The Cardiac Surgery Advanced Life Support Course (CALS): Delivering Significant Improvements in Emergency Cardiothoracic Care

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Background. **A 3-day cardiac surgery advanced life support course was designed with a series of protocols to manage critically ill cardiac surgical patients and patients who suffer a cardiac arrest. We sought to determine the effect of this course on the management of simulated critically ill and cardiac arrest patients.**

Methods. **Twenty-four candidates participated in the course. Critically ill patients were simulated using intubated mannikins, with lines and drains in situ, and a laptop with an intensive care unit monitor simulation program. Candidates were tested before and after the course with rigidly predesigned clinical situations. Candidates were split into groups of 6, and cardiac arrests were simulated in the same fashion, with all required surgical equipment immediately available. All scenarios were videotaped, and after blinding, an independent surgeon assessed the times to achieve predetermined clinical endpoints.**

Results. **The time to successful definitive treatment was significantly faster postcourse for the critically ill patient scenarios: (565 secs [SD 27 secs] precourse, compared with 303 secs [SD 24 secs] postcourse; $p < 0.0005$). In addition, the times taken to achieve a wide range of predetermined objectives, including airway check, assessing breathing, circulation assessment, treating with oxygen, appropriate treatment of the circulation, and requesting blood gases, chest radiographs, and electrocardiograms, were also significantly faster in the postcourse scenarios. Times to successful chest reopening and internal cardiac massage were also significantly improved in cardiac arrest patients: (451 secs [SD 39 secs] precourse and 228 secs [SD 17 secs] postcourse; $p = 0.011$).**

Conclusions. **Structured training and practice in the management of critically ill cardiac surgical patients and patients suffering a cardiac arrest leads to significant improvements in the speed and quality of care for these patients.**

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Protocols for the management of patients who suffer an in-hospital cardiac arrest are well established in patients on general medical and surgical wards. These protocols allow all staff members to participate fully in the cardiac arrest with speed and confidence; and even if resuscitation is not successful, a well-managed cardiac arrest allows the staff and relatives of the patient to be satisfied that everything possible has been done to save the patient.

Among patients after cardiac surgery, however, although cardiac arrest is not a rare event with an incidence of approximately 0.5% to 2% [1–4], no established protocol or structured training program exists that is tailored to the special needs of such patients. Staff members are often well trained in basic life support and defibrillation, but once chest reopening is required, the lack of a protocol means that staff must await for expert assistance before potentially life-saving maneuvers.

In Europe and the USA, there are major changes to the make-up of staff members being called to attend critically ill patients, postcardiac surgery. The European working time directive together with falling caseloads have resulted in fewer cardiac surgical trainees. That means that there are fewer senior cardiothoracic residents available to cover the wards and intensive care. In their place, intensive care or anesthetic trainees, noncardiothoracic junior staff members, and nurse practitioners are increasingly being asked to attend patients, but these staff members are often very low on experience of the issues particular to our specialty.

We, therefore, created a series of protocols for the critically ill cardiothoracic patient and set up a 3-day course to teach these skills. This study sought to evaluate the improvements in clinical skills taught by this course, both for the management of the critically ill patient and also for patients suffering a cardiac arrest.

Material and Methods

Construction of Cardiac Surgical Unit Advanced Life Support (CALS) Course Protocols

A group of cardiothoracic surgeons and anaesthetists (J.D., S.A., J.J., A.L.) derived a series of protocols for the

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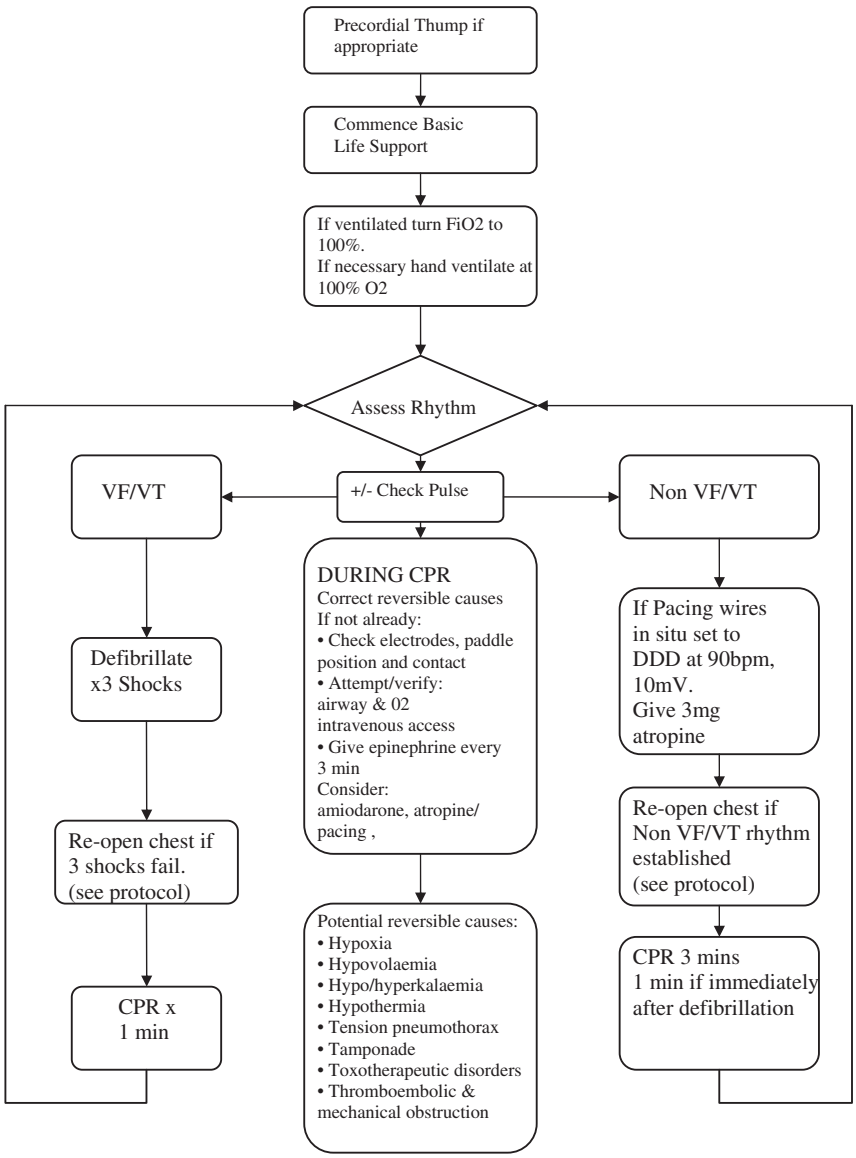

Fig 1. Initial management of cardiac arrest. (BLS = Basic Life Support; CPR = cardiopulmonary resuscitation; DDD = dual chamber sensing and pacing; VF/VT = ventricular fibrillation/tachycardia.)

management of cardiac arrests or critical illness in cardiothoracic surgical patients, based on existing guidelines from Advanced Cardiac Life Support (ACLS), the European Resuscitation Council guidelines, publications from the cardiothoracic literature, and their own clinical experience. A protocol for patients who suffer a cardiac arrest was derived (see Figs 1 and 2). Further protocols for hypotension, vasodilatation, low cardiac output, arrhythmias, respiratory failure, and renal failure were derived. A 3-day course was then constructed, comprising lectures, practical skills stations, and "real-time" patient scenario reconstructions. At the heart of the protocols to treat critically ill cardiothoracic surgical patients was a reproducible and rigid methodology to identify significant pathology in an ABC (Airway, Breathing, Circulation) fashion, similar to that taught on Advanced Trauma Life Support courses and Care of the Critically Ill Surgical Patients courses [5, 6].

Candidate Testing

Before any training, candidates attending the course were tested by asking them to manage patient scenarios of patients who had recently become acutely unstable. A mannikin (Resusci Anne, Laerdal Medical Corp) was used to simulate the patient which was intubated, had central lines, chest drains, urinary catheters and syringe drivers placed in the same fashion as a typical patient shortly post cardiac surgery. A laptop computer with an intensive care monitor simulator program was used to present real time clinical data, and a trainer presented the case, ran the laptop computer, and gave any clinical data as required if the correct information was requested. All scenarios were