ORIGINAL ARTICLE

Active Resuscitation in Malaysian District Hospitals - Is It Adequate?

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Summary

Adequacy of active resuscitation in collapsed inpatients aged 12 and above (excluding those with terminal illness) were studied in 6 Malaysian district hospitals for 3 months starting 1/1/93. Results showed 59.5% (25 out of 42 inpatients) were inadequately resuscitated measured by : failure of nurses to initiate resuscitation (24%), duration of resuscitation less than 30 minutes (42%) and incompletely equipped emergency trolleys (44%). Questionnaires revealed lack of knowledge and training in cardiopulmonary resuscitation in medical staff. Regular cardiopulmonary resuscitation courses, regular spot checks on emergency trolleys and management protocols on active resuscitation are recommended. Each hospital should design its own criteria for adequacy.

Key Words: Active resuscitation, Inpatients, Quality assurance

Introduction

Active resuscitation is an emergency procedure which all medical and paramedical personnel should be familiar with. Its successful implementation depends on team work and the availability of facilities. Very often one or more factors operate to interrupt this procedure which may result in tragic consequences. Inadequate active resuscitation results in mortality and morbidity that are preventable[1]. Problems in personnel, equipment and communication are perceived as major contributing factors in inadequate active resuscitation.

A study using simulated cardiac arrests for monitoring quality of inhospital resuscitation showed many unsuspected deficiencies[2]. Nurses did not apply mouth to mouth resuscitation, did not use hand held defribillator or give supplementary oxygen while waiting for arrival of the medical team. Confusion over different models of defribillators caused delay in defribillation. Suction equipment was found to be defective and lack of protocols produced errors in treatment. Time is critical in initiating resuscitation as delay can result in brain damage starting at four minutes and after 10 minutes brain death is certain[3].

Although some larger Malaysian district hospitals have resident specialists, the majority are managed by medical officers only. Often these are junior doctors in their compulsory three-year service and posted to district hospitals soon after completion of housemanship. Many district hospitals are manned by minimum staff especially after office hours. A staff nurse may be required to cover more than one ward during night shift. After office hours it is common for one doctor on call to cover the whole hospital including casualty and wards.

In one of the states' quality assurance programme workshop, participants felt that inadequate active resuscitation was the number one quality problem in their respective district hospitals. As a result, this study was done to determine the adequacy of active resuscitation in collapsed inpatients aged 12 and above in district hospitals. Specifically the study looked at whether the staff nurse initiated resuscitation once a patient collapsed, the duration of active resuscitation, knowledge of doctors and staff nurses and availability of adequately equipped emergency trolley

Materials and Methods

This prospective descriptive study was carried out in six Malaysian district hospitals in the 3 months starting 1/1/93. Five (DH1 to DH5) were district hospitals managed by medical officers (with only visiting specialists). The sixth (DH6) was a district hospital with resident specialists. In this hospital the study was conducted in the medical and surgical wards only. The hospitals and wards (DH6) chosen were a convenient sample (where the participants of the quality assurance programme workshop were working).

All inpatients aged 12 and above who collapsed (defined in footnote) during the study period were included in the study except for patients with terminal illness e.g. terminal cancer and those whom relatives requested minimal or no resuscitation. The doctor conducting the study in the hospital was informed of every patient who collapsed or died in the ward by the sister in charge (from the nurses' daily report) and the hospital records officer. An investigation was then conducted by the doctor. Staff managing the collapsed inpatients were interviewed either by the doctor or sister in charge. Data from hospital records (bedhead tickets and nurses report book) and interviews were compiled using the data collection format in Appendix 1.

For this study, active resuscitation (see footnote) was considered adequate only when all the following four criteria were fulfilled[4,5] :

1) Resuscitation was started by staff nurse once patient noted to collapse
2) Resuscitation included the following procedures in the initial stage : oxygen, suction, ambu bagging, cardiac massage, intravenous line[6]
3) Duration of active resuscitation at least 30 minutes.
4) Emergency trolley was adequately equipped (see Appendix 2)

All medical officers and staff nurses in the medical and surgical wards of DH6 and all medical officers and staff nurses in hospitals DH1 to DH5 were tested for their knowledge of resuscitation by questionnaires. The nurses' questionnaire tested knowledge on basic life support (airway control, breathing support, circulation support and first aid)[3]. Doctors' questionnaire tested knowledge of advanced life support (drugs and fluids, electrocardiography, treatment of arrhythmias and defribillation)[7].

Prior to commencement of the study, all six hospitals were instructed to stock up all emergency trolleys according to the checklist in Appendix 2. Ward staff were told to replenish their emergency trolleys according to the checklist. Spot checks were then made on all ward emergency trolleys in the 6 hospitals during the study period. Data collected were compiled and analysed.

Results

Twenty five (59.5%) of forty two inpatients (excluding those with terminal illness) who collapsed during the study period were inadequately resuscitated (see Table I). There was no significant difference in performance between the 5 district hospitals without resident specialists and DH6 (with resident specialists).

Staff nurses failed to initiate resuscitation in 24% of the collapsed inpatients. The majority put up a drip and gave oxygen but some failed to do cardiac massage for cardiac arrest while others failed to give suction and ambu bagging for respiratory arrest. Reasons given for failure to initiate resuscitation included lack of training in resuscitation and the belief that only the doctor could initiate resuscitation.

Eighty one percent of the doctors reached the patient and started resuscitation within 5 minutes. Nineteen percent took between 5 to 15 minutes after patient collapsed to reach the ward and start resuscitation.

The duration of resuscitation was inadequate (less than 30 minutes) in 42% of collapsed inpatients. Doctors

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1 Collapsed :
1. Stopped breathing or gasping
2. Blood pressure unrecordable or systolic blood pressure < 50 mmHg
3. Pulse not felt or small volume or rate < or = 50 mmHg

At least 2 of the above

2 Active resuscitation : mask + ambu bagging/intubation + ambu bagging/cardiopulmonary resuscitation (CPR)

tend to shorten resuscitation in patients whose pupils were fixed and dilated. In one patient the reason given for resuscitating only 15 minutes was that the patient was old and from an old folks home. When another patient who was mentally retarded and a vagabond collapsed a second time, no resuscitation was attempted by the doctor on call. The doctor admitted that the patients' mental retardation and absence of family support were the reasons for withholding resuscitation. One doctor did not know he had to resuscitate for 30 minutes.

Forty four per cent of the emergency trolleys used in resuscitation of collapsed inpatients were found to be incomplete. Spot checks on all ward emergency trolleys showed that majority (87%) were inadequately equipped, according to checklist (see Appendix 2). Missing items included introducer, battery, torch light, airway, branulas and endotracheal tubes of various sizes, needles, laryngoscope, plaster, scissors, injection lignocaine, intravenous drip sets and Hartmans solution. Leaking ambu bags and expired drugs were also found. This inadequacy was due to ward staff not replacing items used for resuscitation, using items from emergency trolley e.g. torch light, branulas for general ward use and not replacing them. Staff nurses were routinely signing in the book to certify the emergency trolley was complete without checking the trolleys at each shift. Some items were not available in the hospital store e.g. endotracheal tubes size 8.5 and spare ambu bags. There was also delay of up to one month in indenting and supplying such items from the hospital store.

Adequacy of knowledge of doctors and staff nurses assessed through questionnaires is shown in Table I. Thirty six percent of doctors and 24 % of staff nurses from 4 hospitals (DH1, DH2, DH4 and DH6) had training in CPR. Nurses in the district hospital with specialists (DH6) had a higher passing rate (66%) than those in the hospitals without resident specialists (38.3%). There was no difference in the doctors scores. Although the nurses had a higher passing rate than the doctors, these could not be compared as their questionnaires were different.

Discussion

Active resuscitation includes a series of critical interventions that occurs in a rapid and sequential

Table I
Adequacy of resuscitation & adequacy of knowledge of doctors and staff nurses in 6 Malaysian district hospitals

	District hospitals without specialists (DH1 to DH5)		District hospital with specialists (DH6)		Total	
	No	%	No	%	No	%
Adequate resuscitation	11/26	42.3	6/16	37.5	17	40.5
Inadequate resuscitation	15/26	57.7	10/16	62.5	25	59.5
Adequate knowledge doctors (score = or > 75%)	2/28	7.1	1/17	5.9	3	6.7
Inadequate knowledge doctors (score < 75%)	26/28	92.9	16/17	94.1	42	93.3
Adequate knowledge nurses (score = or > 75%)	44/115	38.3	33/50	66.0	77	46.7
Inadequate knowledge nurses (score < 75%)	71/115	61.7	17/50	34.0	88	53.3

manner. If any one or more of these critical actions is neglected or delayed chances of survival are severely compromised[8]. The American Heart Association identified four such critical interventions (a four link "chain of survival") in cardiopulmonary resuscitation. This includes access link to emergency services (e.g. 911 telephone); early CPR link (e.g. bystander initiated basic CPR); early defribillation link (e.g. first respondent automated defribillation procedures) and advanced life support link (e.g. physician services)[4]. As a chain, removal of one link can mean a bleak outcome even if all other links are in place. The same concept with modification can be applied to inhospital resuscitation. For successful resuscitation, a team of trained and knowledgeable doctors and paramedics must be ready to respond immediately to any cardiac arrest that occurs. They must be able to carry out rapidly and without interruptions the critical interventions in active resuscitation and within the critical time frame before brain death sets in. They need support from adequate and functioning equipment and drugs.

This study found the critical early CPR link (bystander or nurse initiated CPR) was faulty in 24 % of the resuscitations because of lack of CPR training, guidelines and management protocols for the nurses. There were no special "code teams" trained and identified to respond to cardiac arrests. After office hours the "resuscitation team" was often just the doctor on call. When a patient collapsed, the ward staff nurse would call the doctor on call. While waiting for the doctor she would try to resuscitate with the help of the ward attendant or assistant nurse who were not trained in CPR. Their efforts were frequently hindered by incompletely equipped emergency trolleys which inevitably caused delays and interruptions. One doctor described that on discovering a defective laryngoscope, his staff had to run to another ward to get a functioning laryngoscope. The delay contributed to poor outcome.

Clear guidelines on which patients to resuscitate need to be given. The decision to initiate and continue resuscitation should not be left solely to the doctors and staff nurses. A study on attitude of medical staff regarding resuscitation of oncology patients in a large teaching hospital found that qualitative factors such as current psychological factors, past psychiatric history, age, poorer quality of life of patients affected the medical staff's decision not to resuscitate beyond the usual disease based criteria[9]. In this study qualitative factors such as age, mental retardation and lack of family support influenced the medical staff's decision not to resuscitate two patients.

Success of CPR technique in coronary care units and several municipal paramedic programs in USA have been documented. However several urban areas in USA still showed poor survival rates in out of hospital CPR. Simulated cardiac arrests to monitor resuscitations in hospitals also showed several deficiencies[2]. There is very little published data on local CPR outcome.

Although survival rate has emerged as the "gold standard" for determining the effectiveness of cardiac arrest treatment[8], this study did not use survival rate as the measurement of adequate resuscitation. The author and the rest of the study group members felt that although inadequate resuscitation would result in poor outcome, adequate resuscitation would not always result in survival. Unlike out of hospital cardiac arrests which tend to be a more homogenous population, in-hospital cardiac arrests have more confounding comorbidity variables such as serious underlying illnesses. Also initial management of patients from time of admission to time of collapse was not assessed. Inadequate or wrong management could have resulted in collapse and contributed to poor outcome. This study assessed only some aspects of the process of resuscitation which were perceived as major factors contributing to inadequate resuscitation in district hospitals. Resuscitation technique, defribillation and drug therapy in the patients who collapsed were not assessed. However this was indirectly gauged by the staff's knowledge of CPR. The study was also limited to inpatients aged 12 and above. Paediatric patients and patients in casualty departments who collapsed were not included in this study.

From the findings in this study, recommendations include regular spot checks on ward emergency trolley, guidelines and management protocols on active resuscitation and CPR training for all doctors and paramedics. One staff in each hospital can be trained as instructor and be responsible for the CPR program

in the hospital. Hospital stores need to have sufficient stock of items e.g. spare ambu bag, endotrachael tubes. The process of supply to ward need to be reviewed to avoid delays. Items for emergency trolleys should be given priority and replaced the same day.

The six district hospitals were not selected by random sampling and therefore not representative of all district hospitals in the country. However deficiencies identified may possibly be found in other district hospitals. Therefore it is good practice for each hospital to design its own set of criteria for assessment of adequacy of active resuscitation.

Acknowledgement

The author would like to thank the Director General of the Ministry of Health for permission to publish this paper and to the facilitators and other members of the study group who together planned and conducted this study : Dato Dr. Zohrah Wong Mae Yee, Dr. Noorimi Hj. Morad, Dr. SC Subramaniam, Dr. Chong Kuck Meng, Dr. Ow Yeang Yuan Loong, Dr. Mohd. Ramzan bin Abd. Gafoor, Dr. Azian Bani Hashim, Dr. Mior Zulfli Saaid and Dr. Ramaloo A/L Appalasamy.

References

1. Thoburn E, Norris P, Flores R *et al.* System care improves trauma outcome : patient care errors dominate reduced preventable death rate. J. Emerg. Med. 1993; 11 (2) : 135-9.

2. Sullivan MJ, Guyatt GH. Simulated cardiac arrests for monitoring quality of inhospital resuscitation. Lancet 1986;2 (8507) : 618-20.

3. Heartsaver Manual A Student Handbook for Cardiopulmonary Resuscitation & First Aid for Choking (1st ed.). American Heart Association, 1987.

4. Cummmins RO, Ornato JP, Thies W *et al.* The American Heart Association Emergency Cardiac Care Committee's Subcommittee On Advanced Life Support. Improving survival from sudden cardiac arrest : The "chain of survival" concept. Circulation 1991;83 : 1832-47.

5. Standards and guidelines for cardiopulmonary resuscitation (CPR) and emergency cardiac care (ECC). JAMA 1986;255: 2905-89

6. Robinson R, Stott R. Medical Emergencies Diagnosis and Management (3rd ed). London: William Heinemann Medical Books, 1980.

7. Albarran-Sotello R, Anderson M, Atkins JM *et al.* Textbook of Advanced Cardiac Life Support (2nd. ed). American Heart Association, 1990.

8. Pepe PE. Outcome analysis of basic and advanced life support. In : Benumof JL, Rothenberg DM (eds). Anesthesiology Clinics of North America : Current concepts in Cardiac Resuscitation. Philadelphia: WB Saunders 1995 : 981-91.

9. Owen C, Tennant C, Levi J *et al.* Resuscitation Patient & Staff Attitude in the Context of Cancer. Gen. Hosp. Psychiatry 1992;14 : 327-33.

APPENDIX 1

Format for data collection

Name	Age
Identity card number:	Registration number:
Sex: male / female	Race: Malay/Chinese/Indian/Others
Date of admission:	
Date of collapse:	(during office hours/after office hours)
Time of collapse:	
Time doctor informed:	Time doctor arrived:
Time resuscitation stopped:	
Has staff nurse initiated resuscitation:	yes/no
Checklist for initial resuscitation:	
Oxygen	yes/no
Suction	yes/no
Ambu bagging	yes/no
External cardiac massage	yes/no
Intravenous line	yes/no
Was resuscitation trolley complete *	yes/no
If not complete specify:	

* *Ask doctor who resuscitated patient. If all the equipment and drugs he requested were available and functioning (based on checklist for complete emergency trolley) answer is yes, if any one item was missing from trolley or non functioning, answer is no.*

APPENDIX II

Adequately equipped (complete) Emergency Trolley

(must contain all of the following items, including their numbers)

1. **Equipment**	**Number**
1.1 Ambu bag with mask	1
1.2 Airway	
i) small	1
ii) medium	1
iii) large	1
1.3 Oxygen Face mask	
1.4 Oxygen (functioning, usable)	
1.5 Suction apparatus	
1.6 IV fluids	
i) Normal saline	1
ii) Hartmans	1
iii) Dextrose 5%, 1	
iv) Dextrose 10%	1
v) Dextrose saline	1
vi) Hemacoele or any plasma expander	1
1.7 Syringes	
i) 20cc	3
ii) 10cc	3
iii) 5cc	3
iv) 2cc3	
1.8 Needles	
i) 18G	5
ii) 21G	5
iii) 23G	5
1.9 Branulas	
i) 16G	3
ii) 21G	3
iii) 23G	3
1.10 Intravenous sets	5
1.11 Laryngoscope	1 (functioning)
1.12 Endotracheal tubes sizes:	
i) 6.0	1
ii) 6.5	1
iii) 7.0	1
iv) 7.5	1
v) 8.0	1
vi) 8.5	1
1.13 Introducer	1
1.14 plaster	1
1.15 scissors	1
1.16 cardiac board	1

2. **Drugs**	No. of ampoules
2.1 Inj. Atropine	5
2.2 Inj. Adrenaline	5
2.3 Inj. Aminophylline	5
2.4 Inj. Calcium laevulinate	5
2.5 Inj. Chlorpheniramine maleate	5
2.6 Inj. Digoxin	2
2.7 Inj. Dexamethasone	2
2.8 Inj. Dopamine	5
2.9 Inj. Dextrose 30%	5
2.10 Inj. Dextrose 50%	5
2.11 Inj. Frusemide	5
2.12 Inj. Hydrocortisone	5
2.13 Inj. Hydrallazine	2
2.14 Inj. Lignocaine (Xylocard) 100 mg.	2
2.15 Inj. Lignocaine (Xylocard) 500 mg.	2
2.16 Inj. Naloxone (Narcan)	5
2.17 Inj. Sodium Bicarbonate 8.4%	15
2.18 Inj. Distilled water	15

3. Defribilator available when required