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TERMINATION OF RESUSCITATION

(Adult, Non-trauma, Non-hypothermic)

Background

350,000 out-of-hospital cardiac arrests occur annually in the U.S. with a survival rate of 12%[1]. There are two main factors that increase the rate of ROSC: early defibrillation for shockable rhythms and high-quality minimally-interrupted CPR[2]. As long as scene safety allows, the resuscitation should occur at the point of patient contact as quality of CPR suffers in the back of a moving ambulance and safety to providers and to the public is placed at risk during transport[3-6]. As ALS providers are capable of performing an initial resuscitation that is equivalent to an in-hospital resuscitation attempt, the need to transport the patient in cardiac arrest is limited to special circumstances and should be discussed with OLMC on a case-by-case basis.

Research

Though research continues to demonstrate that early defibrillation and high-quality CPR are key to favorable outcomes, *when* to terminate resuscitation remains open to debate. Pepe et al. reviewed this topic in 2001, promoting that the non-traumatic out-of-hospital cardiac arrest patient should have resuscitation attempted if no signs of obvious death (lividity, rigor, etc.) were present. If after 20-25 minutes there was no ROSC and the arrest was unwitnessed, he proposed that resuscitation could be terminated if (with the cases of persistent VF as an exception). If the arrest was witnessed, then termination was recommended if ROSC was not achieved by 30 minutes[7]. More recently, Reynolds et al. found that with conventional resuscitation, 90% of subjects with good outcome have ROSC within 20

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minutes and 99% within 37 minutes. Looking at the subgroups, initial shockable rhythm was the best prognostic indicator followed by witnessed arrest and bystander CPR[8].

As we considered our Termination of Resuscitation protocol during the 2017 protocol revision, the data were considered and our on-scene times were extended in cases of refractory VF/pulseless VT and narrow complex/fast PEA.

Non-shockable rhythms

Asystole & slow/wide QRS complex PEA

The non-shockable rhythms are asystole and PEA. Asystole carries very poor prognosis across the literature. The MDPB therefore continues to recommend termination of resuscitation after 20 minutes of persistent asystole for this population. If the patient goes into a shockable rhythm, the resuscitation timeframe extends, i.e. the clock re-sets.

PEA can be divided into slow/wide QRS complex and fast/narrow QRS complex. The etiologies of which are different, hence treatment differs between the two groups. Littmann et al recommended a therapeutic approach to PEA based on QRS width in addition to vasopressor (epinephrine) administration: patients with a narrow QRS complex should be treated with fluid resuscitation while an aggressive search is made for reversible causes and patients with a wide QRS complex should empirically receive sodium bicarbonate (to treat hyperkalemia or sodium channel blocker toxicity)[9]. As a review of the literature has shown potential harmful effects of sodium bicarb during cardiac arrest, its use outside of the indications of treating hyperkalemia or sodium channel blocker toxicity are not promoted in the MEMS protocols[11].

The following figure illustrates Littmann's approach to PEA which is becoming more of a paradigm as opposed to the AHA's classic 5 Hs and 5 Ts[2,9,10].

	Rapid rate +/- P waves	**Slow rate, no P waves**
Narrow QRS	• Hypovolemia • Septic/anaphylactic shock • Cardiac tamponade • Pulmonary embolism (usually) • Tension pneumothorax • Dynamic hyperinflation • Cardiogenic shock (variable) • Any other cause of profound shock	• Massive inferior MI (P waves with complete heart bloc) • Vagal response due to pulmonary embolism or other obstructive shock • Hypothermia (variable)

Wide QRS	• Massive anterior MI • Pulmonary embolism (rarely, in presence of acute RBBB) • Tricyclic antidepressant overdose +/- other sodium channel blocker overdoses	• Hyperkalemia • Hypoxemia • Acidosis • Post-countershock PEA • Hypothermia (variable) • Sodium-channel blocker overdose (variable)

If slow/wide QRS PEA does not respond to oxygenation/ventilation, high-quality CPR and sodium bicarbonate (in the case of suspected hyperkalemia or TCA/sodium channel blocker overdoses), resuscitation attempts may be terminated after 20 minutes.

Fast/narrow QRS complex PEA

Patients presenting with fast/narrow QRS PEA should undergo longer resuscitation as the numerous reversible causes are considered and treated. We have extended the length to 45 minutes given the Reynolds findings and forthcoming recommendations of the National Model EMS Clinical Guidelines[12].

Shockable rhythm 60 minutes

Patients presenting with a shockable rhythm are those that have the best outcomes[8]. If a patient presents in a shockable rhythm or converts to a shockable rhythm, resuscitative efforts should be continued for up to 60 minutes provided they remain in a shockable rhythm (total BLS & ALS times), if resources are available. Early consultation with OLMC should be made as to discuss other options.

If resuscitative efforts are terminated

Recall that it is not just the patient but the family and bystanders that require attention during resuscitative efforts. While the resuscitation is on-going, it is best to assign a provider to help manage and explain the events as they unfold and to prepare the family that termination of resuscitation may happen on scene. This provider may also assist the family or bystander contact other family, friends, or social supports as needed.

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