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Members, Instructors and ICs:
To ensure we can continue to notify you about future newsletters, please let us know if your email address changes.

Online contact details update form
Firstly, I wish readers a happy and successful new year on behalf of the Resuscitation Council (UK). 2010 was the busiest year I can remember since my involvement with the Council. There were new resuscitation guidelines, new course materials, an excellent symposium, the National Cardiac Arrest Audit, and numerous other activities. I thank the individuals, who are far too many to mention by name, who have put in a huge amount of work to deliver these projects and meet the tight deadlines that were set.

The new Advanced Life Support and Immediate Life Support courses are already available and the new Paediatric and Newborn courses will be available soon. As well as including the new Resuscitation Council (UK) guidelines, new course materials also have a far greater emphasis on non-technical skills. One area where both the teaching of technical and non-technical skills will be important is the new defibrillation strategy for guidelines 2010. Charging during chest compressions and safe shock delivery will require improved communication and team skills from all those involved in resuscitation. This defibrillation strategy has been safely used in clinical practice in several countries before inclusion in the new 2010 Resuscitation Council (UK) Guidelines. The risks from accidental defibrillation to rescuers are less than previously thought but safety remains paramount. Charles Deakin’s article in this newsletter emphasizes why it is still important to make sure no one is in contact with the patient when the shock is delivered.

In 2011 there will be further work to develop an e-ALS course. This is covered in more detail in this newsletter. The Council has learned a lot from the pilot e-ALS work carried out over the past few years and we will provide updates as the project progresses. As things stand, there will still be a 2-day standard ALS course for the foreseeable future. Instructors can find out more at the Advanced Life Support Instructor Day on 5 May 2011 in Edinburgh. The ALS Subcommittee has put together a programme of excellent speakers and topics, so as always I suggest booking early to avoid disappointment.

The National Cardiac Arrest Audit has grown rapidly over the past year as more hospitals join. An update and details for those yet to join are available elsewhere in this newsletter. Good local and national data collection will help drive improvements in the care of deteriorating patients and those patients who have a cardiac arrest.

The success of the Council’s activities depends on the implementation of new guidelines and training at a local level, so that patients benefit by receiving high quality resuscitation care. I thank all those involved in implementing the new guidelines and courses. Finally, the Resuscitation Council (UK) welcomes your feedback on its activities.

Jasmeet Soar
Chairman, Resuscitation Council (UK)
The Scientific Symposium was held at the National Motorcycle Museum on 18 November 2010. This event was extremely well attended, reflecting the combination of being the first opportunity to hear about the new guidelines along with a first class programme.

Charles Deakin delivered the Asmund Laerdal lecture ‘Defibrillation – Shockingly simple’, and five excellent Free Papers and 12 posters were presented.

Abstracts for the Free Paper presentations are available on our website.

New honorary members Jerry Nolan, Sam Richmond, Bob Bingham and Andrew Marsden were acknowledged.
Following the publication of the updated course materials, the ALS Subcommittee, in partnership with the Scottish Resuscitation Group, is holding the ALS Instructor Day on Thursday 5 May 2011 at the Edinburgh Conference Centre, Heriot-Watt University.

The programme includes emergency planning for the Olympics, hot topics and the importance of human factors and feedback in CPR. The full programme is available on the website and we advise that you register early using the registration form provided to avoid disappointment.

Introduction

The recent 2010 Resuscitation Council guidelines emphasise the need for high quality, uninterrupted chest compressions. Several studies have shown the detrimental effects of interruptions to chest compressions, both in terms of reducing the efficacy of defibrillation, survival to hospital admission and survival to hospital discharge. A number of studies looking at the percentage of time spent not delivering chest compression have shown significant ‘no-flow’ time ranging from 24-63%. It is therefore clear that interruptions to chest compressions are common and significant. Minimising these interruptions has real potential to improve outcomes from cardiac arrest.

The main reason for interruptions to chest compression relates to the delivery of defibrillation. The sequence for shockable rhythms recommended in the 2005 guidelines was a brief pause at the end of the two minute cycle to check the rhythm, charging the defibrillator, checking that everyone is clear of the patient, delivery of the shock and recommencing chest compressions. Even with the 2005 change to single rather than up to three stacked shocks, this sequence resulted in significant delays. The 2010 guidelines have attempted to reduce these interruptions by recommending that chest compressions are recommenced immediately after the rhythm check with charging of the defibrillator during this period, only pausing chest compressions for no more than 5 seconds while defibrillation is delivered. Delays associated with this sequence could be further reduced by maintaining chest compressions during actual delivery of the defibrillation, and it is this concept that is termed ‘hands-on’ defibrillation.
How much electricity does a defibrillator deliver?

Most defibrillators generate a current using a relatively small battery. However, the use of a capacitor in the defibrillator’s electrical circuit (Fig. 1) enables the accumulation of sufficient charge to deliver significant amounts of energy. Modern biphasic defibrillators can deliver 1400-2800 V, but the older monophasic defibrillators can deliver as much as 5000 V. Associated current flow is in the range of 10-70 A. Considering a kettle for example uses 240 V with a current of about 10 A, the electrical output from a defibrillator is clearly significant.

Current pathways

Electrical current takes the path of least resistance, which in the case of defibrillation is normally between the two defibrillation electrodes, through transthoracic and myocardial tissue. The risk to the rescuer comes from current pathways created by the rescuer being in contact with the patient during defibrillation. With hands-on defibrillation, a distinct alternative pathway exists from an electrode pad, through the rescuer’s arms and down the legs to the ground (earth). This pathway theoretically puts the rescuer at a specific risk because the current traverses the rescuer’s heart and risks inducing ventricular fibrillation.

Is this energy harmful?

With the exception of a few medical students who have ‘accidentally’ defibrillated themselves across their head or chest, there have been no fatalities documented in association with defibrillation. Accidental shocks to the rescuer generally document no more than ‘tingling’ or paraesthesia of an affected limb, although cases of skin burns and nerve damage have been documented. The possibility of continuing chest compressions while defibrillation is performed was first investigated in a study by Lloyd in 2008. This involved deliberately creating a current pathway through a rescuer and measuring the current flowing through the rescuer during actual hands-on defibrillation. The Lloyd study concluded “Rescuers performing chest compressions during biphasic external defibrillation are exposed to low levels of leakage current. The present findings support the feasibility of uninterrupted chest compressions during shock delivery, which may enhance the efficacy of defibrillation and cardiocerebral resuscitation.” This paper was accompanied by an enthusiastic editorial encouraging a move towards this strategy. Interestingly however, there has been no uptake of this recommendation in clinical practice.

What are the actual risks?

The risk of inducing a fatal arrhythmia in a rescuer relates to the magnitude of transmyocardial current. The risk approaches 100% at 300 µA and decreases to approximately 5% at 100 µA. Below this, the risks are unknown; in particular, the safe threshold below which induction of a ventricular arrhythmia is unlikely. The risks are further influenced by other factors such as contact with wet or metal surfaces and the integrity of clinical gloves. Although gloves will provide an electrical barrier, they may break down at the voltages seen with defibrillation and often become torn during resuscitation attempts, rendering them ineffective as an insulating barrier.
What are the safety standards?

A number of European and international safety standards exist, with recommendations for maximum leakage currents for electrical devices. Some of these thresholds are exceeded by the currents documented in Lloyd’s study, whilst others are not. It is difficult to directly apply these standards to leakage currents during defibrillation, as none are specifically designed for this scenario. Clearly, if accidental shocks from defibrillation have resulted in burns, paraesthesia and possible nerve damage, it is likely that leakage currents in rescuers may exceed what could be considered a safe threshold, despite the conclusions of the Lloyd paper.

What are the possible solutions?

There are three possible solutions to this problem:

1) Now the defibrillator is charged during ongoing chest compressions, accept that the subsequent interruption to chest compressions while the shock is actually delivered is so brief that it is unlikely to be of any consequence. Whether this is the case is unknown.

2) Develop insulating materials such as thicker gloves or an insulating blanket to provide a barrier to leakage current.

3) Use of mechanical devices, which can continue to perform chest compressions while the defibrillation shock is delivered.

Summary

- High quality, uninterrupted chest compressions are emphasised in the 2010 resuscitation guidelines.
- Defibrillation is a major cause of these interruptions.
- Defibrillators deliver significant amounts of electrical energy.
- Leakage current through the rescuer is unlikely to be fatal, but may cause significant morbidity.
- Rescuers keeping their hands on the patient’s chest in order to continue chest compressions during defibrillation is not recommended until current pathways are better understood.

Dr. Charles D. Deakin  MA MD FRCP FRCA FERC
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FIGURES

Figure 1: Electrical circuit of a defibrillator showing the battery (a), capacitor (b) and electrodes (c)

REFERENCES

Each year the cardiac charity SADS UK holds the National Lifesaver Defibrillator Awards. Nominations are invited from emergency care personnel and the community. The person nominated may be a member of the public or they may have acted/responded outside the normal remit of their everyday work. The nomination is for someone who has used a defibrillator to successfully revive a person in cardiac arrest anywhere in the United Kingdom within the last 2 years.

If you would like to nominate someone, please contact the SADS UK head office on 01277 811215 or email info@sadsuk.org. You will need to provide a 300 - 750 word testimony explaining why you feel the person should receive an award. Applications must be received by 31 July.

The idea behind the award is to tell inspirational stories and encourage more people to use lifesaving skills and the AED. The successful nominee will be invited to attend (with a guest) an awards dinner in London on Saturday 22 October 2011 at the Royal College of Pathologists, 2 Carlton House Terrace, London.

Feedback as a learning conversation

Over the past year, the Educator group and the GIC working group have undertaken a review of the GIC programme. Part of the review was to consider how to give candidate feedback and a new approach was used during the GIC pilot. The Educator group developed a supporting document called ‘Debrief as a Learning Conversation’ and this was e-mailed to all Provider Course Directors and later to all Instructors. The document is also available on our website.

Following completion of the GIC pilot, the Educator group recommended that this approach to giving feedback be used by all the Provider course groups and this was formally introduced last September when the new GIC Programme went ‘live’.

ALSG and RC(UK) have now developed a short film giving examples on how to provide feedback. Copies of the DVD have been sent to all Provider course centres and the film can now be viewed on our website.
The Resuscitation Science Symposium (ReSS), which is held each year in association with the American Heart Association (AHA) Scientific Sessions meeting, has established itself as a popular and respected forum for the presentation of new research relating to cardiopulmonary resuscitation (CPR).

The 2-day 2010 ReSS meeting was held in Chicago on 13 and 14 November. From among the many ‘cutting edge’ presentations, I have selected four that I consider particularly interesting. All but the first of these studies were also presented at the 10th Scientific Congress of the European Resuscitation Council in Porto, Portugal 2-4 December 2010.

There were several very interesting basic science presentations during the 2010 ReSS, but the one that stood out as particularly thought provoking was entitled ‘Intravenous oxygen gas-filled liposomes prevent death from asphyxia’. The oxygenated liposomes used in this study were around 2 microns in diameter and when in a suspension (which looked like regular intralipid) they contained 60 ml of oxygen per 100 ml. When injected into non-pre-oxygenated rabbits with total airway obstruction, this suspension of oxygenated liposomes maintained a normal circulation for 13 minutes. All rabbits in the control group developed cardiac arrest. This clinically relevant model of critical hypoxia implies that in the future, in a clinical emergency, such as a ‘can’t intubate, can’t ventilate’ situation, oxygenated liposomes could be injected to buy enough time (provide sufficient oxygen) until the airway could be rescued. Further research on this novel therapy is awaited with interest.

A recent study from Norway documented no long-term benefit from intravenous cannulation and the delivery of drugs compared with no cannulation and no drugs during resuscitation after out-of-hospital cardiac arrest. One of the highlights of the 2010 ReSS was the presentation by Ian Jacobs of a randomised placebo-controlled trial of adrenaline in cardiac arrest (the PACA trial). In this study from Perth, Australia, patients with out-of-hospital cardiac arrest were randomised to receive either 1 ml aliquots of adrenaline 1:1000 or normal saline. Although the investigators had hoped to enrol 5000 patients, the study had to be finished early (many ambulance services refused to participate) after enrolment of just 535 patients. Return of spontaneous circulation (ROSC) was achieved in 30.4% of the adrenaline group versus 11.1% of the placebo group (odds ratio (OR) 3.51; 95% CI 2.21 to 5.58). Although survival to hospital discharge was also higher in the adrenaline group (4.1% versus 1.9%), this was not statistically significant (OR 2.16, 95% CI 0.74 to 6.30). Significantly higher ROSC rates were achieved in both the shockable and non-shockable subgroups. We must await the publication of the full manuscript before coming to any detailed conclusions but these preliminary data seem to confirm that adrenaline increases rates of ROSC regardless of rhythm.
Two studies presented during the Hot Topics session in Resuscitation Science Symposium 2010 were randomised controlled trials of the impedance threshold device (ITD). Previous studies have indicated that use of the ITD during CPR may improve short-term survival but until now, there were no long-term survival data. The first of the studies, the Resuscitation Outcomes Consortium (ROC) PRIMED trial, compared survival to hospital discharge with a modified Rankin score (MRS) ≤3 in patients with out-of-hospital cardiac arrest receiving manual chest compressions and CPR with a sham or active ITD. Patients were entered concurrently into another study that compared giving initially 30 seconds of chest compressions (Analyze Early) versus 3 minutes of chest compressions (Analyze Later). There were 8,718 evaluable patients entered in the study, 4,345 (49.8%) of which were treated with a sham ITD and 4,373 (50.2%) with an active ITD. There was no significant difference in the proportion of patients who survived to hospital discharge with an MRS ≤3 (6.0% with a sham ITD and 5.8% with an active ITD, p = 0.61). This study suggests that there is no benefit in using an ITD during manual chest compressions.

The second ITD study, the RESQ trial, compared standard CPR with a combination of active compression-decompression (ACD) CPR and the ITD for out-of-hospital cardiac arrest. The ITD was connected to the facemask and to any airway device used (tracheal tube or supraglottic airway). This study has now been published in the Lancet and is accompanied by an editorial. The primary end point was survival to hospital discharge with a MRS of ≤3. Survival to hospital discharge with a MRS ≤3 was 75/840 (8.9%) in the ACD-ITD group versus 47/813 (5.8%) in the control [p=0.019, OR 1.58 (CI= 1.07, 2.36)]. At 90-day follow-up, survival with good neurological function (Cerebral Performance Category ≤2) was significantly greater in the ACD-ITD group: 72/840 (8.6%) versus 47/813 (5.8%) [p=0.036, OR 1.52 (CI = 1.02, 2.27)].

The results of this trial imply that there is long-term benefit from the combined use of ACD-CPR and the ITD. Should we therefore adopt this technique routinely for resuscitation following out-of-hospital cardiac arrest? Ideally, these results should be confirmed by another group of investigators. By necessity, the rescuers were not blinded to the treatment given in each arm of the study and this introduces the possibility of bias. As suggested by the author of the accompanying editorial, a study comparing ACD-CPR and active ITD versus ACD-CPR with sham ITD might provide more reliable evidence of the long-term benefit of the ITD.

**REFERENCES**

REFERENCES (continued)


status

The e-ALS project has made significant progress since the last newsletter and it is with great pleasure we are able to report on the two key phases of the project: the successful completion of the e-ALS pilot study and the development of a new e-ALS course for national roll out.

e-ALS pilot study

An international randomised controlled study was conducted comparing the e-ALS course (comprising an e-learning package and one day face to face course) with the traditional two day face to face ALS course. After obtaining informed consent, 2762 participants were enrolled on an Advanced Life Support Course having been randomised to either an e-ALS course or traditional ALS course. This study is the largest of its kind to date.

We reached our candidate recruitment target on the 1st October 2010 and preliminary results were presented at the Resuscitation Council (UK) Scientific Symposium at the National Motorcycle Museum in Birmingham on the 18th November. Further detailed analysis is required before a paper can be submitted for peer reviewed journal publication in the spring of 2011.
The project group would like to thank all the course centres who participated in the study both in the UK and in Australia. Without your support and hard work the completion of this project would not have been possible.

List of e-ALS pilot course centres

- Birmingham Heartlands Hospital
- Bristol Royal Infirmary
- Calderdale Royal Hospital
- Chelsea & Westminster Hospital
- Colchester General Hospital
- Gloucestershire Royal Hospital
- Guy's & St Thomas' Hospital
- Hammersmith Hospital
- Hillingdon Hospital
- Leeds General Infirmary
- Maidstone Hospital
- NHS Lothian
- Nottingham City Hospital
- Oxford Radcliffe Hospital
- Penine Acute Trust
- Poole Hospital NHS Trust
- Prince Charles Hospital
- Queen Elizabeth Hospital
- Queen's Hospital Burton
- Raigmore Hospital
- Royal Group of Hospitals
- Royal Liverpool University Hospital
- Royal Melbourne Hospital
- Sir Charles Gairdner Hospital
- Spire Hospital Havant
- St George's Hospital
- St Luke's Hospital
- Staffordshire General Hospital
- University College Hospital
- University Hospital Aintree
- Walsgrave Hospital Coventry

National course development

Following the successful completion of the pilot study and the encouraging results the RC(UK) has moved into a new phase of the project.

Development of a new e-ALS course has begun. In late November RC(UK) completed a tendering process and awarded the contract to the Brighton-based e-learning company Epic. Epic has a strong background of developing educational packages for both industry and healthcare organisations. From that point work has begun in earnest. The project team is engaging key stakeholders in this early phase to best understand the needs of the learners and provide the best platform for them to achieve their learning outcomes.
National course development (continued)

In January of this year the first focus group was held at an ALS course in Birmingham. A team from RC(UK) and the Lead Designer from Epic observed the ALS course and met with candidates with two main aims:

- To develop learner profiles
- To canvass opinions on current training and previous e-learning

Information gathered here along with data collected from participants and faculty during the e-ALS pilot study will be used to inform the development of the new material and platform.

Below is a screenshot of an early version of the material which gives an idea of the look and feel of the e-learning site.
Anyone who takes an interest in childbirth will be aware of the arguments surrounding the timing of cord clamping after delivery. Many will have read the brief opinion on the topic from Charles Darwin’s grandfather, Erasmus, written in 1801 and some will know of the paper by Pierre Budin entitled “A quel moment doit-on pratiquer la ligature du cordon ombilical” published in Paris in 1875. Despite arguing over this topic for over 200 years the possibility of a definitive answer is only just beginning to emerge.

In the 1960s the concept of active management of the third stage of labour was developed in the hope that this would help to reduce the risk of postpartum haemorrhage. This ‘active management’ involves the early prophylactic use of uterotonics, immediate cord clamping – immediate usually taken to mean within 20 seconds of delivery of the baby – and controlled cord traction. The giving of uterotonics is thought to be the most important factor in ‘active management’ and the importance of the other two components is unclear and their use is less widespread. A survey of European obstetric practice published in 2007 showed that, while 90% of 1175 units in 14 countries routinely used prophylactic uterotonics, 77% of units in the UK practised early cord clamping compared with 17% in Denmark and 15% in Austria.

A number of bodies have reviewed the issue in recent years. In 2007 the World Health Organization published recommendations for the prevention of postpartum haemorrhage. They felt able to recommend the following: “Because of the benefits to the baby, the cord should not be clamped earlier than is necessary for applying cord traction in the active management of the third stage of labour (weak recommendation, low quality evidence). For the sake of clarity, it is estimated that this will normally take around 3 minutes. Early clamping may be required if the baby is asphyxiated and requires immediate resuscitation.”

In May 2009 a scientific advisory committee appointed by the Royal College of Obstetricians and Gynaecologists issued an opinion paper looking specifically at the issue of cord clamping and placental transfusion. They commented that “For decades immediate cord clamping has been bundled into the package of care known as ‘active management’ and the potential consequences either ignored or forgotten. Prophylactic uterotonic drugs reduce the risk of postpartum haemorrhage but whether this should be routinely combined with immediate cord clamping is unclear. As draining the placenta may encourage placental separation, it is possible that immediate cord clamping may prolong the third stage.”

The Royal College document does not make any firm recommendation as to the timing but did firmly recommend that “In order to properly understand the advantages and disadvantages of these alternative strategies, we need large randomised trials, with assessment of substantive outcomes and long-term follow-up for both mother and baby.”
In 2010 the neonatal sub-group of the International Liaison Committee on Resuscitation (ILCOR) published its most recent conclusions on the evidence about questions related to resuscitation at birth. They concluded that

“Delay in umbilical cord clamping for at least 1 minute is recommended for newborn infants not requiring resuscitation. There is insufficient evidence to support or refute a recommendation to delay cord clamping in babies requiring resuscitation.”

For those interested in examining the evidence for themselves I would recommend starting with the original worksheets prepared for the recent ILCOR deliberations. These can be downloaded from [http://www.ilcor.org/en/consensus-2010/worksheets-2010/](http://www.ilcor.org/en/consensus-2010/worksheets-2010/) from where they will find worksheets – numbers NRP-030A, NRP-030B, NRP-030C and NRP-03D, prepared by four separate reviewers of the topic. These contain a list of all the relevant papers on the topic together with their abstracts and the opinions of the author of each worksheet on their relevance and importance.

What is perhaps most important is that we now address this question with the appropriately large randomised controlled trials recommended by the RCOG and others and come to a definitive conclusion. We must heed Sir Thomas Allbutt and no longer allow our path to remain “cumbered with guesses, presumptions and conjectures, the untimely and sterile fruitage of minds which cannot bear to wait for the facts, and are ready to forget that the use of hypothesis lies not in the display of ingenuity but in the labour of verification”.

Sam Richmond
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REFERENCES

NCAA is a joint initiative between Resuscitation Council (UK) and ICNARC (Intensive Care National Audit & Research Centre) with a view to establishing an audit of in-hospital cardiac arrests to improve resuscitation care and patient outcomes.

NCAA

NCAA was formally launched in October 2010. Currently, a total of 82 hospitals are participating. Recruitment of hospitals is ongoing so, if your hospital would like more information about participating, then please contact the NCAA Team at ICNARC (ncaa@icnarc.org).

NCAA Activity Reports

Following development of the infrastructure, NCAA Activity Reports are now in production. These reports provide hospitals with an overview of the completeness of submitted data and an analysis of activity for a given time period.

Analyses of data presented in the Activity Report are for:

- all individuals (excluding neonates) receiving chest compressions and/or defibrillation from the hospital-based resuscitation team (or equivalent) in response to a 2222 call

- as per the current scope for NCAA data collection.

If, on receiving your Activity Report, you have any questions, then please email the NCAA Team (ncaa@icnarc.org). We welcome any feedback you may have.

Current focus

Aside from the regular production of NCAA Activity Reports, the NCAA Team are busy working on improving the infrastructure for data validation. We will be providing participating hospitals with NCAA Data Validation Reports soon.

In addition, following consultation with participants, work continues on implementing the minor revision to the NCAA dataset and development of the secure, web-based data entry system to support it. Participants will be informed of the formal activation date in due course.

Let us know what you think:
If you have any comments regarding this newsletter, please contact us at enquiries@resus.org.uk

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