UEA NORWICH

Do chest compressions prior to defibrillation improve survival outcome for cardiac arrest?

Research Protocol

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Introduction and Objective

The principal researcher for this project is a 5th year medical student. This Research Protocol is an educational Research Project. The main objective of this Research Protocol is to determine which Resuscitation Protocol within the East Anglian Ambulance NHS Trust has the best survival outcome for Cardiac Arrest.

Background

East Anglian Ambulance NHS Trust has introduced new protocols for cardiac arrests during the years of 2005/2006 and 2006/2007. The theory behind chest compressions prior to defibrillation is that when the heart stops beating, the right side of the heart over fills while the left side becomes under filled and gradually compressed by the right side. With the heart in this condition it makes it almost impossible to get the heart beating again. With one side of the heart hyper-expanded it prevents the heart from contracting due to be full and the left side unable to contract as it is not stretched. Cardiac muscle contraction is related to the degree by which it is stretched, if it is not stretched it has no ability to contract despite any electrical activity that may be occurring. There are studies which suggest that doing chest compressions at this rate keeps the brain perfused and improves neurological deficit outcome.

At present there are a few ambulance services that are doing chest compressions prior to defibrillation; however this is likely to change in accordance with the new Resuscitation Council Guidelines. Currently East Anglian Ambulance Trust are the only ambulance service doing 100 chest compressions, Sussex Ambulance Service NHS Trust are doing 200 chest compressions. This is likely to change further due to the new Resuscitation Council Guidelines and further studies suggest 150 and even 300 chest compressions.

Literature Review

There are many papers that have appeared over the last few years offering various advice and guidance for those who work with or in resuscitation. The paper by Hallstrom et al looks at cardiopulmonary resuscitation by chest compression alone or with mouth-to-mouth ventilation. The outcome was that chest compression alone was more effective possibly because it is easier to teach and bystanders are more likely to commence it because many are put off by mouth to mouth.

Sanders et al, 2002 research paper studied the effects of different ratio of breaths to compressions to decide if there was any improvement in neurological deficit. Those receiving 50 compression to one breath had the best survival outcome with the least amount of neurological damage.

Turner et al, and Babbs et al, both had similar results looking at the ratio of chest compression to rescue breaths. They found that the ratio of 30 chest compressions to 2 rescue breaths had the best survival outcome. The results plateau at this level.

Cobb et al and Wik, L, Hansen et al- These studies found that Patients who have been in cardiac arrest for more than 5 minutes before receiving emergency care may possibly respond better if they are treated with cardiopulmonary resuscitation (CPR) prior to defibrillation. The findings support previous studies in animals and humans suggesting that CPR prior to defibrillation may be of benefit especially when emergency response is delayed.

During the literature review no papers were found that supported a theory that few or no chest compressions prior to defibrillation would be more beneficial to the patient.

The cardiac arrest guidelines from the resuscitation council changed in November 2005 which changes the resuscitation ratio from 15:2 to 30:2. EAAT has taken this into consideration with the new protocols.

Method

To get a full understanding of how chest compressions fit into the cardiac arrest resuscitation protocol attendance at a professional development training day and observing ambulance personnel attending cardiac arrest are the initial steps. The intended sample size is 200 outcomes from each resuscitation protocol (total 600), using a convenience sample. The data is collected by the ambulance trust from Patient Report Forms (PRFs) and Cardiac Arrest Performa (CAP). This information is kept within a database. There will be three sets of data one from Protocol A, one from Protocol B and Protocol C. The CAP has a box which asks ambulance personnel to say which of the protocols they followed; the boxes are 2004/2005 or 2005/2006 and 2005/2006 or 2006/2007. A CAP is filled out by ambulance personnel immediately after the cardiac arrest. Information on this form includes bystander intervention, who attended and their grade, whether a first responder took a defibrillator to the scene. The survival outcome of these patients will taken from the CAP which has a selection of boxes which gives the patients status at hospital, the choice being, deceased,

resuscitating, ROSC or not conveyed. For the purpose of this study, survival is defined as having a cardiac output on arrival at hospital. Data has been collected by the Clinical Audit Department on the Cardiac Arrest Audit and is anonymous within a database; the author has no access to the identity of patients.

The 2004/2005 (Protocol A) guidelines are as follows: after arrival on scene, Check Airways, Breathing, if absent two rescue breaths are given, check Circulation (ABC), if C is absent defibrillation is carried out at 150J,150J 200J checking each time for a rhythm change before continuing with the next shock. If the final shock is unsuccessful Cardiopulmonary Resuscitation (CPR) is commenced a ratio of 15:2 (chest compression:ventilations) for one minute, and then defibrillate the patient three more times at 200J. The cycle continues until a return of spontaneous circulation (ROSC) or for 20 minutes if unsuccessful.

The guidelines for 2005/2006 (Protocol B) are slightly different. Airways, Breathing and Circulation is checked if in cardiac arrest the first thing done is 100 chest compressions during this time an Automated External Defibrillator (AED) is attached to the patient in manual mode and rhythm is assessed immediately after the compressions have finished. If it is a shockable rhythm defibrillation is done at 150J, 150J and 200J, if no ROSC then the Intermediate Life Support (ILS) or Advanced Cardiac Life Support (ACLS), is commenced the same as the 2004/2005 protocol. If a paramedic is present ACLS is commenced, intravenous access is obtained cardiac drugs are given and intubation is attempted for both protocols.

The guidelines for 2006/2007 (Protocol C) are as always the initial assessment ABC. If the patient is in cardiac arrest CPR is commenced at a rate of 30:2 for two minutes while the AED is attached. After two minutes the rhythm is assessed. If the rhythm is shockable then a shock of 200J is given, if this is unsuccessful CPR is recommenced for a further two minutes, the rhythm is assessed again and if appropriate a second shock of 200J is given. CPR is then recommenced and this cycle continues until there is either a change in patient condition or further help arrives. ACLS is commenced if a paramedic is present.

The exclusion criteria include Pulseless Electrical Activity (PEA), Paediatrics, Pregnant Women, Hypothermia, Poisoning, Overdose, Drowning and Dead – where no attempt of resuscitation was made. The reason for this is due to a difference in practise. These groups will not be included in the study.

Other Ambulance Trusts will be contacted initially by telephone and then by email to ask if they would be willing to participate so that a comparison can be made between trusts. They will be asked to provide their current resuscitation guidelines and asked for data on their survival outcomes.

Ethics

The ethical considerations are few as every step has been taken to ensure they have been limited. The welfare of any subjects is not affected as the ambulance service is not changing the way they manage these patients. All data will be anonymous before it is processed. Patient confidentiality will be maintained as there is no need to access this information. The researcher is to be given an Honorary Contract with EAAT and supervised closely by the Clinical Audit and Research Manager. COREC approval will be sought and the project will not be undertaken until approval is given. The research will be carried out within the NHS Research Governance Framework.

Results

The results for each protocol will be compared as a whole before looking at the different factors that may influence the outcomes. These include whether or not a paramedic is in attendance, if bystander intervention occurred, time taken for ambulance crew to arrive. The results are likely to show that survival outcome from cardiac arrest have improved. The evidence for defibrillating after chest compressions is very convincing. By doing chest compression before shocking it helps to redistribute the blood within the heart so that both sides are perfused equally enabling the heart to restart whilst the brain is perfused with oxygenated blood that is being ‘pumped’ around the body. The results from the study could have a significant impact on future resuscitation guidelines and may change the use of chest compressions within the ambulance service. Statistical analysis will be carried out using SPSS. There will be a direct analysis of protocols A, B and C.

Discussion

The outcome of this research project could influence further resuscitation guidelines if it provides evidence that chest compression prior to defibrillation improves survival outcome. One potential limitation is that CAP are not always completed for every cardiac arrest, therefore it means this is a possible weakness. There will be no access to fill in missing information from the databases.
Information from other Ambulance Trusts will be used in the discussion to compare the results other trusts are getting depending upon their protocol. Inclusion within the study will be dependant upon the quality of information available and its relevance to the study.

References

Hallstrom et al, Cardiopulmonary resuscitation by chest compression alone or with mouth-to-mouth ventilation. N Engl J Med 2000 May 25; 342(21):1546-1553

Turner et al, Optimum Cardiopulmonary Resuscitation for Basic and Advanced Life Support," Resuscitation, August 2004, Vol. 62, No. 2, pp. 209-217.

Babbs et al, Optimizing Chest Compression to Rescue Ventilation Ratios During One-Rescuer CPR by Professionals and Lay Persons," Resuscitation, May 2004, Vol. 61, No. 2, pp. 173-181.

Cobb, L.A. - influence of C.P.R to patients with out of the hospital ventricular fibrillation- JAMA 1999: 281(13):1182-82.

Wik, L, Hansen- Delaying defibrillation to give basic C.P.R to patients with out of the hospital V.F. a randomized trial. JAMA 2003; 289:1389-1395.

JRCALC Clinical Practice Guidelines, Joint Royal Colleges Ambulance Liaison Committee, Warwick University.
www2.warwick.ac.uk/fac/med/healthcom/emergencycare/research/ambguidelines/

UK Resuscitation Council Website, http://www.resus.org.uk/

European Resuscitation Council Website, http://www.erc.edu/

East Anglian Ambulance NHS Trust, Continuing Professional Development 2005/2006 CD-Rom

APPENDIX A

Research Curriculum Vitae

Anna Campbell-Porter

UEA Medical Student anna.campbell@uea.ac.uk

BSc (Hon) Biomedical Sciences with Business Studies

Previous Experience

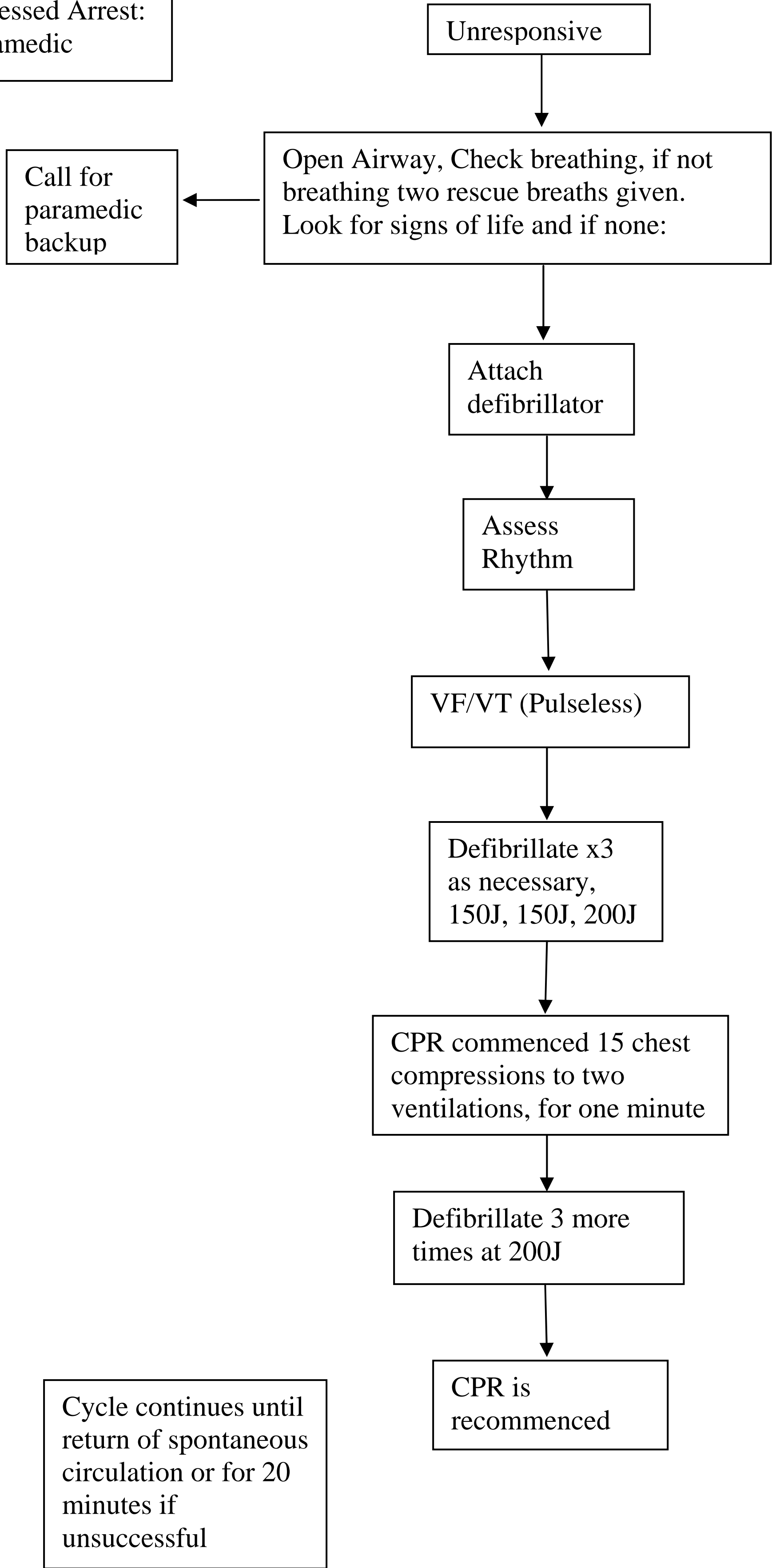
My previous research experience is my dissertation from my previous degree.

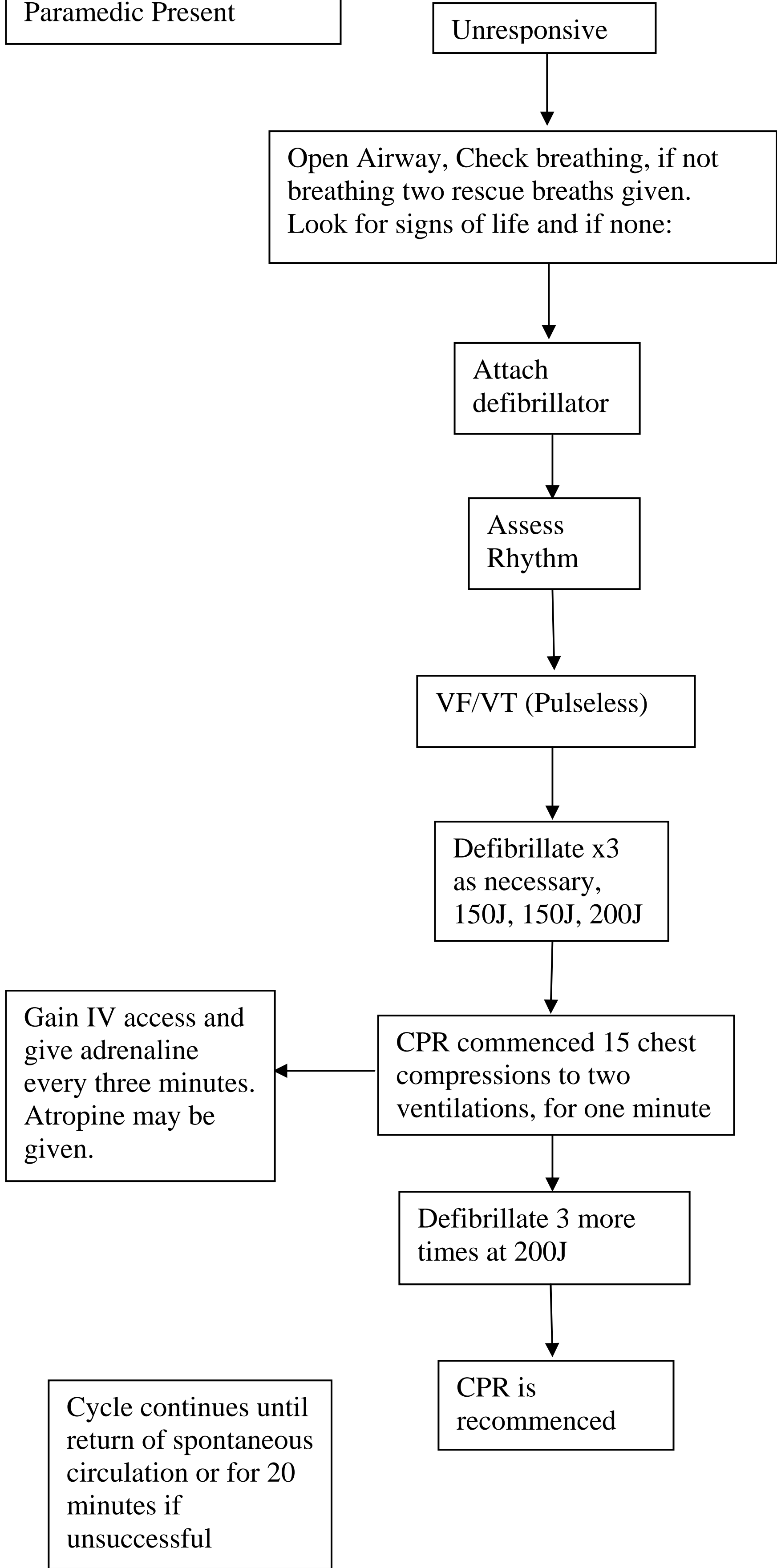
'The future of radioisotopes in nuclear medicine and their effects on the human body'

The research was literature based using published journals, books and the internet.

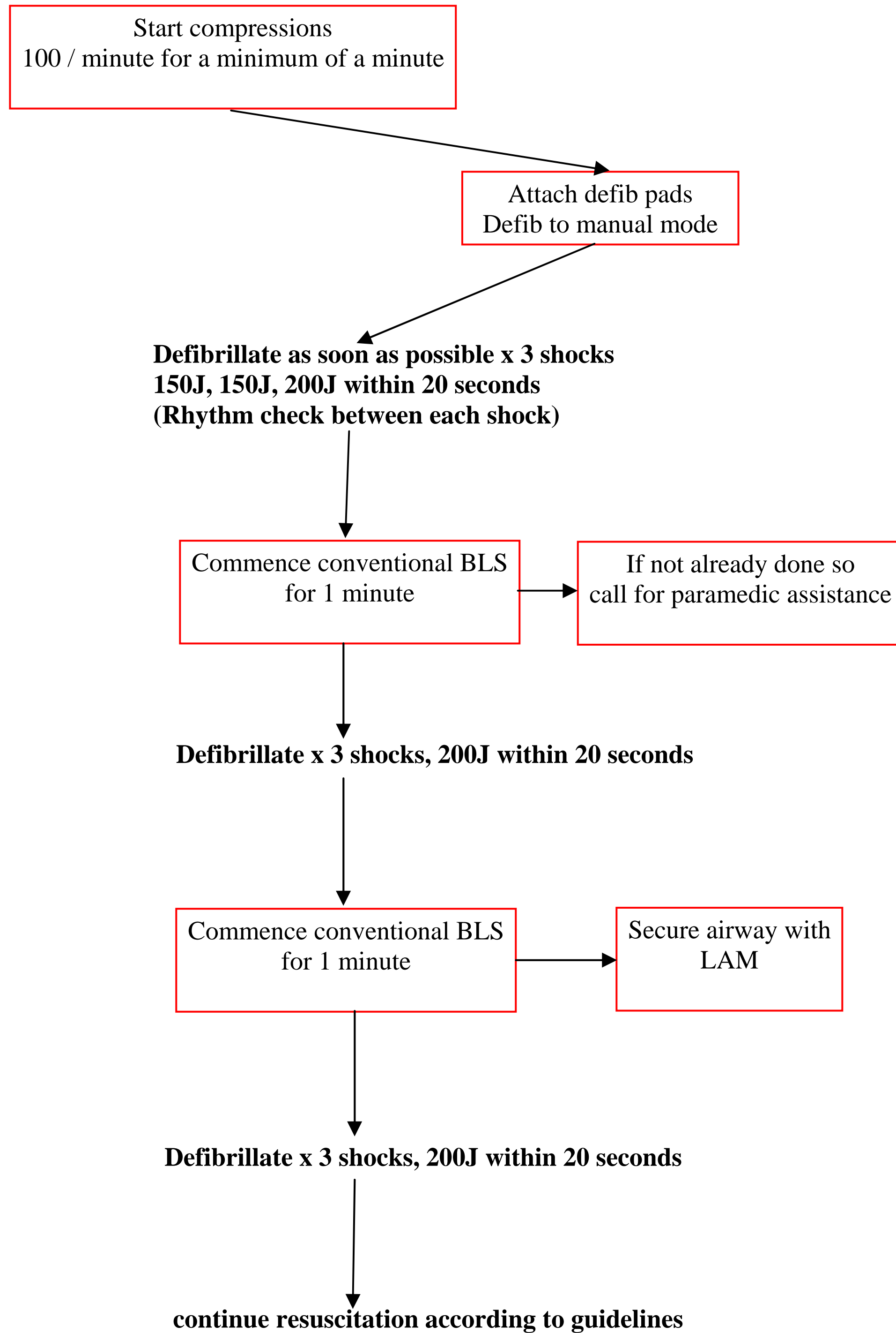
Research Training

The UEA has run a series of lectures and seminars offering guidance on how to carry out research projects. The Project itself it is an educational research project.

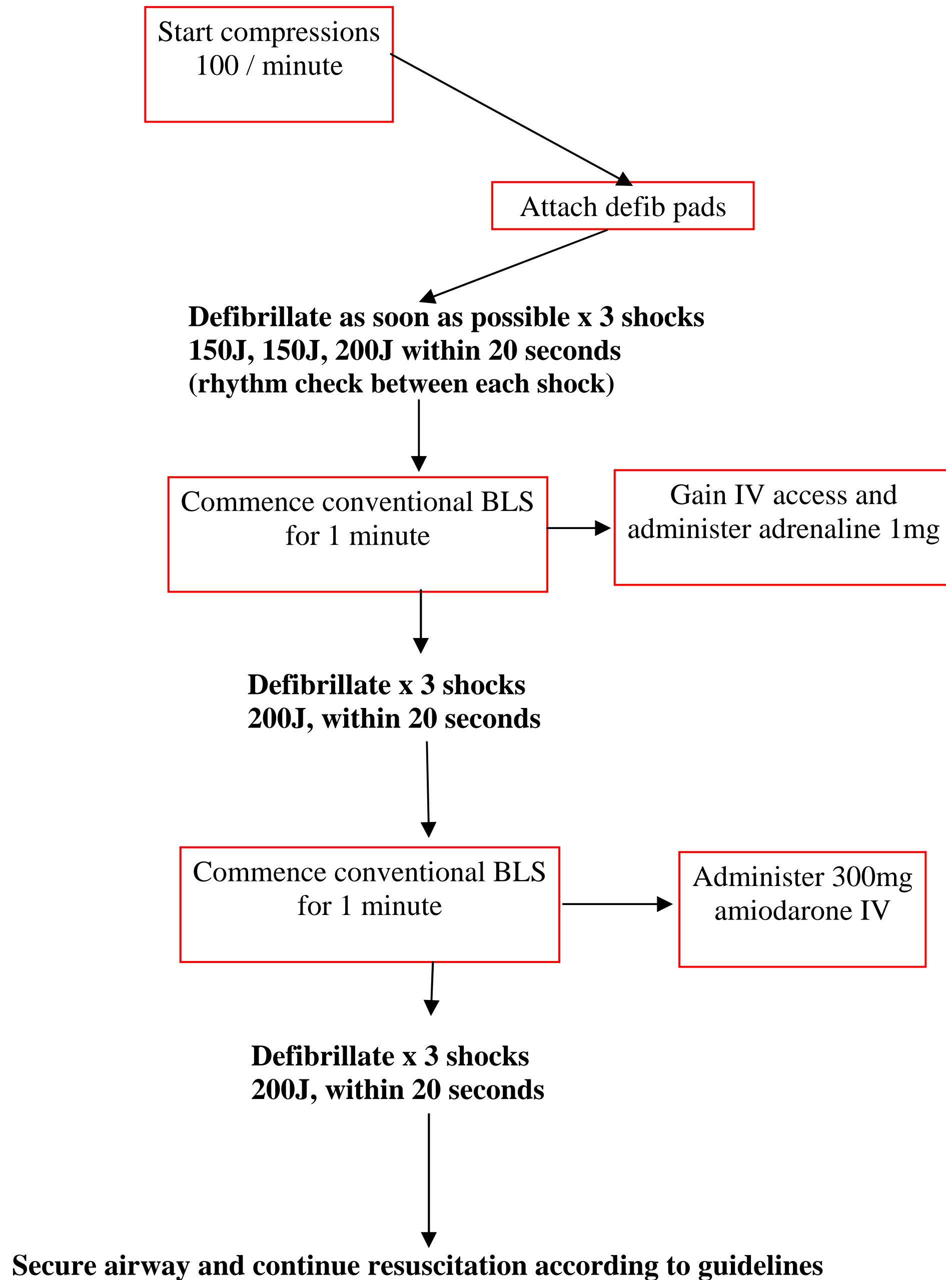

PROTOCOL A
Unwitnessed Arrest:
No paramedic
Unresponsive
Open Airway, Check breathing, if not breathing two rescue breaths given. Look for signs of life and if none:
Call for paramedic backup
Attach defibrillator
Assess Rhythm
VF/VT (Pulseless)
Defibrillate x3 as necessary, 150J, 150J, 200J
CPR commenced 15 chest compressions to two ventilations, for one minute
Defibrillate 3 more times at 200J
CPR is recommenced
Cycle continues until return of spontaneous circulation or for 20 minutes if unsuccessful


PROTOCOL A
Unwitnessed Arrest:
Paramedic Present
Unresponsive
Open Airway, Check breathing, if not breathing two rescue breaths given. Look for signs of life and if none:
Attach defibrillator
Assess Rhythm
VF/VT (Pulseless)
Defibrillate x3 as necessary, 150J, 150J, 200J
CPR commenced 15 chest compressions to two ventilations, for one minute
Gain IV access and give adrenaline every three minutes. Atropine may be given.
Defibrillate 3 more times at 200J
CPR is recommenced
Cycle continues until return of spontaneous circulation or for 20 minutes if unsuccessful

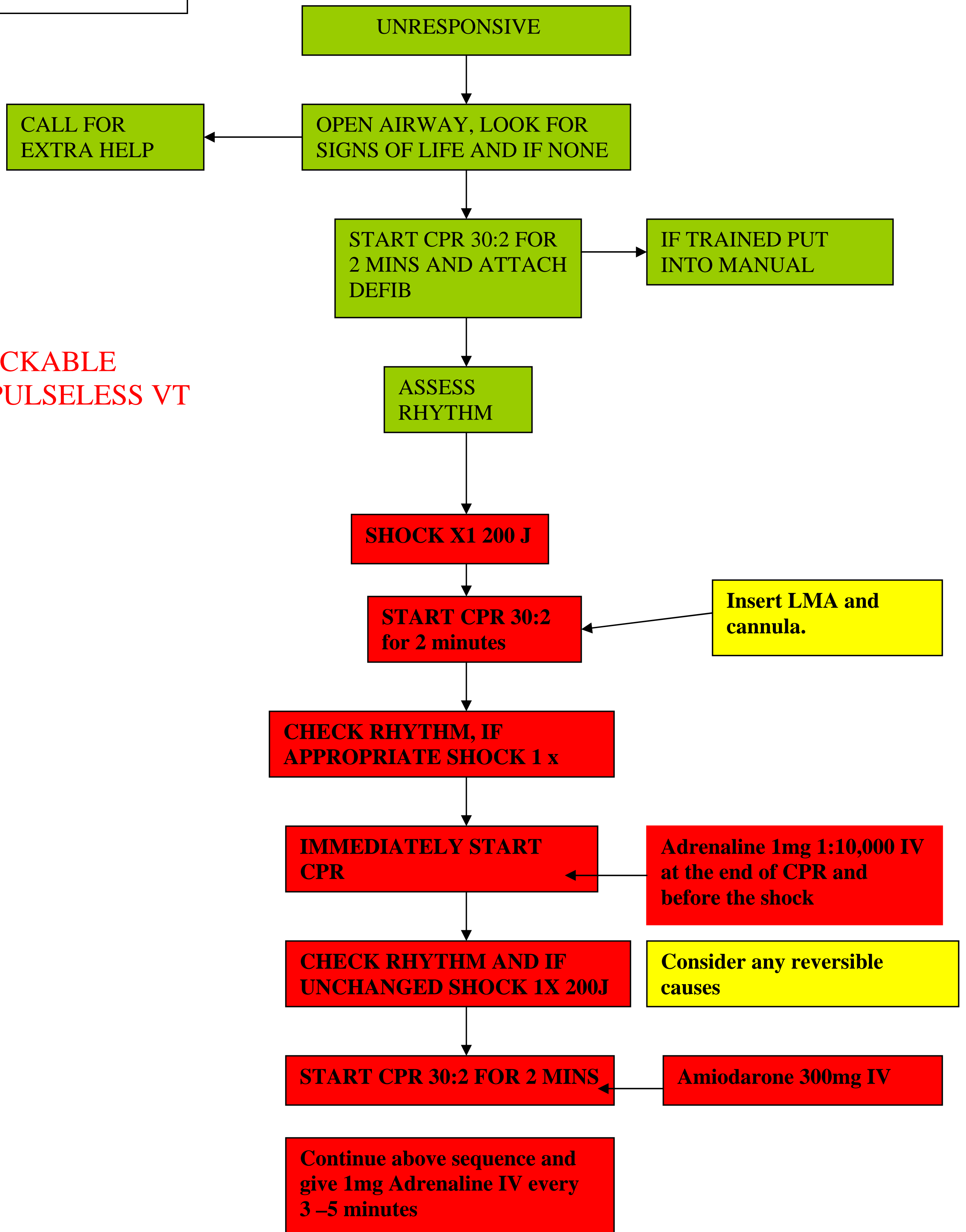
PROTOCOL B
Unwitnessed Arrest: No Paramedic



PROTOCOL B
Unwitnessed Arrest: Paramedic Present



PROTOCOL C
Unwitnessed Arrest:
No Paramedic
UNRESPONSIVE
CALL FOR PARAMEDIC BACK UP
OPEN AIRWAY, LOOK FOR SIGNS OF LIFE AND IF NONE
CPR 30:2 FOR 2 MINS AND ATTACH DEFIB
IF TRAINED PUT INTO MANUAL
SHOCKABLE
VF/PULSELESS VT
ASSESS RHYTHM
SHOCK X 1 200 J
START CPR 30:2 FOR 2 MINS
CHECK RHYTHM, IF APPROPRIATE SHOCK 1 x 200 J
INSERT LMA AND IF POSSIBLE DO CONTINUOUS COMPRESSIONS WITH 10 BREATHS PER MINUTE
IMMEDIATELY START CPR 30:2 FOR 2 MINS
Continue the shock/CPR sequence until further help arrives or patients condition changes


PROTOCOL C
Unwitnessed Arrest:
Paramedic Present
UNRESPONSIVE
CALL FOR EXTRA HELP
OPEN AIRWAY, LOOK FOR SIGNS OF LIFE AND IF NONE
START CPR 30:2 FOR 2 MINS AND ATTACH DEFIB
IF TRAINED PUT INTO MANUAL
SHOCKABLE
VF/PULSELESS VT
ASSESS RHYTHM
SHOCK X1 200 J
START CPR 30:2 for 2 minutes
Insert LMA and cannula.
CHECK RHYTHM, IF APPROPRIATE SHOCK 1 x
IMMEDIATELY START CPR
Adrenaline 1mg 1:10,000 IV at the end of CPR and before the shock
CHECK RHYTHM AND IF UNCHANGED SHOCK 1X 200J
Consider any reversible causes
START CPR 30:2 FOR 2 MINS
Amiodarone 300mg IV
Continue above sequence and give 1mg Adrenaline IV every 3 –5 minutes