compared with adult doses. **Methods** Following 7 minutes of untreated VF, 24 piglets were randomized to receive either biphasic shocks at 35–35–35 J (Bi35 group) or 50–75–86 J (Bi50 group) via pediatric-sized pads or adult shocks at 200–300–360 J (Bi200 group) via adult pads. Resuscitation was per pediatric BLS protocol to 20 minutes, then pediatric ALS protocol to 27 minutes. A nonparametric statistical test (Kruskal-Wallis with Dunn correction) was used. **Results** Piglets (19±3kg) required more Bi35 than Bi200 shocks to terminate the initial VF episode (*p=0.03) and received more shocks overall (7.9±6.3 vs 1.4±0.5, p=0.008). There was no significant difference between the 3 groups in cumulative dose. Animals defibrillated with 35 J had a 10% decrease in LVEF from baseline at 4 hours versus a 32% decrease in piglets receiving the adult dose shock (p=0.14). Survival to 4 hours was nearly equal between the three groups with good neurological outcome in 7/8 Bi35 piglets versus 3/8 Bi200 (p=0.09). **Conclusion** Outcomes were similar for this lower dose and the previously proven 50 J pediatric AED dose. Compared to the adult dose, both attenuated doses tended to be associated with less myocardial dysfunction and better 24-hour outcome. Although this lowest dose required more shocks than the adult dose, our results suggest that this new, lower dose would be safe and effective for pediatric defibrillation.

Outcomes (mean±;std dev)

Defib Dose Group	Number of Piglets	Number of Shocks Prior to First Defibrillation	Cumulative Dose (J/Kg)	Percent Decrease in 4-hr LVEF from Baseline	4-hour Survival	24-hour Good Neurologic Outcome
Bi35	8	5.9±6.3*	12.2±10.4	10±21%	7	7
Bi50	8	2.4±1.4	12.9±15.1	7±30%	7	6
Bi200	8	1.1±0.4	14.5±7.5	32±18%	8	3

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Increasing CPR during Out-of-hospital Ventricular Fibrillation Arrest: Survival Implications of Guideline Changes

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Background: The most recent resuscitation guidelines have sought to improve the interface between defibrillation and CPR. However, the survival implications of these changes are unknown. A year prior to issuance of the most recent guidelines, the EMS of the study community implemented protocol changes that provided a single shock without rhythm reanalysis, stacked shocks, or post-defibrillation pulse checks, while extending the period of CPR from 1 to 2 minutes. We hypothesized survival would be better in patients treated with the new protocol. **Methods:** The study took place in a community with a two-tiered EMS response and an established system of cardiac arrest surveillance, training, and review. Per the Utstein template, the investigation was a cohort study of persons suffering bystander-witnessed, out-of-hospital ventricular fibrillation arrest due to heart disease that compared a prospectively-defined intervention group (January 1, 2005-January 31, 2006) with a historical control group that was treated with the prior guideline approach of rhythm reanalysis, stacked shocks, and post-defibrillation pulse checks (January 1, 2002-December 31, 2004). In fall of 2004, EMTs were trained regarding the new protocol and AEDs were reprogrammed. The primary outcome was survival to hospital discharge. Logistic regression was used to assess the association between survival and study period while accounting for potential confounders. **Results:** The proportion of all treated arrests meeting inclusion criteria was similar for intervention and control periods (15.4% $^{134}/_{869}$ versus 16.6% $^{374}/_{2255}$). Survival to hospital discharge was greater during the intervention compared to control period (46% $^{61}/_{134}$ versus 33% $^{123}/_{374}$, p=0.008). Adjustment for covariates did not alter the association. Better hospital survival during the intervention period corresponded to a greater proportion with return of circulation at the end of EMS care (74% $^{99}/_{134}$ versus 60% $^{223}/_{374}$) as well as a decrease in the interval from initial shock to start of CPR (7 seconds versus 28 seconds) based on electronic AED record review. **Conclusion:** These results suggest the new guideline approach will alter the interface between defibrillation and CPR and in turn may improve outcome.

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Comparison Between Cerebral Microcirculatory Blood Flow Following Epinephrine and Vasopressin During CPR

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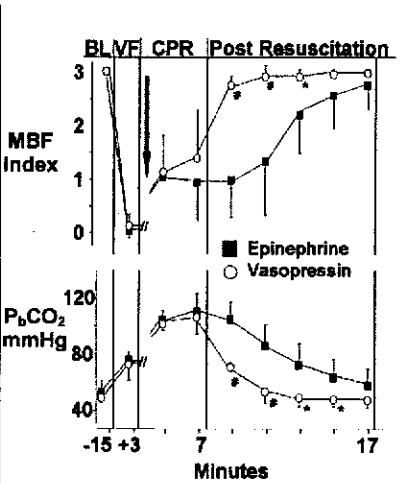
Introduction. Both epinephrine and vasopressin increase cerebral cortical large vessel pressure when administered during CPR. However, we recently demonstrated that epinephrine reduces cerebral cortical microcirculatory blood flow (MBF). Accordingly, we explored the effects of non-adrenergic vasopressin on cerebral cortical perfusion. **Methods.** Ten domestic male pigs weighing 40 ± 2 kg were intubated and mechanically ventilated. A fronto-parietal bilateral craniotomy was created. MBF was measured with the Orthogonal Polarization Spectral imaging method using the CYTOSCAN A/R (Cytometrics Inc., Philadelphia, PA). Tissue carbon dioxide tension (P_bCO_2) was measured with a miniature carbon dioxide tissue electrode (CO2-02-PH ABG Module, Optical Sensors Inc, MN). Blood flow velocity in pial and penetrating vessels < 20 μm was graded from 0 (no flow) to 3 (normal). Ventricular fibrillation (VF) was induced by an AC current delivered to the right ventricular endocardium. VF was untreated for 3 min. Animals were randomized to receive either epinephrine (30 μg/kg) or vasopressin (0.4 U/kg) at one minute after the start of CPR. After 4 minutes of CPR including precordial compression and ventilation with oxygen, defibrillation was attempted. **Results.** All animals were successfully resuscitated. Significantly lower P_bCO_2 and greater MBF were observed after vasopressin (Figure). **Conclusion.** Cortical microcirculatory blood flow was markedly reduced after epinephrine, but not after vasopressin.



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Use of an Impedance Threshold Device Improves Survival in a Suburban EMS System

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Introduction: The 2005 AHA guidelines recently recommended (Class IIa) the use of an impedance threshold device (ITD) to increase circulation and return of spontaneous circulation (ROSC) rates in patients in cardiac arrest. **Hypothesis:** We assessed the hypothesis that adding an ITD to standard BLS and ALS resuscitation efforts would improve short-term survival in patients with out-of-hospital cardiac arrest from all causes when compared to historical controls. **Methods:** Cypress Creek EMS (population 400K) covers a suburban area North of Houston (TX) in Harris County. From 8/05–4/06, 104 patients in cardiac arrest were prospectively treated with an ITD (ResQPOD®) and survival results were compared to historical controls (n=143) from 8/04–7/05 when an ITD was not in use. The primary endpoint was ROSC. A Chi square test was used for statistical analysis. Age, gender and EMS response time (~8 min) were evenly matched between groups. The ITD was used on all patients in cardiac arrest (all etiologies) who were >1 year of age. It was applied ~ 10 minutes after the 911 call, typically first on a facemask and then moved to an endotracheal tube if the patient was intubated. **Results:** ROSC rates were 45% in the historical control group vs. 59% in ITD patients (P=0.03). Neurologically intact hospital discharge rates improved from ~10% (control) to 17% in the ITD group (p=ns). The benefit was observed regardless of presenting rhythm, including 4 ITD-treated patients with intact neurological status at discharge who presented with asystole vs. none in the control group. There were no adverse events associated with ITD use. **Conclusion:** In conclusion, following ITD implementation, ROSC rates increased by 29% and neurologically intact discharge rates improved by >50%. Use of the ITD was easily and rapidly implemented, resulting in a significant improvement in survival - the highest overall resuscitation rates observed in the 30-year history of the Cypress Creek EMS system.

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Lower Ventilation Rates Improve Brain Tissue Oxygenation and Perfusion During Hemorrhagic Shock

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Background: Recent studies showed that arterial blood pressure during hemorrhagic shock is made worse with hyperventilation and improved with a ventilation rate of 6 breaths/min. **Objective:** To compare the effect of three ventilation strategies on brain tissue PO_2 ($P_{br}O_2$) and perfusion in an animal model of hemorrhagic shock. **Methods:** Swine (mean weight 52.4 ± 3.3 kg) were randomly allocated to receive one of three ventilation strategies after hemorrhage: 12 breaths/min (N=7), 6 breaths/min (N=6), or ventilation rate adjusted to maintain a target end-tidal CO_2 ($ETCO_2$) = 40 mm Hg. Sufficient blood was removed to maintain a target mean arterial pressure (MAP) = 35 ± 5 mm Hg during a 40 min period. Three LICOX probes (Integra Neurosciences) and a tissue perfusion probe (Integra Neurosciences) were placed in the cerebral cortex, and output was recorded continuously. During the baseline period, ventilation rate was 12/min for all groups. Tidal volume was adjusted to maintain $ETCO_2$ = 40 mm Hg during the baseline period and remained unchanged thereafter. FIO_2= 1 and arterial hemoglobin oxygen saturation was 100% for all animals at all times . Immediately after hemorrhage and achieving the target