

# ORAL 1

## *Scaling Exponent Prediction of Rescue Shock Outcome in Out-of-Hospital Cardiac Arrest*

Christopher B. Lightfoot, BS  
James J. Menegazzi, PhD  
Henry E. Wang, MD  
Kristofer C. Fertig, BS  
Lawrence D. Sherman, MD  
Clifton W. Callaway, MD, PhD

**University of Pittsburgh, Pittsburgh, Pennsylvania**

**Objectives:** Previously, we derived a predictive model using the scaling exponent (ScE) to predict rescue shock outcome for human ventricular fibrillation (VF). We sought to examine the external validity of the model using new automated external defibrillator (AED) tapes from an independent EMS system. **Methods:** After obtaining IRB approval, we performed a single-blind, retrospective study of AED ECG tracings recorded from 20 out-of-hospital cardiac arrest (OOHCA) patients whose presenting rhythm was VF. Patients were treated in a northwestern, multi-tiered, urban EMS system. ECG data were digitized (sampling rate of 1000/second), and 5-second artifact-free epochs were used to calculate the ScE using customized software. The ScE was calculated 10 seconds before shocks and 10-20 seconds after each failed shock. We were blinded to the clinical outcome and voice channel on the AED recordings, and thus classified rhythms as successful if an organized ECG rhythm was restored, and failed if the post-shock rhythm was VF or asystole. We determined immediate and sustained (30 second) rhythm classifications. We performed multiple logistic regression, and compared ScE values for successful and failed shocks using Student's t-test. **Results:** We analyzed 62 rescue shocks. Thirty-seven shocks were immediately successful, 29 of which were sustained through 30 seconds. Mean ScE values for successful shocks were 1.27 (n =37, SD=0.14), and 1.46 (n=25, SD=0.15) for failed shocks (p<0.001). Pre-shock ScE values for failed shocks (1.49, SD=0.20) did not differ from their post-shock values (1.56, SD=0.24), p=0.17. Regression modeling indicated that the ScE was a significant predictor of rescue shock success, correctly classifying 83.8% of shock outcomes (b=-6.6, SE=1.95, p=0.001). The addition of shock number, and time of rescue shock to the model did not affect predictive accuracy. **Conclusions:** The ScE remains an independent predictor of rescue shock outcome in human OOHCA and may be useful in guiding initial treatment.

## ORAL 2

### ***Near-Infrared Spectrometry: A Sensitive Technique To Determine Changes In Cerebral Blood Volume Following Cardiac Arrest In Rats***

Davon Ferrara, 1,2  
Feng Xiao, MD  
Juan Rodriguez, PhD1,2  
Shu Zhang, MD  
Jennifer Ewing1,2  
Harold Battarbee, PhD1  
Thomas Arnold, MD  
J. Steven Alexander, PhD1

**Louisiana State University Health Sciences Center, Shreveport, Louisiana**

**Introduction.** Near-infrared spectrometry (NIRS), at a wavelength of 808 nm, is a non-invasive method that is very sensitive to changes in tissue blood volume. The utilization of this technique, therefore, can offer a new insight into the mechanisms by which mild cerebral hypothermia (34 C) improves histological and functional outcome after cardiac arrest (CA). **Objectives.** The objective of this study was to determine the feasibility of utilizing NIRS for real-time measurement of cerebral blood volume following normothermic or mild hypothermic CA. **Methods.** Eight male Sprague-Dawley rats (300-400 grams) were subjected to normothermic (37.5 C) CA (n=4) or mild hypothermic CA (n=4). CA was induced by 8 minutes of asphyxiation. The animals were resuscitated with external CPR, mechanical ventilation and epinephrine. Mild hypothermia was induced with external cooling before CA. Near-infrared light of 808 nm was generated from 2 laser diodes, which illuminated the rat's head through two light guides that were placed into the external ears. Light transmitted through the cranial bone and brain tissue was collected with another light guide placed over occipital area. The light transmission was recorded every 2.5 seconds and expressed as the changes vs. baseline before CA. **Results.** 1). Normothermic CA resulted in an immediate decrease in cerebral blood volume and a post-resuscitation hyperemic state; 2). Compared with normothermic CA, hypothermic CA resulted in a lower decrease in cerebral blood volume and a faster repletion of cerebral blood volume. In addition, hypothermia blunted the post-resuscitation hyperemic state. **Conclusions.** NIRS can be used as a sensitive non-invasive method to measure real-time changes in cerebral circulation following CA.

## ORAL 3

### ***Predicting Emergent Operating Room Use In Trauma Patients Based On The Presence Of High-Risk Trauma Triage Criteria.***

Robert E. O'Connor, MD, MPH  
Glen H. Tinkoff, MD

**Christiana Care Health System, Newark, Delaware**

Introduction: The American College of Surgeons Committee on Trauma has proposed triage criteria to identify high-risk trauma patients. We conducted this study to evaluate whether paramedics and EMTs could use these criteria to identify patients requiring immediate transfer to the operating room (OR) on hospital arrival. Methods: This observational study was conducted using an EMS system that transfers patients level-I trauma center, based on field triage. The following high risk criteria were identified in the field, and documented on data collection forms: systolic blood pressure (SBP) < 90 mmHg, GCS < 8, airway compromise managed with endotracheal intubation or surgical airway (ETI), and penetrating trauma to neck or torso (PEN). The primary outcome measure was direct transfer to from ED to OR for emergent craniotomy, thoracotomy, or laparotomy. Statistical analysis was performed using the chi-square test, and regression analysis. Results: A total of 4910 patients were included, with 6% having SBP < 90 mmHg, 8% having GCS < 8, 10% requiring ETI, and 30% having penetrating trauma to the neck or torso (PEN). Of these, 2900 (59%) had none, 1496 (30%) had one, 282 (6%) had two, 161 (3%) had three, and 71 (1%) had four of the specific high-risk criteria. Immediate transfer to the OR was required in 14% of patients with none or one of the criteria, compared with 30%, 32%, and 33% of patients with two, three, or four of the criteria. Overall OR use was 16%. And mortality was 5%. Conclusions: The presence of only one of the ACS high-risk criteria for trauma triage is a poor triage instrument for identifying patients requiring direct transfer to from ED to OR. One-third of patients with two or more of the criteria will require direct transfer to from ED to OR. We recommend that EMS systems use the ACS criteria in field trauma triage to identify patients likely to require operative intervention, and activate direct transfer to OR protocols only if multiple criteria are present.

## ORAL 4

### *An Emergency Medical Services Program Of Alternate Destination Of Patient Care*

Rebecca A. Schaefer  
Thomas D. Rea  
Michele Plorde  
Kraig Peiguss  
Paul Goldberg  
John Murray

**Public Health Seattle and King County, Seattle, Washington**

Objective: The emergency department (ED) is ideally reserved for urgent health needs. The ED however is often the site of care for non-urgent conditions. We investigated whether emergency medical technicians could decrease ED use by patients with non-urgent concerns who use 911 by appropriately identifying and triaging them to alternate care destinations. Methods: From August 2000 through January 2001, two fire-based emergency medical service (EMS) agencies participated in an alternate care destination program for patients with specific low-acuity diagnosis codes (intervention group). Eligible patients (n=1016) were offered care at a clinic-based destination as an alternate to the ED. The frequency of the destination of care (ED, clinic, or home [no transport]) for the intervention group was compared to a matched control group that was comprised of a preintervention historical cohort of EMS encounters from the same two agencies and with the same acuity and diagnosis criteria and seasonal interval (n=2617). To determine if differences observed in the main analysis were due to temporal trends rather than the program, we compared care destinations between the preintervention and intervention periods for patients with the same acuity, diagnosis, and seasonal characteristics among agencies not participating in the program. Results: Compared to the preintervention group, a smaller proportion of patients in the intervention group received care in the ED (44.6% vs 51.8%, p=.001) while a greater proportion of patients in the intervention group received clinic (8.0% vs 4.5%, p=.001) or home care (47.4% vs 43.7%, p=.043). Results were comparable when adjusted for other patient characteristics. Similar relationships were not evident among nonparticipating EMS agencies. Based on physician review and patient interview, the alternate care intervention appeared to be safe and satisfactory. Conclusion: An EMS-based program may represent one approach to limiting non-urgent ED use.

# ORAL 5

## *Use of the Tracheal Tube Introducer in a Paramedic Ambulance Service*

Brian D. Mahoney, MD, FACEP

Mark A. Lappe, EMT-Paramedic

John McGill, MD, FACEP

**Hennepin County Medical Center, Minneapolis, Minnesota**

Hypotheses: Overall success for adult oral endotracheal intubation (AOEI) will be higher using the tracheal tube introducer (TTI) as an adjunct for intubation when compared to standard endotracheal intubation (ETI) technique. The first attempt AOEI success rate will be higher using the TTI. The rate of successful AOEI will be higher using the TTI with higher grade laryngeal views. Methods: Design: Prospective, controlled study from 3/1/99 until 6/30/01. Setting: Urban and suburban paramedic ALS service. Subjects: All adults requiring oral endotracheal intubation. Interventions: Assignment on alternating months to use or not use the TTI on the first attempt only. On subsequent attempts the paramedic chose his ETI method. Results: Results on an intention to treat basis for the first attempt and actual technique used for subsequent attempts. 357 patients with 332 successful intubations out of 463 attempts (1st 265/357, 2nd 53/ 86, 3rd 13/18, 4th 1/2) for an overall final success rate of 93% (332/357). On the first attempt intention to treat there were 189 patients assigned the TTI with 75% success (142/189), and 168 patients assigned to standard ETI with 73% success (123/168, chi squared  $p=.68$ ). On subsequent tries TTI had 29 successes out of 50 attempts (58%), and standard ETI had 38 successes out of 56 attempts (68%). Overall TTI had 171 successes out of 239 attempts (72%). Standard ETI had 161 successes out of 224 attempts (72%, chi squared  $p=.94$ ). Success rates by laryngeal view were as follows:

View I - TTI 77/89 (87%), Standard 86/94 (91%),  $p=.28$

View II - TTI 60/81 (74%), Standard 50/73 (68%),  $p=.44$

View III - TTI 30/52 ( 58%), Standard 20/36 (56%),  $p=.84$

View IV - TTI 2/5 (40%), Standard 2/12 (17%),  $p=.30$

Conclusions: There is no statistical difference in overall success using the TTI as an adjunct for AOEI, in the first attempt success, nor in success for increasingly difficult laryngeal views.

## ORAL 6

### ***A Multivariate Logistic Regression Model of Failed Prehospital Intubation Using a Prospective, Multi-Center Dataset***

Henry E. Wang, MD  
Douglas F. Kupas, MD  
Paul M. Paris, MD  
Robyn R. Bates, MS  
Donald M. Yealy, MD

**University of Pittsburgh, Pittsburgh, Pennsylvania**

**PURPOSE:** Previous studies have identified individual variables associated with failed prehospital endotracheal intubation (ETI) without examining the interaction between the multiple factors impacting ETI. We sought to develop a multivariate logistic model describing factors associated with failed adult prehospital ETI based on a multi-center dataset. **METHODS:** We obtained clinical and demographic data from a prospective, multi-center observational study involving ALS systems in a mid-Atlantic state. Providers used standard forms to report details of attempted ETI, including system and patient demographics, methods used, difficulties encountered, and initial outcomes. We performed stepwise logistic regression to develop a multivariate model identifying factors associated with failed ETI. We used a Wald chi-square criteria of  $p < 0.25$  for predictor variable entry into the model and a log-likelihood ratio test of  $p < 0.1$  to develop the multivariate model. **RESULTS:** We used data from 40 ALS systems on 351 adult ETI, including 44 failed cases. Of 55 factors potentially related to ETI failure, 25 were identified as candidates for multivariate modeling. Stepwise logistic regression revealed the following as the only significant covariates associated with ETI failure (OR; 95% CI): Inability to visualize vocal cords (9.88; 3.83-25.48); Clenched jaw (trismus) (5.43; 1.96-15.05); Inability to pass tube (3.04; 0.86-10.71); Patient alive at end of field course (4.16; 1.52-11.42); Number of ETI attempts (0.56; 0.38-0.83); Estimated weight (lb) (0.99; 0.98-1.00); Glasgow Coma Scale (0.90; 0.79-1.04). ECG in place on ETI (0.24; 0.08-0.74). This model was the most parsimonious of 40 candidate models and demonstrated good model fit (Hosmer-Lemeshow test,  $p = 0.91$ ). There were no significant interaction variables. **CONCLUSION:** We derived a multivariate logistical model to predict failed adult prehospital ETI. If validated independently, this model could help direct ALS training and practice.

# ORAL 7

## ***The Use of the Combitube as a Salvage Airway Device for Paramedic Rapid Sequence Intubation***

Carla Valentine, MD  
Daniel Davis, MD  
Mel Ochs, MD  
David Hoyt, MD  
David Bailey, RN  
Gary Vilke, MD

**University of California San Diego Emergency Medicine, San Diego, California**

Background: There is concern that paramedic RSI may increase patient morbidity and mortality due to unrecognized esophageal intubation or lack of an effective salvage device with failure of orotracheal intubation (OTI). Purpose: To evaluate the efficacy of the Combitube as a salvage device with paramedic RSI. Methods: Patients were enrolled prospectively as part of the San Diego Paramedic RSI Trial using the following inclusion criteria: age >18 yrs, MTV, potential head injury, GCS 3-8, >10" transport time, and inability to intubate without RSI. This analysis evaluated the use of the Combitube as a salvage device after 3 failed OTI attempts; data were included from the first 2 ½ yrs of the trial. Outcome measures included: overall intubation success, Combitube intubation (CTI) success and complications, pre- and post-intubation SaO<sub>2</sub> and SBP, and arrival ABG data with comparisons between OTI and CTI patients. Data were analyzed using Mann Whitney rank sum testing and t-testing with significance at p<0.01. Results: 325 patients were enrolled in the trial during the first 2 ½ years; overall intubation success was 223/225 (99.1%) including 280 OTI (86.2%) and 43 CTI (13.2%). CTI was successful in 43/44 (97.7%). Median SaO<sub>2</sub> for CTI patients improved from 92.5% to 98.0% (p<0.001). There was a nonsignificant decrease in SBP from 134.8 mmHg to 114.8 mmHg (p=0.08). The mean pO<sub>2</sub> was significantly higher with OTI than with CTI (328 mmHg vs. 224 mmHg, p<0.001); the mean pCO<sub>2</sub> was significantly lower with OTI than with CTI (34.8 mmHg vs. 45.0 mmHg, p<0.001). There were no reported complications with CTI. The anterior cervical collar required loosening on several occasions to improve ventilation following CTI. Conclusions: The Combitube is an effective salvage airway device when used with paramedic RSI. Improvements in SaO<sub>2</sub> and supranormal pO<sub>2</sub> values were observed. Ventilation should be increased following CTI to avoid hypercapnia.

## ORAL 8

### *Feasibility of a Prospective, Multi-Center Evaluation of Prehospital Endotracheal Intubation*

Henry E. Wang, MD  
Douglas F. Kupas, MD  
Paul M. Paris, MD  
Robyn R. Bates, MS  
Donald M. Yealy, MD

**University of Pittsburgh, Pittsburgh, Pennsylvania**

**PURPOSE:** Prehospital airway management data are limited by small, single site designs. We sought to demonstrate the feasibility of performing a large-scale, prospective, multi-center evaluation of prehospital endotracheal intubation (ETI). **METHODS:** This was the pilot phase of a prospective multi-center observational study involving ALS systems from a mid-Atlantic state. Using a standard data form, providers reported details of each attempted ETI, including patient demographics, methods used, difficulties encountered, and initial outcomes. We calculated capture rates using independent queries. Data were collected centrally and analyzed using descriptive techniques. **RESULTS:** Data were obtained from 40 ALS systems (7 urban, 14 suburban, 17 rural, and 2 air medical) in both volunteer and career configurations serving a total population of over 1,800,000. Data forms were completed on 351 adult ETI attempted during the pilot study period 6/1/01 – 8/31/01, capturing 39-100% of ETI performed by individual systems during this time. Only 0.3-4.0% of entries for major variables were missing. The overall reported ETI success rate was 85.9% (92.1% for cardiac arrests and 75.8% for non-cardiac arrests). Success did not vary by population setting ( $p=0.69$ ) or method of ETI (conventional oral/nasal, sedation-facilitated, RSI;  $p=0.59$ ). The most commonly reported difficulties were inability to visualize vocal cords (19.4%), anterior vocal cords (27.1%), and vomiting (21.4%). There was 1 unrecognized esophageal intubation and 14 cases of tube dislodgement during transport. When stratified for cardiac arrests vs. patients with perfusing rhythms, ETI success was not associated with field ( $p=0.32$  vs. 0.22) or initial ED ( $p=0.32$  vs. 0.42) mortality. **CONCLUSIONS:** We demonstrated the feasibility of performing a large-scale, prospective, multi-center evaluation of prehospital ETI. These initial findings provide an improved understanding of the factors impacting successful field ETI.

# ORAL 9

## ***Lack of Impact of an Educational Intervention on Prehospital Pain Management***

Christine McEachin, BSN, EMT-P/IC  
Joseph McDermott, FF/EMT-P  
Robert Swor, DO

**William Beaumont Hospital-Royal Oak, Royal Oak, Michigan**

Introduction: A retrospective study at this (our) institution, identified a very low rate of prehospital analgesia (PA) for patients with hip and lower extremity (LE) fractures. Objective: 1) To compare whether rates of PA increased for pts. with hip and LE fractures after an educational intervention. 2) To describe the characteristics of EMS patients who did not receive PA. Methods: A before/after retrospective study of patients with a final hospital diagnosis of hip or LE fracture that were transported by EMS to a single suburban community hospital. The brief educational intervention consisted of development and distribution of a pain assessment form, and frequent discussions with EMS and hospital personnel regarding low rates of PA. There were two study periods (4/00-7/00) and (4/01-7/01). Data elements collected included fracture type, EMS response and treatment characteristics, ED treatment and ED pain scores (1-10 scale) were abstracted from review of EMS run sheets and ED records. Patients with ankle fractures, multiple traumatic injuries, under age 18 and without fractures were excluded. Results: 124 and 102 patients were enrolled in the two study periods. The two study groups did not differ in pt. age, fracture type, or the rate of ED pain med administration (91.1% vs 88.0%, p=ns). There was no increase in EMS PA between the two study periods (19.3% vs 14.0%, p=0.28). In the second study period, patients received PA more often when EMS personnel suspected a fracture (20.8% vs 6.4%, p=.04). Absence of PA was not associated with pt. age, fracture type, mode of EMS transport, pt. sex, or mental status. Of those pts. who did not receive PA, 26 (39.4%) reported pain scores of 9/10 or 10/10 on ED arrival. Conclusion: For this patient population, an educational intervention alone did not increase the rate of administration of prehospital analgesics. ED pain scores suggest that a subgroup of EMS patients may benefit from aggressive PA. Only paramedic suspicion of fracture was associated with PA administration.

# ORAL 10

## ***Smoke Detector Placement During EMS Calls: Outcomes of a Fire Safety Intervention***

C.E. Cady

R.G. Pirrallo

G.A. Murawsky

**Medical College of Wisconsin, Milwaukee, Wisconsin**

**Introduction:** It is well known that properly installed and functioning smoke detectors save lives and reduce dollar loss and injuries. A pilot study found that many dwellings that have fires have had prior EMS calls, but only 17% of those dwellings had operational smoke detectors at the time of the fire. This led to "Operation First Responder" in which smoke detectors and batteries were installed in unprotected homes during an EMS call. **Purpose:** To evaluate a program designed to increase the prevalence of operating smoke detectors in these at-risk dwellings decreasing dollar loss, morbidity and mortality. **Methods:** The fire department serving an urban population of 628,088 was provided smoke detectors and batteries to be placed in unprotected homes at the time of an EMS call from 3/1/99 - 1/31/01. Fire department records through 7/31/01 were obtained to provide at least 6 months of surveillance for this retrospective case series analysis to identify which of these dwellings had a subsequent fire. The smoke detector status, estimated dollar loss, number of injuries and fatalities were extracted. **Results:** 1335 smoke detectors were placed. Thirty dwellings had subsequent alarms of fire. Six dwellings were excluded: 2 incomplete records; 3 vacant properties; 1 outside car fire. N=24. At the time of the subsequent fire, 10 of 24 (42%) had an operating smoke detector. Mean property loss with an operational smoke detector was US\$665 (SD US\$1884); not operational US\$19179 (SD US\$33785)[p=0.018]. No injuries or fatalities occurred. **Conclusion:** These data confirm that an operational smoke detector significantly decreases dollar loss. This program was successful in placing 1335 smoke detectors in at-risk dwellings resulting in an operating smoke detector at the time of a subsequent fire 42% of the time, an improvement from 17% in the pilot study.

# ORAL 11

## ***Pre-hospital Administration of Reteplase for ST Elevation Myocardial Infarction: Preliminary Results of ER-TIMI 19***

Assaad J. Sayah, MD  
David A. Morrow, MD  
Elliott M. Antman, MD  
Kristin Schuhwerk  
Donald Rosenberg, MD  
Rakesh Bhargava, MD  
Carolyn H. McCabe  
Michael Waller, MD  
Eugene Braunwald, MD  
Ron Walls, MD

**Caritas Good Samaritan Medical Center, Brockton, Massachusetts**

**STUDY OBJECTIVE:** The introduction of bolus-dosed fibrinolytics offers a practical option for the early and rapid initiation of reperfusion therapy for ST elevation MI in the prehospital setting. ER-TIMI 19 is a multicenter, open-label study designed to assess the time saved, feasibility and safety of pre-hospital administration of reteplase (rPA) for ST elevation MI. **METHODS:** Fibrinolytic-eligible patients with ST elevation on a 12-lead ECG, transmitted to hospital-based medical control physicians, are being enrolled in 20 geographically diverse emergency medical systems in North America. The primary endpoint is the time saved with pre-hospital initiation of rPA compared to in-hospital lysed sequential historical controls collected at these same hospitals from the 6-12 month period prior to the start of ER-TIMI 19. **RESULTS:** As of February 2001, 248 patients were enrolled with an anticipated total enrollment of >300 by study completion. Based on best available data, 99% had a confirmed MI. The median time from EMS scene arrival to the first bolus of fibrinolytic was 31 min (25th -75th: 24 –37) for study patients compared with 64 (47 – 91) min for historical controls ( $P < 0.001$ ) resulting in median time saved of 33 min. Complete ST resolution (>70%) was achieved in 15% of patients by ED arrival and 54% by 90 minutes after the first bolus of rPA. Twelve (5.4%) deaths and 2 (0.9%) intracranial hemorrhages have occurred. **CONCLUSIONS:** Pre-hospital administration of rPA saves critical time compared to in-hospital initiation of fibrinolytic. In a properly organized and trained setting, pre-hospital rPA appears to be a feasible and safe approach to accelerating myocardial reperfusion.

# ORAL 12

## ***Combining Physician and Nurse Life Support Training in a Developing Country: Results of the Albania Pilot Project.***

W.A. Walters  
L.J. Kaplan  
G.C. Wydro  
F. Bilaj  
M. Derivishi  
J. Kaditus  
W. Satz

**MCP Hahnemann University School of Medicine, Philadelphia, Pennsylvania**

Introduction: The presentation of life support training (LST) in developing countries has not been well studied. This study evaluates a combined nurse(NU)/physician(MD) LST program in Albania. Methods: The Shkodra EMS Pilot Project was funded under a United Nations Quick Impact Project grant. A four week practical/didactic curriculum was developed, using a needs-assessment-based task list. All examinations were taken from a validated question bank; each 100 questions in length. The training schedule was designed to assure participation of the entire staff of the Shkodra Emergency Center, including ambulance staff (14 MD/23 NU). The staff was pretested (PRE) at day 0, trained, examined after each one-week block (CARDIAC, PEDIATRIC, TRAUMA), then posttested (POST) at day 28. The pretest and posttest were identical. Practical skills were evaluated using validated skills checklists. All training and evaluation materials were made available in English and Albanian. Significance was judged as  $p < .05$ . Results: All candidates successfully passed objective skills evaluation. Data are summarized in Table 1:

Table 1:

Examination	MD	NU	Significance
PRE	43	35	$p < 0.05$ (*)
CARDIAC	59	58	$p = NS$ (*)
PEDIATRIC	68	70	$p = NS$ (*)
TRAUMA	69	79	$p < 0.05$ (*)
POST	70	71	$p = NS$ (*)
PRE vs POS	43 vs 70	35 vs 71	$p < 0.05$ (#)
Grp PRE vs POST	39 vs.	70.2	$p < 0.05$ (#)

(Data are mean scores) (\*) Mann-Whitney U (#) Paired t-test

Conclusion: In developing areas, a question of training paradigm for LST remains controversial. This study suggests that nurses may perform as well, or indeed better, than physicians in mixed classrooms, simultaneously building professional esteem for nursing and teamwork amongst healthcare professionals. Future efforts in LST should consider integrating their classrooms to enhance outcomes.

# ORAL 13

## ***Revisiting Assumptions Underlying Defibrillation Shock Protocols: How Much Does Impedance Change Between First And Second Shocks?***

Robert G. Walker  
Fred W. Chapman

**Medtronic Physio-Control, Redmond, Washington**

Rapid defibrillation is a critical link in the chain of survival. When a first shock fails to defibrillate, the relative strength of the second shock has important implications for this goal of rapid defibrillation. The Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care provide rationales both for using second shocks of a higher energy than the first shock, and for using second shocks of the same energy as the first shock. The stated rationale for delivering a second shock of the same energy is partly predicated on an assumption that the second shock will deliver more current than the first due to a drop in transthoracic impedance (TTI). This drop in TTI has only been clinically studied using high peak current monophasic shocks, and only in a small number of patients. We examined the change in impedance between 1st and 2nd shocks of a low peak current biphasic waveform delivered to victims of out-of-hospital cardiac arrest. Methods and Results: Data were gathered from 40 patients who received at least 2 defibrillation shocks from biphasic AEDs for treatment of out-of-hospital cardiac arrest. TTI was automatically measured during each shock and recorded by the AEDs. All patients received 200 J first shocks; 26 got 200 J second shocks and 14 got 300 J second shocks. Among all patients, TTI dropped an average of 2.8% from 1st to 2nd shock ( $87 \pm 23$  ohms to  $85 \pm 24$  ohms, paired t-test,  $p < 0.0032$ ). For those receiving second shocks of the same energy as the first, TTI dropped an average of 1.3% ( $89 \pm 27$  ohms to  $88 \pm 27$  ohms,  $p = 0.25$ ), resulting in a 1.6% increase in current ( $0.3 \pm 0.9$  A). If instead the second shock had escalated to 300 J in these patients, current would have increased by about 25% ( $4.5 \pm 1.7$  A). Conclusions: For low peak current biphasic shocks, the decrease in TTI from 1st to 2nd shocks is minimal and of questionable clinical significance. The commensurate increase in delivered current is unlikely to appreciably improve the probability that the second shock will defibrillate. Conversely, escalation of the second shock dose provides a more substantial boost in delivered current. For patients in whom a first shock is unsuccessful, this increase in transmural current may better facilitate the goal of rapid defibrillation within the chain of survival.

# ORAL 14

## ***Effects of Interventions Prior to Defibrillation in a Swine Model of Prolonged Ventricular Fibrillation***

James J. Menegazzi, PhD  
Henry E. Wang, MD  
Nicole L. Chengelis, BS  
Christopher B. Lightfoot, BS  
Krisotfer C. Fertig, BS  
Lawrence D. Sherman, MD  
Clifton W. Callaway, MD

**University of Pittsburgh, Pittsburgh, Pennsylvania**

**Objectives:** We hypothesized that pretreatment with CPR and HDE would produce higher rates of successful first-shock defibrillation and would prevent decay of the ventricular fibrillation (VF) waveform, as measured by the scaling exponent (ScE), when compared to immediate defibrillation. We also sought to determine the predictive value of the ScE in determining post-shock outcomes. **Methods:** We used 33 domestic swine (22.5 to 24.3 kgs). VF was electrically induced and was untreated for 11 or 14 minutes. ECG was continuously recorded digitally (1000 samples/sec). We randomly assigned swine to four groups (number denotes time of first rescue shock). Two groups had rescue shocks as the first intervention (RSF) after 11 minutes of VF (RSF-11), or 14 minutes of VF (RSF-14); 1 group had CPR for 3 minutes (then rescue shock) beginning at 11 minutes of VF (CPR-14); and 1 group got CPR for 3 minutes with 0.1 mg/kg epinephrine (then rescue shock) beginning at 11 minutes of VF (HDE-14). Defibrillation outcome was classified as successful (either restoration of spontaneous circulation [ROSC] or restoration of organized electrical activity [ROEA]), or failed (remain in VF, or asystole). Data were analyzed with RMANOVA, Fisher's exact tests, and ROC curves. **Results:** We analyzed 168 shocks. Successful first-shock defibrillation occurred in 1/9 (11%) RSF-11; 0/9 (0%) RSF-14; 0/7 (0%) CPR-14; and 1/8 (13%) HDE-14. First-shock ROSC occurred in 1/8 (13%) HDE-14 and 0 in all other groups. Mean ScE values at 11 minutes VF for the RSF-11 (1.46) were similar to 14-minute ScE values for CPR-14 (1.47) and HDE-14 (1.46) and lower than RSF-14 (1.69). ROC areas under the curves using the ScE as a predictor of shock outcome were .84 for success and .81 for ROSC. **Conclusions:** Interventions prior to rescue shocks prevent decay of the VF waveform but did not improve rescue shock outcomes. The ScE accurately predicts 81-84% of post-shock outcomes.

# ORAL 15

## ***Cardiac Arrest in Private vs Public Locations: Different Strategies are Needed to Improve Outcome***

Robert A. Swor, DO  
Raymond E. Jackson  
S. Compton  
L. Honeycutt  
R. Zalenski  
Robert M. Domeier, MD

### **William Beaumont Hospital, Royal Oak, Michigan**

A tremendous amount of public resources are focused on improving out of hospital cardiac arrest (OHCA) survival. The PAD trial is designed to provide early defibrillation in densely populated areas, yet most OHCA occur in private residences. Objective: Our objective is to: 1) To compare characteristics of OHCA patients and those who respond to them in public (public) and private locations (home) Methods: We performed a prospective, observational study of patients transported to 7 urban and suburban study hospitals during period 1/97 to 12/00, and the individuals who called 911 at the time of a cardiac arrest (WITNESS). Followup phone interviews of WITNESSES were performed beginning 2 weeks after the incident. Data regarding patient and responder demographics, CPR training and patient EMS data were collected. Outcome is defined as Discharge alive from hospital (DC). Results: During study period 710 cases were considered 621 interviews initiated and 543 interviews completed. Of all arrests 80.2% were in homes. Public pts were significantly younger (63.2 vs 67.2,  $p<0.02$ ), more often had an initial rhythm VF (63.0% vs 37.7%,  $p<0.001$ ), were seen or heard to have collapsed by a bystander (74.8 vs 48.1%,  $p<0.001$ ), received Bystander CPR (60.2% vs 28.6%,  $p<0.001$ ), and survived to DC (17.5% vs 5.5%,  $p<0.001$ ). Pts at home were older and had an older WITNESS (55.4 vs 41.3,  $p<0.001$ ). The WITNESS was less likely to be CPR trained (65.0% vs 47.4%,  $p<0.001$ ), less likely to be trained w/i last 5 years (49.2 vs 17.9,  $p<0.001$ ), and less likely to perform CPR if trained (64.2% vs 30.0%,  $p<0.001$ ). Collapse to shock intervals for public vs home VF pts were not statistically different. Conclusion: Most important characteristics of cardiac arrest pts and the WITNESS of the event differ in public vs. private locations. Fundamentally different strategies are needed to improve survival from private residence arrests.

# ORAL 16

## ***Location and Frequency of Out-of-Hospital Cardiac Arrest in Georgia: Implications for Public Access Defibrillation***

George E. Malcom III, MSIV

Phillip L. Coule, MD

Theresa Michelle Thompson, MSIV

**Medical College of Georgia, Augusta, Georgia**

Introduction: AED placement strategies have been mostly anecdotally and financially driven. Most studies to date have only addressed the venue of cardiac arrests within limited geographical areas. The purpose of this study is to evaluate the frequency and location type of cardiac arrest within the State of Georgia based on differing population densities. Methods: This study is a retrospective analysis of data from 624,199 Ga. State EMS Patient Care Reports (PCR) for the year 2000. Of these reports, 6530 (1.05%) listed an impression of cardiac arrest. The PCR allows medics to categorize these cardiac arrests into 12 location options and the county of incident. Counties were divided into population densities of: <100 persons/sq. mile, 100-400 persons/sq. mile, 400-1000 persons/sq. mile, and >1000 persons/sq. mile. The incidence of cardiac arrest for each location type was calculated for each population density group. Results: Of the 6530 cardiac arrests, 17 (0.26%) were not classified by county of occurrence, leaving 6513 for analysis. For the entire state the location of cardiac arrest were as follows: Home, 4338 (66.61%); Farm, 15 (0.23%); Industrial, 66 (1.01%); Recreation, 63 (0.93%); Street/Hwy, 303 (4.65%); Public Buildings, 8 (0.12%); Residential Institution, 593 (9.10%); Other, 5 (0.08%); Unspecified, 553 (8.49%); Educational Building, 11 (0.17%); Hospital (non-acute), 189 (2.90%); Physicians Office/Clinic, 130 (2.00%); Not-classified, 239 (3.67%). Cardiac Arrest that occurred in the home by population density: <100 persons/sq.mile, 1388 (67.67%); 100-400 persons/sq.mile, 1,605 (68.83%); 400-1000 persons/sq.mile, 405 (65.75%); >1000 persons/sq.mile, 940 (62.09%) (p=0.0001). Conclusions: The majority of cardiac arrest occur in the home. As population density increases to >1000 persons/sq.mile, there is a statistically significant decline in the percentage of cardiac arrests occurring in the home, and therefore Public Access Defibrillation may be more beneficial than for lower population density areas.

# POSTER 1

## *The Effect of Standing Orders for Paramedic Rapid Sequence Intubation on Intubation Success Rates for a Large Urban Prehospital System*

Daniel Davis, MD  
Mel Ochs, MD  
David Hoyt, MD  
David Bailey, RN

**UCSD, San Diego, California**

Background: The San Diego Paramedic RSI Trial was designed to evaluate the safety and efficacy of paramedic RSI, with a high success rate reported after the first year. Purpose: To evaluate the effect of standing-order RSI protocols on a large, urban prehospital system. Methods: Subjects were enrolled prospectively for: age  $\geq 18$ , suspected head injury, GCS 3-8, transport time  $>10$ ", and inability to intubate without RSI (midazolam/succinylcholine followed by rocuronium). The Combitube was used as a salvage device. Tube placement was verified by exam, SaO<sub>2</sub>, syringe aspiration, and capnometry. For this analysis, adults with potential head injury and GCS 3-8 during the first trial year were compared to an historic cohort from the prior year. Outcome measures: demographics, mechanism of injury, and intubation success with and without medications. Patients were stratified by GCS (3 vs 4-8); separate analysis was performed on patients treated exclusively by paramedics (without aeromedical). Significance was set for  $p < 0.01$ . Results: 189 patients with potential head injury and GCS 3-8 were identified during the preceding year vs 253 for the first trial year. The groups were identical with regard to patient demographics, mechanisms of injury, GCS, and SBP. Intubation success increased significantly from 38.6% to 86.6%; this was true for all patients and for GCS 3 and GCS 4-8. With exclusion of aeromedical intubations, overall success increased even more significantly (15.9% to 83.9%). Patients not intubated during the first trial year included 1 trial patient (single attempt unsuccessful), 11 patients  $<10$ " transport, 4 patients treated by an untrained agency, 4 patients without IV access, and 15 patients who met inclusion criteria but were not enrolled (usually because of alcohol potentially accounting for low GCS). Conclusions: Standing orders for paramedic RSI resulted in a significant increase in intubation success in our prehospital system.

## POSTER 2

### *Effect Of An Airway Education Program On Prehospital Intubation*

Eric R Swanson, MD

David E Fosnocht, MD

**University of Utah, Salt Lake City, Utah**

**OBJECTIVE:** To determine the impact of an airway education program (AEP) on prehospital intubation by an air medical service and identify factors associated with failed intubation. **METHODS:** Retrospective review of 372 consecutive intubations performed by a university hospital based air medical program for 3 years prior to, and 3 years after, the institution of an AEP. The AEP consisted of initial operating room time, yearly lectures on rapid sequence intubation (RSI) and difficult airway management, monthly manikin training and review of difficult airway cases, yearly animal model skills teaching, intubating laryngeal mask airway (I-LMA) training, and review of written RSI protocols. Descriptive statistics were utilized and comparison of groups were made using Chi-square tests with significance set at  $p < 0.05$ . **RESULTS:** The pre-AEP group consisted of 180 intubations from January 1995 to December 1997 and the post-AEP group included 192 intubations from January 1998 to December 2000. Intubation success rate was 170/180 (94%) for the pre-AEP group and 186/192 (97%) for the post-AEP group ( $p > 0.05$ ). Neuromuscular blockade (NMB) was used in 113/180 (63%) of pre-AEP intubations and in 145/192 (76%) of post-AEP intubations ( $p < 0.01$ ). The use of NMB without sedation decreased from 62/113 (55%) in the pre-AEP group to 12/145 (8%) in the post-AEP group ( $p < 0.001$ ). All pre-AEP failed intubations resulted in cricothyrotomy ( $n=10$ ). There were 6 failed intubations in the post-AEP group resulting in 1 cricothyrotomy, 3 intubations through an I-LMA and 2 cricothyrotomies after failed I-LMA. The cricothyrotomy rate decreased from 10/180 (6%) in the pre-AEP group to 3/192 (2%) in the post-AEP group ( $p < 0.05$ ). Excluding patients in cardiac arrest, the failed intubation rate over the entire 6 year period was 10/144 (7%) in patients receiving NMB only or no RSI medications compared to 3/181 (2%) in patients who had full RSI ( $p < 0.025$ ). **CONCLUSIONS:** Establishment of an AEP for this air medical service resulted in increased use of NMB for intubation and a dramatic decrease in the use of NMB without sedation. Cricothyrotomy rate decreased after institution of the AEP in part due to use of the I-LMA. The majority of intubation failures in non-arrested patients occurred in those who received no medications or received NMB without sedation.

## POSTER 3

### *The Effect of Etomidate on Airway Management Practices of an Air Medical Transport Service*

Howard Werman, MD  
David Schwegman, MD  
James Gerard, MD

**The Ohio State University College of Medicine and Public Health; Columbus, Ohio**

Purpose: Etomidate is a sedative/hypnotic drug that has been used as an induction agent in many rapid sequence induction (RSI) protocols. Etomidate has been shown to produce adequate intubating conditions without the need for paralytic agents in patients requiring emergent airway control. The purpose of our investigation was to examine the impact of introducing etomidate in the air transport environment on the intubation practices of our air medical crew. Hypothesis: The use of etomidate would alter the airway management practices of an air medical transport service. Methods: All patients transported by a busy air medical program who required intubation during the study period were eligible for inclusion. An educational program on the use of the etomidate was conducted prior to introducing the drug in clinical practice. Data was prospectively collected on the airway practices of the air medical transport service for 10 months prior to the introduction of etomidate (PRE) as well as 6 months following its introduction (POST). We examined the method used for intubation, intubation success rate and need for paralytic agents. The use of oral versus nasal intubation approaches was compared between the study periods. The need for paralytic agents was also compared. Student's t-test and chi-square analysis was used to compare the groups with  $p < 0.05$  considered to be statistically significant. Results: One hundred fifty six patients were intubated during the study period. Comparing the PRE and POST periods, orotracheal intubation was performed in 31/81 (38.3%) versus 29/73 (39.7%) [ $p > 0.05$ ]. Etomidate did not improve the rate of successful orotracheal intubation; the procedure was successful in 129/133 (97.0%) patients without etomidate and 22/23 (95.7%) with etomidate. However, when used as a part of an RSI, etomidate reduced the use of paralytic agents from 46/62 (74.6%) of patients to 10/22 (45.5%) between the two study periods [ $p < 0.05$ ]. Conclusions: Etomidate did not appear to have an impact on the airway management practices of our air medical transport crew. It did, however, significantly reduce the need for administration of paralytic agents used in an RSI. Further study is needed to determine if the use of etomidate over time will alter the airway management practices of an air transport program.

## POSTER 4

### ***Transient Hypoxemia During Rapid Sequence Induction by Paramedics for Closed Head Injury***

Michael Doney, MD  
James Dunford, MD  
Mel Ochs, MD

**University of California San Diego Hospital, San Diego, California**

**Purpose:** Describe the incidence and duration of unrecognized hypoxemia during rapid sequence induction (RSI) by paramedics for closed head injury (CHI). **Methods:** Retrospective descriptive analysis of capnographic data recorded on 33 consecutive CHI patients (GCS <8) undergoing RSI in an urban EMS system with 75,000 dispatches/year from 4/30/99 – 7/12/01. Medics received standardized training including the importance of preoxygenation in RSI. Capnographic data were analyzed for patients on whom a Model 710B Tidal Wave hand-held capnograph and pulse oximeter was applied. Pulse (P), O<sub>2</sub> saturation (O<sub>2</sub> sat) and end-tidal CO<sub>2</sub> (ETCO<sub>2</sub>) are recorded every 8 seconds upon activation of the unit. Transient hypoxemia was defined as a reduction in O<sub>2</sub> sat to < 90% for more than 32 seconds in a patient whose baseline O<sub>2</sub> sat was > 90% prior to initiation of RSI. A single physician debriefed the medics using a standardized questionnaire including whether the procedure had gone smoothly (Yes/No) or whether problems were encountered. For cases of hypoxemia, detailed review of runsheets was performed to determine whether comorbid airway conditions existed. **Results:** There were 9/33 instances of transient hypoxemia during the study period, with incomplete / unobtainable data for 13 patients. Four patients were initially hypoxic and remained so, 2 patients were initially hypoxic but improved post-intubation. The impression of the medics of these intubations was graded easy in 31/33. Review of these 9 cases did not reveal evidence of difficult airway (i.e., no severe hemorrhage, vomiting or anatomic abnormality). **Conclusion:** Despite the self-reported assessments by medics, there was a 27.2% incidence of concerning transient hypoxemia. Such events pose risk for subsequent bradycardic or hypotensive complications and secondary brain injury. EMS medical directors should be aware that such concerning hypoventilation may occur during this intervention.

## POSTER 5

### ***Measurement Of End-Tidal Carbon Dioxide (ETCO<sub>2</sub>) During Cardiopulmonary Arrest In Both The Pre-Hospital Setting And The Emergency Department Can Be Used To Enhance The Effectiveness Of CPR***

Craig T. Lauder, DO  
Robert E. O'Connor, MD, MPH  
William Azie, MD  
Ross E. Megargel, DO

**Christiana Care Health System, Newark, Delaware**

**Objectives:** End-tidal CO<sub>2</sub> (ETCO<sub>2</sub>) measurement has been used as a surrogate marker for coronary perfusion pressure and may be indicative of potential for survival from cardiac arrest. While low ETCO<sub>2</sub> is often seen during resuscitation, an abrupt increase is seen prior to return of circulation. We conducted this study to identify whether dynamic monitoring of ETCO<sub>2</sub> during CPR has an impact on the effectiveness of CPR. **Methods:** This prospective, observational study was performed on intubated cardiac arrest patients in the prehospital setting. Traumatic arrests were excluded. Continuous ETCO<sub>2</sub> waveform recording was initiated in the ambulance at the time of hospital arrival, and continued in the ED for 10 minutes. Rescuers were permitted to observe the ETCO<sub>2</sub> tracing. Data was gathered with regard to patient demographics, Utstein based time intervals, ROSC, serial ETCO<sub>2</sub> readings, and medications administered. Statistical analysis was performed using repeated measures ANOVA and Mann-Whitney U test. **Results:** Nineteen patients were enrolled. Mean age was 61 and 68% were male. Mean time from collapse to ALS arrival was 9 minutes. Initial rhythm was asystole in 10, PEA in 3, and ventricular fibrillation in 6. The mean ETCO<sub>2</sub> was 4.7 in the ambulance, 3.4 on ED stretcher arrival, 9.3 at 1 minute, 12.2 at 5 minutes, and 13.1 at 10 minutes. These differences were statistically significant. (p=0.02) The mean increase in ETCO<sub>2</sub> from baseline (3.4) to peak (18.0) was significant. (p=0.008) There were 6 cases of where the ETCO<sub>2</sub> rose to a mean of 23 immediately prior to ROSC. There were no long-term survivors. **Conclusions:** Increased ETCO<sub>2</sub> is seen immediately prior to return of circulation. The ability of medical personnel to monitor ETCO<sub>2</sub> appears to result in more aggressive CPR. We recommend continuous monitoring of the ETCO<sub>2</sub> waveform during cardiac arrest to assess the adequacy of CPR, and as a means to detect rescuer fatigue.

## POSTER 6

### ***Endotracheal Drug Administration During Out-of-Hospital Resuscitation: Where are the Survivors?***

Samuel J. Stratton, MD, MPH  
James T. Niemann, MD  
Brian Cruz, MD  
Roger J. Lewis, MD, PhD

**Harbor-UCLA Medical Center, Torrance, California**

Introduction: Drugs administered endotracheally are effectively absorbed during normal spontaneous cardiac activity. However, animal cardiac arrest studies and limited clinical investigations do not support either the use of endotracheal (ET) drugs in doses currently recommended for adults or the method of direct endotracheal instillation. The purpose of this study was to compare the effect of intravenous (IV) and ET drug therapy on outcome from out-of-hospital cardiac arrest secondary to all cardiac arrest rhythms. Methods: Retrospective 5 ½ year review of all out-of-hospital cardiac arrests presenting to the emergency department of a 553 bed public hospital. Patients > 18 years old in non-traumatic cardiac arrest whom received ALS medications in the field by only the IV (preferred route) or ET route were included. Drugs administered by the ET route were injected into the ET tube at twice the IV dose. The rates of restoration of spontaneous circulation (ROSC), survival to hospital admission (SHA), and survival to hospital discharge (SHD) were compared for patients receiving IV and ET medications. Results: 596 patients met inclusion criteria, IV drugs = 495, ET drugs = 101. There was no difference between groups in the rate of witnessed arrest and the frequency of bystander CPR. In the ET drug group, significantly more patients had initial arrest rhythms of asystole (56% vs 37%, p=0.01). The ROSC rate (27% vs 15%, p=0.01) and the SHA rate (20% vs 9%, p=0.01) were significantly greater in the IV drug group. None of the patients receiving ET drugs survived to hospital discharge compared to 5% of those receiving IV drugs (p=0.01). Conclusion: For our out-of-hospital ALS system, direct ET drug administration to patients without venous access at twice the recommended IV dose was futile.

## POSTER 7

### ***Prehospital Cardiac Arrest and the Outcome Performance of the Low Energy Rectilinear Biphasic Waveform***

J.C. Stothert  
T. S. Hatcher  
C. L. Gupton  
T. Dalton  
J. E. Love  
J. E. Brewer

**Omaha Fire Department, Omaha, Nebraska**

The rectilinear biphasic (RLB) waveform has been shown to effectively defibrillate short duration ventricular fibrillation (VF) at significantly lower energies than a monophasic damped sine (MDS) waveform. This study provides a first outcome performance report of the RLB waveform in a prehospital setting for long duration VF compared to historic MDS performance. **Methods.** External RLB defibrillators were deployed in a regional emergency response service. The RLB defibrillators delivered an escalating 3—shock sequence of 120, 150, and 200 J. The results observed during the first 6 months of deployment were compared to results observed during matching months of the previous year when MDS defibrillators were deployed. Outcomes were documented as return of spontaneous circulation (ROSC), patient expired in the ED, patient admitted to the hospital, patient died in the hospital, or patient discharged alive. All code 99 patients (CPR in progress) were included in the study. **Results.** There were 133 cases of out—of—hospital cardiac arrest (OHCA), with 78 patients presenting in VF without trauma. ROSC occurred in 28 of these patients (28/78, 35.9%). Five patients died in an ED prior to admission, and 23 patients were admitted to a hospital (23/78, 29.5%). Of these admitted patients, 16 patients expired during hospitalization, and 7 were discharged alive (7/78, 9.0%). All discharged patients demonstrated good neurologic function. The ROSC was increased from 20% in 2000 using MDS defibrillators to 35% in 2001 using RLB defibrillators. The true save rate from VF events (discharged with good neurologic status) increased from 5% to 9%. **Conclusion.** The regional EMS system increased the ROSC rate by 75% using RLB defibrillators and the true save rate by 80% when compared to the same rates for MDS defibrillators. RLB defibrillators significantly enhance an EMS system's ability to discharge neurologically intact OHCA patients when compared to MDS defibrillators.

## POSTER 8

### *An Assessment of Public Knowledge and Attitudes Regarding Automated External Defibrillation*

Jeffrey Lubin, MD  
S. Sujin Chung, MD  
Kenneth Williams, MD

**Rhode Island Hospital / Brown University School of Medicine, Providence,  
Rhode Island**

Introduction: Initiatives in public access defibrillation policies, such as the Cardiac Arrest Survival Act of 2000, have encouraged the placement of automated external defibrillators (AEDs) in various public venues. This gives non-traditional responders rapid access to potentially life-saving technology. However, it is unclear if untrained or minimally trained people would be willing to use these devices. Objectives: To assess the general public's familiarity with AEDs and determine if the public would be willing to use them during a cardiac arrest. Methods: Random shoppers completed a survey at a suburban mall equipped with an AED. Physician reviewers separated responses by degree of medical training and evaluated participants' definitions of "defibrillator." Adequate answers mentioned shocking the heart or assisting in cardiac resuscitation. Results: 359 surveys were completed: 40 from healthcare workers, 182 from participants with at least CPR or first aid training, and 137 from participants with no formal medical training. Overall, 60% of those surveyed were able to define "defibrillator" adequately. 71% (95% CI: 66-76) stated they would be "very likely" to use an AED to resuscitate a stranger. Healthcare workers were most willing to use the AEDs, followed by minimally trained and then untrained personnel (90%, 71%, 66%, respectively,  $P=0.01$ , chi-square). The most common concerns involved legal liability (38%) and fear of using the machine incorrectly (57%). After being informed of the liability protection of the Cardiac Arrest Survival Act, 84% (95% CI: 80-88) stated they would be "very likely" to use the AED. This increased to 91% (95% CI: 88-94) if the participants had a chance to receive training. Conclusions: Although a large percentage of people were willing to use an AED on a stranger, education regarding legal liability and training led to significant increases. Further public education is needed to provide optimal public access defibrillation programs.

# POSTER 9

## ***Willingness of High School Students to Perform Cardiopulmonary Resuscitation (CPR) and Automatic External Defibrillation (AED)***

Michael W. Hubble  
Michael Bachman  
Randy Price  
Nancy Martin  
Dennis Huie

**Western Carolina University, Cullowhee, North Carolina**

Introduction: Successful resuscitation of cardiac arrest victims is associated with early CPR and defibrillation, leading the American Heart Association to advocate Public Access Defibrillation (PAD). Despite these recommendations, there are few investigations into the willingness of the public to perform PAD even if these devices were widely available. Objective: To evaluate the willingness of high school students to perform CPR and PAD. Methods: A convenience sample of high school students was surveyed regarding how they would respond if they witnessed a cardiac arrest. Participants were first shown a video segment on the operation of an AED. They were then shown a series of video clips depicting 6 different cardiac arrest scenarios: MVC with facial bleeding, child drowning, IV drug user, choking family member, victim of differing race, and victim with facial vomitus. Following each video, subjects were asked how they would respond had they witnessed a similar event. Results: With parental permission, 683 students participated. Of these 94 (85%) were trained in CPR and 139 (20%) in AED. One hundred six (16%) had witnessed a cardiac arrest, while 20 (3%) had performed mouth-to-mouth resuscitation (MMR), 15 (2%) had performed chest compressions (CC) and 1 (0.15%) had used an AED. Across all 6 scenarios and 683 respondents, AED would have been performed only 1308 times (32%). In comparison, respondents indicated they would have performed MMR 1768 times (43%) and CC 2249 times (55%). More respondents were willing to intervene on behalf of a child or family member, while fewer were willing to act in the setting of blood, vomitus, or an IV drug user ( $p < .05$ ). There was no association in willingness to intervene and prior experience with any of the interventions. Fear of infection, legal consequences, and fear of harming the patient were the most frequently cited reasons for not intervening. Conclusions: Among high school students, few are willing to perform AED. Willingness to perform MMR and CC appears to depend on the circumstances. Previous experience with cardiac resuscitation has no bearing on willingness to intervene.

# POSTER 10

## *Use Of Automatic External Defibrillators By Untrained Elderly Laypeople*

Shawn Carter  
Juan March  
Jack Gough  
Kori Brewer

**East Carolina University, School of Medicine, Greenville, North Carolina**

**OBJECTIVE:** Prior studies have shown that untrained laypeople can perform automated external defibrillation successfully. The purpose of this study was to examine if untrained elderly laypeople could successfully perform automated external defibrillation.

**METHODS:** All participants were elderly individuals that were alert, oriented, ambulatory, and fully functioning. A convenience sample of individuals, residing in an independent living environment associated with a rest home or residing in an assisted living environment within a rest home, participated in this study. Self-reported physical impairments (vision, hearing, arthritis) were recorded on initial enrollment. Participants were given no formal automated external defibrillation training. Participants were given a mock code situation using a training manikin. The times to first shock and reasons for incorrect defibrillation were recorded. **RESULTS:** Twenty-five elderly persons participated in the study with a mean age of 82. Only two participants (8%) properly placed the electrodes on the chest, stood clear of the manikin during defibrillation, and successfully completed the first defibrillation within two minutes. All participants (100%) had a visual impairment (eyeglasses, cataracts, etc) and only 6 of the 25 had properly placed the electrodes on the chest. Thirteen of fifteen residents (87%) with arthritis required help opening the AED cover at the one-minute time interval, compared with only 2 of 10 (20%) who did not have arthritis,  $p=.002$ . Six of the twelve (58%) participants who had a hearing impairment touched the manikin during defibrillation although prompted by the device “do not touch patient”, in contrast to only one of thirteen (8%) without a hearing deficit,  $p=.03$ . **CONCLUSIONS:** This study suggests that the majority of untrained elderly even if living independently and fully functioning cannot successfully perform automated external defibrillation due to arthritis, visual and hearing impairments.

# POSTER 11

## *The Cardiac Arrest Quotient and Efficient Police AED Response: The Effects of Unified Medical Priority Dispatch System Data on Locating Cardiac Arrests*

Jeff J. Clawson, MD

### **National Academies of Emergency Dispatch, Salt Lake City, Utah**

Recent articles indicate police-based AED systems may not be finding significant numbers of cardiac arrests (CA) at-scene. One large system reported a 9% finding success. Effectively locating arrests is a factor of selecting a CA “rich” set of dispatch codes. Such choices may have a profound effect on ultimate survival of CAs and effectiveness of dispatch-determined deployment of AED-equipped police responders. Since outcome-based data linked to dispatch codes is uncommon in EMS, any system establishing a strategic AED deployment scheme must initially “guess” which codes to deploy on. Hypothesis: Knowing the frequency of CAs found within dispatch sub-codes in one system can be used to deploy AEDs in another without local richness data. Known CA frequency variations allows for more specificity in AED dispatch. Process: We chose the equivalent-sized cities of Montreal, Quebec (pop’n 3M) and Melbourne, Australia (pop’n 3.5M) with which to compare sub-codes with the inquiring US center. We compared the number of cases of cardiac arrests found at-scene in Montreal with the total number of responses within inquiring system’s sub-codes and used Melbourne responses as validation comparison. From this a cardiac arrest quotient (CAQ = # Arrests found at-scene divided by # Runs) was established for all 297 sub-codes. Results: CAQ showed a dramatic range of “richness” within problems often lumped together as potential CA finders. “High level” (DELTA) breathing problems (code 6) and chest pains (code 10) revealed:

Sub-code	Problem	Arrests	Runs	CAQ
6-D-1	Severe Respiratory Distress	78	1,433	5.44%
6-D-2	Breathing problems/Not alert	53	1,348	8.09%
6-D-3	Sweaty or changing color	59	7,521	0.78%
10-D-1	Severe Respiratory Distress	2	336	0.6%
10-D-2	Chest Pain/Not alert	53	441	12.02%
10-D-3	Sweaty or changing color	56	6,517	0.86%

Using “mixed” but unified (same protocol) CAQ data, we selected 17 sub-codes and calculated the at-scene CA findings. The arrest percent increased from the actual of 9.7% to 26.6%. Conclusions: When choices must be made by EMDs as to which patients should be dispatched an AED, what those initial choices are can profoundly affect the chance of actually finding arrests at-scene. Small systems and those without outcome data may be able to rely on the pooled CAQ data to establish more effective initial AED response plans.

# POSTER 12

## *A Survey of First Responder Fire Fighter's Attitudes, Opinions, and Concerns about Their AED Program*

E. Brooke Lerner, PhD, EMT-P;  
Paul R. Hinchey, BS;  
Anthony J Billittier IV, MD;  
Aaron Goldfarb, MD;  
Ronald M Moscati, MD

**State University Of New York at Buffalo, Buffalo, New York**

Objective: To identify barriers to first responder automated external defibrillator (AED) use by determining firefighter (FF) attitudes, opinions, and concerns about their AED program. Methods: An anonymous survey was mailed to all FF in a municipal department that had had first responder defibrillation for over 2-years and a 63% AED application rate for cardiac arrests (CA). A follow-up survey was mailed to all non-respondents. The survey requested FF demographics, comfort and experience with AED use, definition of DOA, and opinion of the AED program. Results: Of 749 FF surveyed, 687 responded (92%). Respondents had an average of  $12.0 \pm 8$  years experience as a FF. 66% (451/684) felt very comfortable using the AED on patients and 3% (23/684) felt very uncomfortable. Respondent FF had applied an AED to a patient a median of 2 times. 24% (158/671) had never applied an AED. 83% (568/683) reported failure to apply an AED to at least one CA patient. Reasons for not applying an AED included: the ambulance arrived "soon enough" (72%; 411/568), ambulance arrived first (62%; 355/568), patient was DOA (61%; 348/568), patient had DNR (32%; 184/568), AED not effective (2%; 12/568), family refused (3%; 15/568), AED not functional (1%; 5/568), not enough training (<1%; 1/568). 84% (503/600) correctly listed at least one clinical finding that defines DOA. 99% (679/683) felt they should continue the AED program because it saves lives and they typically arrive on scene first. FF gave numerous suggestions for improving the program including being able to visualize the rhythm, increasing their level of care, and improving the AED training program. Conclusions: Municipal first response FF view their AED program favorably despite infrequently applying an AED. The appropriateness of withholding defibrillation because a secondary response unit will arrive "soon enough" should be reviewed. FF should review the definition of DOA to ensure that viable patients are not denied defibrillation.

# POSTER 13

## ***Paramedic Reluctance to Terminate Resuscitation Efforts for Out-of-Hospital Cardiac Arrest Patients: Potential Factors Affecting Paramedics' Comfort Level with a Proposed New Field Termination Protocol***

William L. Hall II, MD  
John F. Marcucci, MD  
Paul E. Pepe, MD, MPH  
Lucy deTamble, RN  
Jane G. Wigginton, MD

**University of Texas Southwestern, Dallas, Texas**

**Purpose:** While on-scene termination of resuscitation efforts (OSTRE) has become common practice in EMS, studies have reported a reluctance of paramedics (PARAs) to initiate OSTRE when unfamiliar with the practice. Our purpose was to prospectively identify potential factors affecting PARA decisions to use an OSTRE protocol in an EMS system preparing to implement the procedure for the first time. **Methods:** A 30-item survey instrument, addressing demographics, clinical presentations (and other factors) was provided, along with the criteria for termination, to PARAs in an urban EMS system (~225,000 annual incidents) previously not performing OSTRE. The blinded, confidential surveys were completed immediately after each cardiac arrest in the 90 days prior to implementing a proposed OSTRE protocol. **Results:** Of 95 completed surveys, 69 cases met protocol criteria for OSTRE. However, PARAs (mean age 34 yrs; 60% caucasian; 7 yrs mean length of service) only identified 44 of these (64%) as meeting the criteria. Also, they responded that they would have been comfortable with OSTRE in only 25 cases (36%). These 25 “comfortable” cases disproportionately involved caucasian PARAs (n=20; 80%) versus the 19 “uncomfortable with OSTRE” in which 53% (n=10) involved non-caucasian PARAs. In contrast, other factors (e.g., patient age/ethnicity, family members present) were similar for both situations. Common reasons PARAs stated for not wanting to initiate OSTRE were: “too short an arrest interval” (38%); patient “age” (16%) and “other” (e.g., family/scene) reasons (37%). **Conclusions:** Prior to implementing an OSTRE protocol, PARAs may indicate reluctance to use it in the majority of applicable cases. PARA cultural differences may play a role, but logistic/sociological factors are also reported as key influences. For comparison, similar studies should be performed after PARAs gain experience with OSTRE or when a more aggressive training program, including grievance counseling, is provided.

# POSTER 14

## ***Complications of prehospital CPR: A description of injury type and risk profile.***

Craig T. Lauder, DO  
Robert O'Connor, MD, MPH  
Sharon M. Vickers, RN  
Michael Caplan, MD

**Christiana Care Health System, Newark, Delaware**

Objective: CPR with closed-chest compression has been used extensively since its inception more than 30 years ago. Potential complications from CPR include injury, with a reported incidence ranging from 3% to 65%. We conducted this study to identify risk factors for such injury. Methods: This retrospective study was conducted by reviewing the autopsy records of adults who had been given CPR initially by bystanders or EMS, and then by hospital personnel. Sampling was consecutive. Patients with historical or physical evidence of preceding trauma were excluded. Clinical and autopsy records were abstracted for patient demographics, height, weight, clinical findings, duration of CPR, persons administering CPR, and medical examiner summaries. Injuries to the thoracic or abdominal organs, including fractures of the ribs or sternum, were noted. Statistical analysis was performed using logistic regression, t-test, and by determining 95% confidence intervals. Results: A total of 73 cases were reviewed, of which 14 (19%; CI 12%, 26%) had evidence of injury due to CPR. Eleven (80%) had sternal fractures, 10 (70%) had rib fractures, 4 (30%) had lung injury, and 3 (20%) had cardiac injury. The injured group had a higher mean age (55.9 vs. 40.2 years), duration of CPR (47 vs. 33 minutes), and body weight (224 vs. 176 lbs.). ( $p < 0.05$ ) Bystander-initiated CPR was seen in 57 (78%) cases, and was associated with a similar incidence of injury when compared with EMS-initiated CPR. No gender predisposition for injury was noted. Conclusions: Significant iatrogenic injuries are common in adults who receive CPR, with increased risk of injury seen with advanced age, prolonged duration of CPR, and increased patient body weight. Acknowledgment of these risk factors may help reduce injury severity, and could have implications for the post-arrest management of those who regain spontaneous circulation.

# POSTER 15

## ***Cardiac Arrest Resuscitation Evaluation in Los Angeles: CARE-LA***

Marc Eckstein, MD  
Samuel J. Stratton, MD  
Kimberly Weems, RN

**Los Angeles Fire Department, Los Angeles, California**

Objectives: To determine the survival rate from out-of-hospital (OOH) cardiac arrests in Los Angeles, CA. Methods: Design: A prospective, observational, longitudinal one year study. These are the preliminary results from the first six months. Setting: A large, metropolitan area with a population of 3.8 million, with EMS provided by fire department based paramedics and EMTs. Participants: All patients over age 18 with non-traumatic, OOH cardiac arrests with attempted resuscitation by EMS providers. Results: 766 patients were included in the study, of which 620 (81%) had outcome data available. The mean age was 66 years (range 18-102). 62% of all patients were male. Asystole was the most common presenting rhythm (40%), followed by ventricular fibrillation (VF) (29%) and PEA (28%). 271 (44%) of all cases were witnessed arrests; of these, 80 (30%) received bystander CPR. Of the 175 patients found in VF, 27 (15%) achieved a return of spontaneous circulation (ROSC), compared with 30 patients (7%) in the Non-VF group. ( $p = .001$ ; OR 2.21, 95% CI: 1.36, 3.61) A total of 21 patients (4%) survived to hospital discharge. In the VF group there were 14 (8%) survivors versus 6 (1.4%) survivors in the Non-VF group. ( $p < .0001$ ; OR 5.73, 95% CI 2.24, 14.7) Conclusions: The survival rate for OOH cardiac arrest in the nation's second largest city is low. Targeted programs are needed to improve the rate of bystander CPR and promote the availability of public access AED programs in order to increase survival.

# POSTER 16

## ***Automated External Defibrillators and Cardiac Arrests in NCAA Division III College Athletic Facilities***

David A. Pipho, MD

Robert N. Farrell, MA, EMT-P

William D. Fales, MD, FACEP

**MSU/KCMS, Kalamazoo, Michigan**

**Objectives:** The purpose of this study is to determine the prevalence of Automated External Defibrillator (AED) programs in NCAA Division III college athletic facilities and to describe factors associated with these programs or the potential need for such programs. **Methods:** A survey along with a letter of explanation was mailed to athletic directors at all NCAA Division III colleges. A second mailing was sent to non-respondents 1 month later. Survey data were entered into a computerized database and statistical analysis was performed using chi-square. **Results:** Surveys were mailed to 423 colleges of which 296 (70.0%) responded. Currently, 45 (15.2%) respondents have at least one AED in their athletic facilities (range 1-6, mean 1.6). Twenty AEDs (32.8%) are located in field houses / gymnasiums, 19 (31.1%) are in training rooms, 12 (19.7%) are in recreation centers, and 4 (6.6%) are in stadiums. Personnel trained in AEDs include 37 of 45 (82.2%) athletic training staffs, 23 of 45 (51.1%) campus police, 19 of 45 (42.2%) health and fitness staffs, and 8 of 45 (17.8%) faculty. Of the 251 respondents that do not currently have an AED, 144 (57.4%) were considering acquiring one. 71 respondents (24.0%) report having at least one cardiac arrest at their athletic venues in the past 10 years, totaling 102 cardiac arrests (range 1 to 4). Of these, 12 (11.8%) involved students while 46 (45.1%) involved faculty and staff and 22 (21.6%) involved spectators. In comparing colleges with and without a history of cardiac arrest, 17 of 71 (23.9%) and 28 of 225 (12.4%) respectively, currently report having at least one AED ( $p=.019$ ) with 36 of 54 (66.7%) and 108 of 197 (54.8%) respectively, are considering acquiring an AED (NS). **Conclusions:** There is a low prevalence of AEDs at NCAA Division III College athletic facilities. Colleges with past cardiac arrests are more likely to have an AED. Cardiac arrests are not rare at these colleges and infrequently involve students.

# POSTER 17

## *The Winslow Method for Determining the Number of AEDs Needed at Mass Gatherings*

Tracy M. Motyka, MD  
Kelly Newton, BA  
Jane H. Brice, MD, MPH  
Janes E. Winslow, MD

**University of North Carolina, Durham, North Carolina**

Background: A previous study derived a method for determining the number of automatic external defibrillators (AEDs) required for a 3-minute response time at mass gatherings. The current research attempts to replicate and validate this method. Methods: After informed consent, ten EMT volunteers were timed walking defined courses in a college basketball arena. Velocities were obtained for a horizontal distance and ascending/descending steps in the lower (19 slope) and upper (33 slope) decks. The second standard deviation of these velocities was used to calculate a worst-case response time for the arena's longest distance. EMTs were then timed over two preset distances to compare predicted and actual response intervals, validating the method. IRB exemption was obtained. Results: Ten EMTs (20-54yrs) participated. Average time for the 1015ft horizontal circular main concourse was 180.1s (CI 167.0-193.1), velocity = 5.6ft/s. The 85.0ft lower deck ascending time was 22.0s (CI 16.3-27.6), velocity = 3.9ft/s; descending was 22.3s (CI 20.0-24.5), velocity = 3.8 ft/s. The 80.3ft upper deck ascending time was 26.2s (CI 21.3-31.1), velocity = 3.1ft/s; descending was 26.5s (CI 22.6-30.4), velocity = 3.0ft/s. The longest possible response distance was determined to be half the circular concourse (507.5ft), plus the combination of lower and upper decks (85.0ft and 80.3ft). Using average velocities, the predicted response time was 138.8s. Using the second standard deviation as the most pessimistic estimate of velocity, the worst-case response time was 186.0s. For a desired 3-minute (180s) response, one AED should be sufficient in a setting of this size. In the validation phase, two response locations were selected. The first distance was 327 horizontal and 24 descending (19 slope) feet, for a predicted worst-case response of 77.8s. The second distance was 145 horizontal and 38 ascending (33 slope) feet, for a predicted worst-case response of 50.0s. Actual response times were 68.9s and 39.7s respectively. Conclusion: The Winslow method was easily replicated and appears to be valid for determining the required number of AEDs at mass gatherings. The number of AEDs needed for any desired response interval can be calculated using the predicted response time for the longest distance within an arena.

# POSTER 18

## *Field Termination of Resuscitation for Out-of-Hospital Cardiac Arrests*

Marc Eckstein, MD  
Samuel J. Stratton, MD  
Kimberly Weems, RN

**Los Angeles Fire Department, Los Angeles, California**

**Objectives:** To determine the frequency of termination of resuscitation for out-of hospital cardiac arrest (OOHCA) and whether there is a significant variability among different paramedic base stations who provide on-line medical control (OLMC). **Methods:** Design: A prospective, observational, longitudinal one year study. These are the preliminary results from the first six months. Setting: City of Los Angeles, a major metropolitan area with a population of 3.8 million. EMS is provided by Los Angeles Fire Department (LAFD) paramedics and EMTs. OLMC is provided by 11 paramedic base stations. **Participants:** All patients over age 18 with non-traumatic, OOHCA with resuscitative efforts attempted by LAFD personnel. **Results:** 764 patients met the study inclusion criteria. Of these, 78 (10.2%) had resuscitative efforts terminated in the field through OLMC. Of the 96 resuscitations directed by one particular base station, 31 (32%) patients were pronounced in the field. Of the remaining 570 patients with OLMC provided by the other base stations, 46 (8%) were pronounced in the field ( $p < .0001$ ; OR 4.00, 95% CI 2.68, 5.97) The mean age, number presenting with VF, frequency of bystander CPR for these two groups of patients compared to the rest of the study patients is shown below:

	Base Station X	All Others	P-
	N (%)	N (%)	Value
No. Patients	94 (12)	670 (88)	N/A
Age (mean)	65	67	N/A
VF	34 (38)	140 (27)	$p = *0.001$
Witnessed	39 (42)	231 (44)	$p = 0.183$
Bystander CPR	15 (38)	65 (28)	$p = 0.192$
ROSC	15 (16)	45 (9)	$p = *0.002$
Pronounced in Field	31 (39)	47 (10)	$p < *0.0001$

**Conclusions:** There is a wide disparity with regards to OLMC terminating resuscitative efforts for patients with OOHCA within a single EMS system. Given the medical, ethical, and economic implications, further study is warranted to determine whether this is appropriate and to achieve consistency within the system.

# POSTER 19

## *Comparison of Prehospital Providers and Medical Control Physicians' Opinion of DNR Care*

Steve Shelton, MD  
Mike Kaczmarek, MD  
Holmes Finch  
Ed DesChamps, MD  
Doug Silk, NREMT-P

**Palmetto Richland Memorial Hospital, Blythewood, South Carolina**

**Purpose** The purpose of this study was to determine if a consensus exists among the prehospital providers and medical control physicians as to which treatments should be provided during the out of hospital care of DNR patients. **Methods** A questionnaire was developed with the following question: "During transportation of a patient with an active Do Not Resuscitate order, in your opinion, should the following procedures / medications be administered or withheld?" Participants were given twenty-three basic and advanced treatments to evaluate. Possible responses were administer, withhold, or not sure. An additional question was "Would you like to receive more education on EMS DNR?" Questionnaires were completed by 153 prehospital providers (EMT) attending a state EMS Symposium. Questionnaires were mailed to all of the medical control physicians (MCP) in the state. Responses were received from 44 (45.8% response rate). In order to determine whether differences in responses on any of the items existed, stepwise logistic regression was used, with the response being type of respondent (MCP or EMT) and the independent variables being the responses to the survey items. In addition to the items of interest, sex, years of experience and service volume were also included in the model to account for any effects on the response due to demographics. **Results** Prehospital providers were more likely to respond "not sure" concerning atropine for bradycardia ( $p=0.015$ ); to respond either "administer" or "not sure" concerning dopamine for hypotension ( $p=0.034$ ); and to want more education on EMS DNR than were medical control physicians ( $p=0.001$ ). While not statistically significant, response variability was observed for several treatment options. Clinical significance was defined as greater than 10% difference in response for administering a treatment. Four treatments met this criteria and are as follow: Epinephrine for anaphylaxis - MCP 72.1%, EMT 85.7%; BVM ventilation - MCP 14.3%, EMT 33.6%; Insert an NPA/OPA - MCP 26.2%, EMT 49.0%; Place on cardiac monitor - MCP 58.1%, EMT 77.0. **Conclusions** Prehospital providers and medical control physicians have different opinions concerning treatment to be given to a patient with a DNR order. Prehospital providers would like more education concerning DNR care.

# POSTER 20

## *Does Location of Cardiac Arrest Predict Long Term Survival?*

Robert A. Swor, DO  
Raymond E. Jackson  
Rebecca G. Pascual

**William Beaumont Hospital, Royal Oak, Michigan**

Substantial effort and public resources have been focused on improving cardiac arrest survival in public locations. Objective: To assess whether location of cardiac arrest is associated with one year and three year survival rates in patients that have survived to hospital discharge. Methods: Population: All Out of hospital Cardiac Arrests patients transported to two suburban community teaching hospitals between 7/1/89 and 7/1/00 and who survived to hospital discharge. We retrospectively identified long term survival (one year and three year survival ) data on all patients through review of hospital medical records and state death indexes. Patient demographics including location of cardiac arrest were captured, with location dichotomized to public location (public) or private residence(home). Nursing home cases were excluded. Simple proportions, chi square analysis and T-tests were calculated . Results: During the study period 161/1674 (9.6%) survived to hospital discharge. Of these 19 were lost to followup and were equally distributed between public and home locations. Of the remainder , 115 (81.0%) were alive at one year and of the 106 who arrested prior to 9/98, 82(77.4%) were alive at 3 years. One year survivors were significantly younger than non survivors (62.9 vs 70.8 years,  $p=0.004$ ). There was a trend to improved outcome for public location arrests at 1 year (89.8% vs 76.3%,  $p=0.052$ ) and for those who survived the first year, we observed no difference between groups for 3 year survival (92.3% vs 88.5%,  $p=0.54$ ). Conclusion: Patients that survive cardiac arrest in public locations have a greater one year survival when compared to private location arrests. All patient who survived 1 year had excellent 3 year survival rates

# POSTER 21

## *Cardiac Arrest Resuscitation Experience Under System Status Management*

Rollin J. Fairbanks, MD, MS, NREMT-P  
Manish N. Shah, MD

**University of Rochester, Rochester, New York**

**INTRODUCTION:** System status management (SSM) aims to provide a consistently short call-response interval, and this has been shown to be independently associated with cardiac arrest survival. A review of the literature revealed no cardiac arrest studies from regions using SSM. SSM gives us a unique ability to study the characteristics of cardiac arrest survival while minimizing bias created by a wide variation in the call-response interval. **METHODS:** This pilot descriptive study enrolled all adult cardiac arrest patients with a resuscitation attempt occurring between February and July 1998 in Rochester, NY (pop. 220,000). Utstein criteria were used as a guide in data collection and reporting. Arrests of non-cardiac etiology were excluded. The outcome measure used was the pre-hospital return of spontaneous circulation (ROSC). **RESULTS:** 137 consecutive cardiac arrests were identified. 91 met inclusion criteria. The median call-response interval was 5 minutes (range 2-11). We found 29 cases of VF/VT (32%), 33 asystole (36%), and 39 other (43%) initial rhythms. 41 arrests (45%) were witnessed. 23 patients (25%) received bystander CPR. 33% of arrests witnessed by a bystander received bystander CPR. Overall 15 patients experienced ROSC (16%). Subgroup analysis showed ROSC occurred in 13% of blacks, 18% of whites; 13% of males, and 23% of females. ROSC was also found for 22% with and 15% without bystander CPR, 17% of intubated and 20% of non-intubated patients. 28% with VF/VT, 6% with asystole, and 24% with other initial rhythms experienced ROSC. **CONCLUSION:** This pilot study finds ROSC rates to be consistent with resuscitation rates published in the literature. Expanding the study to include additional patients and longer-term survival data is warranted to better evaluate cardiac arrest outcome under SSM.

## POSTER 22

### ***Early Brain Edema Formation Following Cardiac Arrest Is Not Mediated By Resident Neutrophils***

Eric Daniel  
Thomas Arnold, MD  
Feng Xiao, MD  
Ping Zhang, MD, PhD2  
Shu Zhang, MD  
Donna Carden, MD1  
Steven Conrad, MD, PhD

**Louisiana State University Health Sciences Center, Shreveport, Louisiana**

Introduction: It has been documented that brain neutrophil accumulation, as determined by brain myeloperoxidase (MPO) activity, is significantly increased six hours following focal ischemic injury and this increase correlates with brain injury. Objectives: This study was designed to investigate the role of brain neutrophil infiltration in the early brain edema formation following cardiac arrest (CA) in rats. Methods: Sixteen male Sprague-Dawley rats weighing 300-400 grams, were assigned to normal control surgery (n=6), or subjected to normothermic CA ( $37.5\pm 0.5^{\circ}\text{C}$ , n=5) or hypothermic CA ( $34\pm 0.5^{\circ}\text{C}$ , n=5). Hypothermia was induced with external cooling before CA. CA was induced by 8 minutes of asphyxiation. Animals were resuscitated with external CPR, mechanical ventilation and epinephrine. Brain edema was determined by brain wet-to-dry weight ratio at three hours after restoration of spontaneous circulation. Coronal sections of brain tissue were examined with H&E staining under light microscopy for ischemic neurons and neutrophil infiltration. Results: Brain wet-to-dry weight ratio was  $4.56\pm 0.03$  in normal controls,  $4.74\pm 0.03$  in normothermic CA ( $p=0.006$  vs. normal controls), and  $4.65\pm 0.03$  in hypothermic CA ( $p=0.045$  vs. normothermic CA). Compared with normal controls, normothermic CA resulted in an increased number of ischemic neurons in the brain sections examined. The increase in ischemic neurons was diminished in hypothermic CA. There was no neutrophil infiltration observed in any of the brain tissue sections examined. Conclusions: Brain neutrophil infiltration does not contribute to the early development of brain edema following CA. The role of neutrophil infiltration in the delayed brain injury following CA needs to be determined.

# POSTER 23

## *New Insights Into Prehospital Stroke Care: A One-Year Study*

Nicole Flores, MD  
Todd Crocco, MD  
Laura Sauerbeck, RN  
Travis Gullett, BS  
Edward Jauch, MD  
Brian Pio, EMT-P  
Michael Ottaway, EMT-P  
Thomas Chenier, PhD.

**University of Cincinnati / West Virginia University, Morgantown, West Virginia**

Neuroprotective agents (NPA) are still being vigorously investigated despite early disappointments. This one-year study provides novel data about EMS personnel's ability to accurately diagnosis stroke using a Likert scale, and their ability to obtain prehospital consent, which will be valuable when an acceptable NPA is found. Objective: To re-evaluate the accuracy of EMS personnel to recognize stroke using a 5-point Likert scale (in conjunction with prospectively validated inclusion/exclusion criteria), and to assess their ability to obtain informed consent for future NPA administration. Methods: 20 urban EMS agencies volunteered to participate. EMS personnel collected data on any patients considered to be potential stroke victims. Demographic information, inclusion/exclusion criteria for NPA administration, and event/decision times were reported. A Likert scale assessment was performed on a subset on patients. A case-control design was used to estimate the ability of EMS personnel to diagnose stroke compared with the discharge ICD-9 codes. Control patients were enrolled into the study based upon test patient recruitment using a predefined algorithm. Data analysis was performed using descriptive statistics. Results: 213 test patients and 157 control patients have been enrolled, with additional control patients forthcoming. The overall positive predictive value for EMS was 36%. Using the 5-point Likert scale, those that felt 'certain' (Likert 4) or 'very certain' (Likert 5) that an acute stroke was occurring were correct in 67% of the cases. Only 25% of Likert 3 rankings were actual strokes. 55% of all test patients had someone present for informed consent. Conclusions: Prehospital informed consent can usually be obtained for potential stroke victim management, and EMS accuracy of stroke recognition is improved when evaluated using stratified analysis. Limitations include inability to capture all stroke patients transported by the EMS agencies and incomplete data sheets.

# POSTER 24

## *EMT Knowledge of Cerebral Vascular Accidents*

David J. Fuller, EMT-P  
Terri A. Schmidt, MD, MS  
Jason B. Snider, MS, NREMT-P  
Jon Jui, MD, MPH

### **American Medical Response, Portland, Oregon**

**OBJECTIVES** To assess EMTs knowledge of the signs and symptoms, treatment, and risk factors for cerebral vascular accidents. **METHODS** EMTs attending a mandatory protocol in-service were asked to complete a survey questionnaire which assessed the EMT's knowledge of signs and symptoms, treatment, and risk factors for cerebral vascular accidents. Completion of this survey was voluntary. EMT demographic information asked for EMT certification level, experience, and to which type of response vehicle they are regularly assigned (ambulance, engine, rescue, or other). **RESULTS** Of the 430 EMT's attending the in-service, a total of 356 EMTs (82.8%) returned a survey questionnaire. Of the 356, 3.7% (n=13) were EMT-Basics, 1.7% (n=6) were EMT-Intermediates, 92.7% (n=330) were EMT-Paramedics, and 2.0% (n=7) did not record a certification level. 41.0% (n=146) primarily worked on an ambulance, 44.1% (n=157) on an engine, 5.8% on a rescue, 5.6% (n=20) other, and 3.3% (n=12) did not record a primary assignment. 77.4% (n=113) of ambulance EMTs, 69.6% (n=124) of engine and rescue, and 65.0% (n=17) others correctly identified the signs and symptoms of stroke (not statistically significant difference, (p=0.1181)). The mean experience of the EMTs was 12.6 years (range 0.25 years to 35 years). Correctly identifying the signs and symptoms of stroke was not affected by years of experience as an EMT. 71.5% (n=252) knew the tPA window for administration was 3 hours. 55.7% (n=194) knew that a hypertensive patient having a stroke should not be treated to lower blood pressure. 76.9% (n=274) of EMTs could identify the time of onset of stroke symptoms. Only 1 of 356 EMTs correctly identified all the risk factors for stroke. **CONCLUSIONS** Most EMTs in this system can correctly identify the signs and symptoms of stroke and were aware that tPA must be administered within 3 hours. Few EMTs know the risk factors for stroke.

## POSTER 25

### ***Prehospital Heart Code Team Activation Based On Paramedic ECG Interpretation Is Accurate, And Does Not Result In Excessive Overtriage***

Robert E. O'Connor, MD, MPH

Charles L. Reese, MD

Ross E. Megargel, DO

E. David Bailey, MD

Craig T. Lauder, DO

James Hopkins, MD

Angela DiSabatino, MSN

Lynn Bitner, BSN

Anne Dougherty, BSN

Sharon M. Vickers, BSN

Ehsanur Rahman, MD

**Christiana Care Health System, Newark, Delaware**

Purpose: Prehospital 12-lead ECG tracings are used to facilitate rapid diagnosis and treatment of AMI. Concerns still exist regarding mobilizing resources based on field interpretation of the prehospital EKG, and the potential for inappropriate triage and treatment of patients. Methods: This prospective observational study was performed at a tertiary care emergency department (ED). All patients with heart code activation based on field or emergency department (ED) ECG were enrolled. Requirement for heart code activation included clinical evidence of AMI, with the following ECG criteria: ST-segment elevation  $>1$  mm in 2 contiguous limb leads, or  $>2$  mm in 2 contiguous precordial leads. Paramedics described their provisional ECG interpretation to the base station physician, who had the option of activating the code team prior to hospital arrival. Activation of the heart code team placed the cardiac catheterization lab on standby. Patients were grouped according to site heart code activation; ED vs. prehospital. Heart code activation resulted in primary angioplasty (PA), thrombolytic therapy (TT), rescue angioplasty (RA), or no intervention. The main outcome measure was whether or not reperfusion therapy was performed following heart code activation. Results: A total of 572 heart code activations were studied, of which 191 were activated from the field and 381 from the ED. A total of 306 of the 381 (80.3%) ED activations, and 152 of the 191 (79.6%) field activations underwent reperfusion therapy. ( $p=NS$ , Power  $>98\%$ ) The rate of primary angioplasty was slightly higher in the field activation group. (88% vs 84%,  $p=NS$ ) Conclusions: Approximately 20% of all heart code activations did not result in reperfusion therapy. Field heart code activation for AMI patients has a similar rate of overtriage when compared with ED activation. We recommend field activation for patients meeting ECG criteria, in that it permits earlier identification of AMI can be reliably performed by EMS.

# POSTER 26

## *Accuracy of Paramedic 12 Lead Electrocardiogram Interpretation and Utilization by Emergency Department Physician*

Carmen Brown, BS  
Thomas A. Sweeney, MD  
Robert E. O'Connor, MD

**Christiana Health Care System, Newark, Delaware**

Objective: Decreased time to reperfusion therapy has been shown to improve outcome in acute myocardial infarction patients. Interpretation of 12-lead electrocardiograms by paramedics and early notification of the emergency department has been shown to reduce the time to therapy in-hospital for acute myocardial infarction. The purpose of this study is to determine the accuracy of interpretation and cost effectiveness of a 12-lead EKG paramedic program. Methods: This retrospective study was conducted in an urban/suburban county with a population of 500,000. Patients who had a 12-lead EKG performed or whose chief complaint indicated a 12-lead EKG by paramedic protocol, were included. The information was abstracted using a standardized form. Paramedic EKG interpretation was compared with researcher interpretation. The paramedic data was integrated with the emergency department and hospital myocardial infarction database to determine which patients suffered a myocardial infarction. The sensitivity and specificity of paramedic assessment were calculated. The cost effectiveness of paramedic 12-lead EKG assessment was determined. Results: A total of 2134 charts were reviewed, 493 met paramedic protocol criteria for performing a 12-lead EKG and 461 of the patients had EKGs performed. Of these patients acute myocardial infarction was noted in 21 cases by paramedic interpretation and 20 cases by researcher interpretation. Nineteen patients fulfilled hospital criteria for acute myocardial infarction and were transported to the catheterization lab. One patient who fulfilled hospital criteria for myocardial infarction was identified by paramedics as having a normal EKG. In 13 cases the cardiologist was alerted prior to hospital arrival. Sensitivity of paramedic interpretation was 90.5% and specificity was 99.8% (p-value of 0.044). The cost of having paramedics perform an EKG was \$3.75/EKG and \$79/EKG for acute MI identification. Conclusion: Paramedics are able to accurately interpret 12-lead electrocardiograms in the pre-hospital setting. This interpretation may be used for early identification and activates earlier interventions for the patients, leading to reduced time to therapy. Paramedic 12-lead interpretation is also cost effective for detecting acute myocardial infarction.

## POSTER 27

### ***Chest Pain Patients Calling 9-1-1 or Self-Transporting to the Hospital: Which Mode is Quicker?***

Caroline Hutchings, Mstat  
N. Clay Mann, PhD, MS

**University of Utah School of Medicine, Salt Lake City, Utah**

Chest pain patients may not call 911 to initiate hospital transport because they believe private transportation is faster. We assessed transport times for patients utilizing private transportation compared with patients activating EMS. Methods: Retrospective cohort study utilizing data from the REACT trial conducted in 20 U.S. cities. Population: All patients presenting to study EDs with a possible or confirmed coronary event. Measurements: Time to seek care was estimated using 911 call time (i.e.EMS group) or the time the patient left for the ED, collected in a follow-up interview (private vehicle). Elapsed time to reach definitive care was examined using: 1) time to ED arrival [private and EMS groups], 2) time to initial care (private-ED arrival vs. EMS-EMS arrival) and, 3) time to reperfusion therapy. Analysis: Elapsed travel times were ranked within Zip Codes to account for distances traveled to study EDs. ANOVA was utilized for ranked data to determine if elapsed times were different between groups. Results: A total of 2397, 1213 and 321 observations were assessed for time to ED, initial care and reperfusion therapy, respectively. The quickest transport mode varied based upon the chosen measure of definitive care. Private transportation (median-35 minutes) was faster than EMS (median-39 minutes,  $p < 0.01$ ). However, if one considers EMS treatment to be decisive care, calling 911 (median-6 minutes) results in care much quicker than seeking care at the ED (median-32 minutes,  $p < 0.001$ ). When assessing thrombolytic therapy transport via EMS (median-32 minutes) resulted in a shorter "decision-to-needle" time compared to private transport(median-49 minutes,  $p < 0.01$ ). Conclusions: Patient's experiencing chest pain accurately surmise that private transport, rather than activating EMS, results in a quicker trip to the ED. However, EMS activation results in rapid initial care and quicker thrombolytic therapy

## POSTER 28

### *Is There a Difference in Protocol Treatment of “Acute Coronary Syndromes” as Opposed to “Chest Pain”?*

Michael E. Schnyder, NREMT-P

Jeffrey Cox, BS, NREMT-P

T. Allen Barnes, NREMT-P

Craig Lauder, DO

Ross Megargel, DO

**Christiana Care Health System, Wilmington, Delaware**

**Introduction:** Starting in June 2001, new training was provided to paramedics to align them with the acute coronary syndromes (ACS) concept of the American Heart Association. These paramedics were introduced to suspecting nondiagnostic ACS patients rather than the typical chest pain (CP) patient. The goal would be to recognize and treat patients that might have been previously missed. **Objective:** The purpose of this study is to determine whether the new training standards has changed the assessment and treatment practices of paramedics. **Methods:** Paramedic charts were reviewed for June - August 2000 (CP protocol) and June - August 2001 (ACS protocol). Counts of CP and ACS interventions were made and compared to each other. Statistical analysis was performed using chi-square test to discover any statistically significant differences. **Results:** A total of 606 charts were discovered where either the CP or ACS protocol was used (CP: 284 charts & ACS: 322 charts). There was a significant increase in the number of patients treated under the new protocol (ACS: 13.1% vs. CP: 10.3%;  $p < 0.01$ ) More patients were given aspirin under the new ACS protocol (ACS: 85.7% vs. CP: 70.4%;  $p < 0.001$ ). There were no significant changes in nitroglycerin administration, morphine administration, or discoveries of significant ST changes on a 12-Lead ECG. **Conclusion:** The training has increased the number of patients treated under the new ACS protocol. In addition, more patients are receiving aspirin because of the training.

## POSTER 29

### ***Prehospital Naloxone Resuscitation With Subsequent Refusal Of Treatment As A Risk Factor For Death From Opiate Overdose***

Robert L. Norton, MD,  
Jason Snider, MS, NREMT-P

**Oregon Health & Sciences University, Portland, Oregon**

Objective: Naloxone is commonly used to treat prehospital opiate overdose. Some EMS systems allow patients resuscitated with naloxone to refuse further treatment or transport. Because of the short duration of effect of naloxone, other EMS systems mandate transport. One prior study found no opiate overdose deaths in 317 patients who received naloxone and refused other treatment. Our hypothesis is that no patients with opiate overdose who refused transport died within twelve hours of naloxone treatment.

Methods: This was a retrospective review of all patients in Multnomah County who received prehospital naloxone treatment for opiate overdose and refused transport from January 1, 1998 to May 31, 2000. The County's single ALS transporting agency's prehospital care, computer assisted dispatch and billing databases were cross referenced by date, time, name, gender and social security number with the list of all medical examiner (ME) certified deaths attributed to opiate overdoses during the same period to determine whether any patient died within 12 hours of naloxone treatment. The EMS system serves 650,000 (fire department ALS first response and single ALS transport agency). Standing order protocols permit naloxone treatment. Online medical direction is available for patient refusal.

Results: There were 128,178 ALS responses during the study period and 1702 patients were treated with naloxone; 143 ( 8.3%) of these patients refused transport. Mean age was 38.2yrs and 77% were male. There were 276 ME deaths attributed to opiate overdose. None of the 143 patients (0%, 95% CI: 0% - 2.8%) treated with naloxone and released were matched to the ME list of deaths.

Conclusion: Treatment with naloxone and subsequent patient refusal resulted in no opiate related deaths during the study period. These findings support the EMS system's protocol of not requiring transport for naloxone-resuscitated opiate overdoses patients.

# POSTER 30

## *Submental Naloxone: A Useful Approach To Field Treatment Of Narcotic Overdose*

Lawrence Dunlap, MD  
Mike Anderson, PM  
Karen Rich  
Donald Vaught, PM

**Eugene Fire/EMS, Eugene, Oregon**

**STUDY OBJECTIVE:** The submental use of Naloxone offers a safe, effective, and preferred approach to the intramuscular delivery of a narcotic antagonist in selective circumstances. **METHODS:** Following a training program our EMS system authorized the submental approach as an option for Naloxone delivery in the emergency setting. Naloxone use was then tracked for 13 months and ambulance charts reviewed for presumed paramedic diagnosis, drug dose, and effectiveness. Cases of submental injection were paired with hospital ED and discharge records for drug effectiveness, complications, and outcome. Field response was considered positive with documentation of increasing alertness, respiratory rate, or activity. **RESULTS:** Naloxone was used 107 times over 13 months. The submental route was employed on 41 (38%). Of this cohort (30 (73%) improved with field treatment and 11 (23%) had no response noted. The 11 non-responders included 3 non-transported cardiac arrests, 2 strokes, 1 respiratory failure and 5 overdoses of alcohol, psychiatric drugs, or combinations of predominantly non-narcotic drugs. Of the 30 patients who improved, 3 refused transport and 14 were discharged from the ED after a period of observation (57%). The remainder were admitted to the hospital, usually for psychiatric stabilization or because of mixed drug ingestions. There was no mention or documentation of any problems relating to the submental injection. 24 of 41 patients received 2 mg. of Naloxone while the remainder received lesser doses. Paramedics can often predict Naloxone response from the scenario and subsequently resuscitate high contamination risk patients with a minimum of exposure and resources. **CONCLUSION:** Naloxone via submental injection is shown to be safe and effective in a small patient sample. It may constitute the preferred route for emergency intramuscular narcotic reversal based on simplicity and safety of access while allowing maximum attention to airway.

# POSTER 31

## *A Pilot Study of Prehospital Intra-Nasal Fentanyl*

I. Jacobs, MD  
Harry F. Ozer, MD  
David Ford

### **St. John Ambulance, Perth, Western Australia**

**Aim-** A pilot study to determine the dosage, effectiveness and safety of intranasal fentanyl for use by paramedics in the prehospital situation. **Method-**a non-randomized clinical trial of intranasal fentanyl was undertaken according to a specific clinical protocol, approved by the University of Western Australia Human Ethics Committee. Each selected paramedical crew was instructed in the indications, administration, post analgesia monitoring and recognition of adverse effects. Fentanyl was prepared at a concentration of 300 mcg/ml and packaged in tamper-evident nasal spray packs. Each contained 3 ml, each delivered squirt was 0.2ml-60mcg. Pain scores using a 10 cm visual analogue scale were assessed before the loading dose, after 5 minutes, and on arrival at hospital. Number of doses and time to pain relief were recorded, any side effects, and the performance of the delivery spray. Descriptive analysis was performed on the data. Using the Wilcoxon rank test, and established at 0.05. 95% confidence limits were derived for each of the sample estimates. Results i/n fentanyl was given to 33 adult patients in the pilot study.

Pain Score	Initial	5 minutes	At hospital
Mean (95%CI)		7.8 (7.1,8.5)	5.7(5.1,6.5) 3.8 (2.9,4.5)
Median	8	6	4
Range	3-10	1-9	0-9

Differences in pain scores were highly significant  $p = 0.000$  in each. Average squirts was 3, max 6, mean time to adequate pain relief was 11.9, median of 10 minutes. **Discussion.** There were no adverse events observed, but problems with the spray required a change of administration device. A parallel study in children at the Children's hospital had almost identical results. This was a pilot study, and when problems with the delivery method have been addressed a larger definitive study is planned.

# POSTER 32

## ***Can A Simple Reminder Letter Improve Numbering Of Single-Family Residences?***

Don MacMillan, PA, EMT-P  
David C. Cone, MD

**Yale Emergency Medicine, New Haven, Connecticut**

**Objective:** To determine if a single mailing from the local volunteer fire department could increase the number of homes with proper, visible address numbering. Proper house numbering is essential in rapidly locating a house during an emergency response. **Methods:** The study was conducted at a suburban fire department providing EMS and fire suppression services to a 22 square mile area with 2233 single-family homes. Mailboxes are located at the street, and many homes are set back and not visible from the street. During the hazard identification aspect of pre-plan operations, each single-family residence in the district was visited and assigned a classification: A: No house number visible on either the house or the mailbox (improper) B: House number found on only one side of the mailbox (improper) C: House number found on both sides of the mailbox, or on the house, clearly visible from the street (proper). All residences with improper numbering (A or B) were sent a one-page letter from the fire chief, discussing the advantages of having the residence properly numbered for rapid identification in an emergency, and the small expense of doing so. These residences were re-visited six weeks later to determine whether the deficiencies had been corrected. It was prospectively determined that a 25% improvement was being sought. The local Human Investigation Committee approved the study. **Results:** During the pre-plan tour, 73 houses were classified as type A, 454 as type B, and 1706 as type C. At the re-visit, 135 (26%) of the 527 type A and B homes now had proper numbering. Re-numbering was better ( $p < 0.001$  by Chi-square) at type A homes than at type B: 37 (51%) of the type A homes now had proper numbering, as did 98 (22%) of the type B homes. **Conclusion:** For houses with no numbering, a single mailing from the fire department can be effective in encouraging residents to post proper numbers. For houses with partial but incomplete numbering, additional efforts may be required.

# POSTER 33

## *Temporal Trends In Ambulance Diversion In A Mid-Sized Metropolitan Area*

Craig R. Warden, MD, MPH  
Christopher Bangs, MS  
Robert Norton, MD  
James Huie, BA

**Oregon Health Science University, Portland, Oregon**

Objective: To verify whether the amount of ambulance diversion has increased in an emergency medical services system (EMS) and to investigate which factors may be associated with an increase in diversion. Methods: Ambulance diversion status of individual hospitals in a four-county mid-sized metropolitan area has been voluntarily recorded electronically for fifteen years. This study calculated the aggregate yearly hospital ambulance diversion time for “Total Ambulance Divert (TAD)” and “Critical Care Divert (CCD)” from January 1, 1996 to December 31, 1999. EMS 911-generated patient transport volume, hospital emergency department census volume, total population, amount of health maintenance organization (HMO) penetration, and number of licensed and available hospital beds were calculated from appropriate administrative databases for each yearly interval. Kendall’s tau-b correlation was used to test whether any variable changed significantly over time. Potential factors associated with ambulance diversion were determined using Pearson correlation and adjustment was attempted using multivariate linear regression analysis. Results: Total TAD increased 122.5% ( $p=0.04$ ), total CCD increased 64.4% ( $p=0.50$ ), total EMS transport volume increased 16.1% ( $p=0.04$ ), total ED census increased 9.4% ( $p=0.04$ ), total licensed beds decreased 5.7% ( $p=0.17$ ), total available beds decreased 15.8% ( $p=0.17$ ), HMO penetration increased 4.7% ( $p=0.04$ ), and total population increased 9.7% ( $p=0.04$ ) over the 4 year study period. CCD and TAD were not significantly related to each other ( $p=0.50$ ). The only significant factor associated with the increase in TAD was number of available beds ( $p=0.03$ ). There were no factors significantly associated with CCD. Conclusions: In this study, TAD increased significantly over time and was found to be associated with the decrease in total available hospital beds. Any attempts to mitigate ambulance diversion may need to address this issue.

# POSTER 34

## ***Can Paramedics Accurately Identify Patients Who do Not Require ED Care?***

Salvatore Silvestri, MD  
Steven G. Rothrock, MD  
Dan Kennedy, MD  
Jay Ladde, MD  
Joe Pagane, MD  
Marsha Bryant, RN, EMT-P

**University of Florida, and The Institute of EMS Education and Research, Inc.,  
Orlando, Florida**

Study Objective: To determine if paramedics can identify patients contacting 911 who do not require ED care. Setting: Urban county with a two tiered, dual response to 911 calls comprising 8 local fire departments with advanced life support capabilities and a private advanced life support 911 agency (~ 35,000 total patient contacts per year) with primary transport responsibilities. Population: Consecutive patients transported by a private transporting paramedic agency. Methods: After patient contact and stabilization, paramedics completed a survey detailing the necessity for transport to an ED for each patient. Prior to data analysis, it was determined that patients would be designated as requiring ED care if they (1) were admitted, (2) required surgical, surgical subspecialty, obstetric or gynecology consult, or (3) required advanced radiological procedures (excluding plain films). Sensitivity, specificity, and predictive values for paramedic assessment of necessity for ED care were calculated with 95% confidence intervals. Results: Over the study period, 313 patients were enrolled. Paramedic assessment was 81% sensitive (72-88%, 95% CI) and 34% specific (28-41%, 95% CI) in predicting requirement for ED care. In 85 cases where paramedics felt ED transport was unnecessary, 27 (32%) met criteria for ED treatment including 15 (18%) who were admitted and 5 (6%) who were admitted to an intensive care unit. Conclusion: In our urban system, paramedics cannot reliably predict which patients do and do not require ED care.

## POSTER 35

### ***"Shake, Rattle and Broil": The Environmental Storage Condition Compliance of Out of Hospital Pharmaceuticals in Central Virginia***

Russell S. Hummel, III, MSBME, NREMT-P  
Daniel P. Barry, MHA, NREMT-P  
James Gould, RN, NREMT-P  
Rutherford Rose, Pharm.D

**Virginia Commonwealth University, Medical College of Virginia, Richmond, Virginia**

We hypothesized that EMS agencies located in the Old Dominion Emergency Medical Services Alliance (ODEMSA) service area were in compliance with manufacturer's standards for storage conditions of the drugs carried in EMS vehicles. This was based on the observation that the EMS vehicles are not equipped with environmentally controlled storage devices and that the office of EMS had not cited any agencies for failure to store drugs as per the manufacturer's standards. The study region is a 9000 square mile area of central Virginia with a population of 1.3 million. It has a moderate climate and is located 90 miles inland from the Atlantic coast. There are 22 counties 7 towns and 6 cities in the region. It has approximately 545 EMS response vehicles with 3325 BLS and 1125 ALS providers. Both volunteer and career EMS agencies are represented. We designed an observational study to measure the temperature inside an EMS drug storage container (DSC). Temperature measurements were taken at 20-minute intervals over a 28-day summer period. The measurements were made with a Thermochron iButton (Dallas Semiconductors, Dallas TX) temperature data acquisition system that collects 2048 time and date stamped temperature measurements. The measurement range of the Thermochron is -10 C to +85 C. We attached a Thermochron inside 100 of the 800 DSCs utilized in the region. Ninety of the 100 Thermochrons have been recovered as of June 1, 2001 and a total of 184,320 data points were collected. The data was analyzed to determine the time each DSC was exposed to temperatures greater than 85F. The range of exposures above 85 F varied from zero hours to a maximum of 525 hours. Our conclusion is that drugs carried in EMS vehicles in central Virginia are not stored in compliance with the manufacturer's standards for temperature exposures. It is yet to be determined if these exposures have a detrimental effect on the potency of any of the drugs in the study or on patient outcomes.

# POSTER 36

## *Reliability of Short-Term Outcome Coding in an EMS System*

Christine Anderegg  
Steven M. Joyce

**University of Utah, Salt Lake City, Utah**

Purpose: Reliable measurement of short-term outcomes would allow an Emergency Medical Services (EMS) system to evaluate its performance independent of Emergency Department (ED) or hospital interventions. The reliability of short-term EMS outcome codes used by an urban EMS system was assessed. Methods: Codes were assigned at the time of patient death or delivery to the ED as follows: 1=dead at the scene, 2=dead en route or on arrival after EMS resuscitation attempted, 3=died after attempted ED resuscitation, 4=alive in critical condition requiring immediate intervention, and 5=alive in stable condition. A convenience sample of 100 cases was selected to ensure inclusion of all outcome codes. EMS run reports and extracted ED records were examined for: provisional diagnosis, interventions, timing of therapeutic and critical diagnostic interventions, and other demographic data. Extracted ED data and EMS run sheets were reviewed by the authors (one blinded to paramedic-assigned codes), and outcome codes were assigned using detailed definitions. Codes assigned by paramedics were compared to those assigned by the blinded author, using the intraclass correlation coefficient (ICC) to determine interrater reliability. ICC > 0.8 indicates good interrater reliability. Results: 94 cases had sufficient documentation. Reliability was measured for patients who died and those who were alive at time of ED delivery. Agreement was very good for patients who had died (codes 1-3), ICC = 0.96. Agreement was only fair for patients alive at the time of ED arrival (codes 4 & 5), ICC = 0.42. There was no trend towards any diagnosis in cases of disagreement. Conclusions: there was only fair interrater reliability in outcome coding for patients alive at the time of ED arrival in this EMS system sample. Refinement of outcome code definition and further reliability testing is indicated before results can be used to assess system performance.

# POSTER 37

## *Distribution of Presenting Medical Complaints in a Multi-Day Charity Bicycling Event*

David A Purpora, MSN, CRNP  
Christopher Handley, EMP-T, CPTC  
Christine Cottingham, MSN  
H. Neal Reynolds, MD  
Michael J. VanRooyen, MD, MPH

### **Johns Hopkins**

**Purpose:** Charitable sporting events have increased in popularity over the past several years. The medical care for these events varies widely. Managing the medical team is a difficult task. The medical team is responsible for treating participants, spectators and coordinating with local EMS and hospital staff. The purpose of this study is to describe distribution of medical complaints presenting to medical treatment areas during a multi-day, mass gathering, bicycle event and describe the impact of interventions provided by the medical team on the riders. **Methods:** The DC AIDS Ride takes place each year in late June, covering 100 miles each day from Raleigh to DC. The participants each year are made up of 2000-3000 bike riders, mostly amateurs. We performed a retrospective chart review of all documented patients presenting to medical treatment areas. We then analyzed the medical care provided at the first three of these bicycle rides comparing outcomes after the medical team provided interventions. Each year we made changes to policies, supplies, staffing of medical team, and types of hydration and education of riders. **Results:** The medical team treated 15,972 patient encounters for the first three years. We stratified the patient complaints into two broad groups; non-urgent /the mild-moderate and urgent /severe complaints. Each year dehydration and orthopedic overuse were the complaints with the highest incidence. In 1996 dehydration accounted for 9% of all treatments and 71% of those was severe requiring IV hydration. After interventions the following years decreased the occurrence of severe dehydration to 43% in 1997, and 24% in 1998. Orthopedic overuse accounted for 71% of all treatments in 1996 and after interventions decreased to 44% in 1997 and 19% in 1998. Hospitalization of the riders was 11% in 1996 and decreased to 6% in 1997 and in 1998 to 2% of the riders. **Conclusion:** Dehydration and overuse were the most common presenting complaints. Greater than 60% of patients brought to the hospital were due to dehydration. This study showed that we were able to significantly decrease the episodes of severe dehydration and thus improved safety and decreased hospitalization of the riders. This information may serve as to better tailor health resources for other multi-day amateur events improving safety to the participants.

# POSTER 38

## ***Hepatitis B Antibody Testing of Prehospital Care Providers: The MedicScreen HEP-B Project***

C. Richard Packer, MS, NREMT-P  
Vince N. Mosesso, Jr., MD, FACEP  
Joan O'Dair, RN, MPH, MSW

**UPMC Health System, Pittsburgh, Pennsylvania**

Hepatitis B Surface Antigen Testing of Emergency Care Providers: **PURPOSE:** The hepatitis B virus (HBV) is the major infectious hazard for health-care personnel. Although EMS agencies are required by the Department of Labor to provide the HBV vaccination series to emergency care personnel (ECP), follow-up testing for antibodies to Hepatitis B surface antigen (anti-HBs) to determine vaccine response often was not completed. The CDC recommends post-vaccination verification of antibody response. Documenting anti-HB levels aid in the determination of post-exposure prophylaxis. The MedicScreen HEP-B Project provided anti-HBs testing to ECPs who had not received such testing. The purpose of this pilot study was to determine the prevalence of antibody titers to anti-HBs in ECPs that previously received the HB vaccine series but did not receive post vaccination titer testing. **METHODS:** This IRB-approved prospective, observational trial was conducted over three months. ECPs recruited from local EMS agencies that volunteered to participate were enrolled and educated in anti-HBs testing and HBV prevention. Blood samples for anti-HBs were tested via EIA. ECPs who tested negative for anti-HBs were advised to contact their PCP or occupational health department. **RESULTS:** A total of 107 ECP's were enrolled, of which 55 (51.4%) were males. The median age was 36 years (SD=11.39). Many of the subjects functioned as volunteer ECP's (n=50, 46.7%), with non-profit agencies (n=83, 77.6%). Patient contacts/year ranged from 0-15,000 (median=200). The majority reported 0-1 exposures in their careers (n=60, 63.8%). The years in which the Hep-B series were completed ranged from 1982-2000 (mode=10 for 1993 and 1998). Of the ECP's tested, 77 (72%) were positive for anti-HBs. **CONCLUSION:** Over one-fourth of ECPs tested did not have detectable levels of anti-HBs. Further study to determine the clinical significance of this finding is warranted.

# POSTER 39

## *Fire Safety Practices Among Residents of an Independent Living Facility*

David Jaslow, MD, MPH

Jacob Ufberg, MD

Russell Yoon, MD

Greg Jakubowski, MS, EMT

Clay McQueen

**Temple University Department of Emergency Medicine, Wyncote, Pennsylvania**

Older adults, who represent one of the highest fire risk populations, are moving into independent living facilities (ILF) in increasing numbers. ILF pose unique fire risks that may be linked to specific fire safety (FS) practices. Such practices are poorly described in the EMS literature. Objective: To evaluate self-reported FS practices among ILF residents. Methods: A closed-ended survey was administered by a fire department physician to all residents of a small ILF immediately prior to an annual FS seminar. The survey evaluated actual and hypothetical FS behaviors, self-perceived fire risk and FS preparedness, and fire injury risk factor prevalence. Descriptive statistics were used to evaluate responses. Results: All (58, 100%) residents completed the survey and only one was excluded from the study. The median age of respondents was 78 years (range 54-95) and 40 (68%) were female. 32 (56%) individuals listed themselves as college graduates. 33 (58%) individuals reported one or more disabilities including 17 (30%) who had ambulatory difficulties. 7 (12%) residents ignore the fire alarm and 21 (35%) can't hear it clearly. 16 (28%) residents attempt to locate the source of a fire rather than escape from the building. Only 24 (42%) residents were familiar with the building fire plan; 34 (58%) had not reviewed it within the last year. 36 (63%) people did not have a copy of the fire safety plan in their apartment and 49 (86%) people did not have a map of fire escape routes posted either. Only 21 (37%) residents agreed that they had practiced the fire escape plan enough to feel comfortable with it. 23 (40%) people surveyed believed that they were not at risk of fire in the study facility. Conclusion: ILF residents may be at increased fire injury risk due to their FS practices and disabilities. Larger studies are required to determine why this phenomenon occurs and what educational and technological interventions could be implemented to reduce fire deaths and injuries.

# POSTER 40

## *Cleaning The EMS Vehicle: Are Current Practices Effective?*

Kerri L. Corbit, MD  
Rita M. Chambers, BBA, NREMT-P  
David Peter, MD  
Lynn White, MS  
Edward Chang

**Akron General Medical Center, Akron, Ohio**

Background: EMS vehicles may be a potential source of nosocomial infection that can pose a threat to both patients and EMS professionals. Objective: To determine the adequacy of a weekly cleaning protocol for EMS vehicles. Methods: EMS ambulances in a mid-sized Midwestern city were examined on the day before their scheduled weekly cleaning and again on the following day. Researchers cultured O<sub>2</sub> outlets, cell phone keypads, gurney handrails, and stethoscope diaphragms from each vehicle. Paramedics staffing the vehicles were not informed of the intention to culture the vehicles contents. Culture swabs used to inoculate Mueller-Hinton agar with 5% sheep's blood were incubated at 36 degrees C for 48 hours. Colony counts were performed and any *Staphylococcus aureus* colonies were tested for methicillin resistance. Results: In all four vehicles examined, the oxygen tank outlet valves were clean before and after cleaning. Half of the "dirty" cell phones grew *Staphylococcus* which resolved after cleaning. In two vehicles the gurney handrails harbored three types of bacteria including *Staphylococcus* (not aureus), bacillus, and enterobacter agglomerans, most of which was removed after cleaning. However, in one of the ambulances, the *Staphylococcus* contamination increased after cleaning, and in the remaining clean gurney handrails were found to have acquired bacillus after the cleaning. Dirty stethoscope diaphragms showed an abundance of non-resistant *Staphylococcus* (range 14-100 colonies) which decreased markedly after cleaning (range 0-10 colonies). Conclusion: Current weekly cleaning protocols appear to be relatively effective in reducing potential sources of nosocomial infection. However, inadequate attention to technique may allow organisms to flourish, and the high level of bacterial buildup on stethoscopes indicates that more frequent cleaning would be beneficial for these often used instruments.

# POSTER 41

## *Tactical Emergency Medical Services: A Snapshot*

Michael Tricaso, DO  
MJ McMullen, MD  
Kevin Hilbert, EMT-P  
Lynn White, MS

**Akron General Medical Center, Akron, Ohio**

Background: Tactical EMS (TEMS) is still a young subspecialty. The optimal configuration of the tactical team is yet unproven, as are the methods for optimizing equipment. Objective: To describe the activities and practices carried out by TEMS teams and to characterize the role and responsibilities of the tactical medical provider in the U.S. Methods: A survey of TEMS practices was distributed during the International Tactical EMS Association's (ITEMS) Tactical EMS '99 Conference. Results: 25 teams (12 police, 6 sheriff, 2 private EMS, 1 military, 1 FBI, and 3 unspecified) returned surveys. Areas served by the teams were both urban and rural with populations ranging from 35,000 to 2 million (median 200,000). Call-outs per year averaged 18.5. The average team consisted of 16 tactical officers and 4 tactical medical providers; 13 teams had physician personnel, 21 teams had paramedics, 10 teams had EMTs, and two teams had R.N.s. Standard equipment carried by most teams included SKED litters, basic trauma supplies, wound repair supplies, and equipment for airway and IV access. Medications carried included narcotics, ketorolac, over the counter medications for pain relief, and sedatives. Seven teams carried rapid sequence intubation drugs. Monitor/defibrillators were carried by 7 teams and AEDs by 3. Twelve teams had no access to an AED or monitor/defibrillator. Other items carried included personal protective equipment, communication, and distraction devices. Conclusion: Overall, EMTs and paramedics are given more autonomy for drug administration and multiple procedures in the tactical environment. The ongoing nature of these activities and emphasis on mission support requires training, supplies, and protocols for advanced wound care and over the counter medication not utilized by standard EMS services.

## POSTER 42

### ***First Field Trial of a Combined Umbilical Cord Disinfectant, Clamp, Cutter and Containment System for Use in Emergency, Disaster and Developing Country Contexts***

Lorraine Bell, DrPH, MSN  
Alex Papilaya, MD, DTPH

**Center for Family Welfare, University of Indonesia, North East, Maryland**

**Purpose:** Childbirth in emergency, disaster and developing country contexts can result in morbidity and mortality due to unclean delivery practices. Additionally, identification of mother and child are paramount in emergency or disaster situations. This study is the first field trial of a newly developed combined umbilical cord disinfectant, clamp, cutting, containment and identification system for use in childbirth where clean facilities are lacking. **Methods:** Funded by the World Health Organization, a pilot study was undertaken in West Java, Indonesia to assess the feasibility and safety of the prototype umbilical cord device. Twenty-two vaginal deliveries utilized the rubber mold prototype. To ensure safety, all births took place in a village hospital where 24 hour observation was available. 60% of mothers were not immunized for tetanus. After informed consent, the device was used in place of cord ties or an umbilical clamp. Once closed, the device was then separated into 2 distinct units. The neonatal umbilical cord unit remained in place until the cord atrophied and fell off. Daily follow up at home by a midwife assessed for infection and problems until the cord dried and fell off. **Results:** The device successfully disinfected and cleanly cut the umbilical cord in 100% of cases. 86% of the devices remained closed, with the remaining requiring additional binding. Three cases failed due to bleeding at the clamp site. There was no infection in mother or neonate groups. Focus groups and interviews revealed overwhelming support for the use and safety of the device, with suggestions for improvement. **Conclusions:** Changes in the design of the device will be made and a second trial undertaken. The combined umbilical cord disinfectant, clamp, cutting and containment system may be a viable alternative or addition to emergency, disaster or developing country childbirth situations.

# POSTER 43

## ***Base Station Physician Refusals of Paramedic Drug Intervention Requests***

Edward T. Dickinson, MD, NREMT-P

Denise Schultz, EMT-P

C. Crawford Mechem, MD

### **Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania**

Purpose: Paramedic requests for drug interventions are intermittently refused by online base station physicians. The purpose of this study was to determine the frequency and types of paramedic drug requests denied by base physicians. Methods: This observational study was conducted in a suburban municipal EMS system where paramedics operate on both standing order protocols and on-line hospital base station medical direction. Patient care reports (PCRs) were screened during routine QI surveillance for documentation by paramedics of the refusal of base physicians to comply with paramedic drug intervention requests. Each call PCR was then reviewed by the agency medical director and classified as either paramedic request appropriate (RA), paramedic request inappropriate (RI) or appropriate physician discretion (APD) The number of paramedic ALS calls run completely by protocol versus those where paramedics initiated on-line medical direction where determined from dispatch center logs. Results: Over the one year study period there were 2802 ALS calls of which 1086 (38.8%) involved paramedic contact with a hospital base physician. 11 calls (1.0%) were identified where paramedics documented physician refusals of drug order requests on PCRs. Refused were narcotic analgesia (3), benzodiazepine sedation (3), antiarrhythmics (2) and respiratory drugs (3). Retrospective evaluation of the refusals by the medical director determined 7 (64%) RA, 2(18%) RI and 2 (18%)APD. Conclusions: Physician refusal of paramedic drug requests is an unusual event. However, this data suggests that, although denied, these paramedic drug requests are most often medically appropriate.

# POSTER 44

## *How Paramedic Interventions Differ in a Suburban/Urban and Rural EMS System*

Michael E. Schnyder, NREMT-P  
Ross Megargel, DO  
Craig Lauder, DO

**Christiana Care Health System, Wilmington, Delaware**

Introduction: The purpose of the study is to determine differences between a suburban/urban (S/U) EMS operation and a rural EMS operation by looking at the frequency of paramedic interventions. Objective: The hypothesis is that there are differences, especially operationally influenced interventions, between a S/U and a rural EMS operation. (An example of an operationally influenced area would be: shorter response times would result in more patients in ventricular fibrillation.) Methods: Paramedic charts were reviewed from April to June 2001. A count of the paramedic interventions versus the total patients was completed for both EMS operations. Statistical analysis was performed using chi-square test to discover statistically significant differences. Results: A total of 4,312 interventions were compared between the 2 agencies. Of the 29 intervention types, 9 were significantly different. Three intervention types could be attributed to the EMS operations. Defibrillations were higher in the S/U system (3.4% vs. 1.9%;  $p < 0.01$ ). Note: The first % will always be the S/U operation. Also, lidocaine uses were higher in the S/U system (1.0% vs. 0.2%;  $p < 0.010$ ). For the rural system, uses of sodium bicarbonate were higher (0.2% vs. 0.7%;  $p < 0.025$ ). The remaining 6 interventions were: 12-Lead ECG analysis (27.1% vs. 39.3%;  $p < 0.001$ ); IV placement (56.9% vs. 65.7%;  $p < 0.001$ ); Midazolam administration (1.5% vs. 0.6%;  $p < 0.001$ ); Morphine administration (2.0% vs. 4.5%;  $p < 0.001$ ); Narcan administration (1.5% vs. 0.6%;  $p < 0.01$ ); and NSS boluses (0.9% vs. 1.7%;  $p < 0.05$ ). Conclusion: There are predictable differences between the types of interventions provided in a suburban/urban EMS system versus a rural EMS system.

# POSTER 45

## *The Evidence Basis for Prehospital Interventions*

Scott Sundheim, Resident at the Metrohealth Medical Center, Cleveland, Ohio  
Michael Cruz

**University of Illinois College of Medicine, Peoria, Illinois**

Evidence-based medicine describes the use of the literature by physicians searching to define the strength of evidence underlying medical decisions. This work sought to quantify what percentage of Emergency Medical Services (EMS) patients receives treatments supported by each type of scientific study. A review of the MEDLINE literature from 1966 to 2000 was performed for those conditions documented by the 1999 EMSOP I trial to be those most frequently seen by prehospital providers. The studies were rated on the 8-level strength of evidence scale developed by the American Heart Association. Of a theoretical cohort of 1000 prehospital patients, 361 trauma patients would receive spinal immobilization based on level 5 case series evidence. The number of patients needed to be treated before one would be helped was in the range of 385 to 3333. The 130 dyspneic patients would receive drug therapies aimed at both symptomatic improvement and a mortality benefit supported by levels 3 and 4 case-control evidence. However, patients with presumed pulmonary edema may not be helped and may be harmed by prehospital pharmacological treatment. The 103 patients with chest pain would receive nitroglycerin supported by level 5 case series, could forgo aspirin using level 2 randomized controlled trial (RCT) data and would receive thrombolytics with level 1 meta-analysis certainty in cases of longer transport times. The subset of 48 seizure victims suffering status epilepticus would be treated with benzodiazepines with level 4 retrospective case-control support and level 6 animal study data, with the promise of an impending change to a level 1 or 2 RCT level. Most ambulance patients are not treated with therapies supported by RCTs or other incontrovertibly convincing evidence, but prehospital medication use should not be uniformly condemned. A rigorous study of the outcome of prehospital treatment of presumed cardiogenic pulmonary edema is needed.

## POSTER 46

### *Impact of an On-Call Physician on Emergency 911 Transports from a County Jail*

Theodore C. Chan, MD  
James V. Dunford, MD  
Susan Smith, RN  
William Sparrow, MSW  
Gary M. Vilke, MD

**University of California San Diego, San Diego, California**

**OBJECTIVES:** In our community, emergency 911 ambulance calls to the county jail for the care of inmates is common. Prior studies have suggested that jail staff often call 911 for inmates with non-urgent medical conditions. We sought to determine if a 24-hour-a-day on-call emergency physician available by telephone can safely reduce 911 emergency ambulance transports of inmates from a county jail. **METHODS:** We conducted a before/after cohort study on the impact of an on-call emergency physician on 911 ambulance transports from our county jail. We prospectively studied all 911 ambulance transports for a 10-month period (8/1/00 – 5/31/01) after the initiation of a program in which jail staff were asked to contact a designated on-call emergency physician prior to any 911 emergency ambulance transport of an inmate from the facility (approximate census 800-1000 inmates). This physician could determine whether other options for care could be utilized, including transport of the inmate to the hospital by deputy car or care provided at the jail by the nursing staff instead of transport. All calls and transports were also retrospectively reviewed by physicians to determine if any adverse events occurred as a result. Data was then compared with 911 emergency transports during a similar time period the year prior to the initiation of the on-call program (8/1/99 – 5/31/00). Data between the two time periods was compared by chi square testing as warranted (Stata 6.0). **RESULTS:** 911 ambulance transports rates declined significantly from the pre-on-call period (303 calls, or average of 30.3 calls/month) to the post-on-call period (91 calls, or average of 9.1 calls/month) during the two 10-month study periods ( $p < 0.05$ ). On review of the calls and transports, there were no adverse events attributed to utilizing care plans other than 911 transport as initiated by the on-call physician. **CONCLUSIONS:** The initiation of an on-call emergency physician for nursing staff at the county jail significantly reduced 911 emergency transports for inmates without any adverse consequences.

# POSTER 47

## ***Does Having a Static Paramedic Partner Lead to Reduced On-scene Times?***

Michael E. Schnyder, NREMT-P  
Craig Lauder, DO  
Ross Megargel, DO

**Christiana Care Health System, Wilmington, Delaware**

Introduction: The EMS systems in the state of Delaware place two paramedics together from 6 months to permanently. As time goes on these partners become familiar with each other's assessment and treatment modalities. By having this familiarization, these two individuals are capable of treating a patient more efficiently than if they were paired for the very first time. Objective: The hypothesis of this study is that static paramedic partners have shorter on-scene time, than when they are assigned to temporary partners. The null hypothesis for this study is that there is no difference in on-scene time whether you have a static or temporary partner. Methods: Twenty Paramedics were randomly selected from a statewide EMS system. Data collected spanned from January 2000 through June 2001. The on-scene time was calculated for static partners vs. temporary partners. For the purposes of this study, static partners are defined as at least 50 patient contacts with one other paramedic. Temporary partners are defined as having less than 20 patient contacts with one paramedic. The avg. on-scene time is then calculated for the static and temporary partners. Statistical analysis included a t-test to determine any significance. Results: A total of 4,327 charts were used for this study. The average on-scene time for static partners was 11 minutes ( $\pm 6$  minutes). Temporary partners had an average on-scene time of 12 minutes ( $\pm 7$  minutes). Performing a t-test for independent groups revealed a  $t_{obt}$  of  $-0.92$ . This was less than  $t_{crit}$  of  $\pm 2.021$  (Alpha level of 0.052-tail). Conclusion: As a result of the  $t_{obt}$  being less than the  $t_{crit}$ , the null hypothesis is supported. There is no difference between having a static partner versus having a temporary partner.

# POSTER 48

## *Spatial Modeling in Emergency Medical Systems: Analysis of a Regional Trauma System*

Christopher A. Bangs, MS(c)  
Robert L. Norton, MD  
Mary D. Gunnels, MS, RN

**Oregon Health & Sciences University, Portland, Oregon**

Hypothesis: Geographic Information Systems [GIS] can be used to evaluate and monitor distribution of patients in a regional trauma system. Methods: This is a retrospective cohort analysis of field-designated trauma system patients in a four-county metropolitan area with two Level I trauma centers. Destination hospitals were designated by geographical catchment areas defined by the regional authority in 1990 to equalize distribution of both mechanism of injury and total number of patients by trauma center. Trauma scene location was mapped using GIS to model distribution characteristics, including annual patient volume, mechanism of injury, and transport time for both trauma centers. Sources included regional trauma communications center, state trauma registry, urban planning, and crime data. Results: GIS demonstrated uneven distribution with clusters of blunt and penetrating trauma within the region. From April 1995 to July 1999, the distribution of patients, confirmed by GIS, varied by less than 2% (refer to Table 1). There were 59 (0.7%) patients with incomplete data. The overall geocoding match rate was 91.2%. Mean scene-to-hospital times was 18 minutes both groups. Crime rates were correlated with total number of penetrating trauma by neighborhood (Pearson 0.70).

Table 1. Distribution of Patients by Trauma Center.

Destination	Blunt	Penetrating	4 Year Total
Hospital A	3779 (42.9%)	579 (6.6%)	4386 (49.7%)
Hospital B	3913 (44.3%)	494 (5.6%)	4441 (50.3%)
Total	7692 (87.1%)	1073 (12.0%)	8827 (100%)

Conclusion: The regional trauma system equally allocated patients to the two trauma centers. Geographical distribution resulted in similar mean transport times. GIS can link crime data with trauma system data. GIS can be used by trauma systems to monitor and model distribution and characteristics of trauma patients.

## POSTER 49

### ***Using GIS Software, EMS Data and Spatial Representation To Support Prioritization of Public Health Prevention and Intervention Resources***

David P. Edwards, BA, EMT-P  
Margaret A. Dolan, MD, FAAP  
Barbara Raue, DG  
Petra Menzel  
Jerry Overton, MPA

**Richmond Ambulance Authority / Medical College of Virginia at VCU / Diplom-Geograph, University of Bonn, Germany**

Study Objective: Identifying patterns in EMS responses represents an evidence-based approach to prioritizing limited public health resources for intervention and prevention programs within the community. Merging EMS, US Census, public health and law enforcement data into a common format through a multi-agency collaboration, and processing the data with Geographical Information Systems (GIS) software, we hypothesized that it would be possible to identify areas where community intervention strategies could be most effectively focused and evaluated. Methods: The Computer Aided Dispatch (CAD) system utilized by the (name of EMS agency deleted) uses defined codes to pre-categorize EMS response resources, based upon medically approved dispatcher interrogation of 911 callers, then generates geographical coordinates for scene location and patient destination. A separate database contains patient condition codes based upon the field medic's written prehospital patient care record. Demographic data from the U.S. Census Bureau and community crime statistics from the (name of city deleted) Police Department were collected. EMS response and transport data from the CAD system, ICD9 codes from the billing system, census data and crime statistics were merged into a common database format. Using ArcView 3.2, a GIS software program, spatial representations were created showing EMS response patterns for specific problem codes, and where applicable demographic data by census tract was represented in the background as graduated color. Results: Using spatial representation, clear patterns for specific EMS responses emerged. These patterns are being used to support community initiatives in (name of city deleted), by allowing prevention and intervention programs to prioritize resources and focus efforts toward areas with the greatest need. Conclusion: Widely available GIS software offers an effective new tool for the analysis of existing public health, public safety and emergency medical services data.

# POSTER 50

## *Evaluation of Two Mass Casualty Disaster Drills Using Trained “Victim” Data Collectors*

Steven M. Joyce  
Kathleen Cornia  
Clint Preston

**University of Utah, Salt Lake City, Utah**

**Purpose:** Evaluation of a mass casualty disaster drill should assess accuracy and timeliness of triage, treatment, and transportation. We describe an evaluation methodology using trained “victims”, and results from two drills. **Methods:** Volunteer victims were trained by the investigators before two airport mass casualty disaster drills. Each victim was assigned a scenario with injuries, signs and symptoms displayed on a card, and trained to collect data. During each drill, each victim noted the time and type of triage category assigned, treatments given, and transport used. START triage and specific treatment options were reviewed with providers before each exercise. Drill 2 was redesigned using data from drill 1 to improve victim and provider preparation, and to reflect a more appropriate victim/provider ratio. Drill 1 had 181 victims with many EMS agencies participating, while drill 2 had 45 victims with participating agencies limited to those receiving drill-specific training. **Results:** In drill 1, overall triage accuracy was 75% with 11% overtriage, and mean time to triage of 25.6 minutes. Treatment accuracy was 45%, with an average time to treatment of 53 minutes. Transport data were incomplete due to premature termination of the drill. In drill 2, overall triage accuracy was 80% with 11% overtriage, and mean time to triage of 10.8 minutes. Treatment accuracy was 77.3%, with an average time to treatment of 31.5 minutes. Mean time to transportation was 49.6 minutes, with immediate priority victims evacuated in an average of 48.1 minutes. All transport was appropriate for the patients’ injuries. **Conclusions:** Lay volunteer “victims” may be trained to successfully gather data needed for evaluation of a disaster exercise. The authors were able to evaluate accuracy and timeliness of interventions, and demonstrate improvement in all parameters when the drill was redesigned using data from the first evaluation.

# POSTER 51

## *Hospital Resident Physician Response to a Mass Casualty Drill*

Donald A. Locasto, MD

Thomas Stein, MD

Edward Mistler, DO

**University of Cincinnati, Loveland, Ohio**

**BACKGROUND:** There is an increased awareness of bio-chemical terrorism, and the potential impact on the health system. The government has spent a large amount of effort training civic services but hospitals have received a paucity of attention. In the current crisis of hospital closures, the question of the availability of sufficient manpower to staff the receiving hospitals has not been investigated. This study was directed at assessing one hospital's ability to mobilize the resident staff in response to a staged chemical terrorism event. **OBJECTIVES:** Assess one hospital's ability to mobilize resident physicians in the event of a mass casualty drill and to assess resident physician attitudes about their obligation to respond to a mass casualty event. **METHODS:** Hospital operators paged a predetermined list of residents to respond to a disaster page. Resident house staff in the Internal Medicine, Emergency Medicine, Orthopedic Surgery and General Surgery disciplines were asked to call a specific phone extension for instructions. An investigator answering the phone documented which house staff returned the disaster drill page. A follow up survey conducted during the 2 weeks following the event collected additional data involving the resident staff perspectives regarding their obligation to respond to a disaster. **RESULTS:** 113 residents were selected for paging on the day before the event. Of the 113 residents paged, 39 (34.1%) were in house at the time of the drill. Only 11 (14.9%) of those paged and not in house called the designated telephone extension and reported that they could respond. The low response is contradictory to the 92.5% of the survey respondents that feel there is an obligation to respond to a call for assistance in a mass casualty event. **CONCLUSION:** The phone response of the resident house staff to a disaster drill was quite low (14.9%). This may identify the weakest link in the regional response system to a mass casualty event. This, in turn, will create significant stress on the prehospital aspect of the system.

## POSTER 52

### *The "Mellow Millennium": The Effect of Field Medical Clinics on Demand for EMS Services in San Francisco New Year's Eve 1999-2000*

John F. Brown  
Gwendolyn Hammer  
Timothy Kellogg  
Michael Petrie  
Christine Wachsmuth  
Abbey Yant  
Marshal Isaacs

**San Francisco Department of Public Health, San Francisco, California**

Hypothesis: Deployment of field medical services at multiple venue sites decreased the demand for Emergency Medical Services during a citywide mass gathering. Methods: This is a retrospective, observational design that analyzed data from ambulance dispatch and treatment records, field clinic and emergency department logs on a citywide basis for this New Year's Eve celebration. The setting is San Francisco, a densely populated urban area with 802,000 residents and an event participation of 275,000. The main interventions were the development and deployment of 10 field medical clinics and EMS system modifications supporting this change to emergency care delivery. Outcomes measured were ambulance usage, field clinic treatment rendered and emergency department visits. Results: Deployment of field clinics decreased the use of emergency department visits during their hours of operation but had minimal effect on ambulance call volume. 220 patients were treated at field clinics, and there were 302 calls for ambulance service (no change from previous year's celebrations). During the same New Year's Eve period of operations, there were 4,016 emergency department visits (a decrease from previous years). A chi square test was performed comparing citywide ED visits during New Year's Eve events for three years prior to the deployment of field care clinics to ED visits with field care clinics in place. ED visits with field care clinics in place were significantly lower, especially during the hours of clinic operation (from 6pm to 1 am). The chi square value was 24.74 with 12 degrees of freedom and a p value of 0.01. Ambulance and emergency department services kept pace with demand throughout the event. The field clinic scope of care was adequate for the medical problems encountered. Conclusion: Field medical clinics are useful adjuncts to EMS medical services for mass gatherings but do not decrease the demand for ambulance services.

## POSTER 53

### *Follow-up of Elderly Patients Who Refuse Transport after Accessing 9-1-1*

Gary M. Vilke, MD  
Winfred Sardar, MD  
Roger Fisher, EMT-P  
James V. Dunford, MD  
Theodore C. Chan, MD

**University of California, San Diego Medical Center, San Diego, California**

**Objective:** To obtain medical follow-up and determine reasons why elderly patients access paramedics via 9-1-1 and then refuse transport. **Materials and Methods:** A telephone survey of patients age 65 years and older who refused transport and signed out AMA after accessing paramedics via 9-1-1 was performed to obtain information about the patient's experience, reasons why they refused, medical follow up, and patient outcome. **Results:** 100 of 121(83%) patients who were contacted by telephone participated in the survey. Patients stated that financial concerns were a major determinant in refusing to be transported. Overall, seventy percent of patients reported receiving follow-up medical care. Access to care was obtained by a second 9-1-1 call in 16% of cases, transport to the ED by a private vehicle in 13%, transport to an urgent care by a private vehicle in 35%, and by a family physician in 38% of cases. Of the patients who obtained follow up, there was a 32% hospital admission rate with 39% of those admitted to an ICU setting. Finally, 80% of the population studied did not speak to a physician online with 49% stating that they would have changed their minds if a physician had suggested transport. **Conclusion:** The majority of patients who are 65 years of age and older and refused transport received follow up care, with a significant number requiring admission to the hospital at the time of their follow up.

# POSTER 54

## *Factors Influencing Survival in Pediatric Out-of-Hospital Cardiopulmonary Arrest*

James Moynihan, DO  
Ruchir Sehra, MD  
Noha Daher MS  
Paul A. Checchia, MD

**Loma Linda University Children's Hospital, Loma Linda, California**

Background: Out-of-hospital cardiopulmonary arrest in children has a mortality of greater than 90% in some published series. One of the main determinants of outcome is pre-hospital care provided by emergency medical service (EMS) personnel. The purpose of this study was to examine the influence of various EMS related resuscitation variables in survival from out-of-hospital cardiopulmonary arrest in pediatric patients. Materials and Methods: We prospectively examined all children admitted to the Pediatric Intensive Care Unit (PICU) who required cardiopulmonary resuscitation (CPR) prior to arrival to the Emergency Department (ED). Results: Seventeen children were examined in a 10-month period. Cause of the arrests included drowning/near drowning in 12 cases, one accidental hanging, one smoke inhalation, one non-accidental trauma, and 2 with an unknown cause. Overall survival to discharge was 29% (5/17). Eleven patients were intubated at the scene, 3/5 survivors and 8/12 non-survivors. There was not a significant difference in time at scene between survivors and non-survivors (16.7 + 12.7 vs. 12.1 + 6.7 min, p=0.5). Transport times were longer in survivors compared to non-survivors (16.4 + 9.1 vs. 7.4 + 9.9 min, p=0.01). Time at scene was similar if patient was intubated at the scene (16.6 + 9.1 vs. 7.4 + 3.8 min, p=0.6). EMS intubation did not impact mortality with 73% mortality in the intubated group vs. 67% mortality in the non-intubated group (p=0.6). Overall, survival was improved if the patient had a restoration of sinus rhythm prior to arrival to the ED. 80% (4/5) of the survivors had a pulse on arrival to ED vs. 25% (3/12) non-survivors. Conclusion: Overall survival in children who have suffered an out-of-hospital cardiopulmonary arrest has improved from historical controls. Restoration of sinus rhythm, but not time at scene or rate of intubation correlates with improved survival.

# POSTER 55

## ***Optimal Defibrillation Pad Placement On Pediatric Patients By First Responders***

Dawn B Jorgenson  
Hans Griesser  
Tom Solosko  
Beri Geraci  
Christian Cary  
Konrad Chan  
Gust Bardy

### **Philips Medical Systems-Heartstream, Seattle, Washington**

**Objective:** We investigated the ability of first responders untrained in the treatment of pediatric patients to properly place pads in either an anterior/anterior (A/A) or anterior/posterior (A/P) position on a range of pediatric manikins. Our hypothesis was that A/A positioning would result in ineffective defibrillation pad placement more often than A/P positioning. **Methods:** Manikins representing infant (1 y/o), toddler (3 y/o) and junior (6 y/o) patients were used in mock resuscitation scenarios. Two groups of volunteers were tested. The first group was given an AED with pads depicting the A/A position; the second group the A/P position. In the A/A test, infant and toddler manikins were tested. In the A/P test, infant and junior manikins were tested. The goal was to test both positions on an infant and the more difficult cases of A/A placement on a smaller body and A/P placement on a larger body. Position was defined as acceptable (defibrillation likely), marginal (defibrillation uncertain) and unacceptable (defibrillation unlikely). As a reference, volunteers participated in a second scenario with an adult manikin and standard adult A/A pads. **Results:** For the infant manikin using the A/A position, placement was unacceptable in 46% (n=13) of cases and acceptable in only 54%. Unacceptable pad placement consisted of overlapping or pads immediately adjacent to each other. For the toddler manikin, placement was acceptable in 100% (n=9) for the A/A position. For both the infant and the junior manikins, using the A/P position, placements were acceptable in 100% (n=8) and 100% (n=11), respectively. For the adult manikin, placement in 88% (n=41) were acceptable and 12% were marginal. **Conclusions:** In a mock scenario for infant patients A/A placement was unacceptable in 46% of cases. Pad placement was 100% acceptable with an A/P location (Fisher exact,  $p < .05$ ). AED pad application instructions should differ for children from that typically provided for adults.

# POSTER 56

## ***Out-of-hospital Pediatric Intubation by Paramedics: The San Diego Experience***

Gary M. Vilke, MD

Pamela J. Steen, MSN, RN

Alan M. Smith, MPH

Theodore C. Chan, MD

**University of California, San Diego Medical Center, San Diego, California**

**Purpose:** Recent studies have criticized the ability of paramedics to endotracheally intubate pediatric patients. We sought to evaluate our own county's EMS system. **Methods:** We performed a retrospective review of a prehospital computer database, quality assurance reviews, and prehospital run sheets for all patients less than fifteen years of age who had an endotracheal tube (ETT) placed. **Results:** During the 4.5-year study period, 324 pediatric patients had intubation attempts by field paramedics, of which 264 (82%) were successful and three were reported esophageal and unrecognized by the paramedic. Two of these esophageal placements were noted on arrival to the hospital, and one upon turn-over of patient care to a nurse of an aeromedical service. All three were deemed esophageal with direct laryngoscopy, and had been in cardiopulmonary arrest status prior to the intubation. Of the 264 patients who had ETT placed, 99% were endotracheal, while only 1% were unrecognized esophageal. **Conclusions:** We feel that pediatric endotracheal intubation by out-of-hospital paramedics in an established EMS system has a low occurrence of unrecognized esophageal placements.

# POSTER 57

## *Predictors of Emergency Medical Service Utilization by Elders*

Manish N. Shah MD  
Cai Glushak, MD  
Robert Mulliken, MD  
James Walter, MD  
Peter D. Friedman, MD, MPH  
Marshall H. Chin, MD, MPH

**University of Rochester School of Medicine, Rochester, New York**

**Purpose:** Although the elderly (age  $\geq 65$ ) use EMS three times more often than younger individuals and studies estimate that 14-40% of EMS use may be unnecessary, no studies have identified patient characteristics associated with EMS use by the elderly. This study aims to identify patient attributes, particularly potentially modifiable attributes, associated with EMS use by the elderly. **Methods:** We performed a retrospective cohort study of non-institutionalized elderly patients presenting to the ED of an urban, university hospital. 930 of the 1753 (53%) elderly patients consented and completed the survey. We asked patients demographic, access to care, and health belief questions. Health status at ED presentation and 1 month prior to presentation was determined by using a validated, modified SF-36 survey. Finally, we asked patients who were transported to the ED by EMS their reasons for using EMS services. **Results:** The sample had a mean age of 75 years; 37% were male; 80% were black; 52% were admitted to the hospital. Patients reported requesting EMS transport due to illness or pain (57%), physician instruction (12%), and lack of transportation (11%). Logistic regression identified older age (OR=1.67 age  $>75$  vs. age 65-75; 95% CI=1.05, 2.64), increased deficiencies in activities of daily living (OR=1.41, 95% CI 1.26, 1.58) worse physical functioning (OR=1.11 95% CI=1.01, 1.21), worse social functioning (OR=1.06; 95% CI=1.01, 1.10), and symptom onset within 4 hours of seeking care (OR=3.18; 95% CI 1.91, 5.29) as factors associated with EMS use. Other factors such as education, living arrangements, health beliefs, insurance coverage, presence of a regular physician, and recent change in health were not associated with EMS use. **Conclusion:** EMS use by the elderly is associated with poor health status, poor social support, and acute illness symptoms. EMS use by the elderly is unlikely to be altered though modification of health beliefs or other patient characteristics.

# POSTER 58

## *Apparent-Life-Threatening-Events (ALTE) and EMS No-Transport*

James E. Pointer, MD FACEP

Thomas J. McGuire, EMT-P

### **Alameda County Emergency Medical Services Agency**

**PURPOSE** Prehospital providers do not appreciate the significance of pediatric apparent life-threatening events (ALTE) or the importance of transporting these patients. An ALTE is "an episode that is frightening to the observer and is characterized by some combination of apnea (central or occasionally obstructive), color change (usually cyanotic or pallid but occasionally erythematous or plethoric), marked change in muscle tone (usually marked limpness), choking, or gagging." Serious sequelae are common and hospital admission is usually advised. Fifty percent of ALTE patients demonstrate a treatable medical condition. None of the current paramedic textbooks discuss ALTE; a few prehospital pediatric texts discuss ALTE only briefly. We wanted to determine the incidence of one or more ALTE criteria among under 2 year old (y.o.) non-transporters.

**METHODS** We retrospectively examined 382 consecutive paramedic reports written over a 15 week period for patients <2 y.o. in our busy urban EMS system. We extracted the non-transporters and two emergency physicians independently examined the reports for patients meeting one or more ALTE criteria.

**RESULTS** Of the 382 calls, 105 (28%) transport refusals were found. Of the 105, reviewer #1 identified 12 cases and reviewer #2 identified 13 cases ( $\kappa=.95$ ). Paramedics did not contact the base hospital physician to discuss any of the 105 cases, including those meeting ALTE criteria, although BHP contact is common for adult refusal cases.

**CONCLUSIONS** The incidence of one or more ALTE criteria in this population is at least 11% (12/105). Paramedics apparently discount the seriousness of these relatively common ALTE events. Because of the relatively high percentage of ALTE patients who subsequently are diagnosed with serious conditions, field personnel and their patients would benefit from continuing education in this area.

## POSTER 59

### ***Recognition Of Apparent-Life-Threatening-Events (ALTE) By Out-Of-Hospital Personnel***

Juliet Henshaw, EMT-P

James E. Pointer, MD, FACEP

**Alameda County Emergency Medical Services Agency,**

**Purpose:** An Apparent-Life-Threatening-Event (ALTE) is a syndrome unfamiliar to out-of-hospital personnel. An ALTE is "an episode that is frightening to the observer and is characterized by some combination of apnea (central or occasionally obstructive), color change (usually cyanotic or pallid but occasionally erythematous or plethoric), marked change in muscle tone (usually marked limpness), choking, or gagging." Serious sequelae are common and hospital admission is frequent. No ALTE citations appear in the peer-reviewed EMS literature and it is discussed sparsely in EMS training materials. A survey assessed paramedics' and EMT-Basics' knowledge of ALTE. **Methods** : A "pretest" was administered to 166 paramedics and 172 EMT-Bs. Three questions regarding ALTE were asked. 1). Have you heard of the clinical entity ALTE? 2) Which of the following can be symptoms of sepsis in a child less than one year of age? Circle all that apply: crying, transient apnea, bradycardia, lethargy, fever, choking, and blue lips. 3) Read the following scenario and answer: Does this baby have a potentially serious medical condition? Would you make base hospital contact if the parent refused transport?. **Scenario [abridged]:** Mom is holding her four-month-old baby. He is contentedly bottle feeding. Mom says 10 minutes ago the baby didn't breathe for about 15 seconds and had cyanotic lips. She called 911. Dispatch suggested she tickle the baby, who began breathing. **Your findings:** normal skin; heart rate/135, respiratory rate/28, pulse oximetry/98%, strong brachial pulse. You suggest ambulance transport to the hospital but Mom prefers to see baby's doctor in two days, insisting that "everything is fine now." **Results:** Question 1. 24 of 172 EMT-Bs (14%) had heard of ALTE versus 22 of 166 (13%) of paramedics. Question 2. Five % of personnel answered correctly (all six signs or symptoms circled except choking). Question 3. 260 of 338 (77%) of personnel felt the infant had a significant medical condition. 88% of EMT-Bs would make base contact if parents refused transportation versus 67% of paramedics. **Conclusions:** Because ALTE is a potentially serious condition, out-of-hospital providers should be educated about this complaint. Contact the base hospital whenever the caregivers refuse transport.

# POSTER 60

## *Eyewitness To Child Abuse & Neglect*

D. Markenson  
 G. Foltin  
 H. Matza-Haughton  
 M. Tunik  
 M. Treiber  
 A. Cooper

**Harlem Hospital Center Columbia University College of Physicians and Surgeons, New York, New York**

Statement of Purpose: A national assessment of EMS personnel was performed covering: knowledge of abuse and neglect signs and symptoms, identification, documentation and reporting; and self-efficacy and attitudes towards recognition and management. It was hypothesized that EMTs and Paramedics have sufficient knowledge concerning child abuse and neglect, and are confident in their ability to respond appropriately. Methods: The assessment tool was developed with the input of an advisory board representing a cross section of the major EMS and Child Protection Organizations in the US. It was distributed nationally using a random sample of EMT-Basics and Paramedics via the National Registry of EMTs. The results were tabulated and analyzed in collaboration with the NREMT and the National EMS for Children Data Research Center. Results: Approximately 7,000 Surveys were distributed with a return rate of approximately 43%.

Self-expressed Confidence Levels (percent answering):

	Assess Physical Abuse	Assess Sexual Abuse	Assess Neglect	Document Findings	Manage Family
Strongly Agree	26	09	21	27	08
Agree	65	45	66	55	44
Disagree	09	41	14	16	41
Strongly Disagree	01	06	01	02	07

Performance on Scenarios:	Correct	Incorrect
Physical Abuse-Pattern Injury	47	53
Physical Abuse-Developmental	31	69
Neglect	73	17

Performance on Cognitive Knowledge:

		Correct	Incorrect
Assessment	11	89	
History		28	72
Family Mgt	25	75	
Documentation		57	43
Proof to Report		51	49

The majority (98%) requested additional training in a broad range of areas of child protection with the greatest requests being in interviewing (77%) and documenting (60%). Conclusions: EMS personnel expressed confidence in their abilities to recognize and handle child abuse and neglect, but demonstrated deficiencies in critical knowledge in interviewing, documentation and identification. Their basic training and CME programs contained insufficient information on child abuse and neglect. They expressed a strong desire for more education.

# POSTER 61

## ***An Analysis of EMT-Paramedic Verbal Reports to Physicians in the Emergency Department Trauma Room***

Lance A. Scott, MSII

Jane H. Brice, MD, MPH

Christopher C. Baker, MD

Ping Shen, Graduate Student

**University of North Carolina School of Medicine, Chapel Hill, North Carolina**

Introduction: Verbal reports provided by paramedics (EMTP) to physicians (MD) in the Emergency Department trauma room (EDTR) can provide vital information regarding the nature of the accident, status of the patient and pre-hospital care – yet, is a scarcely studied area of Emergency Medicine. Methods: Using a before-after design, we explored the extent to which communication between EMTPs and MDs in the EDTR is effective by audio-recording EMT verbal reports in a large, urban EDTR over a twelve week period. Trained research assistants subsequently queried MDs about information from the EMTP's report in a separate interview. Midway through the study, a web-based, educational intervention designed to enhance EMTP communication skill was administered to the 3 participating EMS systems. Comparisons were made between pre- and post-intervention MD recall and between levels of trauma acuity. IRB approval was obtained. Results: Overall, MDs accurately recalled 36% of the EMTP verbal report. Information from “red” trauma reports were recalled less well than that from “yellow” traumas (34% vs. 40%  $p=0.02$ ). Pre- and post intervention recall was not significantly different (33% vs. 38%  $p=0.16$ ). Pre- and post intervention MD recall for information about 1) the accident scene was 50.4% vs. 58.8%, 2) about the patient's injuries and health status was 31.9% vs. 44.3% and 3) about prehospital patient care was 35.1% vs. 36.8%. Conclusion: MDs recall about one-third of EMTP verbal information provided during a trauma report. A brief educational intervention targeted at EMTPs had little impact on MD recall. MD recall of trauma reports is probably multi-factorial and will require further work to design appropriate interventions.

# POSTER 62

## *Injury Patterns and Levels of Care at Mass Gatherings*

Andrew M. Milsten, MD, MS  
Richard A. Bissell, PhD  
Kevin G. Seaman, MD, FACEP  
Brian J. Maguire, MSA, EMT-P

**University of Maryland, Annapolis, Maryland**

Background: First-Aid reports from mass gatherings were reviewed to identify variables that predict injury patterns and required treatment levels. Methods: Patient information collected at football and baseball games and rock concerts (1997–1999) was examined retrospectively for specific variables: weather, event type (crowd mobility/duration), gender, and age. Events were analyzed for case mix and treatment levels required. Results: Overall, 5,899 patient encounters during 215 events were studied (total population 9,708,567). Medical care was sought for medication requests (38%), dermal injuries (12%), musculoskeletal injuries (16%), headache (7%), and heat-related illness (6%). Minor/basic care was provided in 84% of encounters and advanced care in 16% (more advanced care at apparent temperatures >80 F). Medical cases occurred more often at sporting events and (69%) were more common than trauma (31%). Precipitation and rock concerts had a positive association with trauma; whereas age and gender were not associated with medical or traumatic diagnoses. Conclusions: Medication requests accounted for almost half of all patient visits. Medical illnesses were treated more often during sporting events; trauma was seen more often during concerts, especially those with mosh pits and crowd surfing.

# POSTER 63

## *ATLS Practices and Survival at Rural Level III Trauma Hospitals, 1995-1999*

Mary D Gunnels, PhD(c), MS, RN  
Annette L Adams, MA, MPH  
Jerris R Hedges, MD, MS

**Oregon Health & Science University, Portland, Oregon**

**Objectives:** To determine if ATLS practices characterizing initial resuscitation and interfacility transfer at rural trauma hospitals are associated with risk-adjusted survival. **Methods:** Retrospective, observational analysis of rural injured patient survival. Process of care variables were associated with TRISS-derived Z-statistics (95% confidence intervals) for high-risk population subsets (defined below). **Inclusion criteria:** all patients > 12 years of age entered into a statewide trauma system, January 1, 1995 - December 31, 1999, and initially presenting to Level III trauma centers (N=4961). **Exclusion criteria:** pronounced dead on arrival (n=26), directly admitted to hospital (n=3), and unknown disposition at first hospital (n=2). **Process variables include:** intubation in ED given GCS<9 [INTUB], administration of blood products in ED given SBP<90 [BLOOD], trauma surgeon presence within 5 minutes of patient arrival given GCS<9 or SBP<90 [UNSTABLE-TS], trauma surgeon presence within 5 minutes of patient arrival given ISS>15 [ISS-TS], transfer to higher level of care given ISS>20 and no hypotension [TRAN], transfer to higher level of care given GCS<9 [TRAN-GCS]. **Results:** For the high risk subpopulations, the following Z-scores (with and without an intervention) were found:

Process Variable	N(subset) (% Intervention)	Intervention Z-score (95% CI)	Non-intervention Z-score (95% CI)
INTUB	501 (22.8%)	-4.2 (-3.5, -4.9)	-4.2 (-3.5, -4.8)
BLOOD	324 (22.5%)	-3.4 (-2.8, -3.9)	-4.7 (-4.2, -5.3)
UNSTABLE-TS	650 (45.2%)	-5.3 (-4.6, -5.9)	-2.6 (-1.9, -3.2)
ISS-TS	1160 (40.7%)	-2.4 (-1.9, -2.8)	-2.0 (-1.5, -2.4)
TRAN	468 (36.8%)	+0.9 (+0.3, +1.4)	-2.7 (-2.2, -3.2)
TRAN-GCS	501 (40.7%)	-0.8 (-0.1, -1.5)	-6.8 (-6.2, -7.5)

**Conclusions:** Some ATLS interventions (BLOOD, TRAN, and TRAN-GCS) are associated with improved survival for selected high-risk subgroups in these 21 rural Level III trauma hospitals.

## POSTER 64

### ***The Rate of Emergency Department Spine Radiography is Reduced with the use of a Selective Prehospital Spine Immobilization Protocol***

Robert M. Domeier, MD

Robert A. Swor, DO

Shirley M. Frederiksen, RN

**Saint Joseph Mercy Hospital, Ann Arbor, Michigan**

Introduction: Selective prehospital spine immobilization protocols reduce unnecessary field immobilization. Immobilization has been shown to cause head and back pain which may increase the need to perform radiographs in the emergency department (ED) for spinal injury clearance. Selective prehospital spine immobilization protocols have the potential to decrease (ED) radiographs and the cost of spine clearance in trauma patients. Objective: Implementation of a prehospital spine injury assessment protocol, which allows selective spine immobilization, will reduce emergency department (ED) radiography necessary for spine injury clearance. Study Design: Prospective Cohort. Methods: Method of ED spine clearance was determined for EMS trauma patients transported to a single community ED before (phase 1; April 1994 – November 1996) and after (phase 2; October 1997 – February 2001) implementation of a selective prehospital spine immobilization protocol. Hospital outcome data items included method of spine clearance, radiographic or clinical and level of injury for patients with a spine injury. Rate of spine radiograph usage was determined for patients during each study phase. Results. Data for 3115 phase 1 patients in which 96 had spine injuries were compared to 3571 phase 2 patients in which 100 had spine injuries. Spine radiographs were performed for 58.9% of the phase 1 patients compared to 45.9% of phase 2 patients ( $p < 0.001$ ). Patients receiving radiographs totaled 19.1 per injury in phase 1 and 16.4 per injury in phase 2 ( $p = 0.0001$ ). Conclusion. Implementation of a selective prehospital spine immobilization protocol reduces the rate of spine radiographs during ED trauma patient evaluation by 13% in this study population.

# POSTER 65

## ***Change From EMT-I To Paramedic Level Of Care In A Semi-Rural Area Does Not Impact Utilization Of Aeromedical Transport***

David E. Fosnocht, MD  
Eric R. Swanson, MD  
Elizabeth Middleton

**University of Utah, Salt Lake City, Utah**

Hypothesis: The EMS provider level within our semi-rural EMS system changed from EMT-I to paramedic. This increase in local EMS level of care was expected to result in decreased utilization of aeromedical transport and increased acuity of those patients flown. Methods: Retrospective review of the EMS database was performed for the 24-month period prior to and the 24-month period after the change in EMS provider level. The EMS system serves a semi-rural, mountainous area with a 30-60 minute ground transport time to a major medical center. There are two urgent care clinics within the EMS area but no hospital services. Data analysis was performed using chi-square tests with significance set at  $p < 0.05$ . Results: There were a total of 53 flights with a call volume of 2544 in the 24-month period prior to change in EMS provider level and 54 flights with a call volume of 2842 in the following 24-month period ( $p > 0.05$ ). Twelve of 53 flights prior to and 12 of 54 flights following change in EMS provider level were directly from the clinics ( $p > 0.05$ ). No patient data was available in the EMS database for the clinic flights. The number of patients with abnormal vital signs or injury severity markers was not different between the two periods. This data is summarized in table 1.

Table 1: Hemodynamic and injury severity markers of helicopter transported patients pre and post change in EMS provider level

# of patients	Pre(n = 41)	Post(n = 42)	p-value
HR < 50	2/39	3/40	ns*
HR > 100	8/39	15/40	ns
RR > 30 or < 10	6/39	5/40	ns
SBP < 100	4/35	2/35	ns
GCS < or = 14	21/38	26/42	ns
RTS < or = 11	16/33	10/34	ns
Any abnormal vital sign or injury marker	25/33	30/34	ns

\* ns =  $p > 0.05$

Conclusion: The change in EMS provider level from EMT-I to paramedic in this semi-rural area had no impact on the number of aeromedical transports. The acuity of patients flown following the change in EMS provider level remained similar based upon common

hemodynamic and injury severity markers. Limitations include retrospective design and lack of complete data for hemodynamic and injury severity markers.

# POSTER 66

## *An Analysis Of Occupational Injuries In An Aeromedical Program*

Thomas J. Doyle, MD  
Theodore R. Delbridge, MD, MPH  
Diedre Nicholas, RN  
John Cole, MD

**University of Pittsburgh, Pittsburgh, Pennsylvania**

Purpose: Air-medical transport is often considered to be a high-risk occupation. Flight safety is usually viewed as the primary concern, and the hazards of helicopter crashes are well known. The purpose of this investigation was to determine the actual occupation-related injuries and illnesses experienced by the personnel of a large air-medical program. Methods: Reports of occupational injuries and exposures for the years 1998 through 2000 were reviewed. Abstracted data related to the nature of the injury/illness, the circumstances under which it occurred, and lost days of work. Injuries were categorized as relating to flight safety or not. Only formally reported injuries or exposures were included in the study. Results: During the 3-year study period there were 16,062 completed medical flights. No personnel experienced injuries as the result of a crash or other issue related to flight (0 per 1000 missions; 95% UL 0.0%). 9 needlestick injuries occurred (1 per 1000 missions; 95% UL 0.2%). There were no documented seroconversions (0 per 1000 missions; 95% UL 0.0%). There were 77 other reported job-related injuries that occurred during the study period (5 per 1000 missions; 95% UL 0.6%). Of these, 37 injuries were muscle strains (2 per 1000 missions; 95% UL 0.3%), and 22 (59.4%) of those were back strains (1 per 1000 missions; 95% UL 0.2%). 14 injuries resulted in lost time from work. During the study period, there were approximately 140 field personnel at any time. Thus, over the course of the study, 59% of personnel experienced an occupational injury. Conclusions: The current study is limited in that it included only one flight program for a finite period, and considered only injuries and exposures that were formally reported. Nevertheless, the results indicate that the occupational risks for air medical personnel extend beyond issues related to flight safety. On a per mission basis, the risk of injury is low. However, cumulative risks over time may be significant.

## POSTER 67

### *Effect Of Flight Crew Shift And Time Of Day On Number Of Endotracheal Intubation Attempts And Duration Of Intubation Procedures Performed For Air Medical Transport*

R. Silbergleit  
S. Philpott  
M. Lowell  
C. Wagner

**University of Michigan, Ann Arbor, Michigan**

**Background.** Shift work is inherent to providing emergency medical care. Fatigue is a well-known consequence of shift work, and has been implicated as a common cause of medical error. Although fatigue has been proven to decrease psychomotor performance in abstract testing, little is known about effects on clinical performance. Since fatigue is known to be greater at night than during the day, we determined whether time of day effects performance measures of emergent endotracheal intubations by flight crews.

**Methods.** Quality assurance data from 490 intubations, performed by flight crews over a 5 year period, were reviewed. Intubation attempts longer than 4 minutes in total duration or requiring more than one intubation attempt were identified as protocol violations. Time of day was identified, as were other characteristics of the intubation including location performed (scene, ambulance, aircraft, or referring ED), route of intubation, medication use for induction, demographics and diagnosis. Analysis was performed by comparing 12 hour day/night epochs, and 8 hour day shift/evening shift/night shift epochs.

**Results.** All patients were successfully intubated. There was no effect of time of day or shift on performance measures in flight crew endotracheal intubation. Of intubations performed during the day (7a-7p) 36% (90/248) met criteria for protocol violation as compared to 24% (58/242) of intubations performed at night (7p-7a). Protocol violations occurred with similar frequencies in the three 8 hour epochs as well: days 37% (49/130), evening 28% (68/246), and night 27% (31/114). There were no significant differences in other characteristics of the intubations.

**Conclusions:** These data suggest that the effects of fatigue on psychomotor performance, at least with regard to endotracheal intubation, may not be of clinical significance. Emergency care providers may be able to compensate for effects of shift work in the when performing critical procedures.

# POSTER 68

## ***Current Practices in Advanced Airway Management by Air Medical Programs.***

Gerald Wydro, MD  
Ernest Yeh, MD  
William Walters, MD  
Michael Hamel, NREMT-P

**MCP - Hahnemann University, Philadelphia, Pennsylvania**

**OBJECTIVE:** No national standard for airway management by Air Medical Programs (AMP) exists. This allows for tremendous variation in the practice of providers around the country. We set out to assess current practice patterns in airway management by AMP. **METHODS:** A one page survey was mailed to the Physician Medical Director / Chief Flight Nurse of 196 AMP identified through the Association of Air Medical Services database. Phone follow up was performed in one month to non-responders. Surveys were studied with simple descriptive statistics. **RESULTS:** 114 (58%) surveys were completed. Of the respondents, 93 (82%) were hospital based, 16 (14%) private, and 5 (4%) EMS/Fire Based. The average number of responses was 1,110 (IQR 500-2436), with the most common response type being Critical Care/Inter-hospital flights (60%) followed by prehospital trauma (33%) and prehospital medical (7%). The majority of AMP, 87 (76%) utilize a nurse / paramedic crew. 105 (93%) of responding AMP perform RSI. Most programs, 88 (83%) use succinylcholine as the primary paralyzing agent. The most commonly reported induction agents include: midazolam 79 (75%), etomidate 47 (44%), and fentanyl 24 (23%). Lidocaine is administered by 94 (90%) of AMP as part of the RSI protocol, the majority (76%) using it only for head injury. 86 (82%) of responding AMP report having a Failed Airway Algorithm (FAA). Of those with a FAA, the most commonly reported rescue techniques were Bag Valve Mask Ventilation and Surgical Cricothyroidotomy. However, many other techniques were reported with less frequency. The majority (46%) of AMP complete annual in-services on their RSI and FAA procedures. **CONCLUSION:** RSI is a common procedure among AMP in the U.S. Succinylcholine and lidocaine are present in the majority of RSI policies. There is little consensus on the induction agents that programs utilize. Most AMP utilize a FAA, but there remains tremendous variation concerning rescue techniques and training intervals.

## POSTER 69

### ***Severity Scoring And Mortality Of Adult Patients Transported By An Air Medical Service: Identification Of Trends And Characterization Of Performance***

R. Silbergleit  
M. Snyder  
K. Nelson

**University of Michigan, Ann Arbor, Michigan**

**Background.** There is increasing recognition of the importance of outcome measures in health care delivery systems. It has, however, been difficult to quantify the care provided by air medical transport services. A first step toward this end is characterization of the severity of illness or injury, and the relationship between severity and mortality in the patients we transport. Our objective was to use physiologic severity scoring and mortality data to identify trends in, and characterize the performance of our air medical system over many years. **Methods.** This was a retrospective study of a flight database maintained for quality review purposes. The database includes APACHE II scores at the time of transport, length of ICU and hospital stay, and mortality data for adult patient transports since 1986. Each of these measures was evaluated for compliance in recording, and to identify trends in the 15-year interval from 1986 to 2001. The correlation between APACHE scores calculated at transport and subsequent mortality was measured to determine if the use of APACHE scoring in this context is valid, and to characterize the performance of the system. **Results:** 13,808 adult transports were identified from the database. APACHE scores and mortality data were available for 8,204 (59%) and 10,845 (79%) of patients, respectively. Over the study period the average APACHE score of our patients was  $11.6 \pm 8.4$  and the mortality was 22%. Both patient acuity and mortality have fluctuated over time, but are trending upward. The correlation between APACHE scores and mortality was close and linear (mortality =  $0.018 * \text{APACHE score} - 0.0243$ ,  $R^2=0.97$ ). **Discussion.** Marginal compliance with data collection for this database suggests that added efforts are needed to improve the completeness of documentation. Our patient population has a high mean severity score and mortality, and these are increasing over time. The strong correlation between APACHE scoring performed at the time of transport and mortality validates this technique as a measure of patient severity. The slope of this correlation is an outcome-based characteristic of system performance that allows monitoring of a system over time and comparisons between systems. We encourage other flight programs to adopt this methodology, so that performance can be studied across the air medical field.

## POSTER 70

### ***Perceptions Of State Health Officers and State Veterinarians Regarding Risks Posed By Bioterrorism: A National Survey***

R. Steven Tharratt, MD, MPVM  
James T. Case, MS, DVM, PhD  
David W. Hird, DVM, MPVM, PhD

**University of California, Davis, Sacramento, California**

**Background** There is increasing concern regarding the potential for bioterrorism directed against the animal infrastructure of the United States. Perceptions of bioterrorism risk by state animal health officers and how these perceptions compare to their human public health counterparts is not known. **Objective:** To assess perceptions of senior state public health and animal health professionals relating to possible bioterrorism scenarios and agents. **Study Design:** A cross-sectional survey using a written 17 question survey administered in spring 2001. **Study Population:** The state health officer and the state veterinarian in each of the 50 states and District of Columbia. **Results:** The survey had an 86% response rate; 100% of states responded. Risk perceptions were compared utilizing non parametric tests and differences were considered significant at  $p=0.05$ . Perceptions relating to bioterrorism risk of the state health officers and veterinarians were similar. Veterinarians perceived the risks posed by foot and mouth disease and Newcastle disease to be significantly higher than risks perceived by physicians. Veterinarians perceived the risk involving an anthrax hoax, brucellosis and ricin to be significantly lower than did state health officers. Perception of risk posed by agents affecting exclusively animals was higher than zoonotic or exclusively human diseases. The frequency of agent citations in the general press was significantly correlated with perceived risk of the agent. Resources devoted to bioterrorism activities were lower among state veterinarian offices. State veterinarians were less likely to be aware of bioterrorism incidents within their state. **Conclusions:** Perceptions of the risk posed by bioterrorism were similar between state health officials and veterinarians. Provision of sufficient resources to state veterinarians and explicit integration of their expertise and surveillance capabilities may be important to effectively mitigate the risk of bioterrorism.

# POSTER 71

## *A Wilderness Treat and Release Protocol at Grand Canyon National Park*

S.L. Stephanides

P. Kolar

S. Collins

K. Phillips

**University of Cincinnati, Cincinnati, Ohio**

**Purpose:** Grand Canyon National Park is one of the nation's largest wilderness medical systems. In the year 2000, a total of 304 helicopter evacuations occurred, as well as 13 mule evacuations and 147 hiker assists / litter carries. These cases included 171 incidents of heat exhaustion. In an effort to decrease the burden of unnecessary medical evacuations, a treat and release protocol for heat illness was instituted. In this abstract, we present our initial experience with this treat and release protocol. **Methods:** A total of 20 subjects were enrolled between August 1, 2000 and June 30, 2001. Adult heat injury patients in the main canyon corridor were considered for enrollment. In order to be eligible, the patient was required to have normal mental status and vital signs and could not be hyponatremic. Patients were considered eligible for release after a discussion with medical control if they met protocol parameters. **Results:** Of 20 patients enrolled in the study, 13 were able to complete the protocol. None of these patients required further medical assistance prior to reaching the rim. Eight (62%) of the released patients required IV therapy with an average of 2093cc (range 750- 4000cc) of saline administered. Patients were often treated overnight, with treatment time averaging nine hours (range 1:50 – 20:00). Seven patients did not complete the protocol. Two left AMA prior to release (neither required further assistance). One patient was required to be flown for hyponatremia per protocol. One patient was pregnant and did not feel comfortable hiking out and one patient was flown out for intractable abdominal pain thought secondary to inflammatory bowel disease. In the final patient, the protocol could not be completed due to problems with the electrolyte analyzer. She also complained of knee pain. **Conclusions:** Paramedics can safely treat and release heat injured patients in wilderness areas of Grand Canyon National Park. Further wilderness treat and release protocols should be considered.

# 1 INTERNATIONAL ABSTRACT

## *Overview Of The Dominican Red Cross Emergency Relief Operations Following Hurricane Georges*

Amado Alejandro Baez, MD, MSc  
Miguel De La Rosa

### **Dominican Society of Prehospital Medicine**

On September 22nd of 1998 the Dominican Republic was devastated by Hurricane Georges. with winds reaching more than 110 miles per hour, and an aftermath that left 283 dead, 595 injured, 64 missing , 865,510 displaced and 400,000 homeless persons this natural phenomenon became one of the worst disasters in Dominican History. The Dominican Red Cross instituted an Incident Command System (ICS) with basic finance, logistics, operations and planning sections. A Supplies Management (SUMA) unit was incorporated into the logistics section, and a needs assessment unit was placed within the planning section. An information officer with a multilingual staff updated local and international press every four hours, liaison officers were deployed to work for each of the local and international agencies involved in the incident. Emergency operations included initial search and rescue and EMS, improvised shelter location, damage assessment and needs analysis and supplies management. Health Issues encountered included direct damage to the health infrastructure, environmental health issues including, garbage disposal and drinking water control as well as epidemiological surveillance and vector control. Major Health issues in shelters were, diarrhea (902 cases), acute respiratory infections (355 cases), conjunctivitis (350 cases) and fever (350 cases). Challenges: Inadequate communication on behalf of the National Institute of Meteorology and other key agencies leading to lack of activation of the national emergency plan and improper preventative measures including shelter detection and activation. Agency specific challenges included the mobilization of more than 3,350 volunteers, transportation issues, communication deficiencies associated to direct system damage, logistic challenges associated with the interaction of numerous national and international agencies and the fact that volunteer personnel with key tasks had to be replaced once needed in their non-volunteer duties.

## 2 INTERNATIONAL ABSTRACT

### *Prehospital Care in the Bahamas*

Ugo A. Ezenkwele, MD, MPH  
Dept of Emergency Medicine  
Hospital of the University of Pennsylvania

Caroline Burnett-Garraway, MD  
Accident & Emergency Department  
Princess Margaret Hospital  
Nassau, Bahamas

Gary B Green, MD, MPH  
Department of Emergency Medicine  
The Johns Hopkins Hospital

**Department of Emergency Medicine, Hospital of the University of Pennsylvania,  
Philadelphia, Pennsylvania**

The Commonwealth of the Bahamas is an archipelago of approximately 700 islands scattered over 80,000 square miles. More than 95% of the 280,000 inhabitants live on just 7 islands with the major population densities concentrated in the capital city of Nassau, located on the island of New Providence and in the city of Freeport, on the island of Grand Bahama. Pre-hospital care is controlled by the Ministry of Health and is variable dependent on the population density and geography. In New Providence, pre-hospital care is provided on a continuous basis by a central dispatcher located in the police and fire academies. An ambulance is obtained by calling either 919 or 911. Call volume has remained relatively stable with a call rate of 1.5 per 10,000 population per day and a transport rate of 0.6 per 10,000 population per day. Ambulances are staffed by 32 emergency service technicians (EST's) of which, based on training level, 4 are EST-3, 16 are EST-2, and the rest are EST-1 (equivalent of EMT-1 in the US). The levels differ by education and clinical training. All ambulance drivers are EST-2 and are certified under the US Emergency Vehicle Operation Course. Currently, the ambulances are not stocked with intravenous medications due to lack of funding and inadequate EST training, however certain basic life support (BLS) measures can be provided. There is a privately owned air ambulance company that provides two twin engine planes for transport of patients from distant islands to New Providence or from the Bahamas to Florida. Furthermore, during times of mass casualty, the US Coast Guard also lends assistance with helicopters and sea transport. In Freeport, pre-hospital care is also available on a continuous basis, however, only EST-2 and 3 are available offering BLS care to patients. Toward the future, resources have been allocated for advanced medications and EST training.

### 3 INTERNATIONAL ABSTRACT

#### *Emergency Medical Services in St. Vincent and the Grenadines*

Michael J. Boros, MS, BS

**formerly of St. George's University, Grenada**

Nation: St. Vincent and the Grenadines is a nation made up of a number of islands located 1600 miles southeast of Miami. Over 115,000 people live in the country. The majority of the population (82%) is black in ethnicity. Over 30% are under the age of 15 years. The country is 150 square miles in size. Health System: The health care system of St. Vincent and the Grenadines is based on the British system. Health care issues are delegated to the Ministry of Health and the Environment. There are 38 clinics, 5 rural hospitals and one referral hospital (Kingstown General Hospital). Emergency Medicine: There are five full time emergency physicians on staff at Kingstown General Hospital. Around 30,000 patients are seen annually. The highest percentage (26.1%) of visits involves injuries. About 75% of patients are treated and discharged. EMS: The island of St. Vincent has five ambulances. One is stationed at the base at Kingstown General Hospital. The other four are located in small outlying towns. Patients are transported to the nearest health care site, which exist within each of these towns. The vehicles are white minivans that vary in size and make. Ambulance services are requested over the telephone. The call is received by the A&E Department, which then sends a nurse, a male attendant and a driver to respond. On occasion, a physician may go as well. There is no first aid, BLS, or ACLS training for the drivers. The equipment in the van is minimal. There is one gurney, one backboard, a first aid box, a portable oxygen tank, and a leg splint. The nurse may take extra materials (IV, glucose, etc.) per her discretion depending on the call. There are no cervical collars and no medications stocked on the ambulance. Portable defibrillators have only recently been acquired as one of the "extra items" the nurse may choose to take on the call. Summary: Overall, while EMS in St. Vincent and the Grenadines is functional, there is phenomenal opportunity for improvement.

## 4 INTERNATIONAL ABSTRACT

### *Emergency Medical Services in Cuba: an Overview*

Nannette M. Lugo-Amador, MD

**Boston Medical Center, Framingham, Massachusetts**

The communist republic of Cuba has a population of 11 million and a geographical area of 110,860 km<sup>2</sup>. The National Health System is single, integrated, regionalized and decentralized. Approximately 7 % of the State budget is dedicated to the health system. There are 276 hospitals, 12 research institutes, 442 polyclinics, 241 maternal clinics and 165 dental clinics. Two events have greatly affected the country's socioeconomic status and health system: the US embargo that started in 1961 and was further tightened in 1992 and the dissolution of the Soviet bloc in 1989. Cuba is the largest island in the Caribbean. The major industries in Cuba are sugar, minerals, tobacco, agriculture, medicine and tourism. The population is 60% Spanish descent, 22% mulatto, 11% African descent and 1% Chinese. The majority of the population lives in urban areas (51.5%), 29.5% lives in mixed urban rural areas and 19% lives in rural areas. The leading causes of death in Cuba are chronic diseases (cardiovascular disease, malignant neoplasms and cerebrovascular accidents) and accidents. The "Sistema Integrado de Urgencias Médicas" (Integrated System of Medical Urgencies), SIUM, is the agency that operates and coordinates prehospital care and transport. The National Offices of SIUM are located in Havana and there are provincial centers throughout the 14 provinces of the Island. There is one main SIUM center and 2 sub centers in each province. SIUM main centers are located in the main provincial hospitals and the sub centers are located in smaller hospitals. Transport is done by ground and vehicles vary from station wagons to ambulance trucks. Each SIUM center and sub centers have one ambulance and 1-2 additional vehicles. A physician, a nurse and a driver staff each ambulance. The system is activated by community doctors or nurses via telephone. Decisions regarding transport and patient's care are done by the SIUM physicians.

## 5 INTERNATIONAL ABSTRACT

### *An International Training Program in Tactical and Protective Emergency Medical Support*

Nelson Tang, MD  
Amado A. Baez, MD  
Chayan Dey, MD  
Lt. Armando Guzman

**The Johns Hopkins University, Baltimore, Maryland**

The integration of Emergency Medical Services (EMS) personnel and support into modern law enforcement tactical and special operations teams has become an increasingly accepted practice within the United States. Recognizing the rapid growth and evolution of this "Tactical EMS" philosophy, an increasing number of international military, security and law enforcement agencies are seeking to train and prepare specialized medical support groups in this new discipline. In May of 2001, a unique Tactical and Protective Medical Support program was conducted in Santo Domingo, Dominican Republic under the auspices of the Cuerpo de Ayudantes Militares, a branch of the military charged with the support and protection of the President of the Dominican Republic. The program was directed to and attended by 18 military physicians currently deployed as the medical support team for the Dominican President. The specialized ongoing needs of this physician group include current medical knowledge base, advanced triage and transportation guidelines, tactical and protective operations proficiency and mobile travel-related EMS resource utilization. The training program that was subsequently developed was the result of nine months of collaboration between the academic emergency medicine department of a major American university medical center, the Special Weapons and Tactics unit of a large urban U.S. police department and the military leadership of the Dominican Republic. The interdisciplinary training had emphasis on advanced resuscitation methodology, executive protection medical support, tactical EMS, transport and evacuation, medical threat assessment and international emergency medicine. The five-day curriculum encompassed 3.5 days of didactic education encompassing 28 hours of intensive classroom and laboratory instruction. This was augmented by 1.5 days of practical field training dedicated to advanced rescue techniques, tactical and protective procedures and law enforcement special operations. All participants successfully completed the course and achieved significant expansion of previously acquired skills both medical and operational. The multi-disciplinary and multi-agency approach to development and implementation greatly enhanced the success of this international training program.

## 6 INTERNATIONAL ABSTRACT

### *New Paradigm for EMS in Developing Nations: Responding to Realities*

Bobby Girish Kapur, MD

Junaid Razzak, MD

**Yale School of Medicine, Section of Emergency Medicine, New Haven,  
Connecticut**

Purpose: Exporting pre-hospital care models from high income to low income countries will not necessarily result in a significant decrease in morbidity, despite burdening the budgets of health systems, since causes of death and disability vary among nations. This article attempts to define the priorities for pre-hospital care in developing nations and to investigate evidence-based research applicable to major causes of morbidity in these regions. Therefore, developing nations can establish EMS systems that respond to real needs. Methods: Using data from the Global Burden of Disease study, which the World Health Organization uses for morbidity statistics, the projected top ten causes of Disability Adjusted Life Years (DALY's) in 2020 for developing nations were documented. Then a Medline search of articles from 1966 to August 2001 with no language restriction was conducted seeking studies that provide evidence of pre-hospital management of these diseases. Results: The ten most significant DALY's projected for developing nations in 2020 are: major depression, road traffic accidents, ischemic heart disease, COPD, cerebrovascular disease, tuberculosis, lower respiratory infections, war injuries, diarrheal diseases, HIV. When "emergency medical services" was combined with the following subject headings, these number of articles were retrieved: "depression" 12; "accidents, traffic" 472; "angina pectoris" 33; "chest pain" 78; "heart arrest" 776; "coronary disease" 144; "lung diseases, obstructive" 22, "tuberculosis" 8; "respiratory tract infections" 5; "diarrhea" 9; "blast injuries" 36; "wounds, gunshot" 51; "wounds, penetrating" 79, "HIV" 1. Trials exist for pre-hospital management of road traffic accidents, ischemic heart disease, COPD, cerebrovascular disease, and war injuries. However, limited information occurs in the literature for pre-hospital management of depression, TB, respiratory infections, diarrheal diseases, or HIV. Conclusions: Developing nations can maximize utilization of scarce resources by creating EMS systems that address the ten significant causes of DALY's projected for 2020. Evidence in the medical literature exists for appropriate pre-hospital management of five of these diseases, and further research is required for the other five diseases.

## 7 INTERNATIONAL ABSTRACT

### *Emergency Medicine in the Republic of Poland*

Sharon E. Mace, MD, FACEP, FAAP

Richard Chmielewski, DO, FACEP

**Cleveland Clinic Foundation, Cleveland, Ohio**

Emergency medicine EM in Poland is a Soviet battlefield concept = Franco-Prussian Model. Freestanding emergency departments = pogotowie include dispatch, administration, ambulatorium = urgent care, ambulances, transport vehicles = karetki, BLS training school. Cooperation between fire/pogotowie varies. Fire brigades have their own physicians/ambulatoria/EMS training, ALS ambulances (staffed with doctor, nurse, driver, "sanitariusz" = a basic EMT) provide emergency and house calls. Dispatchers cannot refuse to send an ambulance for patients who can call at any time. There are no paramedics, no standing orders and only 2 AEDs in the country. At the scene patients are transported to a hospital/ambulatorium or get a prescription/referral to their doctor. The roster of accepting hospitals changes daily based on equitability not suitability. For pediatrics/orthopedics, transport is to the "duty" hospital for that particular specialty but not for multiple trauma. A patient is transported to a on duty orthopedic hospital then to another hospital for a CT scan, and a third hospital to see a neurosurgeon on duty that day. After WW II karetki = small station wagons with a driver/nurse/doctor, one stretcher, no monitor/defibrillator, no room to do procedures, were the only ambulances. Karetki are also transport vehicles for blood/lab/personnel including administrators/visitors. Now there are 5 ambulances: karetki, R for medical calls (chest pain), W staffed by a surgeon for trauma (MVA), P for pediatrics, N with incubators staffed by neonatologists for interhospital neonatal transfers. The doctors in the pogotowie are often anesthesiologists with a few from other specialties (pediatrics, neurosurgery), and work to earn extra income. Hospitals only have a "receiving ward or room" with little/no equipment for evaluation/stabilization. Involved therapy (thrombolytic therapy/chest tube insertion) is done in the ICU by anesthesiologists. Seriously ill patients are admitted directly to ICU. A few hospital emergency rooms with ancillary medical services as in the United States exist. EM was listed as a specialty in 1999. The Ministry of Health developed a certifying examination for doctors in pogotowie. A program is underway to designate chairs of EM in the universities and to develop EM residency programs.

## 8 INTERNATIONAL ABSTRACT

### *Recent Advancements in EMS delivery in Guatemala City*

Hess, Ann  
Villagran, Oliver  
Green, Gary

**Johns Hopkins University, Department of Emergency Medicine, Baltimore, Maryland**

We wish to provide a qualitative description of recent changes in prehospital care in Guatemala City. In recent years, for the first time a coalition of agencies has initiated a unified and standardized criteria for clinical practice, training and certification for paramedic providers. These changes may serve as a model not only for Guatemala's own growth in prehospital care, but also for other developing countries' prehospital care systems. Guatemala is located in Central America, south of Mexico. It measures 108,889 km<sup>2</sup> with a population exceeding 11,500,000. Due to rapid industrialization, the country has experienced a decline in the prevalence of infectious disease, with trauma related deaths becoming increasingly important. This change increases the number of incidents where early intervention by paramedics can reduce morbidity and mortality. Prehospital care is provided by two organizations, the government funded Municipals, and the publicly funded Volunteers. The development of these organizations has been relatively rapid, dating back only 50 years. These organizations' EMS roles grew out of firefighting services, and today serve over 90% of Guatemala's prehospital care. Formal training began in 1994 and developed to include instruction in HAZMAT and disaster planning, and certification that is BLS, ACLS, PALS equivalent. Instruction stems from both local efforts as well as the involvement of international development agencies. As demographic change increases the prevalence of medical emergencies in which early intervention prehospital care may decrease morbidity and mortality, prehospital care becomes increasingly important in many developing countries. For the first time in its history, Guatemala City's EMS system has undergone rapid change that includes integration throughout the city for combined and formal training. As such Guatemala City may serve as a model to other developing countries seeking to expand their EMS system(s) efficiently.

## 9 INTERNATIONAL ABSTRACT

### *Review Of The First 5 Months Of Service Of A New EMS Prague-West Center At Jesenice, Czech Republic*

T. Drabek  
M. Havlicek  
J. Seblova

#### **EMS Prague-West**

Emergency Medical Service (EMS) system in the Czech Republic is based on physician-on-ambulance design with non-existing in-hospital Emergency Departments. The pavillion system of older hospitals requires precise pre-hospital triage based on clinical signs and symptoms with limited monitoring technique. Prague-West is a rural/suburban area of Prague, the capitol city. The catchment population is 72.000 which doubles during recreational periods of the year. There are 6 ambulances staffed with a MD-EMT-paramedic, and 5 ambulances with EMT-paramedic only. During the summer season, we also cover a dam area with rescue boat staffed with MD-EMT-paramedic. A helicopter is available on request. On March 1, 2001 the second EMS center at Jesenice, Prague-West County District was opened for service. The review of the first 5 months of the service revealed following data: There were 360 calls answered by this center in total: Trauma 25%, cardiovascular 12.5%, CVA 12.5%, spinal back pain 8%, acute abdomen symptoms 7%. Mean call-response interval was 8.2 minutes (1-32); arrival-to-delivery to hospital interval was 40 minutes (8-101). Death upon arrival was eminent in 3 cases, unsuccessful CPR performed in 3 cases. Sixty patients were left on scene (6 refused treatment). All other patients were successfully delivered to different wards at hospitals in Prague and adjacent areas. Based on the presented data, we can conclude that the volume of calls is small (2.4 calls/day) and most cases do not represent a threat to basic life functions. The longer intervals reflect the area characteristics with the need to stay-and-play before the anticipated longer transport time. This situation calls for rearranging of the existing EMS model. Pre-hospital service should be staffed by EMTs, bringing the patients to well equipped in-hospital Emergency Department with laboratory and other background, staffed by board-certified EM physicians.

# 10 INTERNATIONAL ABSTRACT

## *Prehospital Ground and Air EMS of the Argentine Special Forces and Paratroopers*

Shawn F. Taylor, MD

Robert T. Gerhardt, MD, MPH

**Brook Army Medical Center, Converse, Texas**

**PURPOSE:** To compare the prehospital emergency care capabilities utilized by Argentine Special Forces and Paratroopers with models in the U.S. **METHODS:** Argentine medical capabilities were evaluated during a two-week period then further evaluated, tested, and utilized for a 6-week period during a seven nation peacekeeping exercise. **SUMMARY:** The Argentine Paratrooper EMS model is much different than the models seen in the United States. Differences exist in personnel, equipment, and employment. The primary level of care is integral to the Airborne Brigade. The medics are drivers/litter bearers with basic medical training. There are no equivalents to paramedic level providers. This results in a physician dependent model in the prehospital care environment. The ground ambulances used by these elite units consist of Ford F-100's, Renault Alliances, and Mercedes Unimogs. The number available depends on the availability of repair parts and fuel. Equipment is limited to first aid gear, oxygen, and litters. Medical personnel are limited to basic medics and one physician. Additional medics, ambulances, equipment, and nurse/physician level staffing can be provided by Compania de Sanidad 4, the secondary level external medical unit. Assigned physicians are of various specialties. With advanced planning, additional care can be arranged to include a physician and nurse staffed ALS/Cardiac level ambulance from Hospital Militar Cordoba, the tertiary care facility. Air Ambulance capability can be provided by the Argentine Flight School via UH-1H helicopters with litters and oxygen. No night navigation equipment is available. Medical personnel are not part of the flight crew. **CONCLUSION:** Basic medical transportation is readily available within this system. With planning, capability on par with U.S. models is available, dependent on physicians as prehospital providers. Air ambulance ability is limited by a lack of night vision and navigational equipment.

# 11 INTERNATIONAL ABSTRACT

## *A 'Cloak of Care' Spread over a Continent*

Harry F. Oxeer, MD

**St. John Ambulance, WA Ambulance, Inc., Perth, Western Australia**

A unique program provides First Aid training to the public and EMS delivery over the largest ambulance area in the world served by a single provider – 2.5 million sq. Km. Distances are up to 2.5 hours by jet, often with hours of further road travel. Locations are often remote, climate varying from tropical or hot dry desert through Mediterranean to cool temperate. Population is 1.3m in the capital city, a further 500,000 spread over the rest of the huge area. 150 centers serve the smaller areas, mostly with trained volunteers. An integrated response is provided, as the service trains the public and industry in Basic Life Support, First Aid, Occupational First Aid, and Industrial Paramedics for miles and construction sites, and oil and gas platforms. 3000 volunteers provide over 3 million hours of ambulance and first aid training and serve to their communities annually. Volunteer ambulance officers are trained to Certificate 3 and 4 in the tertiary education system. 400 paramedics and 30 Advanced Diploma in Emergency Care, with university articulation to degrees at the University of Western Australia. 120,000 calls are attended annually in the capital, another 25,000 elsewhere in the State. The service works closely with the Royal Flying Doctor Service (fixed wing) but has so far has resisted helicopters. The Medical Director has a team of seven emergency medicine specialists who review and advise on protocols and initiatives, and take part in training and continuous quality improvement. There is no ambulance legislation, and the Service is a private, not-for-profit organization, funded from government and other contracts, an ambulance insurance scheme, service contracts, course fees and ambulance billing. This Ambulance Service provides a unique 'Cloak of Care' of First Aid and paramedical services to Western Australia – over a third of the continent.