Public Health Administration Large Conference Room 2240 E. Gonzales, 2nd Floor Oxnard, CA 93036

Pre-hospital Services Committee Agenda

Ι.	Intro	ductions
II.	Appr	ove Agenda
III.	Minu	ites
IV.	Medi	cal Issues
	Α.	Policy 705.08: Cardiac Arrest-VF/VT
	В.	Policy 705:09: Chest Pain
	C.	Policy 705.25: Ventricular Tachycardia
	D.	Policy 705.10: Childbirth
	E.	Policy 507: Critical Care Transports
	F.	Policy 732: Use of Restraints
	Ι.	Other
۷.	New	Business
	Α.	Stroke System
	В.	Other
VI	Old B	usiness
	Α.	Impedance Threshold Device/King Airway Study Report– D. Chase
	В.	Other
VII.	Infor	mational Topics
	Α.	Pharmacology Manual
	В.	Other
VIII.	Polic	ies for Review
	Α.	Policy 210: Child, Dependent Adult, or Elder Abuse Reporting
	В.	Policy 400: Ventura County Emergency Departments
	<u>C</u> .	Policy 605: Interfacility Transfer of Patients
	<u>D.</u>	Policy 606: Withholding or Termination of Resuscitation and Determination of Death
	<u> </u>	Policy 620: EMT Administration of Oral Glucose
	<u>F.</u>	Policy 624: Patient Medications
	<u>G.</u>	Policy /16: Use of Pre-Existing Vascular Access Devices
	<u>H.</u>	Policy /1/: Intralingual Injection – Possible deletion
	<u>l.</u>	Policy 723: Continuous Positive Airway Pressure (CPAP)
	J.	Policy 725: Patients after TASER Use
	K.	Other
17.		Depart
v	Agen	Report
<u>^.</u>	Ager	
	A. P	ALS Floviders
	D.	Base Hospitals
	<u> </u>	Base nospitals Receiving Hospitals
	 	AI S Education Programs
	 F	Trauma System Report
	G	FMS Agency
	<u> </u>	Other
XI.	Clos	ina



Health Care Services 2240 E. Gonzales Rd Oxnard, CA 93036

For use in "Green Permit Parking" Areas only, **EXCLUDES** Patient parking areas

Parking Instructions: Parking at workshop venue is limited. Arrive early to allow for offsite parking if venue parking lot is full.

2240 Gonzales Rd. location

If you park in a designated "green permit parking" slot, fold this flyer in half and place pass face-up on the dash of your car, to avoid receiving a ticket.

2100 Solar Drive

An additional amount of "Green Permit Parking" spaces (only 30) are available in adjacent parking lot, those that back-up against venue parking area, (Enter this parking lot off of Gonzales[3rd driveway] or Solar Drive). **Place this flyer on your dash.** If all of those stalls are occupied, overflow parking is available at The Palms shopping area or side streets.

The Palms - shopping mall

Enter The Palms at Lombard and Gonzales. Allow for a ten minute walk to venue location.

Additional parking is available on side streets, Lombard, Solar and Wankel Way.



Pre-hospital Services Committee Minutes

				•	· · ·
		Торіс	Discussion	Action	Assigned
Ι.	Introc	luctions			
II .	Appro	ove Agenda			
III.	Minut	es		It was M/S/C to approve the minutes as submitted	
IV.	Medio	cal Issues			
	A	AHA 2010 CPR/ECC		No report	
	7	Guidelines			
	B.	Other	Amiodarone – If we are going to incorp also need EMSA approval and that wou IO – training will go out soon Atropine – on hold		
٧.	New I	Business			
	A.	Policy 1135: Paramedic Program Approval – C. Rosa	Any clinical/hospital training needs to b We received a call from Universal Care on-line paramedic program. We have s Program is stating that they have agree receive a call, please contact EMS. Th	Approved. Effective date is today, June 9, 2011.	
			It was M/S/C (J. Winter/M. Mundell) to a	approve the policy as submitted.	
	В.	Other		None	
VI	Old Bu	isiness			
	A.	Impedance Threshold Device/King Airway Study Report– D. Chase	Nothing new at this time.		
	В.	Other		None	
VII.	Inform	national Topics			
	A.	1402: Trauma Review Committee		Policy is currently in place. Final policy will be sent out by e-mail and will be posted on the EMS website.	Approved
	B.	1404: Guidelines for Interfacility Transfer of Patients to a Trauma Center		There have been minor changes to policy. Final policy will be sent out by e-mail and will be posted on the EMS website.	Approved
	C.	1407: Code Trauma": Emergent Transfer of Patients with Critical Trauma		There have been minor changes to policy. Final policy will be sent out by e-mail and will be posted on the EMS website.	Approved

		to Trauma Center		
	D.	Other	None	
VIII.	Policie	es for Review		
	Α.	Policy 110: County Ord. No. 4099 Ambulance Business License Code	Policy approved as subn McShea/T. Norton).	nitted (K. Approved
	В.	Policy 111: Ambulance Company Licensing Procedure	Policy approved as subm McShea/T. Norton).	nitted (K. Approved
	C.	Policy 319: Paramedic Preceptor	Policy approved as subn McShea/T. Norton).	nitted (K. Approved
	D.	Policy 321: Mobile Intensive Care Nurse: Authorization Criteria	Policy approved as subm McShea/T. Norton).	nitted (K. Approved
	E.	Policy 322: Mobile Intensive Care Nurse: Reauthorization Requirements	Additional lines are need hours. Should be 12/12/ Policy approved with cha McShea)	ded for recording Approved with change (12. ange (T. Norton/K.
	F.	Policy 324: Mobile Intensive Care Nurse: Authorization Reactivation	Policy approved as subn McShea/T. Norton).	nitted (K. Approved
	G.	Policy 622: ICE - In Case of Emergency for Cell Phones	Policy approved as subn McShea/T. Norton).	nitted (K. Approved
	H.	Policy 1001: Paramedic/BH Communication Record	Form will be deleted. For part of the EPCR progra	orm can become Tabled m.
	I.	Policy 1105: MICN Developmental Course and Exam	Minor language change Second F will be deleted change will be forwarded K. McShea. Policy approved with cha McShea)	Approved with change I. Language d to Debbie from ange (T. Norton/K.
	J.	Policy 1130: Advanced Life Support Continuing	Implement current AHA/ should be added. Policy approved with cha	ECC guidelines Approved with change ange (T. Norton/K.

		Educations Lectures		McShea).	
	K.	Policy 1131: Field Care Audit	Review regulations for the ability for agencies other than BH to hold FCA.	Tape: changed to recording.	Tabled for regulation review.
	L.	Policy 1132: Continuing Education: Attendance Roster		Policy approved as submitted (K. McShea/T. Norton).	Approved
	Μ.	Other			
IX.	Repor	ts			
	TAG F	Report	There are no new CQI projects this mor current projects.	nth. All teams are continuing with their	
Х.	Ageno	y Reports			
	Α.	ALS Providers	 VNC - Academy in process with 5 P ETCO2 Study. Training in July for B AMR has attempted use of the Airtra The failed attempts were plagued by the airway, blurry screen etc. Dr. Sa device as we had very low numbers 	Paramedics. Working on ResQpod data and Easy IO aq device 8 times. 3 of 8 were successful. y strange anatomy, swollen tongues, fluid in alvucci would like AMR to continue to try this s of use.	
	В.	BLS Providers	No report		
	C.	Base Hospitals	SJRMC: July 1st both PVH and SJRMC w	vould have new medical directors.	
	D.	Receiving Hospitals	No report		
	E. Progra	ALS Education			
	F. Report	Trauma System	 TORC has added a subcommittee v committee. Trauma exam data. Data will be se Code Trauma, 11 so far and no trau only two met criteria. Urge review c Discussing having trauma committe in favor of inviting. Trauma director to the distribution list but will not be needs review. 	which will be the working group for this ent out shortly. uma continuation. Of the 11 code traumas, of the policy with staff. ee member to this committee. Committee is and trauma program manager will be added considered voting members. Policy 106	
	G.	EMS Agency	 Thanks to Katy and Chris for first ye very great team now. Final stages of remodel next door. EPO is now located within the EMS not change. Homeland Security funds have decrivarious projects. AED replacement in County DuoDote supply will remain 	ear, look forward to many more. EMS has a Agency Office. Their phone numbers did reased, therefore, we are prioritizing the y building will be placed further down the list. Please review stock and get back to C.	

XI.	Closi	ng	Th	e meeting adjourned at 10:35 a.m.	
	Η.	Other			
			•	 Rosa. DuoDote are now Mark I kits. Radio reprogram will be done in 3 phases starting in July Satellite capability is being looked at for the hospitals. This will be a back up for ReddiNet. If internet goes down will kick in automatically. Hospital input will be needed. EMSAAC conference was held earlier this week. The conference was great. 11.5 hours CE. Recommend for next year. Pediatric readiness survey – group of physicians from L.A. County is working with the state to poll hospitals to determine pediatric readiness. All hospitals will be required to complete the survey and may be distributed through the EMS Agency. The survey should take about an hour to complete. S. Carroll announced that he will be on vacation starting next week and return the second week of July. Katy and Chris will be available if any issues come up. 	

Respectfully submitted Debbie Haney

Prehospital Services Committee 2011 For Attendance, please initial your name for the current month

Agency	LastName	FirstName	1/13/2011	2/10/2011	3/10/2011	4/14/2011	5/12/2011	6/9/2011	7/14/2011	8/11/2011	9/8/2011	10/13/2011	11/1 0/2011	12/8/2011	%
AMR	Clay	Nick		NC											
AMR	Panke	Chad		CP		СР									
CMH - ER	Canby	Neil				NC									
CMH - ER	Cobb	Cheryl		CC		CC									
FFD	Herrera	Bill		BH		BH									
FFD	Hall	Jim		JH		JH									
GCA	Norton	Tony		TN											
GCA	Stillwagon	Mike		MS		MS									
Lifeline	Kuroda	Brian													
Lifeline	Winter	Jeff		JW		JW									
LRRMC - ER	David	Paul		PD											
LRRMC - ER	Licht	Debbie				DL									
OFD	Carroll	Scott				SC									
OFD	Huhn	Stephanie		SPH		SPH									
OVCH	Boynton	Stephanie				SB									
OVCH	Patterson	Betsy		BP		BP									
SJPVH	Hernandez	Sandi		SH		SH									
SJRMC	McShea	Kathy		KM		KM									
SJRMC - SJPVH	Larsen	Todd		TL											
SPFD	Dowd	Andrew		AD											
SVH - ER	Tilles	Ira		IT		IT									
SVH - ER	Hoffman	Jennie		JH		JH									
V/College	Mundell	Meredith		MM		MM									
VCFD	Merman	Nancy		NM		NM									
VCFD	Dingman	Rodney		RD		RD									
VNC	Plott	Norm		NP		MNP									
VNC	Black	Shannon				SB									
VNC	Shedlosky	Robin		RS											
VCMC - ER	Chase	David		DC		DC									
VCMC - ER	Utley	Dede				DU									
VCMC-SPH	Daucett	Michelle		MD		MD									
VCMC-SPH	Beatty	Karen				СН									
VCSO SAR	Hadland	Don		DH		DH									
VCSO SAR	White	Don		DW		DW									

Agency	LastName	FirstName	1/13/2011	2/10/2011	3/10/2011	4/14/2011	5/12/2011	6/9/2011	7/14/2011	8/11/2011	9/8/2011	10/13/2011	11/1 0/2011	12/8/2011	%
VFF	Rhoden	Crystal		CR											
VFF	Jones	Brad		BJ		BJ									
Eligible to Vote	Date Change	cancelled	l - not c	SC											
Non Voting Membe	ers														
EMS	Carroll	Steve		SC		SC									
AMR	Drehsen	Charles													
VCMC	Duncan	Thomas				TD									
EMS	Fisher	Barry													
LMT	Frank	Steve				SF									
EMS	Hadduck	Katy		KH		KH									
EMS	Haney	Debora		DH		DH									
EMS	Lara-Jenkins	Stephanie		SLJ		SLJ									
EMS	Rosa	Chris		CR		CR									
EMS	Salvucci	Angelo		AS		AS									



A Division of the Ventura County Health Care Agency

EMERGENCY MEDICAL SERVICES

2220 E. Gonzales Rd., Suite 130, Oxnard, CA 93036-0619 www.vchca.org/ph/ems Phone: 805-981-5301 Fax: 805-981-5300

MEMORANDUM

Date: August 11, 2011

To: PSC Committee

From: Angelo Salvucci, MD

EMS Medical Director

Subject: Amiodarone

The 2010 AHA Guidelines are stronger that the 2005 Guidelines in recommending Amiodarone over lidocaine for shock-resistant VF. Attached is an extract from the current Guidelines and the evidence-review worksheet. There is still no evidence that Amiodarone (or other drugs) improves survival to hospital discharge, and attached is the most recent trial. However, it does not appear to be worse than lidocaine. I would recommend that for the treatment of shock-resistant VF in policy 705_08 (Cardiac Arrest) we move from lidocaine to Amiodarone OR use no antiarrhythmic. Either is reasonable and there are examples of both approaches in other California EMS systems.

Amiodarone may be more effective in converting stable VT (though the evidence is limited), so for Policy 705_25 (Ventricular Tachycardia), I'd recommend that if we decide to add Amiodarone to our SOP we move from lidocaine to Amiodarone here.

For Policy 705_09 (Chest Pain) and for post-VF conversion in Policy 705_08, the Guidelines no longer recommend prophylactic antiarrhythmic medications, so I recommend we delete lidocaine here.

Stroke System:

I would like to propose that we consider organizing a stroke system of care. This is being done in a number of other California EMS systems. The Joint Commission has a Primary Stroke Center Certification Program (attached) that is typically used in these systems. Steve and I have begun discussing this with the hospitals. Our intent is to give time for any hospital interested in designation to do so – perhaps about a year – before turning on the system. If all hospitals are designated then there will be no change in destination decisions. Once the hospitals have had a chance to review the requirements we can consider approving this plan and set a firm date for implementation.

BARRY R. FISHER, MPPA

Director

STEVEN L. CARROLL, EMT-P EMS Administrator

ANGELO SALVUCCI, M.D., F.A.C.E.P Medical Director

2010 AHA Guidelines

http://circ.ahajournals.org/content/122/18_suppl_3.toc

Part 1, p. S641

At the time of the 2010 International Consensus Conference there were still insufficient data to demonstrate that any drugs or mechanical CPR devices improve long-term outcome after cardiac arrest.

Part 8, p. S739

Drug Therapy in VF/Pulseless VT

When VF/pulseless VT persists after at least 1 shock and a 2-minute CPR period, a vasopressor can be given with the primary goal of increasing myocardial blood flow during CPR and achieving ROSC (see "Medications for Arrest Rhythms" below for dosing) (Class IIb, LOE A). The peak effect of an intravenous (IV)/intraosseous (IO) vasopressor given as a bolus dose during CPR is delayed for at least 1 to 2 minutes. The optimal timing of vasopressor administration during the 2-minute period of uninterrupted CPR has not been established. If a shock fails to generate a perfusing rhythm, then giving a vasopressor soon after the shock will optimize the potential impact of increased myocardial blood flow before the next shock. However, if a shock results in a perfusing rhythm, a bolus dose of vasopressor at any time during the subsequent 2-minute period of CPR (before rhythm check) could theoretically have detrimental effects on cardiovascular stability. This may be avoided by using physiologic monitoring such as quantitative waveform capnography, intra-arterial pressure monitoring, and continuous central venous oxygen saturation monitoring to detect ROSC during chest compressions. However, adding an additional pause for rhythm and pulse check after shock delivery but before vasopressor therapy will decrease myocardial perfusion during the critical postshock period and could reduce the chance of achieving ROSC.

Amiodarone is the first-line antiarrhythmic agent given during cardiac arrest because it has been clinically demonstrated to improve the rate of ROSC and hospital admission in adults with refractory VF/pulseless VT. Amiodarone may be considered when VF/VT is unresponsive to CPR, defibrillation, and vasopressor therapy (Class IIb, LOE A). If amiodarone is unavailable, lidocaine may be considered, but in clinical studies lidocaine has not been demonstrated to improve rates of ROSC and hospital admission compared with amiodarone (Class IIb, LOE B). Magnesium sulfate should be considered only for torsades de pointes associated with a long QT interval (Class IIb, LOE B).

Part 8, p. S744

Antiarrhythmics

There is no evidence that any antiarrhythmic drug given routinely during human cardiac arrest increases survival to hospital discharge. Amiodarone, however, has been shown to increase short-term survival to hospital admission when compared with placebo or lidocaine.

Amiodarone

IV amiodarone affects sodium, potassium, and calcium channels and has α- and β-adrenergic blocking properties. It can be considered for treatment of VF or pulseless VT unresponsive to shock delivery, CPR, and a vasopressor. In blinded randomized controlled clinical trials in adults with refractory VF/pulseless VT in the out-of-hospital setting, paramedic administration of amiodarone (300 mg or 5 mg/kg) improved hospital admission rates when compared with administration of placebo or 1.5 mg/kg of lidocaine. Additional studies documented consistent improvement in termination of arrhythmias when amiodarone was given to humans or animals with VF or hemodynamically unstable VT. A higher incidence of bradycardia and hypotension was reported for amiodarone in one out-of-hospital study. A canine study noted that administration of a vasoconstrictor before amiodarone prevented hypotension. The adverse hemodynamic effects of the IV formulation of amiodarone are attributed to vasoactive solvents (polysorbate 80 and benzyl alcohol). When administered in the absence of these solvents, an analysis of the combined data of 4 prospective clinical trials of patients with VT (some hemodynamically unstable) showed that amiodarone produced no more hypotension than lidocaine. A formulation of IV amiodarone without these vasoactive solvents was approved for use in the United States.

Amiodarone may be considered for VF or pulseless VT unresponsive to CPR, defibrillation, and a vasopressor therapy (Class IIb, LOE B). An initial dose of 300 mg IV/IO can be followed by 1 dose of 150 mg IV/IO. Although anecdotally administered IO without known adverse effects, there is limited experience with amiodarone given by this route.

Lidocaine

A retrospective review demonstrated an association between improved hospital admission rates and use of lidocaine (compared with standard treatment) in patients with out-of-hospital VF cardiac arrest. But there is inadequate evidence to recommend the use of lidocaine in patients who have refractory VT/VF, defined as VT/VF not terminated by defibrillation or that continues to recur after defibrillation during out-of-hospital cardiac arrest or in-hospital cardiac arrest.

Lidocaine is an alternative antiarrhythmic of long-standing and widespread familiarity with fewer immediate side effects than may be encountered with other antiarrhythmics. Lidocaine, however, has no proven short- or long-term efficacy in cardiac arrest. Lidocaine may be considered if amiodarone is not available (Class IIb, LOE B). The initial dose is 1 to 1.5 mg/kg IV. If VF/pulseless VT persists, additional doses of 0.5 to 0.75 mg/kg IV push may be administered at 5- to 10-minute intervals to a maximum dose of 3 mg/kg.

Part 8, p. S754

Therapy for Regular Wide-Complex Tachycardias

For patients who are stable with likely VT, IV antiarrhythmic drugs or elective cardioversion is the preferred treatment strategy. If IV antiarrhythmics are administered, procainamide (Class IIa, LOE B), amiodarone (Class IIb, LOE B), or sotalol (Class IIb, LOE B) can be considered. Procainamide and sotalol should be avoided in patients with prolonged QT. If one of these antiarrhythmic agents is given, a second agent should not be given without expert consultation (Class III, LOE B). If antiarrhythmic therapy is unsuccessful, cardioversion or expert consultation should be considered (Class IIa, LOE C).

One randomized comparison found procainamide (10 mg/kg) to be superior to lidocaine (1.5 mg/kg) for termination of hemodynamically stable monomorphic VT. Procainamide can be administered at a rate of 20 to 50 mg/min until the arrhythmia is suppressed, hypotension ensues, QRS duration increases >50%, or the maximum dose of 17 mg/kg is given. Maintenance infusion is 1 to 4 mg/min. Procainamide should be avoided in patients with prolonged QT and congestive heart failure.

IV sotalol (100 mg IV over 5 minutes) was found to be more effective than lidocaine (100 mg IV over 5 minutes) when administered to patients with spontaneous hemodynamically stable sustained monomorphic VT in a double-blind randomized trial within a hospital setting. In a separate study of 109 patients with a history of spontaneous and inducible sustained ventricular tachyarrhythmias, infusing 1.5 mg/kg of sotalol over ≤5 minutes was found to be relatively safe and effective, causing hypotension in only 2 patients, both of whom responded to IV fluid. Package insert recommends slow infusion, but the literature supports more rapid infusion of 1.5 mg/kg over 5 minutes or less. Sotalol should be avoided in patients with a prolonged QT interval.

Amiodarone is also effective in preventing recurrent monomorphic VT or treating refractory ventricular arrhythmias in patients with coronary artery disease and poor ventricular function. It is given 150 mg IV over 10 minutes; dosing should be repeated as needed to a maximum dose of 2.2 g IV per 24 hours. Higher doses (300 mg) were associated with an increased frequency of hypotension, although some reports attributed the hypotension to the vasoactive solvents that are not present in a new form of the drug recently approved for use in the US.

By comparison, lidocaine is less effective in terminating VT than procainamide, sotalol, and amiodarone, and when given to patients with or without a history of MI with spontaneous sustained stable VT in the hospital setting. Lidocaine has been reported to variably terminate VT when administered intramuscularly to patients with AMI and VT in the out-of-hospital setting. Thus, while occasionally effective, lidocaine should be considered second-line antiarrhythmic therapy for monomorphic VT. Lidocaine can be administered at a dose of 1 to 1.5 mg/kg IV bolus. Maintenance infusion is 1 to 4 mg/min (30 to 50 mcg/kg per minute).

Part 10, p. S804

Ventricular Rhythm Disturbances

Treatment of ventricular arrhythmias during and after AMI has been a controversial topic for three decades. Primary VF accounts for the majority of early deaths during AMI. The incidence of primary VF is highest during the first 4 hours after onset of symptoms, but remains an important contributor to mortality during the first 24 hours. Secondary VF occurring in the setting of CHF or cardiogenic shock can also contribute to death from AMI. VF is a less common cause of death in the hospital setting with the use of fibrinolytics and percutaneous revascularization as early reperfusion strategies. Broad use of β -blockers also contributes significantly in the reduction of VF incidence in the after AMI.

Although prophylaxis with lidocaine reduces the incidence of VF, an analysis of data from ISIS-3 and a meta-analysis suggest that lidocaine increased all-cause mortality rates. Thus, the practice of prophylactic administration of lidocaine is not recommended (Class III, LOE A).

Sotalol has not been adequately studied (Class IIb, LOE C).

Amiodarone in a single RCT did not appear to improve survival in low doses and may increase mortality in high doses when used early in patients with suspected myocardial infarction (Class IIb, LOE C).

Twenty published studies including 14 RCTs and 4 meta-analyses/reviews provide no good evidence that prophylactic antiarrhythmics improve outcomes (survival to discharge, 30/60 day mortality) and despite a documented decrease in the incidence of malignant ventricular arrhythmias, they may cause harm. Therefore prophylactic antiarrhythmics are not recommended for patients with suspected ACS or myocardial infarction in the prehospital or ED (Class III, LOE A).

Routine IV administration of β -blockers to patients without hemodynamic or electric contraindications is associated with a reduced incidence of primary VF (Class IIb, LOE C).

Low serum potassium, but not magnesium, has been associated with ventricular arrhythmias. It is prudent clinical practice to maintain serum potassium >4 mEq/L and magnesium >2 mEq/L (Class IIB, LOE A).

Routine administration of magnesium to patients with MI has no significant clinical mortality benefit, particularly in patients receiving fibrinolytic therapy. ISIS-4 enrolled >58 000 patients and showed a trend toward increased mortality rates when magnesium was given in-hospital for primary prophylaxis to patients within the first 4 hours of known or suspected AMI.

Following an episode of VF, there is no conclusive data to support the use of lidocaine or any particular strategy for preventing VF recurrence. Further management of ventricular rhythm disturbances is discussed in Part 8.2: "Management of Cardiac Arrest" and Part 8.3: "Management of Symptomatic Bradycardia and Tachycardia."

WORKSHEET for Evidence-Based Review of Science for Emergency Cardiac Care

Worksneet author(s)	
Ong, Marcus Eng Hock	Date Submitted for review:
Tommaso Pellis	Sep 7/2009
Mark S Link	

Clinical question.

"In adult cardiac arrest (asystole, pulseless electrical activity, pulseless VT and VF) (prehospital [OHCA], inhospital [IHCA]) (P), does the use of antiarrhythmic drugs (lidocaine, procainamide, amiodarone, bretylium, magnesium) or combination with other drugs (I) compared with not using drugs (or a standard drug regimen) (C), improve outcomes (eg. ROSC, survival) (O)."

Is this question addressing an intervention/therapy, prognosis or diagnosis? intervention/therapy State if this is a proposed new topic or revision of existing worksheet: revision

Conflict of interest specific to this question

Do any of the authors listed above have conflict of interest disclosures relevant to this worksheet? No

Search strategy (including electronic databases searched).

Dr Ong's search strategy

PubMed "heart arrest" or "cardiopulmonary resuscitation" or "cardiac arrest" as MESH (headings) AND "Anti-Arrhythmia Agents" or "Lidocaine" or "Lignocaine" or "procainamide" or "amiodarone" or "bretylium" or "magnesium" as textword in headings or abstract

EMBASE search using text words (all fields) "Anti-Arrhythmia Agents" or "Lidocaine" or "Lignocaine" or "procainamide" or "amiodarone" or "bretylium" or "magnesium"AND (cardiac arrest OR resuscitation) AHA EndNote Master library, Cochrane database for systematic reviews, Central Register of Controlled Trials, "Anti-Arrhythmia Agents", "Lidocaine", "Lignocaine", "procainamide", "amiodarone", "bretylium", "magnesium"

Review of references from articles. Forward search using SCOPUS and Google scholar. Repeat review of references on 22 Aug 2009

Dr Link's search strategy

Two different search strategies have been pursued, both targeting the same population: cardiac arrest, heart arrest, cardiopulmonary, resuscitation, post-cardiac arrest, and postresuscitation (textword and MeSH headings when applicable).

As for the intervention, search strategy #1 focused on the keywords arrhythmia, anti-arrhythmic, and unstable (MeSH headings when applicable), while search strategy #2 looked at prophylactic use of single antiarrhythmic agents.

Database searched: PubMed, Cochrane Library (including Cochrane database for systematic reviews and Cochrane Central Register of Controlled Trials), Embase, and AHA EndNote Master Library.

Moreover, cross-references from articles and reviews, and forward search using SCOPUS and Google scholar are ongoing.

Details of search are reported below.

PubMed

Search strategy #1: (("Heart Arrest"[Mesh]) OR (cardiac arrest) OR (cardiopulmonary resuscitation) OR ("Resuscitation"[Mesh])) AND ((Arrhythmia) OR (Anti-Arrhythmic) OR (Unstable)) AND ((Post-Cardiac Arrest) OR (postresuscitation))

Search strategy #2: ((("Amiodarone"[Mesh]) OR ("Lidocaine"[Mesh]) OR ("Procainamide"[Mesh]) OR ("Magnesium Sulfate"[Mesh]) OR ("Diltiazem"[Mesh]) OR ("Verapamil"[Mesh]) OR ("Digoxin"[Mesh]) OR ("Flecainide"[Mesh]) OR ("Propafenone"[Mesh]) OR ("Sotalol"[Mesh]) OR ("esmolol"[Substance Name]) OR

("Atenolol" [Mesh]) OR ("Metoprolol" [Mesh]))) AND (((prophylactic) OR (Post-Cardiac Arrest) OR (postresuscitation))) AND (((("Resuscitation"[Mesh]) OR ("Cardiopulmonary Resuscitation"[Mesh]) OR (cardiopulmonary resuscitation) OR ("Heart Arrest" [Mesh]) OR (cardiac arrest))) Cochrane Search strategy #1: ((prophylac*):ti,ab,kw) AND ((Arrhythmia):ti,ab,kw) OR ("Anti-Arrhythmia Agents"[Mesh])) AND ("Heart Arrest"[Mesh]) OR ("Cardiopulmonary Resuscitation"[Mesh]) Search strategy #2: single antiarrhythmic agents[Mesh] AND prophylac* AND ("Heart Arrest"[Mesh]) OR ("Cardiopulmonary Resuscitation"[Mesh]) Embase Search strategy #1: (("Heart Arrest"[Mesh]) OR ("Resuscitation"[Mesh])) AND ((Arrhythmia[Mesh]) OR (Anti-Arrhythmic[Mesh]) OR (Unstable[Mesh])) AND ((Post-Cardiac Arrest) OR (postresuscitation)) Search strategy #2: (single antiarrhythmic agents [Mesh]) AND (((prophylactic) OR "Prophylaxis" [Mesh]) OR (Post-Cardiac Arrest) OR (postresuscitation))) AND ("Heart Arrest" [Mesh]) NOT (resuscitation) EndNote Search strategy #1: (Cardiac Arrest OR Resuscitation) AND (Arrhythmia OR Anti-Arrhythmic OR Unstable) AND (Post-Cardiac Arrest OR postresuscitation) Search strategy #2: (single antiarrhythmic agents) AND (prophylactic OR Prophylaxis OR Post-Cardiac Arrest OR postresuscitation) AND (Cardiac Arrest OR Resuscitation) And find articles which cite: "Dorian P, et al. Amiodarone as compared with lidocaine for shock resistant

And find articles which cite: "Dorian P, et al. Amiodarone as compared with lidocaine for shock resistant ventricular fibrillation. NEJM 2002; 346: 884-90 or Kudenchuk P, et al. Amiodarone for resuscitation after out of hospital cardiac arrest due to ventricular fibrillation. NEJM. 1999; 342: 871-878.

Task force comments included. Combined submission with Dr Mark Link

State inclusion and exclusion criteria

Inclusion criteria included: human studies of adult cardiac arrest and anti-arrhythmic agents, peer-review Exclusion criteria included: review articles and case reports, case series, not pertinent studies.

• Number of articles/sources meeting criteria for further review:

PubMed "heart arrest" or "cardiopulmonary resuscitation" " or "cardiac arrest" as MESH (headings) AND "Anti-Arrhythmia Agents" or "Lidocaine" or "Lignocaine" or "procainamide" or "amiodarone" or "bretylium" or "magnesium" as textword in abstract 185 articles

On further evaluation of relevant articles:

25 studies met inclusion criteria for further review. Of these 9 were LOE 1, 2 LOE 2, 2 LOE 3, 5 LOE 4, 7 LOE 5.

Summary of evidence Evidence Supporting Clinical Question

Good	{Dorian, 2002, 884} B (amiodarone vs lidocaine) {Kudenchuk, 1999, 871} B (amio vs lido)									
Fair	{Nowak, 1981, 404} B (bretylium vs placebo)		{Herlitz, 1997, 199} A (lidocaine vs no lidocaine)	Herlitz, 2003, 25 (lido vs no lido)	{Gorgels, 1996, 43} E (procainamide vs lido {Somberg, 2002, 853} B (amio vs lido)					
Poor			{Ohshige, 2005, 53} C (lidocaine vs no lidocaine)							
	1	2	3	4	5					
	•	Level of evidence								

A = Return of spontaneous circulationB = Survival of event C = Survival to hospital discharge D = Intact neurological survival

E = Other endpoint Italics = Animal studies

Evidence Neutral to Clinical question

	1	2	3	4	5
Poor					
Fair	{Kovoor, 2005, 518} C (sotalol vs lignocaine) {Thel, 1997, 1272} A (Mg vs placebo) {Fatovich, 1997, 237} A (Mg vs placebo)	{Tahara, 2006, 442} B (nifekalant vs lido)		{Rea, 2006, 1617} E (amio vs lido) {Pollak, 2006, 199} C (amio vs lido) {Stiell, 1995, 264} B (bretylium, lido, procainamide) {Skrifvars M 2004, 582} E (amio)	{Kowey, 1995, 3255} E (amio vs lido) {Levine JH 1996, 67} E (amio)
Good	{Allegra, 2001, 245} A (Mg vs placebo) {Hassan, 2002, 57} A (Mg vs placebo) {Haynes, 1981, 353} C (bretylium vs lido)	{Olson, 1984, 807} B (Bretylium vs Lido)			Haynes R 1981 C (bretylium vs lido)

A = Return of spontaneous circulation

C = Survival to hospital discharge

E = Other endpoint

B = Survival of event

Evidence Opposing Clinical Question



A = Return of spontaneous circulationB = Survival of event C = Survival to hospital discharge

D = Intact neurological survival

E = Other endpoint Italics = Animal studies

Page 1 of 11

REVIEWER'S FINAL COMMENTS AND ASSESSMENT OF BENEFIT / RISK:

"In adult cardiac arrest (asystole, pulseless electrical activity, pulseless VT and VF) (prehospital [OHCA], inhospital [IHCA]) (P), does the use of antiarrhythmic drugs (lidocaine, procainamide, amiodarone, bretylium, magnesium) or combination with other drugs (I) compared with not using drugs (or a standard drug regimen) (C), improve outcomes (eg. ROSC, survival) (O)."?

This is a revision of worksheet 21 from ILCOR 2005.

We have divided the three time frames of resuscitation and treatment into:

1) During resuscitation

2) After admission to the hospital/ED (implying ROSC has returned)

3) Prior to hospital discharge and continuing long-term (implying patient recovery)

Our question and the focus of this worksheet, ALS-D-025, addresses the first time frame. Another worksheet questions addresses time frame 2. There is no specific worksheet question which address time frame

There are actually several parts to this question, and we have divided the evidence according to the type of antiarrhythmic drugs being studied in various publications. However we should note that nearly all of the studies report interventions for Ventricular Fibrillation (VF) and pulseless Ventricular Tachycardia (VT) rather than for asystole or PEA. Only one study (Nowak, 1981) included patients in asystole or PEA. Evidence from Randomised Controlled Trials (RCT) is scant, and most of the studies use another antiarrhythmic drug as a control, rather than a placebo or no treatment. Thus, conclusions are limited to the relative effectiveness of antiarrhythmic drugs.

Studies looking at the use of Lidocaine in adult cardiac arrest:

{Herlitz, 1997, 199} LOE3, Fair Quality, Supporting – OHCA retrospective review, looking at the use of Lidocaine for VF. Reported increased ROSC with lidocaine

{Ohshige, 2005, 53} LOE3, Poor Quality, Supporting – OHCA controlled trial, looking at the use of Lidocaine for VF. Found increased survival in the group treated with lidocaine

{Kovoor, 2005, 518} LOE1, Fair Quality, Neutral - OHCA RCT looking at the use of Lidocaine vs Sotalol for VF. Reported no difference in ROSC.

{Weaver, 1990, 2027} LOE3, Fair Quality, Opposing - OHCA historical controls, looking at the use of lidocaine vs bicarbonate for VF. Reported decreased survival to admission with lidocaine

{Tahara, 2006, 442} LOE2, Fair Quality, Neutral - OHCA historical controls, looking at the use of nifekalant and lidocaine for VF. Reported decreased survival to admission for lidocaine

{van Walraven, 1998, 544} LOE4, Fair Quality, Opposing – In-hospital, retrospective review, looking at the use of Lidocaine for VF. Reported decreased survival to 1h associated with lidocaine

Studies looking at the use of Amiodarone in adult cardiac arrest:

{Kudenchuk, 1999, 871} LOE1, Good Quality, Supporting – OHCA RCT looking at the use of Amiodarone vs placebo (although 92% of placebo group received antiarrhythmic drugs, predominantly lidocaine, before randomization and 82% received antiarrhythmic drugs after randomization) for VF. Reported improved survival to admission for Amiodarone.

{Levine JH 1996, 67} LOE5, Fair Quality, Neutral - Trial in which in-patients with recurrent sustained hypotensive VT or VF who had failed treatment with procainamide, lidocaine and bretylium were given one of three doses of IV amiodarone. Of 273 patients 40% survived 24 hours without another arrhythmic episode. There was no clear difference between the three different doses of amiodarone.

{Skrifvars M 2004, 582} LOE 4, Fair Quality, neutral- Retrospective case series of IV amiodarone use in Helsinki which shows that undiluted amiodarone can be used safely.

{Tomlinson D 2008, 15} LOE 4, Fair Quality, Opposing- Small retrospective case series of patients with hemodynamically tolerated VT in which IV amiodarone terminated VT in 6/41 patients within 20 minutes, and 12/41 within 1 hour.

Studies looking at the use of Magnesium in adult cardiac arrest:

{Allegra, 2001, 245} LOE1, Good Quality, Neutral, {Hassan, 2002, 57} LOE1, Good Quality, Neutral – Prehospital RCT looking at the use of Mg vs placebo for VF Reported no difference in ROSC

{Thel, 1997, 1272} LOE1, Fair Quality, Neutral - ICU, RCT, looking at the use of Mg vs placebo for VF. Reported no difference in ROSC

{Fatovich, 1997, 237} LOE1, Fair Quality, Neutral - ED RCT looking at the use of Mg vs placebo for VF. Reported no difference in ROSC

Studies looking at the use of Bretylium in adult cardiac arrest:

{Nowak, 1981, 404} LOE1, Fair Quality, Supporting – ED RCT, looking at the use of Bretylium vs placebo for all cardiac arrest rhythms. Found improved survival to admission for bretylium

Studies looking at the use of Procainamide & Lidocaine in adult cardiac arrest:

{Gorgels, 1996, 43} LOE5, Fair Quality, Supporting - Inhospital, randomized prospective, looking at the use of Procainamide vs Lidocaine for sustained VT. Reported improved termination of VT with Procainamide. Not all patients were in cardiac arrest.

Studies looking at the use of Procainamide & quinidine in adult cardiac arrest:

{Hallstrom, 1991, 1025} LOE4, Fair Quality, Opposing - OHCA, retrospective review, looking at the use of antiarrhythmics for VF. Reported that use of procainamide & quinidine was associated with decreased survival

Studies looking at the use of Bretylium & Lidocaine in adult cardiac arrest: {Haynes, 1981, 353} LOE5, Good Quality, Neutral, {Olson, 1984, 807} LOE2, Good Quality, Neutral – OHCA, randomised trials, looking at the use of Bretylium vs Lidocaine for VF. Reported no difference in survival

Studies looking at the use of Bretylium & Amiodarone in adult cardiac arrest: {Kowey, 1995, 3255} LOE5, Fair Quality, Neutral – Inhospital, prospective trial, looking at the use of Bretylium & Amiodarone for unstable VT or VF. However not all patients were in cardiac arrest. Reported no difference in survival to 48h.

Studies looking at the use of Lidocaine & Amiodarone in adult cardiac arrest:
{Dorian, 2002, 884} LOE1, Good Quality, Supporting – OHCA RCT looking at the use of Amiodarone vs Lidocaine for VF Reported improved survival to admission with Amiodarone.
{Rea, 2006, 1617} LOE4, Fair Quality, Neutral – Inhospital, retrospective review, looking at the use of Amiodarone vs Lidocaine for VF Reported no difference in survival to 24h
{Pollak, 2006, 199} LOE4, Fair Quality, Neutral – Inhospital, retrospective review, looking at the use of Amiodarone vs Lidocaine for VF. Reported no difference in survival.
{Somberg, 2002, 853} LOE 5, Fair Quality, Supporting – Inhospital RCT, looking at the use of Amiodarone vs Lidocaine for VT. Reported improved survival to 1h with Amiodarone

Studies looking at the use of Lidocaine-procainamide-bretylium in adult cardiac arrest: {Stiell, 1995, 264} LOE4, Fair Quality, Neutral –Inhospital, retrospective review, looking at the use of antiarrhythmics for VF. Reported increased survival to 1h with procainamide, but no difference compared to patients who did not receive anti arrhythmic drugs with bretylium and lidocaine. {Nademanee, 2000, 742} LOE 5, Fair Quality, Opposing – Inhospital, controlled trial, looking at the use of antiarrhythmics vs sympathetic blockade for prevention of VF. Reported decreased survival with antiarrhythmics compared to sympathetic blockade.

Acknowledgements:

Dr Peter Morley for his inputs

Citation List

Allegra J, Lavery R, Cody R, Birnbaum G, Brennan J, Hartman A, et al. Magnesium sulfate in the treatment of refractory ventricular fibrillation in the prehospital setting. Resuscitation. 2001 Jun; 49 (3):245-9.

LOE1, Good Quality, Neutral, – Prehospital RCT looking at the use of Mg vs placebo for VF Reported no difference in ROSC

Dorian P, Cass D, Schwartz B, Cooper R, Gelaznikas R, Barr A. Amiodarone as compared with lidocaine for shock-resistant ventricular fibrillation. The New England journal of medicine. 2002 Mar 21; 346(12):884-90

Randomized double-blind trial comparing amiodarone (n=180) with lidocaine (n=167) for refractory VF/VT demonstrating that amiodarone leads to substantially higher rates of survival to hospital admission. Refractory VF was defined as VF that did not terminate after a series of 3 shocks, epinephrine and fourth shock or VF that recurred after successful defibrillation or VF that occurred for the first time when their initial cardiac arrest rhythm was asystole or PEA. The mean time interval from arrest to drug administration was 25 minutes. The treatment groups had similar clinical profiles. Following administration of amiodarone 22.8% of patients were admitted alive, as compared to 12.0% in the lidocaine group (p=0.009; odds ratio, 2.17). However, there was no difference in survival to hospital discharge. Among the 41 patients who survived to hospital admission after receiving amiodarone, 9 (5 percent of the entire group) survived to hospital discharge, as compared with 5 of the 20 initial survivors in the lidocaine group (3 percent of the entire group, P=0.34). In addition, there was no placebo group, thus whether amiodarone was beneficial or lidocaine harmful could not be ascertained.

LOE 1, good quality, neutral for question which includes all antiarrhythmic drugs, but does show superiority of amidarone over lidocaine, B

Fatovich DM, Prentice DA, Dobb GJ. Magnesium in cardiac arrest (the magic trial). Resuscitation. 1997 Nov; 35(3):237-41.

LOE1, Fair Quality, Neutral - ED RCT looking at the use of Mg vs placebo for VF. Reported no difference in ROSC

Gorgels AP, van den Dool A, Hofs A, Mulleneers R, Smeets JL, Vos MA, et al. Comparison of procainamide and lidocaine in terminating sustained monomorphic ventricular tachycardia. Am J Cardiol. 1996 Jul 1;78(1):43-6.

LOE 5, Fair Quality, Supporting - Inhospital, randomized prospective, looking at the use of Procainamide vs Lidocaine for sustained VT, not cardiac arrest. Reported improved termination of VT with Procainamide.

Hallstrom AP, Cobb LA, Yu BH, Weaver WD, Fahrenbruch CE. An antiarrhythmic drug experience in 941 patients resuscitated from an initial cardiac arrest between 1970 and 1985. Am J Cardiol. 1991 Oct 15;68(10):1025-31.

LOE4, Fair Quality, Opposing - OHCA, retrospective review, looking at the use of antiarrhythmics for VF. Reported that use of procainamide & quinidine was associated with decreased survival

Hassan TB, Jagger C, Barnett DB. A randomised trial to investigate the efficacy of magnesium sulphate for refractory ventricular fibrillation. Emerg Med J. 2002 Jan;19(1):57-62.

LOE1, Good Quality, Neutral – Prehospital RCT looking at the use of Mg vs placebo for VF Reported no difference in ROSC

Haynes RE, Chinn TL, Copass MK, Cobb LA. Comparison of bretylium tosylate and lidocaine in management of out of hospital ventricular fibrillation: a randomized clinical trial. Am J Cardiol. 1981 Aug;48(2):353-6.

LOE5, Good Quality, Neutral, – OHCA, randomised trial, looking at the use of Bretylium vs Lidocaine for VF. Reported no difference in survival

Herlitz J, Ekstrom L, Wennerblom B, Axelsson A, Bang A, Lindkvist J, et al. Lidocaine in out-ofhospital ventricular fibrillation. Does it improve survival? Resuscitation. 1997 Jan;33(3):199-205.

LOE4, Fair Quality, Supporting –A retrospective study of the use of lidocaine in cardiac arrest. There was an inherent bias in who received lidocaine in this study because only ambulances with nurses on board could give lidocaine in the field. Yet the patients receiving lidocaine were more likely to survive to hospital admission, but not to hospital discharge.

Herlitz, J, Gunnarsson J, Engdahl J, et al Factors associated with survival to hospital discharge among patients hospitalized alive after out of hospital cardiac arrest: change in outcome over 20 years in the community of Goteborg, Sweden. Heart 2003. 89: 25-30.

20 year retrospective review of survival in cardiac arrest. In multivariate analysis those give lidocaine in the ED had an improvement in survival (odds ratio of 1.64; 95% CI of 1.12 to 2.10).

LOE 4, ,retrospective, fair quality, supportive C

Kovoor P, Love A, Hall J, Kruit R, Sadick N, Ho D, et al. Randomized double-blind trial of sotalol versus lignocaine in out-of-hospital refractory cardiac arrest due to ventricular tachyarrhythmia. Internal medicine journal. 2005 Sep;35(9):518-25.

LOE1, Fair Quality, Neutral – Small OHCA RCT looking at the use of Lidocaine vs Sotalol for VF. Reported no difference in ROSC.

Kowey PR, Levine JH, Herre JM, Pacifico A, Lindsay BD, Plumb VJ, et al. Randomized, double-blind comparison of intravenous amiodarone and bretylium in the treatment of patients with recurrent, hemodynamically destabilizing ventricular tachycardia or fibrillation. The Intravenous Amiodarone Multicenter Investigators Group. Circulation. 1995 Dec 1;92(11):3255-63.

LOE5, Fair Quality, Neutral – Inhospital, prospective trial, looking at the use of Bretylium & Amiodarone for unstable VT or VF. However not all patients were in cardiac arrest. Reported no difference in survival to 48h.

Kudenchuk PJ, Cobb LA, Copass MK, Cummins RO, Doherty AM, Fahrenbruch CE, et al. Amiodarone for resuscitation after out-of-hospital cardiac arrest due to ventricular fibrillation. The New England journal of medicine. 1999 Sep 16;341(12):871-8

LOE1, Good Quality, Supporting Double-blind randomized controlled trial of amiodarone vs placebo in OOH VT or VF arrest resistant to 3 defibrillatory shocks. This study demonstrated an improved survival to hospital admission in patients administered amiodarone compared to placebo. Baseline characteristics of the 2 groups were similar (amiodarone n=246, placebo n=258). Elapsed time from arrest to amiodarone administration averaged 21.4 minutes. Post-ROSC hypotension or bradycardia were more frequent in the amiodarone group. Odds ratio favoring amiodarone for hospital admission was 1.6 (p=0.02). There was no difference in survival to hospital discharge (13.4 to 13.2%).

Levine JH,. Intravenous amiodarone for recurrent sustained hypotensive ventricular tachyarrhythmias. Intravenous Amiodarone Multicenter Trial Group. J. Am. Coll. Cardiol. 1996; 27: 67-75.

LOE5, Fair Quality, Neutral - Trial in which in-patients with recurrent sustained hypotensive VT or VF who had failed treatment with procainamide, lidocaine and bretylium were given one of three doses of IV amiodarone. Of 273 patients 40% survived 24 hours without another arrhythmic episode. There was no clear difference between the three different doses of amiodarone.

Nademanee K, Taylor R, Bailey WE, Rieders DE, Kosar EM. Treating electrical storm : sympathetic blockade versus advanced cardiac life support-guided therapy. Circulation. 2000 Aug 15;102(7):742-7.

LOE 5, Fair Quality, Opposing – Inhospital, controlled trial, looking at the use of antiarrhythmics vs sympathetic blockade for prevention of VF. Reported decreased survival with antiarrhythmics compared to sympathetic blockade.

Nowak RM, Bodnar TJ, Dronen S, Gentzkow G, Tomlanovich MC. Bretylium tosylate as initial treatment for cardiopulmonary arrest: randomized comparison with placebo. Annals of emergency medicine. 1981 Aug;10(8):404-7.

LOE1, Fair Quality, Supporting – ED RCT, looking at the use of Bretylium vs placebo for all cardiac arrest rhythms. Found improved survival to admission for bretylium

Ohshige K, Shimazaki S, Hirasawa H, Nakamura M, Kin H, Fujii C, et al. Evaluation of out-of-hospital cardiopulmonary resuscitation with resuscitative drugs: a prospective comparative study in Japan. Resuscitation. 2005 Jul;66(1):53-61.

LOE3, Poor Quality, Supporting – OHCA controlled trial, looking at the use of Lidocaine for VF. Ambulances manned with physicians who were allowed to use epinephrine, lidocaine and atropine were compared to ambulances manned without physicians. Survival was improved in those patients lucky enough to be cared for by a more advanced EMS system in which lidocaine was allowed. However, this study suffers from so many confounders that it offers little support for lidocaine

Olson DW, Thompson BM, Darin JC, Milbrath MH. A randomized comparison study of bretylium tosylate and lidocaine in resuscitation of patients from out-of-hospital ventricular fibrillation in a paramedic system. Annals of emergency medicine. 1984 Sep;13(pt 2)(9):807-10.

LOE2, Good Quality, Neutral – OHCA, randomised trials, looking at the use of Bretylium vs Lidocaine for VF. Reported no difference in survival

Pollak PT, Wee V, Al-Hazmi A, Martin J, Zarnke KB. The use of amiodarone for in-hospital cardiac arrest at two tertiary care centres. The Canadian journal of cardiology. 2006 Mar 1;22(3):199-202.

LOE4, Fair Quality, Neutral A retrospective study of in-hospital arrest. Inclusion criteria was VT or VF arrest. Of 95 patients, roughly a third received amiodarone and the remainder chiefly lidocaine. In this small study there was no difference in survival between the groups given amiodarone vs lidocaine

Rea RS, Kane-Gill SL, Rudis MI, Seybert AL, Oyen LJ, Ou NN, et al. Comparing intravenous amiodarone or lidocaine, or both, outcomes for inpatients with pulseless ventricular arrhythmias. Critical care medicine. 2006 Jun;34(6):1617-23.

LOE4, Fair Quality, Neutral – Inhospital, retrospective review, looking at the use of Amiodarone vs Lidocaine for VF Reported no difference in survival to 24h

Skrifvars M.B (2004) The use of undiluted amiodarone in the management of out-of-hospital cardiac arrest. Acta Anaesthesiol. Scand. 2004 48:5 (582 - 587)

LOE 4, Fair Quality, neutral, Retrospective case series of IV amiodarone use in Helsinki which shows that undiluted amiodarone can be used safely.

Somberg JC, Bailin SJ, Haffajee CI, Paladino WP, Kerin NZ, Bridges D, et al. Intravenous lidocaine versus intravenous amiodarone (in a new aqueous formulation) for incessant ventricular tachycardia. Am J Cardiol. 2002 Oct 15;90(8):853-9.

LOE 5, Fair Quality, A very small multicenter double-blinded, parallel-designed, randomized trial evaluating the effectiveness of amiodarone (Amio-Aqueous) and lidocaine on shock resistant VT (lidocaine as control) Amiodarone was superior to lidocaine in: (1) termination of the VT, (2) survival at 1 hour, (3) survival at 24 hours (primary end point). However, there was no placebo group thus it is not clear whether amiodarone was beneficial or lidocaine harmful

Stiell IG, Wells GA, Hebert PC, Laupacis A, Weitzman BN. Association of drug therapy with survival in cardiac arrest: limited role of advanced cardiac life support drugs. Acad Emerg Med. 1995 Apr;2(4):264-73.

LOE4, Fair Quality, Neutral –Inhospital, retrospective review, looking at the use of antiarrhythmics for VF. Reported increased survival to 1h with procainamide, but no difference compared to patients who did not receive anti arrhythmic drugs with bretylium and lidocaine.

Tahara Y, Kimura K, Kosuge M, Ebina T, Sumita S, Hibi K, et al. Comparison of nifekalant and lidocaine for the treatment of shock-refractory ventricular fibrillation. Circ J. 2006 Apr;70(4):442-6.

LOE2, Fair Quality, Neutral - Retrospective study evaluating 120 OOH cardiac arrest patients refractory to 3 shocks from a defibrillator, epinephrine and a 4th shock who then received nifekalant (a class III AAD) or lidocaine. Nifekalant administration was associated with better ROSC and 24 hour survival. However there was no control group, thus whether nifekalant was beneficial or lidocaine detremental could not be ascertained.

The MC, Armstrong AL, McNulty SE, Califf RM, O'Connor CM. Randomised trial of magnesium in inhospital cardiac arrest. Duke Internal Medicine Housestaff. Lancet. 1997 Nov 1;350(9087):1272-6.

LOE1, Fair Quality, Neutral - ICU, RCT, looking at the use of Mg vs placebo for VF. Reported no difference in ROSC

Tomlinson, DR (2008) Intravenous amiodarone for the pharmacological termination of haemodynamically-tolerated sustained ventricular tachycardia: is bolus dose amiodarone an appropriate first-line treatment? Emergency Medicine Journal. 25(1):15-78

LOE 4, Fair Quality, Opposing-Small retrospective case series of patients with hemodynamically tolerated VT in which IV amiodarone terminated VT in 6/41 patients within 20 minutes, and 12/41 within 1 hour

van Walraven C, Stiell IG, Wells GA, Hebert PC, Vandemheen K. Do advanced cardiac life support drugs increase resuscitation rates from in-hospital cardiac arrest? The OTAC Study Group. Annals of emergency medicine. 1998 Nov;32(5):544-53.

LOE4, Fair Quality, Opposing – Inhospital, retrospective review, looking at the use of Lidocaine for VF. Reported decreased survival to 1h associated with lidocaine

Weaver WD, Fahrenbruch CE, Johnson DD, Hallstrom AP, Cobb LA, Copass MK. Effect of epinephrine and lidocaine therapy on outcome after cardiac arrest due to ventricular fibrillation. Circulation. 1990 Dec;82(6):2027-34.

LOE3, Fair Quality, Opposing - OHCA historical controls, looking at the use of lidocaine vs bicarbonate for VF. Reported decreased survival to admission with lidocaine

Intravenous Drug Administration During Out-of-Hospital Cardiac Arrest A Randomized Trial

Theresa M. Olasveengen, MD
Kjetil Sunde, MD, PhD
Cathrine Brunborg, MSc
Jon Thowsen
Petter A. Steen, MD, PhD
Lars Wik, MD, PhD

NTRAVENOUS ACCESS AND DRUG ADministration are integral parts of cardiopulmonary resuscitation (CPR) guidelines.¹ Millions of patients have received epinephrine during advanced cardiac life support (ACLS) with little or no evidence of improved survival to hospital discharge.^{1,2} The use of epinephrine is based on preclinical evidence of increased cerebral and coronary perfusion by redirected peripheral blood flow.1,2 Beneficial short-term effects of epinephrine have been shown in animal studies,³⁻⁵ but there is increasing concern for increased myocardial dysfunction^{6,7} and disturbed cerebral microcirculation after cardiac arrest.8 Epinephrine was an independent predictor of poor outcome in a large retrospective registry study,9 but this observational, nonrandomized study cannot prove a causal relationship. Despite its near-universal use, epinephrine has, to our knowledge, not been tested in a randomized controlled study with a nodrug comparison group.

If a negative association between epinephrine and survival is causal, it may be due to the drug or to inadequate CPR quality associated with drug adminis**Context** Intravenous access and drug administration are included in advanced cardiac life support (ACLS) guidelines despite a lack of evidence for improved outcomes. Epinephrine was an independent predictor of poor outcome in a large epidemiological study, possibly due to toxicity of the drug or cardiopulmonary resuscitation (CPR) interruptions secondary to establishing an intravenous line and drug administration.

Objective To determine whether removing intravenous drug administration from an ACLS protocol would improve survival to hospital discharge after out-of-hospital cardiac arrest.

Design, Setting, and Patients Prospective, randomized controlled trial of consecutive adult patients with out-of-hospital nontraumatic cardiac arrest treated within the emergency medical service system in Oslo, Norway, between May 1, 2003, and April 28, 2008.

Interventions Advanced cardiac life support with intravenous drug administration or ACLS without access to intravenous drug administration.

Main Outcome Measures The primary outcome was survival to hospital discharge. The secondary outcomes were 1-year survival, survival with favorable neurological outcome, hospital admission with return of spontaneous circulation, and quality of CPR (chest compression rate, pauses, and ventilation rate).

Results Of 1183 patients for whom resuscitation was attempted, 851 were included; 418 patients were in the ACLS with intravenous drug administration group and 433 were in the ACLS with no access to intravenous drug administration group. The rate of survival to hospital discharge was 10.5% for the intravenous drug administration group and 9.2% for the no intravenous drug administration group (P=.61), 32% vs 21%, respectively, (P<.001) for hospital admission with return of spontaneous circulation, 9.8% vs 8.1% (P=.45) for survival with favorable neurological outcome, and 10% vs 8% (P=.53) for survival at 1 year. The quality of CPR was comparable and within guideline recommendations for both groups. After adjustment for ventricular fibrillation, response interval, witnessed arrest, or arrest in a public location, there was no significant difference in survival to hospital discharge for the intravenous group vs the no intravenous group (adjusted odds ratio, 1.15; 95% confidence interval, 0.69-1.91).

Conclusion Compared with patients who received ACLS without intravenous drug administration following out-of-hospital cardiac arrest, patients with intravenous access and drug administration had higher rates of short-term survival with no statistically significant improvement in survival to hospital discharge, quality of CPR, or long-term survival.

Trial Registration clinicaltrials.gov Identifier: NCT00121524

JAMA. 2009;302(20):2222-2229

www.jama.com

Author Affiliations: Institute for Experimental Medical Research (Drs Olasveengen and Wik), Centre for Clinical Research (Ms Brunborg), and National Competence Centre for Emergency Medicine (Dr Wik), Departments of Anesthesiology (Dr Olasveengen) and Ambulance (Mr Thowsen and Dr Steen), Surgical Intensive Care Unit (Dr Sunde), and Faculty Division UUH (Dr Steen), Oslo University Hospital, Oslo, Norway. **Corresponding Author:** Theresa M. Olasveengen, MD, Institute for Experimental Medical Research, Oslo University Hospital, Ullevaal, N-0407 Oslo, Norway (t.m.olasveengen@medisin.uio.no).

2222 JAMA, November 25, 2009-Vol 302, No. 20 (Reprinted)

©2009 American Medical Association. All rights reserved.

tration. Drug administration includes time-consuming factors like establishing intravenous access, preparation, and administration of drugs and saline, thereby potentially removing focus from good-quality CPR. There are recent reports of poor-quality CPR and protocol adherence among professional CPR providers,^{10,11} and some consider intubation and intravenous access more important than giving good-quality chest compressions.¹² With inadequate CPR quality, effects of drugs administered peripherally also may be diminished or absent.13 Because there are no randomized controlled studies showing improved survival to hospital discharge with any drugs routinely administered during CPR, we concluded such a study was warranted.

In this prospective, randomized controlled trial of intravenous drug administration during out-of-hospital cardiac arrest, we compared outcomes for patients receiving standard ACLS with intravenous drug administration (control) and patients receiving ACLS without intravenous drug administration (intervention).

METHODS

The city of Oslo has a single-tiered emergency medical service system administered by the Oslo University Hospital for a population of 540 000. On weekdays between 7:30 AM and 10:00 PM, an ambulance staffed by 2 paramedics and an anesthesiologist functions on the same level as the regular paramedic-staffed ambulances. Until January 2006, ACLS was performed according to the International Guidelines 2000,14 with the modification that patients with ventricular fibrillation received 3 minutes of CPR before the first shock and between unsuccessful series of shocks.15 The European Resuscitation Council Guidelines for Resuscitation 2005¹⁶ were implemented in January 2006, incorporating this same modification of 3-minute periods of CPR. Defibrillators in manual mode are used and endotracheal intubation is standard for securing the airways. Two ambulances are routinely dispatched for suspected cardiac arrest. The physicianstaffed ambulance is dispatched whenever available.

All hospitals in Oslo have goaldirected postresuscitation protocols including therapeutic hypothermia regardless of initial rhythm or arrest etiology.¹⁷ A prehospital 12-lead electrocardiogram is routinely transmitted to the cardiologist on call after return of spontaneous circulation (ROSC). If coronary angiography is indicated for possible percutaneous coronary intervention, patients are transported directly from the scene to 1 of 2 university hospitals (Oslo University Hospital, Ullevaal and Rikshopitalet) with this capacity 24 hours per day.

Study Design and Recruitment

All patients older than 18 years with nontraumatic, out-of-hospital cardiac arrests between May 1, 2003, and April 28, 2008, were randomized by ambulance personnel on-site. Simple randomization occurred directly after ambulance personnel confirmed the cardiac arrest and then opened the sealed envelopes provided by the investigators. Patients were randomized to receive either ACLS with access to intravenous drug administration (intravenous group) or ACLS without access to intravenous drug administration (no intravenous group). In the no intravenous group, intravenous access was to be established 5 minutes after ROSC, and drugs could then be given if indicated.

Exclusion criteria were (1) cardiac arrest witnessed by ambulance crew because these patients almost always have an intravenous needle in place at the time of the cardiac arrest, (2) resuscitation initiated or interrupted by physicians outside of the ambulance team, or (3) cardiac arrest induced by asthma or anaphylactic shock (which were the last criteria added in October 2006). The study was approved by the regional ethics committee. Informed consent for inclusion was waived as decided by this committee, but was required from survivors with 1-year follow-up.

Equipment and Data Collection

Standard defibrillators (LIFEPAK 12 Physio-Control, Medtronic, Redmond, Washington) were used. Electrocardiograms with transthoracic impedance signals from these defibrillators were routinely transferred to a server at the National Competence Center for Emergency Medicine (Oslo, Norway) following cardiac arrest. Utstein cardiac arrest forms18 routinely completed by paramedics were submitted to the study supervisor along with a copy of the ambulance run sheet. Automated, computer-based dispatch center time records supplemented ambulance run sheets with regard to response intervals. For admitted patients, additional hospital records were obtained.

All trial data were documented according to the Utstein style.¹⁸ The primary end point was survival to hospital discharge. Secondary outcomes were 1-year survival, survival with favorable neurological outcome (using cerebral performance categories from 1 to 4),¹⁸ hospital admission with ROSC, and quality of CPR (ie, chest compression rate, pauses, and ventilation rate). The study was monitored annually with interim analysis by an external researcher who did not reveal any results to the investigators.

Data Processing

Data from each case were viewed and annotated using CODE-STAT 7.0 (Physio-Control, Medtronic) for detection of ventilations and chest compressions by changes in transthoracic impedance. Written information from patient report forms and locally adapted Utstein style forms were compared with typical changes in CPR patterns as shown using CODE-STAT 7.0. Initial rhythm assessment registered on patient report forms were confirmed by these electrocardiographic recordings if possible. Time without spontaneous circulation, time without compressions during time without spontaneous circulation (hands-off time), preshock pauses, compression rate and actual number of compressions, and ventilations per minute were calcu-

©2009 American Medical Association. All rights reserved.

lated for each episode. Hands-off ratio is defined as hands-off time divided by total time without ROSC. Electrocardiographic analysis was performed by 1 researcher (T.M.O.).

Statistical Analysis

Initial power analysis was based on survival statistics for the Oslo emergency medical service system and assumed that the survival rate would be doubled among patients not receiving epinephrine, as described previously in an observational study.⁹ With a projected survival rate of 7% in the intravenous group and 14% in the no intravenous group, 900 patients provided a power

level of 91.4% with a type I error of 5%.¹⁹

Analysis was performed on an intention-to-treat basis regardless of which treatment was actually given. Patients who were initially randomized, but were later found to meet predefined exclusion criteria were not included in the intention-to-treat analysis. Demographic and clinical data are presented as means with 95% confidence intervals (CIs), medians with ranges, or proportions. Crude effects between the 2 trial groups and survival were quantified by odds ratios (ORs) with 95% CIs. The χ^2 test for contingency tables with different



2224 JAMA, November 25, 2009—Vol 302, No. 20 (Reprinted)

©2009 American Medical Association. All rights reserved.

degrees of freedom was used to detect associations between categorical independent variables. For continuous variables, the t test was used for normally distributed data and the Mann-Whitney test was used for nonnormally distributed data.

Confounders were identified and quantified by using the Mantel-Haenszel test for both short-term and long-term survival, and subsequent manual backward-elimination procedures were performed. Correlations between potential confounders were investigated. Comparison of Kaplan-Meier survival curves was obtained using the Breslow and log-rank test statistics for short-term and long-term survival, respectively.^{20,21}

Two-sided *P* values of less than .05 were considered significant. The statistical analyses were performed using the software packages SPSS version 15.0 and SamplePower version 2.0 (SPSS Inc, Chicago, Illinois) and Egret version 2.0.31 (Cytel Software Corporation, Cambridge, Massachusetts).

RESULTS

Resuscitation was attempted in 1183 patients who experienced cardiac arrest during the study period, and 851 of 946 eligible patients were successfully randomized with 418 patients in the intravenous group and 433 patients in the no intravenous access group. For reasons listed in FIGURE 1, 95 eligible patients were not randomized and further randomization and inclusion details are illustrated. Eligible, nonrandomized patients did not differ significantly from randomized patients with regard to demographic characteristics and outcomes.

Baseline demographic characteristics and CPR-quality parameters are listed in TABLE 1. Defibrillation was attempted in more patients in the intravenous group compared with the no intravenous group (47% vs 37%, respectively; OR, 1.16 [95% CI, 0.74-1.82]). More defibrillation shocks were delivered to those who received defibrillation in the intravenous group compared with the no intravenous group (median, 3 [range, 1-22] vs 2 [range, 1-26], respectively; P = .008). Both groups had adequate and similar CPR quality with few chest compression pauses (median hands-off ratio, 0.15 for the intravenous group and 0.14 for the no intravenous group) and the compression and ventilation rates were within the guideline recommendations (Table 1).

In the intravenous group, 44 of 418 patients (10.5%) survived to hospital discharge vs 40 of 433 (9.2%) in the no intravenous group (OR, 1.16; 95% CI, 0.74-1.82; P=.61). Survival with favorable neurological outcome was 9.8% for the intravenous group and 8.1% for the no intravenous group (OR, 1.24; 95% CI, 0.77-1.98; P=.45). Short-term survival was significantly better in the intravenous group than in the no intravenous group with 40% vs 25%, respectively, achieving ROSC (OR, 1.99; 95% CI, 1.48-2.67; P<.001), 43% vs 29% admitted to the hospital (OR, 1.81; 95% CI, 1.36-2.40; P<.001), and 30% vs 20% admitted to the intensive care unit (ICU) (OR, 1.67; 95% CI, 1.22-2.29; P=.002) (TABLE 2). In-hospital treatments, including therapeutic hypothermia and percutaneous coronary intervention, were equally distributed between the 2 groups. There were no differences in cause of death among patients admitted to the ICU and most deaths were due to brain damage (Table 2).

Patients were divided into 2 predefined subgroups based on their initial rhythms (TABLE 3). In patients with an initial rhythm of ventricular fibrillation or pulseless ventricular tachycardia, there were no differences in short-term or long-term outcomes. In the subgroup with nonshockable rhythms (initial rhythm of asystole or pulseless electrical activity), the ROSC rate was 3-fold higher with intravenous treatment (P < .001), but there was no difference in long-term outcome because the survival rate among those admitted to the ICU tended to be almost 3 times higher in the no intravenous group (P = .07; Table 3).

A public cardiac arrest location, response interval, and initial ventricular fibrillation were identified as potential confounders and were included in the logistic regression analysis. Multivariate logistic regression analyses for short-term survival (admitted to the ICU) and long-term survival (discharged from the hospital) were performed. After adjustment for confounders, patients in the intravenous group had a nonsignificant 15% increased chance of surviving to hospital discharge (adjusted OR [AOR], 1.15; 95% CI, 0.69-1.91) compared with patients in the no intravenous group. Patients with ventricular fibrillation or pulseless ventricular tachycardia as the initial rhythm had a 10-fold improvement in long-term survival (AOR, 10.47; 95% CI, 5.47-20.03). Patients with bystander-witnessed cardiac arrests or cardiac arrests in public places had a 2-fold improvement in longterm survival (AOR, 2.13 [95% CI, 1.02-4.45] and AOR, 2.03 [95% CI, 1.19-3.44], respectively), whereas the odds of long-term survival decreased by

Table 1. Demographics and Quality of	of Cardiopulmonary Resuscitation (CPR) ^a						
	No Intravenous (n = 433)	Intravenous (n = 418)	<i>P</i> Value ^b				
Age, mean (SD), y	64 (17)	64 (18)	.85				
Male sex, No. (%)	303 (70)	302 (72)	.51				
Cardiac etiology, No. (%)	305 (70)	300 (72)	.72				
Location of arrest, No. (%) Home	238 (55)	237 (57)	.72				
Public	159 (37)	144 (34)	.50				
Other	34 (8)	37 (9)	.70				
Bystander witnessed, No. (%)	273 (63)	283 (68)	.18				
Bystander basic life support, No. (%)	274 (63)	261 (62)	.86				
Initial rhythm, No. (%) Ventricular fibrillation or pulseless ventricular tachycardia	142 (33)	144 (34)	.66				
Asystole	228 (53)	192 (46)	.06				
Pulseless electrical activity	63 (15)	82 (20)	.06				
Physician-staffed ambulance present	160 (37)	157 (38)	.91				
Response interval, mean (95% Cl), min	10 (9-10)	10 (9-10)	.28				
Intubation, No. (%)	363 (84)	368 (88)	.10				
Intravenous drugs during resuscitation, No. (%)	42 (10)	343 (82)	<.001				
Epinephrine	37 (9)	330 (79)	<.001				
Atropine	20 (5)	194 (46)	<.001				
Amiodarone	17 (4)	69 (17)	<.001				
Defibrillation	160 (37)	194 (46)	.005				
No. of shocks when defibrillated, median (range)	2 (1-22)	3 (1-26)	.008				
Electrocardiogram available for analysis, No. (%)	329 (76)	314 (75)	.83				
CPR duration, mean (95% CI), min	18 (17-19)	22 (20-23)	<.001				
Hands-off ratio, median (range) ^c	0.14 (0.01-0.59)	0.15 (0.02-0.89)	.16				
Compression rate, mean (95% CI) ^d	116 (115-117)	117 (116-119)	.12				
Compressions, mean (95% CI), min ^{-1e}	94 (93-96)	94 (92-96)	.90				
Ventilations, mean (95% Cl), min ^{-1e}	11 (10-11)	11 (11-11)	.48				
Preshock pause, median (range), s	11 (1-74)	12 (1-82)	.58				

Abbreviation: CI, confidence interval. ^a Data are missing for 80 patients in the group with advanced cardiac life support without intravenous access or administration (no intravenous) and 79 patients in the group with advanced cardiac life support and intravenous access and administration of drugs (intravenous).

^b The differences between groups were analyzed using the χ^2 test with continuity correction for categorical data and the *t* test or Mann-Whitney test for continuous data as appropriate. ^CIndicates the proportion of time without chest compressions during the resuscitation effort.

^d Indicates the rate of compressions when delivered.

^eIndicates the average number of compressions actually given per minute during the resuscitation effort.

©2009 American Medical Association. All rights reserved.

(Reprinted) JAMA, November 25, 2009-Vol 302, No. 20 2225

17% for each minute of prolonged response interval (AOR, 0.83; 95% CI, 0.77-0.90). When adjusted for the same confounding factors, survival to ICU admission was higher for patients in the intravenous group (AOR, 1.78; 95% CI, 1.26-2.51).

The cumulative postcardiac arrest survival rate at 7 days was 14.6% (95% CI, 11.3%-17.9%) for patients in the intravenous group vs 12.8% (95% CI, 9.7%-15.9%) for patients in the no intravenous group, 11.3% (95% CI, 8.4%-14.2%) vs 8.8% (95% CI, 6.1%-11.5%), respectively, at 1 month, and 9.8% (95% CI, 6.9%-12.7%) vs 8.4% (95% CI, 5.9%-10.9%) at 1 year (FIGURE 2). Short-term survival was significantly higher for patients in the intravenous group compared with patients in the no intravenous group (Breslow P=.004), although there was no difference in long-term survival (logrank P=.23)

COMMENT

Our results represent the first attempt, to our knowledge, to evaluate the effect of intravenous access and intravenous drug administration on outcome in patients with an out-ofhospital cardiac arrest. Short-term survival was higher in the intravenous group, but these nearly universally applied interventions were not associated with a statistically significant improvement in survival to hospital discharge.

Administration of intravenous drugs did not appear to interfere with the quality of CPR. Ambulance personnel delivered good-quality CPR with few

Table 2. In-Hospital Treatment and Outo	come		
	No Intravenous (n = 433)	Intravenous (n = 418)	<i>P</i> Value ^a
Any ROSC during resuscitation	107 (25)	165 (40)	<.001
Admitted to hospital	126 (29)	178 (43)	<.001
ROSC	89 (21)	133 (32)	<.001
Ongoing CPR	37 (9)	45 (11)	.33
Admitted to ICU ^b	88 (20)	125 (30)	.002
Awake at ICU admission	8 (9)	7 (6)	.48
Therapeutic hypothermia	62 (70)	90 (72)	.93
Angiography or PCI	43 (49)	50 (40)	.33
Time in ICU, median (range), d ^c	6 (1-31)	4 (1-44)	.05
Cause of death in ICU ^d Brain	29 (69)	52 (70)	>.99
Cardiac	8 (19)	12 (16)	.90
Multiorgan failure	5 (12)	10 (14)	>.99
Discharged alive	40 (9.2)	44 (10.5)	.61
Cerebral performance score at discharge 1 (good cerebral performance)	30 (7.0)	37 (8.9)	.31
1-2 (good cerebral performance to moderate cerebral disability)	35 (8.1)	41 (9.8)	.45
2 (moderate cerebral disability)	5 (1.2)	4 (1.0)	>.99
3 (severe cerebral disability)	3 (1.0)	3 (1.0)	>.99
4 (coma or vegetative state)	2 (<1.0)	0	.50
Discharged from hospital if admitted to ICU	40 (45)	44 (35)	.17
Alive 1 y after cardiac arrest ^e	36 (8)	41 (10)	.53

Abbreviations: CPR, cardiopulmonary resuscitation; ICU, intensive care unit; PCI, percutaneous coronary intervention; ROSC, return of spontaneous circulation. ^aThe differences between groups were analyzed using the χ^2 test with continuity correction for categorical data and

^aThe differences between groups were analyzed using the χ² test with continuity correction for categorical data and the Mann-Whitney test for number of days in the ICU.

^b Includes patients admitted to the ICU only. ^cData are missing for 3 patients in each group

Includes patients who died in the ICU only. Data are missing for 6, leaving 42 as the denominator in the group with advanced life support without intravenous access or drug administration (no intravenous), and 7, leaving 74 as the denominator in the group with advanced cardiac life support and intravenous access and administration of drugs (intravenous).

^eTwo patients in the no intravenous group and 1 patient in the intravenous group were lost to 1-year follow-up.

pauses and with rates within guideline recommendations¹ in both groups. This is important because potential improvements in intravenous medication administration during ACLS will not need to overcome an intrinsic tendency to degrade CPR.

We did not confirm the previous observational finding that intravenous epinephrine was an independent predictor for poor outcome.⁹ Our results are consistent with a multicenter study by Stiell et al²² that found no difference in survival after implementing intravenous drug administration during outof-hospital cardiac arrest (OR, 1.1; 95% CI, 0.8-1.5).

Without differences in the predefined primary outcome, patients in the intravenous group received more defibrillations, were resuscitated for a longer period, and more frequently had ROSC. With similar and adequate CPR quality, this is likely due to the pharmacological effects of the drugs used (epinephrine, atropine, and/or amiodarone). This finding is consistent with previous animal studies with epinephrine,^{6,7} and clinical studies evaluating the effects of amiodarone,²³ atropine,24 and even high-dose epinephrine,²⁵ all of which documented improved short-term effects without improving long-term outcomes. While epinephrine can produce more spontaneously beating hearts in animal models, it is also associated with increased postresuscitation myocardial dysfunction that might partly explain these clinical observations.6,7 Negative postresuscitation effects of epinephrine also are reported to be more prominent after longer, more clinically relevant cardiac arrest periods (eg, 4-6 minutes) than short cardiac arrest periods (eg, 2 minutes).7 Moreover, an experimental study has recently documented detrimental effects of epinephrine on cerebral microcirculation.8

The clinical implications of an increased ROSC rate in the intravenous group are difficult to interpret. Should improved short-term outcome be regarded as unfulfilled potential that

2226 JAMA, November 25, 2009-Vol 302, No. 20 (Reprinted)

	With Rhythms, No. (%)			Without Rhythms		
	No Intravenous (n = 142)	Intravenous (n = 144)	P Value ^a	No Intravenous (n = 291)	Intravenous (n = 274)	<i>P</i> Value ^a
Any ROSC during resuscitation	75 (53)	85 (59)	.35	32 (11)	80 (29)	<.001
Admitted to hospital	79 (56)	94 (65)	.12	47 (16)	84 (31)	<.001
Admitted to ICU	60 (42)	74 (51)	.15	28 (10)	51 (19)	.003
Discharged alive	32 (23)	39 (27)	.45	8 (3)	5 (2)	.65
Discharged with CPC score of 1-2	29 (20)	37 (26)	.36	6 (2)	4 (2)	.82
Discharged if admitted to ICU	32 (53)	39 (53)	>.99	8 (29)	5 (10)	.07

Abbreviations: CPC, cerebral performance score; ICU, intensive care unit; ROSC, return of spontaneous circulation ^aThe differences between the groups were analyzed using the χ^2 test with continuity correction.

might be addressed with better post-ROSC care, or unproductive resuscitation of patients whose vital organ injury makes them unlikely candidates for long-term survival? In the present study, most patients who died in the hospital after initial successful resuscitation in both groups had severe cerebral damage. If present pharmacological interventions only facilitate cardiac resuscitation in patients who will ultimately experience irreversible cerebral damage, this may cause an additional burden on already overburdened ICUs.

However, long-term survival cannot be achieved without first restoring circulation. Improved brain-directed postresuscitation treatment might at some point prevent irreversible cerebral damage and increase survival. At present, the only established braindirected treatment is therapeutic hypothermia,^{26,27} and the rate of which was high in both groups (71% and 72%). It is possible that for some patients in our study with early postresuscitation cardiac death, advanced options such as mechanical chest compression devices,28 extracorporeal membrane oxygenation,²⁹ or left ventricular assist devices³⁰ could enable corrective treatment of underlying causes and theoretically improve survival.

The results of our study highlight the question of whether patients presenting with initial shockable rhythms and nonshockable rhythms should be treated differently. Initial shockable rhythm was a potential effect modifier in our statistical analysis, indicating that the degree of benefit or harm of intravenous drug administration during cardiac arrest may depend on the presenting rhythm. No differences in outcome were found for patients with shockable rhythms, while patients with nonshockable rhythms had higher rates of ROSC in the intravenous group, but an opposite tendency toward a lower rate of survival to hospital discharge among those admitted to the hospital. This suggests that late toxicity after intravenous drug administration contributes importantly to the poor outcomes of these patients.

Several studies have identified dissimilar etiologies in subgroups with shockable and nonshockable rhythms, ³¹⁻³³ and it seems reasonable that differences in treatment strategies will emerge.³⁴ Retrospective subgroup analysis for cardiac arrest times (<5 minutes, 5-10 minutes, or >10 minutes) did not reveal any suggestive information either alone or combined with initial rhythm (data not presented but available from authors upon request). However, our study was not powered for formal subgroup analysis and no conclusions should be drawn.

The present data indicating goodquality CPR in both groups suggest that the lack of improved long-term outcome with ACLS with intravenous drug administration cannot be explained by poor-quality CPR.¹³ This does not exclude the possibility that other drug regimens might improve outcome. Early administration, as recently advocated,^{35,36} must be evaluated in systems with shorter ambulance response intervals or





other intravenous drug regimens and priorities that are different from the present guidelines.

Our study has several limitations. First, ambulance personnel could not be blinded to the randomization. Closely related to this, only patients who were randomized to the no intravenous group could be monitored with regard to protocol compliance. If intravenous drugs were administered to a patient in the no intravenous group, violation of the study protocol could be documented. If intravenous drugs were not administered to a patient in the intravenous group, several valid reasons could exist, such as rapid ROSC. We have no reason to believe that personnel refrained from establishing intra-

©2009 American Medical Association. All rights reserved.

venous access under the pretense that the procedure was unsuccessful. The ambulance personnel involved were strongly committed to testing the hypothesis presented, but we cannot totally rule out possible bias toward procedures such as intravenous access and administration of drugs, which have been important in Norwegian culture for decades.

Second, quality of CPR could only be assessed in 75% of cases. Still, this is, to our knowledge, the first clinical intervention study reporting CPR quality data, and no significant differences were found between these data and those unavailable for analysis. Also, we do not have reliable time points for drug administration. Paramedics in the Oslo emergency medical service system are highly trained and both the guidelines and training emphasize early intravenous access and drug administration and intubation with the shortest possible pauses in chest compressions.

Third, this is a single center study and the results may not be generalized to systems with different training, infrastructure, treatment protocols, or quality of CPR. Fourth, while time from cardiac arrest to the initiation of ACLS is important for patient survival, the estimated time of cardiac arrest is imprecise and one-third of the cardiac arrests were unwitnessed. This variable is therefore not included in the anlysis. Only the emergency medical service response interval was included.

Finally, a type II error cannot be ruled out. Although based on the best available evidence at the time,⁹ the power analysis was, in retrospect, optimistic in assuming a doubling in survival for the patients in the no intravenous group. For the observed difference between the groups to be statistically significant, a sample size of 14000 patients would be needed. Because this sample size has not been considered inappropriate in cardiovascular interventions, our results could be background for such a large study that could be positive for intravenous access and drug administration. At a minimum, our results indicate that clinical equipoise exists on the efficacy of intravenous drugs in the treatment of cardiac arrest and that more definitive trials could be ethically undertaken. Alternatively, the poor survival rates after cardiac arrest, which do not seem to be significantly improved by intravenous drug administration, indicate that research should be directed at new pharmacological interventions that hold promise of greater effect.

CONCLUSION

Despite improved short-term survival among patients randomized to receive intravenous access and drug administration, these nearly universal interventions were not associated with a statistically significant improvement in survival to hospital discharge. Larger trials examining resuscitation without intravenous access and drug administration, as well as of existing or new drugs, appear to be justified.

Author Contributions: Dr Olasveengen had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Thowsen, Steen, Wik. Acquisition of data: Olasveengen, Thowsen, Wik. Analysis and interpretation of data: Olasveengen, Sunde, Brunborg, Steen.

Drafting of the manuscript: Olasveengen, Sunde, Steen.

Critical revision of the manuscript for important intellectual content: Brunborg, Thowsen, Wik. *Statistical analysis:* Olasveengen, Brunborg.

Obtained funding: Steen.

Administrative, technical, or material support: Thowsen, Wik.

Study supervision: Sunde, Brunborg, Steen, Wik. Financial Disclosures: Dr Olasveengen reported receiving speakers' fees from Medtronic (Oslo, Norway) and research support from Laerdal Medical Corporation (Stavanger, Norway). Dr Steen reported being a member of the board of directors for Laerdal Medical and the Norwegian Air Ambulance. Dr Wik reported being on a medical advisory board for Physio-Control, consulting for Laerdal, Zoll, and Jolife, and being a principle investigator

for a multicenter mechanical chest compression device study sponsored by Zoll. Dr Sunde, Ms Brunborg, and Mr Thowsen did not report any financial disclosures.

Funding/Support: The study was supported by grants from the Eastern Norway Regional Health Authority, Oslo University Hospital, Norwegian Air Ambulance Foundation, Laerdal Foundation for Acute Medicine, and the Anders Jahres Fund.

Role of the Sponsors: The funding organizations had no involvement with the design and conduct of the study; collection, management, analysis, and interpretation of the data; and preparation, review, or approval of the manuscript

Additional Contributions: Martin Samdal assisted in data collection as required research exposure as a medical student at the University of Oslo and did not receive any financial compensation for his

work. Andres Neset is enrolled in a combined MD/PhD program at the University of Oslo and assisted with data analysis and did not receive any financial compensation for his work. Morten Pytte. MD, PhD, provided useful feedback in preparing the manuscript and did not receive any financial compensation for his work. Knut Arvid Kirkebøen, MD (University of Oslo), provided useful feedback in preparing the manuscript and did not receive any financial compensation for his work. Norman Paradis, MD (vice president and chief medical officer at Zoll Circulation), provided useful feedback and advice in preparing the manuscript and did not receive any financial compensation for his work. We thank all of the physicians and paramedics working in the Oslo emergency medical service system.

REFERENCES

1. 2005 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care, part 7.2: management of cardiac arrest. *Circulation*. 2005;112(24)(suppl):IV-58-IV-66. doi: 10.1161/CIRCULATIONAHA.105.16657.

2. Gazmuri RJ, Nolan JP, Nadkarni VM, et al. Scientific knowledge gaps and clinical research priorities for cardiopulmonary resuscitation and emergency cardiovascular care identified during the 2005 International Consensus Conference on ECC and CPR Science with Treatment Recommendations. *Resuscitation*. 2007;75(3):400-411.

3. Pearson JW, Redding JS. Epinephrine in cardiac resuscitation. *Am Heart J.* 1963;66:210-214.

Michael JR, Guerci AD, Koehler RC, et al. Mechanisms by which epinephrine augments cerebral and myocardial perfusion during cardiopulmonary resuscitation in dogs. *Circulation*. 1984;69(4):822-835.
 Otto CW, Yakaitis RW. The role of epinephrine in

CPR: a reappraisal. Ann Emerg Med. 1984;13(9 Pt 2): 840-843.

6. Tang W, Weil MH, Sun S, et al. Epinephrine increases the severity of postresuscitation myocardial dysfunction. *Circulation*. 1995;92(10):3089-3093.
7. Angelos MG, Butke RL, Panchal AR, et al. Cardio-

vascular response to epinephrine varies with increasing duration of cardiac arrest. *Resuscitation*. 2008; 77(1):101-110.

8. Ristagno G, Sun S, Tang W, et al. Effects of epinephrine and vasopressin on cerebral microcirculatory flows during and after cardiopulmonary resuscitation. *Crit Care Med.* 2007;35(9):2145-2149.

9. Holmberg M, Holmberg S, Herlitz J. Low chance of survival among patients requiring adrenaline epinephrine or intubation after out-of-hospital cardiac arrest in Sweden. *Resuscitation*. 2002;54(1):37-45.

10. Wik L, Kramer-Johansen J, Myklebust H, et al. Quality of cardiopulmonary resuscitation during outof-hospital cardiac arrest. *JAMA*. 2005;293(3): 299-304.

11. Abella BS, Alvarado JP, Myklebust H, et al. Quality of cardiopulmonary resuscitation during inhospital cardiac arrest. *JAMA*. 2005;293(3):305-310.

12. Ødegaard S, Kramer-Johansen J, Bromley A, et al. Chest compressions by ambulance personnel on chests with variable stiffness. *Resuscitation*. 2007;74(1): 127-134.

13. Pytte M, Kramer-Johansen J, Eilevstjonn J, et al. Haemodynamic effects of adrenaline (epinephrine) depend on chest compression quality during cardiopulmonary resuscitation in pigs. *Resuscitation*. 2006; 71(3):369-378.

14. Part 1: introduction to the International Guidelines 2000 for CPR and ECC. *Circulation*. 2000; 102(8 suppl):I1-I11.

©2009 American Medical Association. All rights reserved.

15. Wik L, Hansen TB, Fylling F, et al. Delaying defibrillation to give basic cardiopulmonary resuscitation to patients with out-of-hospital ventricular fibrillation. *JAMA*. 2003;289(11):1389-1395.

16. Nolan JP, Deakin CD, Soar J, et al; European Resuscitation Council. European Resuscitation Council Guidelines for Resuscitation 2005. *Resuscitation*. 2005; 67(suppl 1):S39-S86.

17. Sunde K, Pytte M, Jacobsen D, et al. Implementation of a standardised treatment protocol for post resuscitation care after out-of-hospital cardiac arrest. *Resuscitation*. 2007;73(1):29-39.

18. Jacobs I, Nadkarni V, Bahr J, et al; International Liaison Committee on Resuscitation; American Heart Association; European Resuscitation Council; Australian Resuscitation Council; New Zealand Resuscitation Council; Heart and Stroke Foundation of Canada; InterAmerican Heart Foundation; Resuscitation Councils of Southern Africa; ILCOR Task Force on Cardiac Arrest and Cardiopulmonary Resuscitation Outcomes. Cardiac arrest and cardiopulmonary resuscitation outcome reports: update and simplification of the Utstein templates for resuscitation registries. *Circulation*. 2004;110(21):3385-3397.

19. Pocock SJ. Chapter 9: the size of a clinical trial. In: *Clinical Trials: A Practical Approach*. Chichester, England: Wiley; 1983:123-142.

20. Breslow NE, Day DN. Statistical methods in cancer research. In: *Vol 1: The Analysis of Case-Control Studies*. Lyon, France: International Agency for Research on Cancer; 1980. IARC scientific publications No. 32.

21. Kleinbaum DG, Kupper LL, Morgenstern H. Chapter 19: interaction, effect modification, and synergism. *Epidemiologic Research: Principles and Quantitative Methods*. New York, NY: Van Nostrand Reignold Co Inc; 1982:403-447.

22. Stiell IG, Wells GA, Field B, et al; Ontario Prehospital Advanced Life Support Study Group. Advanced cardiac life support in out-of-hospital cardiac arrest. *N Engl J Med.* 2004;351(7):647-656.

 Kudenchuk PJ, Cobb LA, Copass MK, et al. Amiodarone for resuscitation after out-of-hospital cardiac arrest due to ventricular fibrillation. *N Engl J Med*. 1999; 341(12):871-878.

24. Stueven HA, Tonsfeldt DJ, Thompson BM, et al. Atropine in asystole: human studies. *Ann Emerg Med.* 1984;13(9 pt 2):815-817.

25. Vandycke C, Martens P. High dose versus standard dose epinephrine in cardiac arrest. *Resuscitation*. 2000;45(3):161-166.

26. Bernard SA, Gray TW, Buist MD, et al. Treatment of comatose survivors of out-of-hospital cardiac arrest with induced hypothermia. *N Engl J Med*. 2002;346(8):557-563.

27. Hypothermia After Cardiac Arrest Study Group. Mild therapeutic hypothermia to improve the neurologic outcome after cardiac arrest. *N Engl J Med*. 2002; 346(8):549-556.

28. Grogaard HK, Wik L, Eriksen M, et al. Continuous mechanical chest compressions during cardiac arrest to facilitate restoration of coronary circulation with percutaneous coronary intervention. *J Am Coll Cardiol.* 2007;50(11):1093-1094. **29.** Chen YS, Lin JW, Yu HY, et al. Cardiopulmonary resuscitation with assisted extracorporeal lifesupport versus conventional cardiopulmonary resuscitation in adults with in-hospital cardiac arrest. *Lancet*. 2008;372(9638):554-561.

30. Birks EJ, Tansley PD, Hardy J, et al. Left ventricular assist device and drug therapy for the reversal of heart failure. *N Engl J Med.* 2006;355(18):1873-1884.

31. Silfvast T. Cause of death in unsuccessful prehospital resuscitation. *J Intern Med.* 1991;229(4): 331-335.

32. Virkkunen I, Paasio L, Ryynanen S, et al. Pulseless electrical activity and unsuccessful out-of-hospital resuscitation. *Resuscitation*. 2008;77(2): 207-210.

33. Spaulding CM, Joly LM, Rosenberg A, et al. Immediate coronary angiography in survivors of out-ofhospital cardiac arrest. *N Engl J Med.* 1997;336 (23):1629-1633.

34. Wenzel V, Krismer AC, Arntz HR, Sitter H, Stadlbauer KH, Lindner KH; European Resuscitation Council Vasopressor during Cardiopulmonary Resuscitation Study Group. A comparison of vasopressin and epinephrine for out-of-hospital cardiopulmonary resuscitation. *N Engl J Med.* 2004;350(2):105-113.

35. Ewy GA, Kern KB. Recent advances in cardiopulmonary resuscitation: cardiocerebral resuscitation. *J Am Coll Cardiol*. 2009;53(2):149-157.

36. Morris DC. Vasopressors in cardiopulmonary resuscitation. *N Engl J Med*. 2008;359(15):1624.

I have learned throughout my life as a composer chiefly through my mistakes and pursuits of false assumptions, not by my exposure to founts of wisdom and knowledge.

—Igor Stravinsky (1882-1971)

Cardiac Arr	est – VF/VT
ADULT	PEDIATRIC
BLS Pro	cedures
If collapse before dispatch, complete 5 cycles (2 minutes) of CPR, then attach AED If witnessed, immediately attach AED Airway management per VCEMS policy	If collapse before dispatch, complete 5 cycles (2 minutes) of CPR, then attach AED If witnessed, immediately attach AED Airway management per VCEMS policy
ALS Prior to Base	Hospital Contact
 Defibrillate Use the biphasic energy settings that have been approved by service provider medical director Repeat every 2 minutes as indicated IV or IO access Epinephrine IV/IO – 1:10,000: 1 mg (10 mL) q 3-5 min Lidocaine IV/IO – 1 mg/kg q 3-5 min Max 3 mg/kg ALS Airway Management If unable to ventilate by BLS measures, initiate appropriate advanced airway procedures POST-CONVERSION If patient converts to narrow complex rhythm greater than 50 bpm and not in 2nd or 3rd degree heart block Lidocaine IV/IO – 1 mg/kg If Lidocaine has already been administered, then withhold this dose 	 Defibrillate – 2 Joules/kg If patient still in VF/VT at rhythm check, increase to 4 Joules/kg Repeat every 2 minutes as indicated IV or IO access Epinephrine 1:10,000 IV/IO – 0.01mg/kg (0.1 mL/kg) q 3-5 min Lidocaine – Every 3-5 min IV/IO – 1 mg/kg Max 3 mg/kg ALS Airway Management If unable to ventilate by BLS measures, initiate appropriate advanced airway procedures POST-CONVERSION If patient converts to narrow complex rhythm greater than 50 bpm and not in 2nd or 3rd degree heart block Lidocaine IV/IO – 1 mg/kg If Lidocaine has already been administered, then withhold this dose
Base Hospita	Orders only
 Tricyclic Antidepressants Sodium Bicarbonate IV/IO – 1 mEq/kg Repeat 0.5 mEq/kg q 5 min Torsades de Pointes Magnesium Sulfate IV/IO – 2 gm over 2 min May repeat x 1 in 5 min 	Tricyclic Antidepressants ● Sodium Bicarbonate ○ IV/IO – 1 mEq/kg ● Repeat 0.5 mEq/kg q 5 min
Consult with ED Physician for further treatment measures	Consult with ED Physician for further treatment measures
Additional Information: If sustained ROSC (< 30 seconds), perform 12-lea If patient is <u>hypothermic</u> – only ONE round of me 	ad EKG. Transport to SRC edication administration and limit defibrillation to 6 times

- If patient is <u>nypotnermic</u> only ONE round of medication administration and limit deribrillation to 6 times prior to Base Hospital contact. Field determination of death is discouraged in these patients and they should be transported to the most accessible receiving facility
- Ventricular tachycardia (VT) is a rate > 150 bpm

Effective Date:	June 1, 2011	Date Revised:	April 14, 2011
Next Review Date:	June 1, 2012	Last Reviewed:	April 14, 2012
G:\EMS\POLICY\Ap	proved\0705_08_Cardia	c_Arrest-VF_VT_/	Apr_11.Docx



VCEMS Medical Director

Chest Pain – Acute Coronary Syndrome

BLS Procedures

Administer oxygen if dyspnea, signs of heart failure or shock, or SAO2 < 94% Assist patient with prescribed Nitroglycerin as needed for chest pain

• Hold if SBP < 100 mmHg

ALS Prior to Base Hospital Contact

Perform 12-lead ECG

- If "***ACUTE MI SUSPECTED***" is present, expedite transport to closest STEMI Receiving Center
- Document all initial and ongoing rhythm strips and ECG changes
- For continuous chest pain consistent with ischemic heart disease:

Nitroglycerin

- SL or lingual spray 0.4 mg q 5 min for continued pain
 - No max dosage
 - Maintain SBP > 100 mmHg
 - If normal SBP < 100 mmHg, then maintain SBP > 90 mmHg
- Aspirin

○ PO – 324 mg

IV access

- 3 attempts only prior to Base Hospital contact
- If pain persists and not relieved by NTG:
 - Morphine per policy 705 Pain Control
 - Maintain SBP > 100 mmHg

If patient presents or becomes hypotensive:

- Elevate legs
- Normal Saline
 - o IV bolus 250 mL
 - Unless CHF is present

Communication Failure Protocol

One additional IV attempt if not successful prior to initial BH contact

• 4 attempts total per patient

Ventricular Ectopy – PVC's > 10/min, multifocal PVC's, or unsustained V-Tach

- Lidocaine
 - o IV − 1 mg/kg
 - May repeat 0.5 mg/kg slow IVP q 5-10 min for continued ectopy
 - Max 3 mg/kg
- If hypotensive and signs of CHF are present or no response to fluid therapy:
 - Dopamine
 - o IVPB 10 mcg/kg/min

Base Hospital Orders only

Consult ED Physician for further treatment measures

Additional Information:

Nitroglycerin is contraindicated when erectile dysfunction medications (Viagra, Levitra, and Cialis) have been
recently used (Viagra or Levitra within 24 hours; Cialis within 48 hours). NTG then may only be given by ED
Physician order

Effective Date:	June 1, 2011	Date Revised:	April 2011
Next Review Date:	June 1, 2012	Last Reviewed:	April 14, 2011
G:\EMS\POLICY\Appr	oved\0705_09_Chest_Pain	_Apr_11.Docx	

VCEMS Medical Director



Ventricular Tachycardia Sustained – Not in Arrest
BLS Procedures
Administer oxygen as indicated
ALS Prior to Base Hospital Contact
IV Access
 <u>Stable</u> – Mild to moderate chest pain/SOB Lidocaine IV − 1 mg/kg Rate of 50 mg/min
 Unstable – ALOC, signs of shock or CHF Midazolam IV - 2 mg Should only be given if it does not result in delay of synchronized cardioversion For IV use – Dilute 5 mg (1mL) Midazolam with 4 mL NS for a final volume of 5 mL concentration of 1 mg/mL Synchronized Cardioversion Use the biphasic energy settings that have been approved by service provider medical director If patient needs sedation and there is a delay in obtaining sedation medication IV - 1 mg/kg Rate of 50 mg/min
Unstable polymorphic (irregular) VT: Defibrillation Use the biphasic energy settings that have been approved by service provider medical director
 POST-CONVERSION If patient converts to narrow complex rhythm greater than 50 bpm and not in 2nd or 3rd degree heart block Lidocaine IV – 1 mg/kg If Lidocaine has already been administered, then withhold this dose
If recurrent VT, perform synchronized cardioversion at last successful biphasic energy setting
Communication Failure Protocol
 Stable/Unstable: Repeat Lidocaine IV – 0.5 mg/kg q 5-10 min Max 3 mg/kg Hold if decreased cardiac output, significant liver dysfunction, or in patient > 70 years of age
Base Hospital Orders only
 Torsades de Pointes Magnesium Sulfate o IVPB - 2 gm in 50 mL D₅W infused over 5 min May repeat x 1 if Torsades continues or recurs
Consult with ED Physician for further treatment measures
 Additional Information: Early base hospital contact is recommended in unusual circumstances, e.g. Torsades de Pointes, Tricyclic OD and renal failure. Ventricular tachycardia (VT) is a rate > 150 bpm

Effective Date:December 1, 2010Date Revised:August, 2010Next Review Date:December, 1, 2011Last Reviewed:August, 2010G:\EMS\POLICY\Approved\0705_25_V-Tach_Sustained_Aug_10.Doc



VCEMS Medical Director

Childbirth

BLS Procedures

Determine

- number of pregnancies (gravida)
- number of deliveries (para)
- due date (weeks of gestation)
- onset/duration/frequency/intensity of contractions
- if a rupture of membranes has occurred (including color/<u>date/time</u>)
- if any expected complications during pregnancy are present
- Visualize to determine if there-presence of is crowning or any abnormal presenting part at perineum

PROLAPSED CORD		OTHER PRE	ESENTING PA	ART
	DELI	VERING	N	OT DELIVERING
Cover cord with wet saline dressing Place mother in left-lateral Trendelenberg position Provide constant manual pressure on presenting part to avoid cord compression	Elevate hips Assist delivery w Code-3 trans Assist with bree supporting the in (covering to ma warmth)	vhile initiating sport ch delivery while nfant's body intain body	Place mothe Trendele Initiate Code	er in left-lateral enberg position e-3 transport
Initiate Code-3 transport if the	ere is partial delivery o	of the infant and no	further progre	ss after 1-2 minutes
nose The meconium is present, such breathe Dry and stimulate (rub gently, bu Note time of birth	ion mouth and nos t briskly with warm to	e thoroughly prio wel)	r to drying a	nd stimulating to
Double clamp cord and cut with s Begin transport • Do not wait for placent If placenta delivery is present, as • Do not massage fundu	sterile scissors between a to delivery ssist and package, the s until the placenta ha	en clamps en gently massage f as delivered	undus	
Double clamp cord and cut with s Begin transport • Do not wait for placent If placenta delivery is present, as • Do not massage fundu Fetal Newborn assessment – at	sterile scissors between a to delivery sist and package, the s until the placenta ha <u>1 minute and 5 minute</u>	en clamps en gently massage f as delivered es post-delivery	undus	2
Double clamp cord and cut with s Begin transport • Do not wait for placent If placenta delivery is present, as • Do not massage fundu Fetal Newborn assessment – at APGAR score	sterile scissors betwee a to delivery sist and package, the s until the placenta ha <u>1 minute and 5 minute</u> 0	en clamps en gently massage f as delivered es post-delivery 1 Pink w/ blue ov	undus	2 Dink
Double clamp cord and cut with s Begin transport Do not wait for placent If placenta delivery is present, as Do not massage fundu Fetal Newborn assessment – at APGAR score A - Appearance P - Pulse	sterile scissors betwee a to delivery sist and package, the s until the placenta ha <u>1 minute and 5 minute</u> 0 Blue/Pale Absent	en clamps en gently massage f as delivered es post-delivery <u>1</u> Pink w/ blue ex < 100 br	undus tremities	2 Pink
Double clamp cord and cut with s Begin transport • Do not wait for placent If placenta delivery is present, as • Do not massage fundu Fetal Newborn assessment – at APGAR score A - Appearance P - Pulse G - Grimace (reflexes)(reflex irritability)	a to delivery sist and package, the s until the placenta ha <u>1 minute and 5 minute</u> 0 Blue/Pale Absent Absent	en clamps en gently massage f as delivered es post-delivery Pink w/ blue ex < 100 bp Grimac	undus tremities om e	2 Pink > 100 bpm Cough/Cry/Sneeze
Double clamp cord and cut with s Begin transport • Do not wait for placent If placenta delivery is present, as • Do not massage fundu Fetal-Newborn assessment – at APGAR score A - Appearance P – Pulse G – Grimace (reflexes)(reflex irritability) A – Activity (muscle tone)	sterile scissors between a to delivery sist and package, the s until the placenta has a minute and 5 minute 0 Blue/Pale Absent Absent Limp	en clamps en gently massage f as delivered es post-delivery Pink w/ blue ex < 100 bp Grimac Some flex	undus tremities om e tion	2 Pink > 100 bpm Cough/Cry/Sneeze Active
Double clamp cord and cut with s Begin transport • Do not wait for placent If placenta delivery is present, as • Do not massage fundu Fetal Newborn assessment – at a APGAR score A - Appearance P - Pulse G - Grimace (reflexes)(reflex irritability) A - Activity (muscle tone) R - Respirations	sterile scissors between a to delivery ssist and package, the s until the placenta ha <u>1 minute and 5 minute</u> 0 <u>Blue/Pale</u> <u>Absent</u> <u>Absent</u> <u>Limp</u> <u>Absent</u>	en clamps en gently massage f as delivered es post-delivery 1 Pink w/ blue ex < 100 bp Grimac Some flex Slow	undus tremities m e tion	2 Pink > 100 bpm Cough/Cry/Sneeze Active Good cry
Double clamp cord and cut with s Begin transport • Do not wait for placent If placenta delivery is present, as • Do not massage fundu Fetal Newborn assessment – at s APGAR score A - Appearance P – Pulse G – Grimace (reflexes)(reflex irritability) A – Activity (muscle tone) R – Respirations	sterile scissors between a to delivery ssist and package, the s until the placenta ha <u>1 minute and 5 minute</u> 0 <u>Blue/Pale Absent</u> <u>Absent</u> <u>Limp Absent</u> Limp Absent Limp Absent Base Hospit	en clamps en gently massage f as delivered es post-delivery Pink w/ blue ex < 100 bp Grimac Some flex Slow e Hospital Co al Orders only	undus tremities m e tion ntact	2 Pink > 100 bpm Cough/Cry/Sneeze Active Good cry
Double clamp cord and cut with s Begin transport Do not wait for placent If placenta delivery is present, as Do not massage fundu Fetal-Newborn assessment – at APGAR score A - Appearance P - Pulse G - Grimace (reflexes)(reflex irritability) A - Activity (muscle tone) R - Respirations IV Access	a to delivery sist and package, the s until the placenta ha 1 minute and 5 minute 0 Blue/Pale Absent Absent Limp Absent Limp Absent LS Prior to Bas	en clamps en gently massage f as delivered es post-delivery 1 Pink w/ blue ex < 100 bp Grimac Some flex Slow e Hospital Co al Orders only or further treatment	undus tremities m e tion ntact measures	2 Pink > 100 bpm Cough/Cry/Sneeze Active Good cry
COUNTY OF VENT MEDICAL SERVICE	URA EMERGENCY S	HEALTH CARE AGENCY POLICIES AND PROCEDURES		
-----------------------------------	---	---	-----------------------	--
	Policy Title: CRITICAL CARE TRANSPORTS		Policy Number: 507	
APPROVED: Administration:	Barry R. Fisher, EMT-P, BS		Date: 10/10/2002	
APPROVED: Medical Director	Angelo Salvucci, M.D.		Date: 10/10/2002	
Origination Date:	October 31, 1995			
Date Revised:	September 12, 2002	Effective Date:	November 30, 2002	
Review Date:	November 2004			

- I. PURPOSE: To establish requirements for nurse-staffed ALS Units
- II. AUTHORITY: Health and Safety Code 1798.170.
- III. POLICY: An ALS Ambulance Company may be approved to employ or contract with Registered Nurses to staff ALS inter-facility transports providing the company adhere to the outlined conditions. This policy applies to interfacility ground transports only.

IV. PROCEDURE:

- A. Vehicle Staffing Requirements
 - One registered nurse, currently licensed to practice in the State of California, shall be added to the ALS Support team, and shall meet the following requirements:
 - RN with a minimum of two (2) years experience in a critical care area within the previous three (3) years, prior to employment with the ambulance provider.
 - b. Current BLS and ACLS certification from the American Heart Association.
 - c. Successful completion of an in-house orientation program sponsored by the provider agency.
 - d. For pediatric CCT's only: Pediatric Advanced Life Support (PALS),
 Pediatric Education for Prehospital Providers (PEPP) or Emergency
 Nurses Pediatric Course (ENPC).
 - e. Optional endotracheal intubation training.
 If the nurse is ET trained, the nurse may be added to a BLS team for CCT purposes.
 - f. Certification in any one of the following: Certified Emergency Nurse (CEN); Critical Care Registered Nurse (CCRN); Mobile Intensive Care Nurse (MICN); Certified Flight Registered Nurse (CFRN), Certified Nurse Anesthetist; Post Anesthesia Recovery Nurse (PAR); may challenge/pass Ventura County MICN certification exam.

- 2. To maintain authorization as a CCT nurse, s/he will:
 - a. Work a minimum of 384 hours in a critical care area (including time worked as a CCT RN) per year, unless employed full time as a critical care transfer nurse.
 - If the nurse is ET trained, s/he shall obtain a minimum of three (3) successful intubations or demonstration of skills competency to the provider medical director every year.
 - c. Maintain current ACLS certification.
 - d. For pediatric CCT's only: PALS, PEPP or ENPC.
- 3. Nurses used to provide ALS in accordance with this policy, may be employed by the ambulance provider or be sub-contracted, at the provider's option.
- 4. Ambulance providers shall provide an internal orientation to EMT-Is and EMT-Ps participating in nurse-staffed ambulance transports.
- B. Equipment:
 - 1. In addition of the items required by California Administrative Code, Title 13, the ambulance provider shall provide, at a minimum, the following equipment for nurse-staffed ALS units:
 - a. ALS equipment (EMT-P Standard Drug & Equipment List)
 - b. Manual defibrillator with external pacemaker
 - c. Infusion pump(s)
 - d. Back-up power source
 - e. Pulse oximeter
- C. Medical Direction: An agency providing CCTs shall have:
 - 1. Medical protocols to be followed by the RN at the ALS level which have been approved and signed by a Physician, and
 - 2. Either a
 - a. Physician Director

Provider shall have either full or part-time Physician Director qualified by training and/or experience and recent practice in emergency or acute critical care medicine. The candidate for Physician Director must be approved by the Medical Director. The Physician Director shall:

- 1) Ensure the ongoing training of all medical personnel involved.
- Ensure the quality of patient transfers being conducted by the provider by conducting patient care audits.
- 3) Be familiar with applicable patient transfer laws, or
- b. Nursing Coordinator

Provider shall have either full or part-time RN employed as Nursing Coordinator qualified by training and/or experience and recent practice in emergency or acute critical care nursing. The Nursing Coordinator shall:

- 1) Provide ongoing training of all medical personnel involved.
- 2) Ensure quality of patient transfers being conducted by the provider by conducting patient care audits.
- 3) Be familiar with applicable patient transfer laws
- 3. Procedures/Protocols
 - a. Each company providing nurse-staffed ALS units shall develop and maintain procedures for the hiring and training of nursing personnel and vehicle staffing.
 - b. Each provider must develop a manual clearly displaying:
 - 1. Malpractice insurance coverage.
 - Identify and accessibility of the Physician Director and Nursing Coordinator.
 - 3. Vehicle inventory lists
 - 4. Copies of all related interfacility transfer paperwork
 - 5. Statement of responsibility of the sending physician for the patient during transfer and in accordance with COBRA and SB317 laws.
 - 6. Guidelines for change in patient destination due to patient condition
 - Protocols (Standing Orders) based on ACLS, PALS/PEPP, or NALS guidelines.
 - c. Procedures and protocols shall be subject to review by the VC EMS.
- 4. CQI
 - The Physician Director and/or Nursing Coordinator shall be responsible for performing quality assurance outcome audits.
 - b. Patient transport record review shall be performed at least quarterly and involve the use of pre-established criteria.
 - c. All transports resulting in adverse patient outcome shall be reviewed and reported to the VC EMS Agency per Policy 150.
 - d. Periodic staff conferences on audit and outcomes are required in order to improve or revise protocols.
 - e. Records of all these activities shall be kept by the provider and be made available for inspection and audit by VC EMS.

- f. Report (quarterly) to VC EMS. Reports are to include general statistics (number of runs, types of runs, outcomes, intubation statistics, incidents during which EMT-P assistance at ALS level is required).
- 5. Program Approval

Requests for approval must be made in writing sixty (60) days prior to anticipated service starting date, to the administrator of VC EMS, and must include:

- a. Proposed identification and location of the nurse-staffed unit.
- b. Procedures and protocols
- c. Documentation of qualifications of the proposed Physician Director (if applicable).
- d. Documentation of qualifications for the proposed Nursing Coordinator.
- e. Preliminary plan for quality assurance audits.
- f. Agreement to comply with all policies and procedures of VC EMS.

VC EMS shall notify the applicant in writing within ten (10) working days of lack of documentation. The applicant shall be notified in writing within thirty (30) days of receipt of complete package of approval or denial of the program.

- 6 Program Review
 - a. VCEMS may perform periodic on-site audits of records to ensure compliance with this policy.
 - b. Non-compliance with this policy may cause VC EMS to suspend or revoke approval to provide nurse-staffed ALS inter-facility transports.



Prehospital Services Committee Agenda Item Request

Upon completion of this form, submit to the EMS Agency for review.

Submitted by: Susan Franks Date: May 2, 2011

Representing: AMR/GCA CCT Program

A. Description

Title of Agenda Item: Policy 507: Critical Care Transports

Description of Item

Currently this policy requires that CCT vehicle staffing consists of an RN added to an ALS team. We believe the policy ought to allow for various levels of CCT staffing, for example, an RN with a BLS or ALS team. In many cases, an RN and one EMT is sufficient. About 30% of the CCTs done in this county are stable, long term vent-dependant patients going to a sub-acute facility. Another 20% are patients with no IV drips, no ventilator, but an RN is requested by the transferring facility. The RN will receive report from the transferring facility and determine the staffing level needed, according to company policy and procedures. Patients with an unstable airway will not be transferred. If a patient deteriorates enroute, the CCT ambulance can divert to closest emergency facility. If the ETA to that facility is greater than 10 minutes and the RN requires assistance, the ambulance will pull over and request assistance from an ALS unit.

B. Analysis

How will this enhance the Ventura County EMS System? This procedure allows for a more appropriate utilization of resources. About half of the CCTs done are out of county which removes an ALS unit from service for a significant amount of time.

Advantages -Less impact on 911 ALS response system -Utilizes costly resources appropriately -More options to staff the CCT unit -Decreased response times for both CCTs and 911

Disadvantages

<u>-Less people to help with patient care.</u> However, this extra help has not proven to be necessary and the RN may always request more staff if he or she foresees a situation that may require it.

-No one ET trained in ambulance. However, most of the patients are intubated or trached already. A good BLS airway can be sufficient and the RN may request help if required.

Financial Impact Utilizing appropriate resources is more cost effective.

Who has this item been presented to or reviewed by? Dr. Salvucci.

Attach any proposals or supportive documentation to this form.

C. **EMS** Agency Review

Received by VC EMS Agency:

Reviewed by EMS Administrator:

Assigned to:

Purpose:	
Purpose:	
Purpose:	
Purpose:	

EMS Staff Review Summary

Disposition D.

- Add as PSC Agenda item on:
- Inadequate or incomplete information return submission \square
- Not to be addressed at this time, resubmit in . \square
- Adopt item
- Refer to: (for review and comment) \square
 - CQI Subcommittee
 - EMD Subcommittee
 - Prehospital Educators
 - MCI Subcommittee
 - Other:

EMS Administrator Signature:_____ Date:_____

COUNTY OF VENTU	RA	EMERGENO	Y MEDICAL SERVICES
HEALTH CARE AGE	<u>NCY</u>	POLICI	ES AND PROCEDURES
	Policy Title:		Policy Number
	Use of Restraints		732
APPROVED:			Data:
Administration:	Steven L. Carroll, EMT-P		Date.
APPROVED:			Data
Medical Director:	Angelo Salvucci, M.D.		Date.
Origination Date:			
Date Revised:	_		Effective Date: DRAFT
Date Last Reviewed:	_		
Review Date:			

- I. PURPOSE: To provide guidelines for the use of physical and chemical restraints during the course of emergency medical treatment or during an inter-facility transport (IFT) for patients who are violent or potentially violent to themselves or others.
- II. AUTHORITY: California Health and Safety Code, Sections: 1797.2, 1798; California Code of Regulations, Title 22, Sections: 100075, 100147, 100160; California Administrative Code, Title 13, Section 1103.2.
- III. DEFINITIONS:
 - A. <u>Verbal Restraint: Any verbal communication from a pre-hospital provider to a</u> patient utilized for the sole purpose of limiting or inhibiting the patient's behavior.
 - B. Physical Restraint: Any method in which a technique or piece of equipment is applied to the patient's body in a manner that reduces the subject's ability to move his arms, legs, head, or body.
 - C. <u>Chemical Restraint: Any pharmaceutical administered by healthcare providers</u> <u>that is used specifically for the purpose of limiting or controlling a person's</u> <u>behavior or movement.</u>
- IV. POLICY:
 - A. <u>Physical Restraint</u>
 - +1. Prior to use of physical or chemical restraints, every attempt to calm patient should be made using verbal, non physical means.
 - 2. Perform a physical assessment and obtain a medical history as soon as safe and appropriate. Treat any underlying conditions per VCEMS 705 Treatment guidelines.
 - 3. If necessary, apply soft physical restraints while performing assessment and obtaining history.
 - 4. Padded soft restraints shall be the only form of restraints utilized by EMS providers.

- 5. <u>Restraints shall be applied in a manner that does not compromise</u> vascular, neurological, or respiratory status.
- 6. <u>Extremities in which restraints are applied shall be continuously</u> monitored for signs of decreased neurologic and vascular function
- 7. Patients shall not be transported in a prone position. The patient's position shall be in a manner that does not compromise vascular or respiratory status at any point. Additionally, the patient position shall not prohibit the provider from performing any and all assessment and treatment tasks.
- 8. <u>Restraints shall not be attached to the hand rails of the gurney.</u>
- 9. <u>Handcuffs applied by law enforcement require that an officer remain with</u> <u>the patient whenever possible to ensure provider and patient safety and</u> <u>to facilitate removal of the restraint device if a change in the patient's</u> <u>condition requires it.</u>
 - a. If the patient is restrained with handcuffs and placed on a gurney, two to three pairs of handcuffs shall be utilized to allow the patients arms to remain at his side. This facilitates easy access to the patient's arms for vital sign assessment and medication administration. The patient should not be placed on gurney with hands or arms restrained behind patient's back.
 - b. In the event that the law enforcement agency is not able to accompany the patient in the ambulance, a law enforcement unit must follow the ambulance in tandem along a predetermined route to the receiving facility. A plan to address any problems that may arise while transporting the patient should be discussed with the following officer prior to leaving the scene.

B. <u>Chemical Restraint</u>

- **<u>H</u>**<u>1.</u> If while in restraints, the patient demonstrates behavior that may result in harm to the patient or providers, chemical restraint should be considered.
 - a. <u>Refer to VCEMS Policy 705: Behavioral Emergencies for</u> <u>guidance and administration of appropriate chemical restraint.</u>
 - <u>It is important again to investigate and treat possible underlying</u> causes of erratic behavior (e.g. hypoglycemia, trauma, meningitis).
- C. <u>Required Documentation</u>

- Instances in which physical or chemical restraints are applied shall be documented according to VCEMS Policy 1000. Required documentation shall include:
 - a. <u>Type of restraint applied (e.g. soft padded restraint, midazolam,</u> <u>handcuffs by law enforcement)</u>
 - b. <u>Reason restraints were utilized.</u>
 - c. Location on patient restraints were utilized
 - d. <u>Personnel and agency applying restraints.</u>
 - e. <u>Time restraints were applied</u>
 - f. Every 10 minute neurologic and vascular checks
- **H.2.** Base Hospital shall be notified in all circumstances in which physical and chemical restraints are utilized.



Facts about Primary Stroke Center Certification

The Joint Commission's Primary Stroke Center Certification Program, launched in December 2003, was developed in collaboration with the American Heart Association/American Stroke Association (AHA/ASA). As of January 1, 2011, there are more than 800 certified primary stroke centers in 49 states. Certification is available only to stroke programs in Joint Commission-accredited acute care hospitals.

The Certificate of Distinction for Primary Stroke Centers recognizes centers that make exceptional efforts to foster better outcomes for stroke care. It is The Joint Commission's first advanced certification program. Programs applying for advanced certification must meet the requirements for Disease-Specific Care Certification plus additional, clinically specific requirements and expectations. Certified primary stroke centers:

- Use a standardized method of delivering care based on the Brain Attack Coalition recommendations for establishment of primary stroke centers.
- Support a patient's self-management activities.
- Tailor treatment and intervention to individual needs.
- Promote the flow of patient information across settings and providers, while protecting patient rights, security and privacy.
- Analyze and use standardized performance measure data to continually improve treatment plans.
- Demonstrate their application of and compliance with the clinical practice guidelines published by the <u>AHA/ASA</u> or equivalent evidence-based guidelines.

Certification process

On-site certification reviews are conducted by reviewers with expertise in stroke care. The certification decision is based on the evaluation of standards, clinical practice guidelines and performance measurement activities. Primary Stroke Centers that successfully demonstrate compliance in all three areas are awarded certification for a two-year period. At the end of the first year, the organization is required to attest to its continued compliance with standards and evidence of performance measurement and improvement activities. To maintain certification, the cycle repeats with an on-site review conducted every two years and a bi-annual submission of an acceptable assessment of compliance by the organization.

Standards

The standards are published in the *Disease-Specific Care Certification Manual*. They incorporate the "Recommendations for the Establishment of Primary Stroke Centers" developed by the Brain Attack Coalition. The chapters address:

- Program management
- Delivering or facilitating clinical care
- Supporting self-management
- Clinical information management
- Performance improvement and measurement

Performance measurement

Certified primary stroke centers must collect and report on eight National Inpatient Hospital Quality Measures for stroke. Data are submitted quarterly to The Joint Commission through the secure extranet site no later than 45 days following the end of the calendar quarter. The eight measures include:

- Venous thromboembolism (VTE) prophylaxis
- Discharged on antithrombotic therapy
- Anticoagulation therapy for atrial fibrillation/flutter
- Thrombolytic therapy
- Antithrombotic therapy by end of hospital day two
- Discharged on statin medication

- Stroke education
- Assessed for rehabilitation

The measures and definitions are in the <u>Specifications Manual for National Hospital Inpatient Quality Measures</u>. Certified programs must use the **current** version of the manual which is updated twice yearly. Future versions of the manual are posted six months prior to the effective date. Revisions called "Release Notes" show all the changes made to a particular version. Questions about core measure specifications can be submitted to the <u>Performance Measurement Q&A Forum</u>.

The measures have been endorsed by the National Quality Forum and approved as a core measure set for use in the Joint Commission's ORYX program. For more information, go to the <u>website</u>.

Government recognition of Joint Commission Primary Stroke Center Certification

As of January 1, 2011, 11 states require or recognize The Joint Commission's Primary Stroke Center Certification for designation as a primary stroke center. These include Delaware, Florida, Georgia, Illinois, Maryland, North Dakota, Oklahoma, Rhode Island, Texas, Virginia and Washington. For more information about government recognition, contact <u>Jen Hoppe</u>, associate director, State Relations, (630) 792-5261.

Information available to the public

Quality Reports for Joint Commission certified Primary Stroke Centers are available on the <u>Quality Check</u>[™] website.

For more information about Primary Stroke Center certification, please visit the <u>website</u>, contact the <u>Disease-Specific Care Certification Program</u>, or call (630) 792-5291.



A Division of the Ventura County Health Care Agency

EMERGENCY MEDICAL SERVICES

2220 E. Gonzales Rd., Suite 130, Oxnard, CA 93036-0619 www.vchca.org/ph/ems Phone: 805-981-5301 Fax: 805-981-5300 **BARRY R. FISHER, MPPA**

Director

STEVEN L. CARROLL, EMT-P EMS Administrator

ANGELO SALVUCCI, M.D., F.A.C.E.P Medical Director

May 19, 2011

Daniel Smiley Interim Director Emergency Medical Services Authority 10901 Gold Center Drive, Suite 400 Rancho Cordova, CA 95670-6073

Dear Mr. Smiley:

Please accept this 18-month report from Dr. David Chase and myself on the trial study "Early use of the King Airway and impedance threshold device by basic and advanced life support personnel in the treatment of adult patients with out-of-hospital cardiac arrest."

Please let me know if you need additional information.

Sincerely;

Angelo Salvucci, MD Medical Director

Cc: David Chase, MD, Ventura County Medical Center



Ventura County Emergency Medical Services

Early use of the King Airway and impedance threshold device by basic and advanced life support personnel in the treatment of adult patients with out-of-hospital cardiac arrest.

Trial Study - 18 Month Report May 15, 2011

Introduction:

The Ventura County EMS system has BLS and ALS first responders and ALS ambulance services. Cardiac arrest treatment protocols begin with 2-rescuer CPR with bag-mask ventilation (BMV) at a 30:2 compression:ventilation ratio and use of an AED. Paramedics continue 30:2 CPR with BMV, and include rhythm assessment, defibrillation, IV/IO medications, and advanced airway as needed.

In the 2005 American Heart Association (AHA) Guidelines for CPR and Emergency Cardiovascular Care (ECC), the impedance threshold device (ITD) was designated as Class IIa (Benefit >> Risk. It is reasonable to perform procedure/administer treatment).

• "Although increased long-term survival rates have not been documented, when the ITD is used by trained personnel as an adjunct to CPR in intubated adult cardiac arrest patients, it can improve hemodynamic parameters and ROSC (Class IIa)."

The King Airway (KA) is not specifically mentioned in the 2005 Guidelines, but two other perilaryngeal airways, the Combitube and Laryngeal Mask Airway (LMA) were also Class IIa.

- "Thus, it is acceptable for healthcare professionals to use the Combitube as an alternative to the endotracheal tube for airway management in cardiac arrest (Class IIa)."
- "It is acceptable for healthcare professionals to use the LMA as an alternative to the endotracheal tube for airway management in cardiac arrest (Class IIa)."

The objective of this trial study was to determine if a revision of EMS treatment protocols, to include early insertion of a KA and application of an ITD in adult (age ≥ 18) patients with out-of-hospital cardiac arrest, would increase the likelihood of survival with favorable neurologic function (CPC 1 or 2).

Methods:

Study Design

The trial is a prospective, non-randomized, historically controlled intervention study to evaluate the effect of the introduction of the KA and ITD into EMS cardiac arrest treatment protocols. All adult cardiac patients who met clinical criteria were included. Historical controls were all cardiac arrest patients over the 18 months prior to the intervention meeting the same criteria.

The trial study was approved by the Ventura County Medical Center (VCMC) Institutional Review Board. The VCMC IRB also approved the continuation of the trial on request for renewal at one year.

Setting

Ventura County, California. Population 800,000. EMS response with BLS and ALS fire department first responders and paramedic-staffed ambulances.

Duration

Control period: March 1, 2008 through August 31, 2009 Intervention period: September 1, 2009 through February 28, 2011 Proposed extension period: March 1, 2011 through August 31, 2012

Inclusion criteria

All patients who are presumed to be 18 years of age or older and sustain a non-traumatic cardiac arrest.

Exclusion criteria

Patients less than 18 years of age, traumatic cardiac arrest and patients that had return of spontaneous circulation (ROSC) prior to KA insertion attempt.

Training

All EMTs and paramedics in Ventura County that treat EMS patients attended an in-service training that included the use of the KA and ITD. Training materials and personnel were provided by Ventura County Fire Protection District (VCFPD) and the ITD device manufacturer (Advanced Circulatory Systems, Minneapolis, MN). Train-the-trainer sessions were conducted for individual service providers. The two hour training session taught field providers the indications, contraindications, use and trouble shooting of the ITD. For BLS personnel, training included the indications, contraindications, placement, trouble shooting and use of the KA. ALS personnel had received training on use of the KA prior to the study. Also included in the training was a review of the 2005 AHA Guidelines as well as reinforcement of a team approach and how to work together when using the device.

Protocol

Treatment protocols were revised.

Prior to the trial the cardiac arrest protocol included:

BLS:

- CPR with BMV at 2 ventilations/30 compressions
- AED analysis, shock as indicated

ALS:

• Advanced airway after IV, medications, earlier if unable to ventilate

Trial protocol for the first 9 months included:

BLS/ALS:

- Chest compressions at 100/min
- Insert KA and attach ITD
- Asynchronous ventilations at 10/min
- AED analysis, shock as indicated
- If ROSC, remove ITD

Trial protocol for the second 9 months included:

BLS/ALS:

- Chest compressions at 100/min
- BMV and attach ITD
- 30:2 compression:ventilation ratio

Hospital care

The KA and ITD remained in place until the patient's care was transferred to hospital personnel. All hospital respiratory therapy and emergency department personnel were advised of the study.

Primary Outcome Measure

Survival to Hospital Discharge with CPC 1 or 2

Data Collection

The following data was collected on all patients:

- name (for hospital follow-up)
- sex
- age
- incident number
- date
- time of arrest
- etiology of arrest
- time of first CPR
- time of defibrillation (if applicable)
- bystander witnessed/EMS witnessed/not witnessed
- initial rhythm
- airway management (BVM only, KA, ETT)
- waveform capnography / initial ETCO2 in mmHg values
- return of spontaneous circulation (ROSC) (Y,N)
- time of spontaneous circulation (ROSC)
- timing light use
- admission to hospital
- outcome
 - died in hospital
 - o survived to discharge
 - cerebral performance category
 - overall performance category

Patient care reports and equipment use forms were submitted by all prehospital care providers to the EMS Division of VCFPD, in a paperwork-equipment exchange system. VCFPD secured all data received from hospitals regarding survival outcomes of study patients. All records regarding this trial have been maintained in a locked file and or secured electronic data base which can be accessed by the EMS quality managers involved in the study.

Results:

Table 1	
EMTs trained	484
Paramedics trained	230
EMT King Airway insertion attempts	168 total patients, 1 attempt only
EMT King Airway insertion success	111 (66%)
PM King Airway insertion attempts	227 total patients
PM King Airway insertion success	159 1st attempt, 13 2nd attempt = 172 (76%)
Complications	20: Unable to insert: Emesis in oropharynx
	48: Unable to insert: No emesis
	29: Unable to ventilate after insertion
	21: Emesis in airway section of device

EMT King Airway insertion success rate was 66% and paramedic was 76%. Complications are listed in Table 1.

Та	ble 2													
Dates	3/08	8-11/08	12/0	8-8/09		9/0)9-5/10				6/-	10-2/11		
Ν	101	%	281	%	247	%	BVM	ETT	KA	240	%	BVM	ETT	KA
VT/VF	35	35%	77	27%	62	25%				43	18%			
AS	53	52%	126	45%	127	51%				138	58%			
PEA	14	14%	78	28%	56	23%				58	24%			
ROSC	28	27.7%	101	35.9%	88	35.6%				82	34.2%			
D/C														
Alive	10	9.9%	34	12.1%	29	11.7%	7	1	21	22	9.2%	18	3	1
CPC 1/2	9	8.9%	29	10.3%	18	7.3%	7	0	11	20	8.3%	17	2	1
CPC 3/4	1	1.0%	5	1.8%	11	4.5%	0	1	10	2	0.8%	1	1	0

N = All cardiac arrests, cardiac etiology

487 patients were enrolled in the intervention period (247 in the first 9 months, 240 in the second 9 months) and results were compared to the 382 patients in the prior 18 month control period.

During the first 9-month intervention period, results for ROSC (33.8% vs. 35.6%) and overall survival (11.5% vs. 11.7%) remained essentially unchanged from the control period.

There was a trend toward a reduction in the proportion of patients with CPC 1 and 2 scores (9.9%) to (7.3%) and an increase in CPC 3 and 4 (1.6%) to (4.5%). These differences were not statistically significant.

The KA was discontinued after the first 9 month intervention period and the protocol changed to include 2-hand mask grip for BMV ventilation with an ITD.

In the second 9-month period the overall survival was 9.2% with a CPC 1 and 2 proportion of 8.3%.

Discussion:

In the first 9 months there was no improvement in the overall survival or proportion of patients with CPC 1 or 2 with use of the KA and ITD. The KA was removed from the BLS protocol and used by paramedics only if unable to ventilate and unable to insert an endotracheal tube.

The King Airway is a Class IIa device in the 2010 AHA Guidelines (2):

• During CPR performed by providers trained in its use, the supraglottic airway is a reasonable alternative to bag-mask ventilation (Class IIa, LOE B) and endotracheal intubation (Class IIa, LOE A).

However, this recommendation is based upon studies that reported ability to insert the device and to adequately ventilate patients (3-5). We were unable to identify a study that evaluated the effect of the device on cardiac arrest survival with favorable neurologic outcome.

A possible explanation for the observed increase in patients with hospital discharge CPC scores of 3 and 4 is the potential for reduced brain circulation from carotid artery compression by the KA oropharyngeal balloon. Carotid bulb compression with the LMA has been shown to decrease carotid blood flow in anesthetized normotensive adults (6), and this effect would be expected to be more prominent in the low-flow setting. Further investigation is needed.

The ITD is a Class IIb (Benefit >= Risk, Procedure/treatment may be considered) device in the 2010 AHA Guidelines (2):

• "The use of the ITD may be considered by trained personnel as a CPR adjunct in adult cardiac arrest (Class IIb, LOE B)."

Preliminary results (7) from the ROC PRIMED study (8) indicate that the ITD did not improve survival. However, the trial was conducted in a number of sites with varying protocols, many of them different than in Ventura County, and the individual site results are yet not published. Two recent studies conclude that the ITD, as part of a bundle of care with standard CPR (9) and active compression-decompression CPR (10) is associated with improved cardiac arrest survival.

Limitations:

The sample size for the first 9 months of the trial was insufficient to have statistically significant results for the KA/ITD portion. The IRB approval was to evaluate whether the change in protocol resulted in an improvement in care, and, when it was clear that there was no patient benefit, it was necessary to revise the protocol.

Similarly, there are no statistically significant results for the ITD portion of the study at this time, and data collection is continuing.

Hospital care has changed during the trial that will affect the analysis. All patients with ROSC are now triaged to a STEMI Receiving Center to be evaluated for therapeutic hypothermia.

Conclusion/Recommendations:

We did not find a benefit from use of the King Airway as a routine device and will continue to use bag-mask ventilation and endotracheal intubation as indicated.

The potential benefit of the impedance threshold device is not yet known and should be further evaluated.

We recommend that the impedance threshold device portion of the trial be continued for an additional 18 months.

References:

- 1. The ECC Committee, Subcommittees and Task Forces of the American Heart Association. 2005 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. *Circulation*. 2005;112:IV1-203.
- 2. Neumar RW, Otto CW, Link MS, et al: Part 8: adult advanced cardiovascular life support: 2010 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. *Circulation*. 2010 Nov 2;122(18 Suppl 3):S729-67.
- 3. Schalk R, Byhahn C, Fausel F, Egner A, Oberndorfer D, Walcher F, Latasch L. Out-ofhospital airway management by paramedics and emergency physicians using laryngeal tubes. *Resuscitation*. 2010;81:323–326.
- 4. Heuer JF, Barwing J, Eich C, Quintel M, Crozier TA, Roessler M. Initial ventilation through laryngeal tube instead of face mask in out-of-hospital cardiopulmonary arrest is effective and safe. *Eur J Emerg Med.* 2010;17:10–15.
- 5. Wiese CH, Semmel T, Muller JU, Bahr J, Ocker H, Graf BM. The use of the laryngeal tube disposable (LT-D) by paramedics during out-of-hospital resuscitation—an observational study concerning ERC guidelines 2005. *Resuscitation*. 2009;80:194–198.
- 6. Colbert SA, OHanlon DM, Flanagan F, et al: The laryngeal mask airway reduces blood flow in the common carotid artery bulb. *Canadian J Anaesth*. 1998 45(1): 23-7.
- Aufderheide TP, Nichol G, Rea TD, et al: The resuscitation outcomes consortium (ROC) PRIMED impedance threshold device (ITD) cardiac arrest trial: a prospective, randomized, double-blind, controlled clinical trial. *Prehospital Emergency Care*. 2011;15:104–137.
- 8. Aufderheide TP, Kudenchuk PJ, Hedges JR, et al: Resuscitation Outcomes Consortium (ROC) PRIMED cardiac arrest trial methods part 1: rationale and methodology for the impedance threshold device (ITD) protocol. *Resuscitation*. 2008 Aug;78(2):179-85.
- 9. Hinchey PR, Myers JB, Lewis R, et al: Improved out-of-hospital cardiac arrest survival after the sequential implementation of 2005 AHA guidelines for compressions, ventilations, and induced hypothermia: the Wake County experience. *Ann Emerg Med.* 2010 Oct;56(4):348-57.
- 10. Aufderheide TP, Frascone RJ, Wayne MA, et al: Standard cardiopulmonary resuscitation versus active compression-decompression cardiopulmonary resuscitation with augmentation of negative intrathoracic pressure for out-of-hospital cardiac arrest: a randomised trial. *Lancet.* 2011 Jan 22;377(9762):301-11.

COUNTY OF VENTU	RA	EMERGEN	CY MEDICAL SERVICES
HEALTH CARE AGE	NCY	POLICI	ES AND PROCEDURES
	Policy Title:		Policy Number
Child, De	pendent Adult, Or Elder Abuse Reporting		210
APPROVED:	At Cll		Data: 12/01/00
Administration:	Steven L. Carroll, EMT-P		Date. 12/01/09
APPROVED:			Data: 12/01/00
Medical Director:	Ángelo Salvucci, M.D.		Dale. 12/01/09
Origination Date:	June 14, 1984		
Date Revised:	September 11, 2003	Effective	Date: November 1, 2003
Last Review:	August 13, 2009		
Review Date:	November 1, 2011		

- I. PURPOSE: To define child, dependent adult and elder abuse and outline the required reporting procedure for prehospital care personnel in all cases of suspected child, dependent adult and elder abuse.
- II. AUTHORITY: Welfare and Institutions code Section 15630-15632
- III. POLICY: EMS Provider will report all suspected cases of abuse.
- IV. DEFINITIONS:
 - A. "Abuse of an elder or a dependent adult" means physical abuse, neglect, intimidation, cruel punishment, fiduciary abuse, abandonment, isolation, or treatment with resulting physical harm or pain or mental suffering, or the deprivation by a care custodian of goods and services which are necessary to avoid physical harm or mental suffering.
 - 1. "Isolation" means any of the following:
 - Acts intentionally committed for the purpose of preventing, and that do serve to prevent, an elder or dependent adult from receiving his or her mail or telephone calls.
 Telling a caller or prospective visitor that an elder or dependent

adult is not present, or does not wish to talk with the caller, or does not wish to meet with the visitor, where the statement is false, is contrary to the express wishes of the elder or the dependent adult, whether he or she is competent or not, and is made for the purpose of preventing the elder or dependent adult from having contact with family, friends, or concerned persons. False imprisonment, as defined in Section 236 of the Penal Code. Physical restraint of an elder or dependent adult for the purpose of preventing the elder or dependent adult for the purpose of

b. The acts set forth in paragraph a. shall be subject to a rebuttal

presumption that they do not constitute isolation if they are performed pursuant to the instructions of a physician licensed to practice medicine in the State of California, who is caring for the elder or dependent adult at the time the instructions are given, and who gives the instructions as part of his or her medical care.

- c. The acts set forth in paragraph a. shall not constitute isolation if they are performed in response to a reasonably perceived threat of danger to property or physical safety.
- 2. "Child" means any person under the age of 18 years.
- "Child abuse" means physical injury which is inflicted by other than accidental means on a child by another person....sexual assault of a child....neglect of a child or abuse in out-of-home care.
- 4. "Dependent Adult" means any person residing in this state between the ages of 18 and 64, who has physical or mental limitations which restrict his or her ability to carry out normal activities or to protect his or her rights including, but not limited to, persons who have physical or developmental disabilities or whose physical or mental abilities have diminished because of age.
- 5. "Dependent adult" includes any person between the ages of 18 and 64 years who is admitted as an inpatient to a 24-hour health facility, as defined in Sections 1250, 1250.2, and 1250.3 of the Health and Safety Code.
- 6. "Elder" means any person residing in this state, 65 years of age or older"
- 7. "Health practitioner" means a physician and surgeon, psychiatrist, psychologist, dentist, resident, intern, podiatrist, chiropractor, licensed nurse, dental hygienist, licensed clinical social worker or associate clinical social worker, marriage, family, and child counselor, or any other person who is currently licensed under Division 2 (commencing with Section 500) of the Business and Professions Code, any emergency medical technician I or II, paramedic, or person certified pursuant to Division 2.5 (commencing with Section 1797) of the Health and Safety Code, a psychological assistant registered pursuant to Section 2913 of the Business and Professions Code, a marriage, family, and child counselor trainee, as defined in subdivision © of Section 4980.03 of the Business and Professions Code, state or county public health or social service employee who treats an elder or a dependent adult for any condition, or a

coroner.

- 8. "Physical abuse means all of the following:
 - a. Assault, as defined in Section 240 of the Penal Code
 - b. Battery, as defined in Section 242 of the Penal Code
 - c. Assault with a deadly weapon or force likely to produce great bodily injury, as defined by Section 245 of the Penal Code
 - d. Unreasonable physical constraint or prolonged or continual deprivation of food or water.
 - e. Sexual Assault, which means any of the following:
 - 1) Sexual battery, as defined in Section 243.4 of the Penal Code
 - 2) Rape, as defined in Section 261 of the Penal Code
 - Rape in concert, as described in Section 264.1 of the Penal Code
 - 4) Incest, as defined in Section 285 of the Penal Code
 - 5) Sodomy, as defined in Section 286 of the Penal Code
 - Oral copulation, as defined in Section 288a of the Penal
 Code
 - Penetration of a genital or anal opening by a foreign object, as defined in Section 289 of the Penal Code.
 - f. Use of a physical or chemical restraint or psychotropic medication under any of the following conditions:
 - 1) For punishment
 - 2) For a period significantly beyond that for which the restraint or medication was authorized pursuant to the instructions of a physician licensed in the State of California, who is providing medical care to the elder or dependent adult at the time the instructions are given.
- 9. "Reasonable suspicion" means that it is objectively reasonable for a person to entertain such a suspicion based upon facts that could cause a reasonable person in a like position, drawing when appropriate, on his or her training and experience, to suspect child abuse.
- V. PROCEDURE:
 - Report by telephone to a county child or adult protective agency (Ventura County Human Services Agency at (805-654-3200) or to a local law enforcement agency immediately or as soon as possible. The telephone report shall include the

following:

- a. Name, address, telephone number, and occupation of the person making the report
- b. Name and address of the victim
- c. Date, time and place of the incident
- d. Other details, including the reporter's observations and beliefs concerning the incident
- e. Any statement relating to the incident made by the victim
- f. The name of any individuals believed to have knowledge of the incident
- g. The name of the individuals believed to be responsible for the incident and their connection to the victim.
- h. Present location of the child
- i. Nature and extent of the injury
- j. Information that led such person to suspect child abuse
- 2. Report in writing to the agency contacted by telephone within two working days of receiving the information concerning the incident.
- 3. When two (2) or more persons who are required to report are present and jointly have knowledge of a suspected instance of child, dependent adult or elder abuse, and when there is agreement among them, the telephone report may be made by a member of the team selected by mutual agreement and a single report may be made and signed by such selected member of the reporting team. Any member who has knowledge that the member designated to report has failed to do so, shall thereafter make such report.
- 4. The reporting duties are individual, and no supervisor or administrator may impede or inhibit such reporting duties and no person making such report shall be subject to any sanction for making such report. However, internal procedures to facilitate reporting and apprise supervisors and administrators of reports may be established provided that they are not inconsistent with the provisions of this article.

COUNTY OF VENTURA HEALTH CARE AGENCY

HEALTH CARE AGENCY		EMERGEN	NCY ME	DICAL SERVICES
Ventura C	Policy Title: County Emergency Departments		Po	olicy Number: 400
APPROVED: Son Administration: Bar	y R. Fisher, MPPA		Date:	December 1, 2008
APPROVED: Medical Director: Ang	elo Salvucci, M.D.		Date:	December 1, 2008
Origination Date: Date Revised: Date Last Reviewed: Next Review Date:	October, 1984 August 10, 2006 October 9, 2008 October, 2011	Effective Da	te: D	December 1, 2008

Base Hospitals

Los Robles Hospital Medical Center 215 W. Janss Road Thousand Oaks, CA 91360 (805) 370-4435

St. John's Regional Medical Center 1600 N. Rose Ave. Oxnard, CA 93030 (805) 988-2663

Simi Valley Hospital 2975 N. Sycamore Dr Simi Valley, CA 93065 (805) 955-6100

Ventura County Medical Center 3291 Loma Vista Road Ventura, CA 93003 (805) 652-6165

Receiving Hospitals

Community Memorial Hospital 147 No. Brent Ventura, CA 93003 (805) 652-5018

POLICIES AND PROCEDURES

Ojai Valley Community Hospital 1306 Maricopa Highway Ojai, CA 93023 (805) 640-2260

St. John's Pleasant Valley Hospital 2309 Antonio Avenue Camarillo, CA 93010 (805) 389-5811

VCMC/Santa Paula Hospital 825 N. 10th Street Santa Paula, CA 93060 (805) 933-8663

COUNTY OF VENTURA			EMERGENCY MEDICAL SERVICES		
HEALTH CARE AGE	NCY	P	OLICIES AND PROCEDURES		
	Policy Title:		Policy Number		
	Interfacility Transfer of Patients		605		
APPROVED:	Barry R. Fisher		Date: December 1, 2008		
Administration:	Barry Fisher, MPPA		Date: Decomber 1, 2000		
APPROVED:	~		Data: Dacambar 1, 2008		
Medical Director:	Angelo Salvucci, M.D.		Date. December 1, 2000		
Origination Date:	July 26, 1991				
Date Revised:	April 13, 2006	Effective D	Date: December 1, 2008		
Date Last Reviewed:	October 9, 2008				
Next Review Date:	October, 2011				

I. PURPOSE: To define levels of interfacility transfer and to assure that patients requiring interfacility transfer are accompanied by personnel capable and authorized to provide care.

- II. AUTHORITY: Health and Safety Code, Sections 1797.218, 1797.220, and 1798.
- III. POLICY: A patient shall be transferred according to his/her medical condition and accompanied by EMS personnel whose training meets the medical needs of the patient during interfacility transfer. The transferring physician shall be responsible for determining the medical need for transfer and for arranging the transfer. The patient shall not be transferred to another facility until the receiving hospital and physician consent to accept the patient. The transferring physician retains responsibility for the patient until care is assumed at the receiving hospital.

If a patient requires care during an interfacility transfer which is beyond the scope of practice of an EMT-1 or EMT-P or requires specialized equipment for which an EMT-1 or EMT-P is untrained or unauthorized to operate, and it is medically necessary to transfer the patient, a registered nurse or physician shall accompany the patient. If a registered nurse accompanies the patient, appropriate orders for care during the transfer shall be written by the transferring physician.

- IV. TRANSFER RESPONSIBILITIES
 - A. All Hospitals shall:
 - 1. Establish their own written transfer policy clearly defining administrative and professional responsibilities.
 - 2. Have written transfer agreements with hospitals with specialty services, and county hospitals.
 - B. Transferring Hospital
 - 1. Maintains responsibility for patient until patient care is assumed at receiving facility.
 - 2. Assures that an appropriate vehicle, equipment and level of personnel is used in the transfer.

- C. Transferring Physician
 - 1. Maintains responsibility for patient until patient care is assumed at receiving facility.
 - 2. Determines level of medical assistance to be provided for the patient during transfer.
 - 3. Receives confirmation from the receiving physician and receiving hospital that appropriate diagnostic and/or treatment services are available to treat the patient's condition and that appropriate space, equipment and personnel are available prior to the transfer.
- D. Receiving Physician
 - 1. Makes suitable arrangements for the care of the patient at the receiving hospital.
 - 2. Determines and confirms that appropriate diagnostic and/or treatment services are available to treat the patient's condition and that appropriate space, equipment and personnel are available prior to the transfer, in conjunction with the transferring physician.
- E. Transportation Provider
 - The patient being transferred must be provided with appropriate medical care, including qualified personnel and appropriate equipment, throughout the transfer process. The personnel and equipment provided by the transporting agency shall comply with local EMS agency protocols.
 - Interfacility transport within the jurisdiction of VC EMS shall be performed by an ALS or BLS ambulance.
 - a. BLS transfers shall be done in accordance with EMT Scope of Practice per Policy 300
 - ALS transfers shall be done in accordance with EMT-P Scope of Practice per Policy 310

IV. PROCEDURE:

A. Non-Emergency Transfers

Non emergency transfers shall be transported in a manner which allows the provider to comply with response time requirements.

B. Emergency Transfers

Emergency transfers require documentation by the transferring hospital that the condition of the patient medically necessitates emergency transfer. Provider agency dispatchers shall verify that this need exists when transferring hospital personnel make the request for the transfer.

C. Transferring process

1. The transferring physician will determine the patient's resource requirements and request an inter-facility ALS, or BLS transfer unit using the following guidelines:

Patie	ent Condition/Treatment	EMT	EMT-P	RN/RT/MD
a.	Vital signs stable	х		
b.	Oxygen by mask or cannula	х		
C.	Peripheral IV glucose or isotonic balanced salt	Х		
	solutions running			
d.	Continuous respiratory assistance needed		x	
	(EMT-P scope management)			
e.	Peripheral IV medications running or		х	
	anticipated (EMT-P scope)			
f.	EMT-P level interventions		х	
g.	Central IV line in place		x	
h.	Respiratory assistance needed (outside			x
	EMT-P scope of practice)			
i.	IV Medications (outside EMT-P scope of			х
	practice)			
j.	PA line in place			Х
k.	Arterial line in place			х
Ι.	Temporary pacemaker in place			х
m.	ICP line in place			х
n.	IABP in place			х
о.	Chest tube			х
р.	IV Pump		х	
q.	Standing Orders Written by Transferring			Х
	Facility MD			
r.	Medical interventions planned or anticipated			X
	(outside EMT-P scope of practice)			
S.	Thoracostomy tube attached to Heimlich valve		x	

- 2. The transferring hospital advises the provider of the following:
 - a. Patient's name
 - b. Diagnosis/level of acuity
 - c. Destination
 - d. Transfer date and time
 - e. Unit/Department transferring the patient
 - f. Special equipment with patient
 - g. Hospital personnel attending patient
 - h. Patient medications
- 3. The transferring physician and nurse will complete documentation of the medical record.

All test results, X-ray, and other patient data, as well as all pertinent transfer forms, will G:\EMS\POLICY\Approved\0605_Interfaciity_Transfer_of_Patients_0604_sig.doc

be copied and sent with the patient at the time of transfer. If data are not available at the time of transfer, such data will be telephoned to the transfer liaison at the receiving facility and then sent by FAX or mail as soon thereafter as possible.

- 4. Upon departure, the Transferring Facility will call the Receiving Facility and confirm arrangements for receiving the patient and provide an estimated time of arrival (ETA).
- 5. The Transferring Facility will provide:
 - a. A verbal report appropriate for patient condition
 - b. Review of written orders, including DNAR status.
 - c. A completed transfer form from Transferring Facility.

V. DOCUMENTATION

A. Documentation of Care for Interfacility transfers will be done in accordance to Policy 1000.

COUNTY OF VENTURA	EMERGEN	NCY MEDICAL SERVIO	CES		
HEALTH CARE AGENC	ſ	POLIC	POLICIES AND PROCEDURES		
F	Policy Title:		Policy Number:		
Withholding or Terr	mination of Resuscitation	on and	606		
Detern	nination of Death				
APPROVED: Sam	y R. Fisher		Data: December 1, 2	008	
Administration: Barry	R. Fisher, MPPA		Date. December 1, 2	000	
APPROVED:	3		Data: December 1, 2	000	
Medical Director Ange	elo Salvucci, MD		Date. December 1, 2	008	
Origination Date:	June 1984				
Date Revised:	October 9, 2008	Effective Da	ate: December 1, 2	2008	
Date Last Reviewed:	October 9, 2008				
Next Review Date:	October, 2011				

- I. PURPOSE: To establish criteria for withholding or termination of resuscitation and determination of death by prehospital EMS personnel.
- II. AUTHORITY: Health and Safety Code, Division 2.5, Sections 1797.220,1798 and 7180.
 Government Code 27491 and 27491.2. California Code of Regulations, Title 22,
 Division 9, Section 100175.
- III. POLICY: Prehospital EMS personnel may withhold or terminate resuscitation and determine that a patient is dead, and leave the body in custody of medical or law enforcement personnel, according to the procedures outlined in this policy.

IV. DEFINITION:

- Prehospital EMS personnel: Prehospital EMS personnel mean all responding EMT-Is and Paramedics, and flight nurses.
- 2. Further Assessment: "Further assessment" refers to a methodical evaluation for signs/symptoms of life in the apparently deceased person. This evaluation includes examination of the respiratory, cardiac and neurological systems, and a determination of the presence or absence of rigor mortis and dependent lividity. The patient who displays any signs of life during the course of this assessment may NOT be determined to be dead,
- 3. Hospital: A licensed health care institution that provides acute medical care.
- 4. Skilled Nursing Facility: A licensed health care institution that provides non-acute care for elderly or chronically ill patients, and has licensed medical personnel on scene (RN or LVN).
- 5. Hospice: A care program into which terminally ill patients may be enrolled, to assist with the management of palliative care during the terminal stages of illness.
- V. PROCEDURE:
 - A. General Guidelines:

- 1. The highest medical authority on scene shall determine death in the field.
 - a. If BLS responders have any questions or uncertainty regarding determination of death, BLS measures shall be instituted until arrival of ALS personnel.
 - b. If ALS responders have questions or uncertainty regarding determination of death, ALS measures shall be instituted until base hospital contact is made and orders received.
- Prehospital EMS personnel who have determined death in the field in accordance with the parameters of this policy are not required to make base hospital contact.
- 3. Prehospital EMS personnel who arrive on scene after the patient is determined to be dead shall not re-evaluate the patient.

PATIENTS WHO ARE OBVIOUSLY DEAD

Upon arrival, prehospital EMS personnel shall rapidly assess the patient. For patients suffering any of the following conditions, no further assessment is required. No treatment shall be started and the patient shall be determined to be dead.

- Decapitation,
- Incineration,
- Hemicorporectomy, or
- Decomposition.

PATIENTS WHO APPEAR TO BE DEAD (WITH Rigor Mortis and/or Dependent Lividity)

- B. Patients who are apneic and pulseless require further assessment as described in table 1.
 - If rigor mortis and/or dependent lividity are present, and if no response for all the assessment procedures indicates signs of life, the patient shall be determined to be dead.
 - 2. Rigor mortis is determined by checking the jaw and other joints for rigidity.
 - 3. Dependent lividity is determined by checking dependent areas of the body for purplish-red discoloration.

CATEGORY	ASSESSMENT PROCEDURES	FINDINGS FOR DETERMINATION OF DEATH
Respiratory	Open the patient's airway. Auscultate lungs or feel for breaths while observing t chest for movement for a minimum of 30 seconds	No spontaneous breathir No breath sounds on auscultation.
Cardiac	Palpate the carotid artery (brachial for infant) for a minimum of 1 minute. Auscultate for heart sounds for minimum 1 minute. <u>OR</u> <u>ALS ONLY- Monitor the patient's cardiac</u> <u>rhythm for minimum of 1 minute. Check</u> <u>asystole in 2 leads. Obtain a 6-second</u> <u>strip to be retained with the EMS provider</u> <u>documentation.</u>	No pulse. No heart sounds.
Neurological	Check for pupil response to light. Check for response to painful stimuli.	No pupillary response. No response to painful Stimuli.

1. While in the process of the assessment procedures, if any response indicates signs of life, resuscitation measures shall take place immediately.

2. **If rigor mortis and/or dependent lividity are present**, and if no response for all the assessment procedures indicates signs of life, the patient shall be determined to be dead.

	PATIENTS WHO APPEAR TO BE DEAD:
	(WITHOUT Rigor Mortis and/or DEPENDENT LIVIDITY)
C.	Patients who appear to be dead but display no signs of rigor mortis and/or
	dependent lividity shall have the cause of apparent death determined to be

MEDICAL (non traumatic, including drowning, ingestion, asphyxiation, hanging, poisoning, lightning strikes, and electrocution), or **TRAUMATIC** (and injuries are sufficient to cause death).

1. **MEDICAL ETIOLOGY**: Resuscitation measures shall take place.

- 2. **TRAUMATIC ETIOLOGY**: Further assessment as defined in Table 1 shall be performed. If no response for all the assessment procedures, the patient's age should be determined. (reasonable estimation appropriate if positive determination of age is not possible)
 - a. For patients younger than 18 years of age, resuscitation measures, including transport to the hospital shall take place.
 - b. For patients 18 years or older:
 - 1) BLS RESPONDERS:

- a) If the time from initial determination of pulselessness and apnea until hospital arrival is estimated to be less than 20 minutes, resuscitation measures, including transport to the hospital shall take place.
- b) If the time from initial determination of pulselessness and apnea until hospital arrival is estimated to be 20 minutes or more, the patient may be determined to be dead.

2) ALS RESPONDERS:

 a). If the time from initial determination of pulselessness and apnea until hospital arrival is re-estimated to be less than twenty minutes, using a cardiac monitor, the patient's rhythm should be assessed.

1. If the rhythm is narrow complex PEA, wide complex PEA greater than 30 beats per minute, ventricular tachycardia or ventricular fibrillation, resuscitation measures, including transport to the hospital, shall take place.

2. If the rhythm is asystole or wide complex PEA at a rate of 30 beats per minute or slower, the patient shall be determined to be dead.

- b.) If the time from **initial determination** of pulselessness and apnea until hospital arrival is estimated to be twenty minutes or more, the patient may be determined to be dead, regardless of cardiac rhythm..
- D. Termination of Resuscitation
 - Base hospitals and EMS personnel should consider terminating resuscitation measures on adult patients (age 18 and older) who are in cardiopulmonary arrest and fail to respond to treatment under VC EMS Policy 705: Cardiac Arrest, Adult.
 - 2. If resuscitation measures have been initiated, base hospital contact should be attempted before resuscitation is terminated and the patient determined toe dead.
 - 3. If unable to make base hospital contact, resuscitation efforts may be terminated and the patient determined to be dead using the following criteria:

- a. Patients without evidence of trauma who meet termination of resuscitation criteria in VC EMS Policy 705: Cardiac Arrest, Adult.
- Patients with blunt or penetrating trauma if the cardiac rhythm is or becomes asystole or wide complex PEA at a rate less than 30 beats per minute.
- In cases of cardiopulmonary arrest as a result of a lightning strike, electrocution or suspected hypothermia, CPR shall be performed for a minimum of one hour. BLS responders in these circumstances shall make all reasonable attempts to access ALS care.
- E. Documentation
 - 1. EMS personnel will document determination of death in the approved Ventura County Documentation System (AVCDS).
- F. Disposition of Decedent's Body
 - Deaths that occur in hospitals or skilled nursing facilities, or to patients enrolled in hospice programs, do not require law enforcement response. Under these circumstances the body may be left at the scene.
 - Deaths that occur anyplace other than a hospital or skilled nursing facility
 except to patients enrolled in hospice programs, must be reported to law
 enforcement personnel and the body must be left in their custody.

Ventura County EMS Determination of Death



COUNTY OF VENTUR	A	EMERG	EMERGENCY MEDICAL SERVICES		
HEALTH CARE AGENO	CY	PC	POLICIES AND PROCEDURES		
	Policy Title:		Policy Number		
EMT-	I Administration of Oral Glucose		620		
APPROVED:	Samy R. Fisher		Data: Dacambar 1, 2008		
Administration: E	Barry R. Fisher, MPPA		Date. December 1, 2008		
APPROVED:	3		Date: December 1, 2008		
Medical Director:	Angelo Salvucci, M.D.		Date. December 1, 2008		
Origination Date:	November 18, 1982				
Date Revised:	March 9, 2006	Effor	Effective Date: December 1, 2009		
Date Last Reviewed:	October 9, 2008	Ellec	Effective Date. December 1, 2008		
Next Review Date:	October, 2011				

- I. PURPOSE: To define the indications and use of oral glucose by EMTs.
- II. AUTHORITY: Health and Safety Code 1798, 1797.220. California Code of Regulations, Title 22, Section 100063.
- III. POLICY:
 - A. Oral glucose is to be used <u>only</u> if the patient meets the following criteria:
 - 1. The patient has a history of diabetes controlled by medication
 - 2. Shows signs or symptoms of altered mental status.
 - 3. The patient is conscious, able to swallow and protect their airway (intact gag reflex).

IV. PROCEDURE:

- A. The following instructions should be followed:
 - 1. Check the expiration date of the oral glucose
 - 2. Monitor patient's airway closely during administration
 - 3. Administer the entire tube in small increments
 - a. Squeeze small portions of the oral glucose into the mouth between the cheek and gum or
 - b. Place small portions f the oral glucose on a tongue depressor and deposit the medication between the cheek and gum
 - 4. Lightly massage the cheek to increase absorption; the medication should not be swallowed.
 - 5. If the patient loses consciousness or seizes, stop administration, consider suctioning.

- 6. Reassess the patient for improvement in mental status
- 7. Document the patient's assessment, the time and amount of medication administered and patient's reassessment.

COUNTY OF VENTU	RA	EMERGE	EMERGENCY MEDICAL SERVICES		
HEALTH CARE AGE	NCY	POLI	POLICIES AND PROCEDURES		
	Policy Title:		Policy Number		
	Patient Medications		624		
APPROVED:	Barry R. Fisher		Date: December 1, 2008		
Administration:	Barry R. Fisher, MPPA		Date. December 1, 2008		
APPROVED:	3		Date: December 1, 2008		
Medical Director:	Angelo Salvucci, M.D.		Date. December 1, 2006		
Origination Date:	December 6, 2006				
Date Revised:		Effectiv	o Doto: Docombor 1, 2009		
Date Last Reviewed:	October 9, 2008	Effective Date: December 1, 2008			
Next Review Date:	October, 2011				

- I. PURPOSE: To establish a procedure for locating, identifying, and transporting medications in order to assist in the prompt and accurate hospital evaluation and treatment of patients.
- II. AUTHORITY: Health and Safety Code, Section 1797.220, and 1798.California Code of Regulations, Title 22, Section 100175.
- III. POLICY:
 - A. Reasonable efforts are to be made to determine the essential information for all medications: name, strength, dose, route, frequency, and time of last dose.
 - B. For patients who do not know this information, either a detailed list or the medications in their original containers will be taken with the patient to the hospital whenever possible.
 - C. Medications include all prescriptions, nutritional and herbal supplements, overthe-counter preparations, pumps, patches, inhalers, drops, sprays, suppositories, creams or ointments.
- IV. PROCEDURE:
 - A. For patients who do not know all of the essential information on all of their medications, either a list of medications with essential information or the medications in the original containers should be taken to the hospital.
 - B. If unable to locate the original labeled medication containers, pills in unlabeled containers or pills not in containers will be taken.
 - C. If the patient or family objects to turning over the medication to EMS personnel, the family must be told of their importance and instructed to take them to the emergency department promptly.
 - D. Medications taken to the hospital are to be turned over to an identified individual hospital staff person.
- E. Hospital staff is responsible for returning the medications to patient or family.
- F. EMS personnel must document all actions on the Approved VCEMS Documentation System, including discussing medications, taking them to the hospital, the person to whom they were turned over, and explain if unable to obtain essential information or medications.

COUNTY OF VENTURA HEALTH CARE AGENCY

EMERGENCY MEDICAL SERVICES POLICIES AND PROCEDURES

		I GEIGIEG	
	Policy Title:		Policy Number:
	Use of Pre-existing Vascular Device (PV	AD)	716
APPROVED:	H-Cll		Date: 12/01/07
Administration:	Steven L. Carroll, EMT-P		Date. 12/01/01
APPROVED:			Data: 12/01/07
Medical Director	Angelo Salvucci, MD		Date. 12/01/07
Origination Date:	March 2, 1992		
Date Revised:	June 11, 2007	Effective Dat	e: December 1, 2007
Last Reviewed:	June 11, 2009		
Review Date:	June 30, 2011		

- I. Purpose: To define the use of pre-existing vascular access devices (PVAD) by Ventura County Emergency Medical Technician- Paramedics (EMT-P) in the prehospital setting.
- II. Policy: PVADs may be used in the prehospital setting as set forth by this document.
- III. Definition: A PVAD is a heparin/saline lock or an indwelling catheter/device placed into a vein, to provide vascular access for those patients requiring long term intravenous therapy or hemodialysis. Internal subcutaneous indwelling devices are not to be accessed by prehospital field personnel.
- IV. Procedure: After successful completion of an approved Ventura County training module, an EMT-P may access a PVAD and administer normal saline and medications, for a patient with the following conditions:
 - A. Peripheral Vein Heparin/Saline Lock
 - 1. Any conditions requiring intravenous fluids and/or medications
 - B. Central Vein Indwelling Catheter/Device
 Urgent need to administer fluids and/or medications which can only be given
 - by the IV route and a peripheral IV site is not readily/immediately available.
 - C. Hemodialysis Fistula (to be used only in the absence of peripheral or central IV access):

Urgent need to administer fluids and/or medications which can only be given by the IV route and an alternate IV site is not readily/immediately available.

COUNTY OF VENTU	IRA	EMERGENCY	MEDICAL SERVICES
HEALTH CARE AGE	NCY	POLICIES	S AND PROCEDURES
	Policy Title:		Policy Number:
	INTRAOSSEOUS INFUSION		717
APPROVED:	ACCO		Date: June 1, 2011
Administration:	Steven L. Carroll, Paramedic		Date. June 1, 2011
APPROVED:			Date: June 1, 2011
Medical Director:	Angelo Salvucci, MD		Date. June 1, 2011
Origination Date:	September 10, 1992		
Date Revised:	April 14, 2011	Effoctiv	(0 Data: Juno 30, 2011
Date Last Reviewed:	April 14, 2011	Ellectiv	e Dale. Julie 30, 2011
Review Date:	June 2013		

- I. PURPOSE: To define the indications, procedure, and documentation for intraosseous insertion (IO) and infusion by paramedics.
- II. AUTHORITY: Health and Safety Code, Sections 1797.178, 1797.214, 1797.220, 1798 and California Code of Regulations, Title 22, Sections 100145 and 100169.
- III. POLICY: IO may be performed by paramedics who have successfully completed a training program approved by the EMS Medical Director.
 - A. Training

The EMS service provider will ensure their paramedics successfully complete an approved training program and will notify EMS when that is completed.

B. Indications

Patient with an altered level of consciousness (ALOC) or in extremis AND there is an urgent need to administer intravenous fluids or medications AND venous access is not readily available.

- 1. Manual IO: For patients less than 8 years of age.
- 2. EZ-IO device: For patients of all ages.
- C. Contraindications
 - 1. Recent fracture (within 6 weeks) of selected bone.
 - 2. Congenital deformities of selected bone.
 - 3. Grossly contaminated skin, skin injury, burn, or infection at the insertion site.
 - 4. Excessive adipose tissue at the insertion site with the absence of anatomical landmarks.
 - 5. IO in same bone within previous 48 hours.
- IV. PROCEDURE:
 - A. Manual IO insertion
 - 1. Assemble the needed equipment

- a. 16-18 gauge IO needle (1.5 inches long)
- b. Alcohol wipes
- c. Sterile gauze pads
- d. Two (2) 5 mL syringes and a primed IV line (with or without stopcock)
- e. IV fluids: 500 mL NS only
- f. Tape
- g. Splinting device
- 2. Choose the appropriate insertion site. Locate the landmarks approximately 2 cm below the patella and 1 cm medial, on the anteromedial flat bony surface of the proximal tibia.
- 3. Prepare the site utilizing aseptic technique with alcohol wipe.
- 4. Fill one syringe with NS
- 5. To insert the IO needle:
 - a. Stabilize the site.
 - Grasp the needle with obturator and insert through skin over the selected site at a 90° angle to the skin surface.
 - c. Once the bone has been reached, continue to apply pressure rotating and gently pushing the needle forward.
 - When the needle is felt to 'pop' into the bone marrow space,
 remove the obturator, attach the empty 5 mL syringe and attempt
 to aspirate bone marrow.
 - e. For responsive patient infuse 2% cardiac lidocaine prior to fluid/medication administration for pain management:
 1 mg/kg (max 40 mg) slow IVP over 60 seconds.
 - f. Attach the 5 mL syringe containing NS and attempt to flush the IO needle. If successful, remove the syringe, connect the IV tubing and secure the needle.
 - g. Infuse NS and/or medications.
 - h. Splint and secure the IO needle.
 - i. Document distal pulses and skin color to extremity utilized for IO insertion before and after procedure. Monitor for complications.
- B. EZ-IO insertion
 - 1. Assemble the needed equipment
 - a. Choose appropriate size IO needle

- 1) 15 mm needle sets (pink): 3-39 kg
- 2) 25 mm needle sets (blue): ≥ 40 kg
- 45 mm needle sets (yellow): For patients with excessive adipose tissue at insertion site
- b. Alcohol wipes
- c. Sterile gauze pads
- d. 10 mL syringe
- e. EZ Connect tubing
- f. IV fluids
 - 1) 3-39 kg: 500 mL NS
 - 2) ≥40 kg: 1 L NS
- g. Tape or approved manufacturer securing device
- 2. Prime EZ Connect tubing with 1 mL fluid
 - a. If less than 2 years old, prime with NS
 - b. If \geq 2 years old, prime with 2% cardiac lidocaine (20 mg)
- 3. Locate the appropriate insertion site on the anteromedial flat surface of the proximal tibia.
 - a. Pediatric: 2 cm below the patella, 1 cm medial
 - b. Adult: 2 cm medial to the mid tibial tuberosity
- 4. Prepare the site utilizing aseptic technique with alcohol wipes.
- 5. To insert the EZ-IO needle:
 - a. Connect appropriate size needle set to the EZ-IO driver.
 - b. Stabilize the site. .
 - Position the EZ-IO needle at 90° to the underlying bone and insert it into the skin. Continue to insert the needle until contacting the bone. Ensure at least one black band is visible above the skin.
 - Once contact with the bone is made, activate the driver and advance the needle without pressure until the bone has been penetrated.
 - e. Once properly placed, attach primed EZ Connect tubing and attempt to aspirate bone marrow.
 - For responsive patients, slow infusion of 2% cardiac lidocaine over 60 seconds prior to fluid/medication administration for pain management.
 - 1) 3-39 kg: 1 mg/kg

- 2) ≥40 kg: 40 mg
- g. Flush with 10 mL NS to assess patency. If successful, begin to infuse fluid.
- h. Splint the IO needle with tape or an approved manufacturer stabilization device.
- i. Document time of insertion on included purple arm band and place on patient's wrist.
- j. Document distal pulses and skin color before and after procedure and monitor for complications.
- C. IO Fluid Administration
 - Active pushing of fluids may be more successful than gravity infusion.
 Use of a pressure to assist with fluid administration is recommended, and usually needed, but not required.
 - Fluid administration on smaller patients should be given via syringe boluses to control/monitor amount infused. Close observation of the flow rate and total amount of fluid infused is required.
 - 3. If infiltration occurs or the IO needle is accidentally removed, stop the infusion, leave the connector tubing attached.
- D. Documentation
 - Document any attempt(s) at establishing a peripheral IV prior to attempting/placing an IO infusion on the approved Ventura County documentation system (AVCDS) and Intraosseous Infusion Data Form (Appendix A).
 - The site(s) and number of attempts to establish an IO infusion shall be documented on the AVCDS, as well as the medications and amount of fluids administered during patient care.
- E. Quality Assurance

Each use of an IO infusion will be reviewed by the Base Hospital, EMS service provider and EMS. The Intraosseous Infusion Data Form (Appendix A) will be completed for all IO insertion attempt.

Appendix A

VENTURA COUNTY EMS AGENCY INTRAOSSEOUS INFUSION CQI FORM*



DEMOGRAPHICS			
DATE:	INCIDENT NUMBER:		
INSERTING PARAMEDIC:	AGENCY:		
PATIENT AGE:			
INDICATIONS: Cardiac Arrest	Shock Other:		
Describe conditions:			
ALOC? : CYes No	IV access unavailable? 🗆 Yes 🛛 No		
	Explain:		
Extremis? Ves No			
IO INFUSION ATTEMPT			
Needle size: D15mm D25mm D45mm Number of IO attempts:			
Insertion site: Distal Pulses Documented: _Yes _ No			
EZ Connect Primed: Lidocaine NS	Infiltration: Yes No		
Saline infused	IO Secured:		
Lidocaine 2% 🗆 Yes 🗆 No	Pressure infusion? Yes No		
COMMENTS:			

*This form is to be completed on all cases where IO infusion is attempted Please submit this form to your agency, the base hosptial and to VC EMSA

Appendix B



Skills Assessment

Name	AgencyDate	_
	Demonstrates, proper body substance isolation	
	States indication for EZ-IO use	
	States contraindication for EZ-IO use	
	Correctly locates target site	
	Cleans site according to protocol	
	Considers 2% cardiac lidocaine for patients responsive to pain	
	Correctly assembles EZ-IO Driver and Needle Set	
	Stabilizes the insertion site, inserts EZ-IO Needle Set, removes stylet and confirms placement	
	Demonstrates safe stylet disposal	
	Connects primed extension set and flushes the catheter	
	Connects appropriate fluid with pressure infuser and adjusts flow as instructed	
	Demonstrates appropriate securing of the EZ-IO	
	States requirements for VC EMS documentation	
Instructor S	ignature:Date	

COUNTY OF VENTURA HEALTH CARE AGENCY

EMERGENCY MEDICAL SERVICES POLICIES AND PROCEDURES

	Policy Title: Continuous Positive Airway Pressure (CPAP)	Policy Number: 723
APPROVED: Administration:	Steven L. Carroll, EMT-P		Date: 12/01/07
APPROVED: Medical Director	Angelo Salvucci, MD		Date: 12/01/07
Origination Date: Date Revised: Last Reviewed: Review Date:	December 2004 September 13, 2007 June 11, 2009 September 30, 2011	Effective Da	te: December 1, 2007

- I. PURPOSE: To define the indications, procedure and documentation for the use of Continuous Positive Airway Pressure (CPAP) by paramedics
- II. AUTHORITY: Health and Safety Code, Sections 1797.220 and 1798. California Code of Regulations, Title 22, Division 9, Section 10063.
- III. POLICY: Paramedics may utilize CPAP on patients in accordance with Ventura County Policy 705.
- IV. PROCEDURE:
 - A. Training: Prior to using CPAP the paramedic must successfully complete a training program approved by the VC EMS Medical Director, which includes operation of the device to be used.
 - B. Indications: Patients age 8 and above with one or more of the following:
 - 1. Congestive Heart Failure with acute pulmonary edema
 - 2. Near drowning
 - 3. Any cause of respiratory failure.
 - C. Contraindications:
 - 1. Absolute
 - a. Respiratory or cardiac arrest
 - b. Agonal respirations
 - c. Unconsciousness
 - e. Pneumothorax
 - f. Inability to maintain airway patency
 - g. Head injury with increased ICP
 - 2. Relative:
 - a. Decreased LOC
 - b. Unable to tolerate mask
 - c. Systolic blood pressure < 90

d. Vomiting

- E. Patient Treatment
 - 1. Place patient in a seated position with legs dependant
 - 2. Monitor ECG, Vital signs, SpO2
 - 3. Set up CPAP system
 - 4. Explain procedure to patient.
 - 5. Apply mask while reassuring patient.
 - 6. Frequently reevaluate patient. Normally, the patient should improve in the first 5 minutes with CPAP, as evidenced by a decreased heart rate, respiratory rate and/or blood pressure and an increased SpO2. Should the patient become worse with CPAP, remove the CPAP device and assist ventilations with BVM as needed.

D. DOCUMENTATION

- 1. The use of CPAP must be documented.
- 2. Vital signs and SpO2 must be documented every 5 minutes.
- 3. Narrative documentation should include a description of the patient's response to CPAP.

COUNTY OF VENTU	JRA	EMERG	ENCY MEDICAL SERVICES	
HEALTH CARE AGE	NCY	POI	LICIES AND PROCEDURES	
	Policy Title: Patients After TASER Use		Policy Number: 725	
APPROVED: Administration:	Barry R. Fisher, MPPA		Date: December 1, 2008	
APPROVED: Medical Director	Angelo Salvucci, MD, FACEP		Date: December 1, 2008	
Origination Date: Date Revised: Date Last Reviewed: Next Review Date:	August 10, 2006 October 9, 2008 October, 2011	Effec	tive Date: December 1, 2008	

- I. PURPOSE: To define the treatment and transportation of the patient on whom a TASER has been used.
- II. AUTHORITY: Health and Safety Code, Sections 1797.214, 1797.220, 1798, and 1798.200, California Code of Regulations, Title 22, Section 100169.
- III. POLICY: It is the policy of the Ventura County Sheriff's Department that all persons on whom a TASER is used be medically cleared prior to incarceration. Law enforcement officers may remove the TASER probes and may transport individuals in custody to an emergency department. On occasion, EMS personnel may be called to evaluate and transport patients with or without the probes in place.
 - A. TASER probes should not be removed by EMS personnel unless they interfere with the safe transportation of the patient.
 - B. Patients should be transported to the closest available hospital or the hospital requested by the law enforcement officer.

IV. PROCEDURE:

- A. When safe to do so, patients should be immediately evaluated, with particular attention to signs and symptoms of excited delirium.
- B. Any injuries or medical conditions will be treated according to the appropriate treatment protocol.
- C. These patients will be in the custody of law enforcement and will require transportation to an emergency department for medical clearance.
- D. If the transporting paramedic determines that the patient is a risk to him/herself and/or the ambulance personnel, law enforcement officer(s) may be requested to accompany the patient.
- E. Unless otherwise contraindicated, the patient should be adequately and safely restrained in an upright position prior to transport.
- F. If one or both of the TASER probes requires removal for safe transportation:
 - 1. Verify the wires to the probes have been severed.
 - 2. Use routine biohazard precautions.

- 3. Place one hand on the patient in the area where the probe is embedded and stabilize the skin surrounding the puncture site between two fingers. Keep your hand several inches away from the probe. With your other hand, in one fluid motion pull the probe straight out from the puncture site.
- 4. Reinsert TASER probes, point down, into the discharged air cartridge and hand it to the law enforcement officer.
- 5. Apply direct pressure for bleeding, and apply a sterile dressing to the wound site.
- G. If the TASER may be in a dangerous area (e.g., face, neck, hand, bone, groin or spinal column), where it may injure bone, nerves, blood vessels, or an eye, do NOT remove the probe. Transport the patient to the ED in an appropriate position.
- H. Refer to Policy 705: Behavioral Emergencies if patient requires sedation.