10-20

Please circle your answer.

APPENDIX 2.2RESUSCITATION QUESTIONNAIRENAME:

As part of an evaluation of the effectiveness of different approaches to teaching basic life support skills, all third year medical students are being asked to complete this questionnaire. There are no right or wrong answers to any of the questions. Your answers will be treated in the strictest confidence.

1. How confident do you feel in being able to resuscitate a patient?

Not at all
confident

Extremely
confident

0 1 2 3 4 5 6 7 8

Please circle your answer.

2. You have attended several resuscitation training sessions.
Do you feel that you will need any further training over
the next 12 months?

Yes

No

Please circle your answer.

3. How many times have you been present at a cardiac arrest in
the last 12 months?

0

5-10

20+

1-5

10-20

Please circle your answer.

APPENDIX 2.3RESUSCITATION QUESTIONNAIRENAME:-

As part of an evaluation of the effectiveness of different approaches to teaching basic life support skills, all third year medical students are being asked to complete this questionnaire. There are no right or wrong answers to any of the questions. Your answers will be treated in the strictest confidence.

1.How confident do you feel in being able to resuscitate a patient?

not at all
confident

extremely
confident

0 1 2 3 4 5 6 7 8

Please circle your answer.

2. You have attended several resuscitation training sessions.

Do you feel that you will need any further training over the next 12 months?

YES

NO

Please circle your answer.

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