THE BODY ARMOR DEBATE

Urban departments take extreme measures to safeguard EMS personnel

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The Future Depends on Research

The Prehospital Care Research Forum presents research from EMS World Expo’s International Scientific EMS Symposium

The Prehospital Care Research Forum at UCLA is proud to present this 2017 abstract supplement, which features the proceedings of the new International Scientific EMS Symposium to be held October 18–19, 2017 at EMS World Expo in Las Vegas. We have also included the educational abstracts from the National Association of EMS Educators symposium presented in Washington, DC, August 11, 2017.

Established in 1992, the PCRF is dedicated to the promotion, education and dissemination of prehospital research. We believe it is the responsibility of emergency medical professionals worldwide to practice evidence-based medicine and develop a body of evidence that examines prehospital emergency care.

Each year we acknowledge those authors who use science to advance EMS through the publication of this supplement and their presentations. As part of our ongoing pledge, the Prehospital Care Research Forum at UCLA continues to make research accessible to the EMS community throughout the U.S. and internationally. Please join us in creating a culture of science in EMS by participating in our symposia, workshops and monthly journal club, held the second Monday of every month at 12 p.m. CST. Register at www.prehospitalcare.org.

We would like to thank our volunteer board of advisors and associates. Without the dedication of these volunteers, none of this would be possible.

In addition to the hard work of many, many people, much of our success can be attributed to the commitment of organizations dedicated to research in prehospital care. I would like to acknowledge our strategic partner, EMS World; founder, iSimulate; benefactor, Laerdal; partners, FirstWatch, Limmer Creative and Jones & Bartlett Learning; and friends, Fisdap, Pocket Nurse and Weber State University. The generous support of these fine organizations and our affiliation with the National Association of EMS Educators, the National Association of EMTs and the International Academies of Emergency Dispatch are what enable the PCRF to fulfill our mission.

The future of EMS depends on the quality and quantity of research we produce. We invite you to take a stand, conduct research in your community and submit it in 2018 for the greater benefit of EMS.

Sincerely,

David Page, MS, NRP
Director, Prehospital Care Research Forum at UCLA

PCRF SALUTES OUR SUPPORTING ORGANIZATIONS:
Biometric Analysis of Cervical and Thoracolumbar Movement During Simulated Ambulance Trauma Transport

Author: David Wampler, PhD, PhD, LP
Associate Authors: Ronald Stewart, MD, Rena Summers, Lawrence Roakes, Craig Cooley, MD, Tasia Long, Brian Eastridge

Introduction—EMS systems have used the long spine board (LSB) to “immobilize” patients with potential spine injury. Recent evidence suggests the LSB may do little to manage spinal motion and may pose greater risk than benefit. This project sought to precisely measure cervical and thoracolumbar (TL) motion during ambulance transport.

Hypothesis—Transport on a mattress with the head elevated without the LSB would allow less spinal movement than transport on a LSB.

Methods—This was a randomized healthy volunteer crossover trial. Real-time 3D motion analysis of spinal motion was measured using biometric sensors (Xsens Technologies, Netherlands). Positions analyzed included: zero and 10 degrees on LSB, and stretcher without LSB with stretcher head elevated to 10, 30, 45 and 60 degrees. Subjects on stretcher without LSB had a c-collar and were transported with and without head blocks. Simulated ambulance transport was on city streets at or below posted speed limits. Descriptive statistics were used to describe movement for each position, and significance was determined using a t-test.

Results—Nine subjects participated, 66% male. For cervical movement, there was no difference in axial, flexion/extension or rotation (2.1 ± 0.07 mm vs. 0.22 ± 0.05 mm, 24 ± 12 mm vs. 22 ± 10 mm, 5.1 ± 19 vs. 5.8 ± 20 degrees, respectively). There were significant differences in lateral (3.7 ± 7 mm LSB vs. 2.0 ± 5 mm no LSB) movement and volumetric movement of the head (120 ± 172 mm3 LSB vs. 77 ± 86 mm3 no LSB). Positions allowing the lowest mean cervical volume of head movement were bed elevated to 30 and 45 degrees with head blocks (20 ± 22 mm3 and 12 ± 6 mm3, respectively). For TL movement, there was no statistical difference in three-dimensional volumetric movement of the TL spine (2 ± 0.6 mm3 LSB vs. 4.7 ± 5 mm3 no LSB).

Conclusion—Spinal motion during transport was small in all groups; however, those secured on a stretcher mattress without LSB had less cervical spine motion than did those secured to LSB. Of the 10 immobilization treatments studied, subjects secured to a stretcher mattress with the head of the bed elevated to 30 degrees had the least spinal movement.

Descriptive Review of Patient Refusal/Against Medical Advice in a Single EMS System

Author: Lucas Myers, BAH, NRP
Associate Authors: Bradley J. Buck, NRP, Anuradha Luke, MD

Introduction—Refusal of treatment and transport against medical advice (AMA) is a common occurrence in EMS. The assessment of patient mental capacity is an essential part of the process to make the proper determination in allowing a patient to refuse care. This study evaluated paramedic documentation of patient capacity in those refusing care AMA.

Methods—The study reviewed records of paramedic–documented refusal of medical treatment and transport from a multisite single ambulance provider located in the Midwest of the United States. All included patients were 18 years or older. The documentation review occurred on records from calendar year 2015 and included document completion; documented assessment of patient capacity; with whom the patient was left; and alcohol or drug intoxication.

Results—There were 799 records included in the review. The median age was 51.9 years, and 50.7% (n=405) were male, although 53 patients did not have a documented gender in the record. Documentation contained at least some level of assessment of patient capacity in 27.5% (n=200) of reports but was absent from the remaining 72.5% (n=579). Documentation of the party with whom the patient was left following refusal was completed in 41.4% (n=331) of reports. Assessment specifically of alcohol or drug intoxication was not documented in 87.8% (n=702) of reports.

Conclusion—The documentation of the level of capacity held by a patient refusing treatment and transport AMA is poor. Implementation of education on documentation key points in these patients might be beneficial. It is unclear whether actual assessment of capacity takes place given the poor documentation.

AED Retrieval and Activation in the Emergency Medical Dispatch Setting

Author: Chris Olola, PhD
Associate Authors: Meghan Broadbent, MS, Greg Scott, Isabel Gardett, PhD

Introduction—Early use of an automated external defibrillator (AED) can significantly increase the likelihood of survival following a cardiac arrest. For out-of-hospital cardiac arrests, activation of a layperson rescuer may lead to faster defibrillation times and, therefore, potentially higher rates of survival. However, no research has investigated the actual use of AEDs by layperson rescuers.
**Objective**—This study determined a baseline understanding of the use of AEDs in the context of out-of-hospital cardiac arrests reported to 9-1-1.

**Methods**—This study involved a retrospective review of calls involving CPR instructions provided by the emergency medical dispatch to a layperson caller. Primary outcomes include how often AEDs were actually present, how often a rescuer was sent to retrieve the AED, how often that person found and returned with the device, and how often it was actually placed and used on the patient. Secondary outcomes included the time taken to locate and return with the AED and the amount of delay, if any, in starting CPR.

**Results**—Preliminary results indicate that an AED is not available (or the caller does not know) more than 95% of the time during out-of-hospital cardiac arrests involving CPR instructions. An AED was only located near enough to be visible less than 2% of the time. Out of 1,107 calls, an AED was actually found and brought to the scene only five times. In some cases the provision of instructions regarding the AED delayed the starting of CPR.

**Conclusion**—The results here are preliminary; this pilot will be significantly expanded for the final study and presentation. However, even these early results indicate a need for better ways to inform callers and rescuers of AED locations, then ensure they can locate the devices and then return in time to be useful before professional responders arrive. The size, location and response patterns of local agencies will likely affect how far it is useful to send rescuers to retrieve AEDs and how often it makes sense to do so with single versus multiple rescuers, as compared to providing CPR instructions only.

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**Distal Femur Intraosseous Access Is Equivalent to Humeral, Tibial or Intravascular Access**

*Author: David Wampler, PhD, LP*

*Associate Authors: Jeremy Allen, Joan Polk, LP, Michael Stringfellow, EMT-P, Scotty Bolleter, EMT-P, David Miramontes, MD*

**Introduction**—Vascular access is an integral component of prehospital resuscitation. Medications and fluids may be beneficial for some patients in cardiovascular collapse, yet access is often difficult in this population. Currently the EZ-IO system is cleared by the FDA to access either the humerus or tibia. The authors recently began educating both EMTs and paramedics to access the distal femur during circulatory arrest resuscitation. The objective of this study was to evaluate if accessing the distal femur was equivalent to the proximal humerus or tibia.

**Methods**—This was a retrospective analysis of prospectively collected data abstracted from the cardiac arrest registry maintained by the office of the medical director from a large urban EMS system. The cohort consisted of all resuscitation attempts. Choice of vascular access was at the discretion of the EMT or paramedic; options included proximal tibia, proximal humerus, distal femur or peripheral IV. Primary single variable outcomes were successful placement (defined as: stable in position, flowing, with no evidence of extravasation) and return of spontaneous circulation (ROSC). Secondary outcomes were pulse on arrival to the emergency department and complication rate (dislodgement, lack of flow or extravasation).

**Results**—During the nine-month period, there were 780 attempted resuscitations. Of these, the distal femur, proximal humerus, and proximal tibia were utilized 35 (5%), 500 (64%) and 128 (16%) times, respectively. The proximal humerus and distal femur first-attempt placement rates exceeded 95%, whereas the tibia rate was 87%. There was no difference in complication rates; all were less than 10%. ROSC rates ranged from 26% (tibia) to 36% (humerus), with no significant difference compared to the distal femur (34%). Pulse on arrival to the hospital was also statistically indifferent. Total average fluid administration during resuscitation ranged from 480±284 ml (humerus) to 361±240 ml (tibia) and was in both cases not different to the femur (431±210ml).

**Conclusion**—The distal femur did not differ from proximal humerus or proximal tibia for any outcomes measured. The distal femur may be favorable for select situations. The authors speculate the femur’s anatomic location is less obstructive to the choreography of resuscitation.

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**How Mobile Technology Impacts Prehospital Personnel Who Are on Acute Stroke Teams**

*Author: Katheryn Courville, PhD, RN*

*Associate Authors: Becky Spencer, PhD, RN, IBCLC, Kelly McShane, PhD, CPsyCh CE*

**Introduction**—There is widespread confidence that mobile technology can enhance interprofessional team-based care, leading to improved patient outcomes. Yet there are few studies demonstrating success and limited explanatory models. The purpose of this study was to build a foundation of knowledge on how and why mobile technology impacts interprofessional team-based care that includes prehospital care.

**Methods**—The authors used a realist-informed methodology (Pawson & Tilley, 1997) in a two-phased qualitative research design. A literature review was conducted of our topic, and developers of an existing mobile technology were interviewed to uncover budding propositions of how and why mobile technology impacts interprofessional team-based care. The authors then tested our propositions on actual users of the same mobile appli-
cation used by prehospital and hospital stroke team members.

Results—The strongest propositions that were supported by prehospital team members emerged from the mobile application's features of transparency and immediate feedback. These features allowed prehospital personnel to (a) feel professional respect, validation and support by their hospital-based team members; and (b) immediately critically appraise their own performance on each stroke case. For prehospital team members, the chief outcomes from using the mobile technology were job satisfaction, engagement and personal learning.

Conclusion—The study's methodology looked at not just the outcomes of mobile technology's impact but the causes of those outcomes. By identifying the features of a mobile application that produce these causal mechanisms and how these causal mechanisms produce desired outcomes, an agency can replicate mobile applications for similar interprofessional team-based activities. Further research is needed to investigate the link between these personnel outcomes and the ultimate goal of improved patient outcomes.

Dispatcher-Assisted CPR Time to First Compression
Author: Greg Scott, MBA
Associate Authors: Christopher Olola, PhD, Isabel Gardett, PhD, Jeff Clawson, MD

Introduction—Rapid identification of out-of-hospital cardiac arrest (OHCA) and delivery of bystander chest compressions in patients with ventricular fibrillation are key elements in the chain of patient survival. The timeliness of dispatcher-assisted CPR may improve survival in such patients.

Objective—The primary objective was to determine elapsed time to start of instructions and time to initiate chest compression by bystanders for cases where EMDs used the MPDS v13 Obviously Not Breathing Fast Track feature. A secondary objective was to identify barriers—problems encountered by bystanders—in completing the delivery of prompt chest compressions.

Methods—A retrospective, observational study of adult cardiac arrest dispatcher-assisted CPR cases was performed. Case audio was downloaded from the emergency medical dispatch center audio system. Elapsed time was recorded for seven key steps in the call relevant to the dispatcher-assisted CPR sequence. Barriers that impeded progress of bystanders to deliver prompt chest compressions were identified.

Results—The study found 60% (18/30) had barriers that impeded the time to chest compression instructions and bystander delivery of chest compressions. The most frequent barrier, at 36.7% (11/30), was difficulty getting the patient from a bed to the floor/ground. The median elapsed time from address verification to identification and entry of cardiac arrest (CA) chief complaint was 65 seconds overall (with or without barriers). The median time to start chest compression instructions was 140 seconds overall (89 seconds without barriers, and 182 seconds with barriers, p<0.001).

Conclusion—A significant difference exists in both time to compression instructions and time to compressions delivered between cases with no barriers and those with barriers. Differences also exist between cases using a “fast-track” cardiac arrest identification feature and cases that do not. Very fast times to hands-on-chest are possible with early dispatcher identification of cardiac arrest.

Gasoline, EMS and Cross-Price Elasticity of Demand in the Urban Setting
Author: Nate Andrews
Associate Authors: Jackson D. Deziel, PhD, MPA, NRP

Introduction—The authors sought to identify any relationship between average monthly unleaded gasoline price and EMS demand in urban areas.

Methods—Data for this study were provided by six urban EMS agencies in North Carolina and South Carolina. Each organization reported monthly total requests for service (call volume) for January 2010 through December 2016. The average monthly price of unleaded gasoline was collected through publicly available sources. For analysis, both call volume and gasoline price were log-transformed (natural log) to derive an elasticity function. A pooled ordinary least squares model with fixed effects was utilized for tests of inference.

Results—a total of 498 observations were analyzed. Linear regression models show for a 10% increase in average gasoline price, EMS demand decreases by 0.8% (95% CI: [-1.12]–[-0.47]; p<0.001). In real terms, for each $0.01 increase in average gasoline price, the monthly demand of EMS decreases by 1.25 calls (95% CI: [-1.96]–[-0.54]; p=0.001). This results in a cross-price elasticity of -0.08, indicating a complementary but inelastic relationship between average gasoline price and EMS demand.

Conclusion—Analysis revealed a negative cross-price elasticity of demand. Gasoline price and EMS demand demonstrate an inelastic relationship.
World Café-Mediated Contribution of Prehospital Practitioners in Ireland to the First Official National Guidance Regarding Continuous Professional Competence

Author: Shane Knox, PhD, MSc HDip, Advanced Para, MCPara, Assoc. CIPD
Associate Authors: Suzanne Dunne, PhD, Colum P. Dunne, PhD

Introduction—There was no regulatory requirement for prehospital practitioners in Ireland to provide evidence of competence, or any link between competence and registration to practice. Having been charged with drafting a guidance document for practitioners relating to the introduction of a continuous professional development (CPD) framework, the authors initiated World Café engagements with practitioners to determine views regarding the utility of the draft guidance, emphasizing the need for unambiguous content of the advisory document, which was to be published for EMTs.

Methods—World Cafés were hosted regionally, with 63 participants from the three practitioner levels (31 EMTs, 22 paramedics, 10 advanced paramedics). A draft guidance document was developed after the completion of a national consultation process though an electronic survey with EMTs. Topics were selected by using section titles from the guidance document with a view to seeking further feedback and subsequent refinement of the proposals for CPD. These topics were then discussed using the World Café process: (a) what was absent from it; (b) perceived challenges regarding provision of evidence; (c) clarity regarding related activities; (d) the purpose of learning portfolios. Qualitative analyses were performed using NVivo (version 10).

Results—Participants’ feedback included: lack of clarity in the guidance document regarding the role of their host organizations in supporting CPD; definition of what constitutes patient contact; the regulator should provide mentorship training, templates for reflective practice, and case studies; details of the audit and review process; accreditation of elective education courses; and the potential consequences of not fulfilling CPD requirements.

Conclusion—The study identified repetitive themes and suggested that the regulator should communicate with registrants regarding CPD activities, the audit process and the validation process for CPD credits; and that templates for case studies, reflective practice and learning portfolios be made available. Given that all participants believed that CPD was an excellent initiative, the regulator had the opportunity to address these identified practitioner concerns and thus introduce an improved system of CPD. However, these changes were not incorporated into the guidance document before it was issued formally. The regulator may have missed an opportunity to provide the basis for a future robust system of CPD for paramedics and advanced paramedics.

A Paramedic Guideline to Recognize and Refer Intimate Partner Violence Patients

Author: Simon Sawyer
Associate Authors: Jan Coles, Dr. Angela Williams, Brett Williams

Introduction—Intimate partner violence (IPV) is a leading contributor to morbidity and mortality for women worldwide. Paramedics report frequently encountering IPV, yet often state feeling unprepared to manage such patients. To ensure paramedics can respond appropriately, there is a need to generate guidelines and educational packages. This study reports on the creation of a guideline and its subsequent endorsement using expert consensus.

Methods—A policy Delphi method was used to generate a clinical guideline for paramedics to recognize and manage IPV patients. The guideline was created using current evidence as well as recommendations from international health agencies. A panel of family violence researchers and service delivery experts, such as paramedics, physicians and advocacy groups, provided feedback on the guideline to obtain consensus agreement.

Results—Feedback was provided by 42 experts over three rounds, resulting in 100% consensus. Results include clinical indicators to recognize IPV patients in the prehospital environment, a method for paramedics to discuss IPV with patients, referral options and documentation guidelines. Additionally a number of recommendations for ambulance services using this guideline were provided.

Conclusion—This study has generated the first comprehensive, consensus-based guideline which allows paramedics to recognize and refer IPV patients to care. This guideline can be easily modified by ambulance services worldwide for use in their region. While evidence of the efficacy of this guideline in practice is needed, this guideline may increase recognition of IPV patients and their access to care and could guide and improve the paramedic response to IPV patients.

Mastery Through Multisensory Medical Moulage: Occult Infection Secondary to Penetrating Trauma

Author: Catriona Graham, MS, PhD, FIACS, CBRN
Associate Authors: Bobbie J. Merica

Introduction—Mastering complex tasks involved in assessment, triage and rapid response requires high-resolution binding of multisensory inputs into memory, maintenance over time and conveyance into future behaviors. This multisensory training framework uses physiologically and anatomically accurate inter-
active wounds to leverage the “psychology of surprise,” increase attention and create a context in which training objectives occur organically.

**Objective**—To facilitate retention of content that is perceived along with novel stimuli by improving the accuracy of triage acuity practicing critical decision pathways; reinforcing patient assessment skills, effective communication and critical thinking; and promoting early recognition and rapid, appropriate responses to sepsis criteria (SRR).

**Methods**—A pretest was given for baseline assessment skills, knowledge of SRR, self-reported confidence and competence. A post-test measured changes to those.

Pre-encounter foundational didactic and prebrief: Physiologically functional medical moulage wounds applied to standardized patients (SP) as sites of penetrating trauma and sources of infection. Wounds were “hidden” by SPs’ clothing. SPs’ vitals met borderline SIRS criteria. Recognition of SIRS criteria and sepsis screening led to revelation of the wound.

Provider-learner joins scenario: The wound was covered by a dirty homemade bandage. Upon removal of the bandage, the care team encountered a high-fidelity wound including purulent/hemorrhagic drainage and accompanying realistic odor. Scoring included participant reactions and subsequent performance to end of scenario (sepsis rapid response). Scoring was cross-validated ED triage and assessment of competency with observation checklist.

**Results**—The study had 76 participants: 4 clinical providers and 72 registered nurses. Self-reported mean improvement: 19.62% ±0.21, greatest increases in assessment, recognizing SIRS criteria and appropriate response to sepsis screen. Mean observed improvement: 31.52% ± 0.28. Changes from pre- to post-test were statistically significant (p<0.001). Iterative data predicts significant impact on future performance, revealing a commitment to application to practice of greater than 96%.

**Conclusion**—Results indicate that this team-based training model, combined with multisensory medical moulage optimizing the psychology of novelty, will increase learner engagement and retention, thereby facilitating accurate assessment and rapid, decisive action in contextually similar situations.

**EMS Safety: Do Courses Positively Affect Crews’ Attitudes Toward Safety?**

*Author: David Miles, PhD, EMT-P, NCEE*

**Introduction**—This study attempted to see how an EMS safety course affected staff attitudes regarding a culture of safety. This presentation highlights original research based upon work of Dr. Daniel Patterson, et al. regarding EMS safety attitudes and the utilization of the National Association of EMTs’ (NAEMT) EMS Safety Course as an intervention in a health-system based interfacility EMS agency.

**Hypothesis**—Interventions such as the NAEMT EMS Safety Course will positively affect staff attitudes regarding a culture safety at the agency studied.

**Methods**—This IRB-approved research was conducted at a health system-based EMS interfacility transport agency that operates in three states. The front-line field staff and supervisory personnel were participants in the study. The research was structured to deliver a pre-intervention assessment (n=141), which was the EMS Safety Attitudes Questionnaire (EMS-SAQ) prior to the delivery of the NAEMT’s EMS Safety Course, which was mandatory for all levels of the organization. The EMS-SAQ measured six domains of EMS safety: safety climate, teamwork climate, perceptions of management, job satisfaction, working conditions and stress recognition. Approximately one year later, all remaining field staff were brought back together (n=128) and given the EMS-SAQ as a post-intervention assessment to gauge for changes either positive or negative.

**Results**—The results of the post-intervention survey showed there was a positive difference in two of the six domains of EMS safety: (overall) safety climate and stress recognition. The largest drop in scores was in the domain of perceptions of management, which is theorized to be due specific actions during the implementation process.

**Conclusion**—Post-assessment scores indicate the need for proper implementation and true management buy-in of the process when implementing an EMS safety program within an EMS agency. Observation of the rollout process during the year between assessments provided valuable context into the process giving other EMS leaders a true “lessons learned” approach for implementation within their agency.

**Blunt Traumatic Circulatory Arrest Is Not Always Fatal: Evidence for Immediate Lifesaving Intervention in the Prehospital Environment**

*Author: Kenneth Conner*

*Associate Authors: Brian Estridge, MD, Stephen Harper, MD, David Miramontes, MD, David Wampler, PhD, LP*  

**Introduction**—Blunt traumatic circulatory arrest (BTCA) has been shown to have a grim prognosis. Due to the dismal survival rates, resuscitation of patients who suffer BTCA is often availing and thought to be an inefficient use of resources. However, emergency medical services personnel can perform some lifesaving interventions that may rapidly restore circulation. Establishment of a basic airway, stopping of exsanguinating
hemorrhage and decompression of tension physiology have all been shown to be potentially lifesaving. The goal of this study was to characterize the survivors of BCTA from a large urban EMS system.

**Methods**—A two-year retrospective chart review from a single large urban EMS system was performed. Inclusion criteria was patients suffering BCTA where resuscitation included transport to the hospital. Exclusion criteria included children, arrest due to mechanism other than BCTA and patients for whom resuscitative efforts were terminated prior to transport. The primary outcome was survival to hospital discharge. Secondary outcomes were patient demographics, mechanism of injury and lifesaving interventions performed.

**Results**—Of the 44 patients included in this study, only one (2.3%) survived to hospital discharge. The survivor was involved in a motor vehicle collision, a similar mechanism for all our study subjects (either MVC or MVC vs. pedestrian). Nine of the patients underwent emergency department resuscitative thoracotomy, and seven made it to the operating room for surgery. The survivor received a prehospital advanced airway and bilateral needle thoracotomy, resulting in return of pulse. Trauma center treatments included resuscitative thoracotomy with chest tube placement, blood transfusion and surgery. After 49 days in the hospital, the survivor was discharged to a rehabilitation facility with quadriplegia and had a cerebral performance category of 2.

**Conclusion**—Although the survival rate of those suffering BCTA is extremely low, there is still evidence that interventions can quickly reverse immediate life threats. Of these interventions, airway establishment and thoracotomy are potentially immediate lifesaving in BCTA.

**Disparities in Prehospital Pain Control Among the Hispanic/Latino Population in North Carolina**

**Author:** Joe Davis, EMT  
**Associate Authors:** Jacob Jones, EMT-P, Melisa McNeil, MHS, EMT-P, Michael Hubble, PhD, MBA, NRP

**Introduction**—Previous studies suggest socioeconomic disparities in pain control among emergency department and prehospital patients, including age, race and gender. However, such disparities have not been thoroughly investigated on a statewide basis among prehospital Hispanic/Latino trauma patients.

**Objective**—To quantify paramedic narcotic administration rates among Hispanic/Latino trauma patients.

**Methods**—A retrospective observational study of prehospital pain control using the North Carolina Prehospital Care Reporting System (PREMIS) data from July 1, 2012 to Dec. 31, 2012. Inclusion criteria consisted of adult (≥16) trauma patients with an initial pain score ≥7 which required narcotic analgesia per treatment protocols. The analgesics of interest included hydrocodone, morphine sulfate, hydromorphone, meperidine or fentanyl. Logistic regression was used to calculate the adjusted odds ratio (OR) for racial/ethnic variation (Caucasian, Hispanic/Latino, non-Hispanic/Latino minority) in the likelihood of narcotic administration while controlling for the potentially confounding variables of patient age, blood pressure, respiratory rate and GCS.

**Results**—A total of 15,121 patients met the inclusionary criteria. Of these, 44.5% were male, 70.2% Caucasian, 1.9% Hispanic/Latino, and 27.9% non-Hispanic/Latino minority. Overall, 28.0% of the sample received a narcotic analgesic. The mean age was 49.0 (±21.3), and the mean pain score was 8.8 (±1.1). Compared to Caucasians, Hispanic/Latino patients were significantly less likely to receive narcotic analgesia (OR 0.59, p<0.01), whereas the disparity was even more pronounced in non-Hispanic/Latino minorities (OR 0.43, p<0.01). Additionally, females were less likely to receive narcotics than males (OR 0.75, p<0.01). Narcotic administration was more likely with increasing pain scale ratings (OR 1.54, p<0.01).

**Conclusion**—This study found similar disparities in North Carolina prehospital pain management practices among trauma patients as smaller regional studies have suggested in regards to race and gender. Additional investigation is warranted to determine the rationale for low rates of narcotic administration and the lower rates among minorities and females in particular.

**The Frequency and Success Rate of Procedures Performed on Trauma Patients in the Prehospital Setting**

**Author:** Zachary Gant, EMT  
**Associate Authors:** Justin Stevenson, EMT, Melisa McNeil, MHS, EMT-P, Michael Hubble, PhD, MBA, NRP

**Introduction**—Prehospital providers respond regularly to victims of trauma, administering care and treatment. Treatment and performed procedures vary geographically due to changes in protocol and differing transport times. Not all procedures are performed frequently, and success rates may vary.

**Objective**—To perform a statewide, population-based retrospective study to determine the frequency and success rate of procedures performed on trauma patients in the prehospital setting.

**Methods**—A retrospective observational study of prehospital procedure frequency and success rate using the North Carolina Prehospital Care Reporting System (PREMIS) data from July 1, 2012 to December 31, 2012. All patients were included in the study. The procedures of interest included Combitubes, King
Airways, LMA, nasotracheal intubation (NTI), endotracheal intubation (ETI), rapid sequence induction (RSI), needle cricothyrotomy, surgical cricothyrotomy, decompression, peripheral venous access (IV), external jugular access (EJ), femoral access, adult and pediatric intraosseous (IO) access, pleural decompression, MAST application, spinal immobilization, basic splinting, traction and hemostatic wound care.

**Results**—A total of 115,764 patients were included in the study. Of these, 47.8% were male, 64.5% were Caucasian, 42.3% suffered blunt trauma, and the average age was 48 years. Airway procedure attempts and success rates were as follows: Combitube (13, 76.9%), King Airways (153, 88.9%), LMA (22, 100%), NTI (16, 50%), ETI (480, 72.9%), RSI (167, 89.2%), needle cricothyrotomy (9, 88.9%) and surgical cricothyrotomy (5, 100%).

Vascular access attempts and success rates were as follows: IV (37,708, 88.8%), EJ (25, 76%), femoral access (132, 98.4%), adult IO (280, 91.8%) and pediatric IO (169, 93.5%). Additional procedures were examined for performance frequency and included pleural decompression (102), MAST application (424), spinal immobilization (32,717), basic splinting (4,770), traction splint (173) and hemostatic wound care (90).

**Conclusion**—Prehospital procedures vary greatly in the frequency with which they are performed and their associated success rates. Additional research is needed to determine the impact continuing education may have on frequency and success rates of procedures performed in the prehospital setting.

**Cardiac Arrest Etiology and Rearrest Occurrences in the Prehospital Setting**

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*Associate Authors: Delaney Garris, EMT, Michael Penland, EMT, Roberto Vaca, EMT, Mohammad Alqarni, EMT, Denise Wilfong, PhD, NRP, Michael Hubble, PhD, MBA, NRP*

**Introduction**—Numerous studies have investigated rearrest in the prehospital setting and its EMS response time, on-scene treatment and associated cardiac rhythms. However, etiology of the cardiac arrest has not been considered.

**Objective**—This study aims to determine the relationship between cardiac arrest etiology and rearrest in the prehospital setting.

**Methods**—The authors conducted a retrospective observational study of cardiac arrest using the North Carolina Prehospital Medical Information System (PREMIS) and the Emergency Medical Services Performance Improvement Center (EMSPIC). Adults (>18 years) with cardiac arrest of cardiac, respiratory or trauma etiologies occurring between Jan. 1, 2012 and June 30, 2014 and who attained ROSC were included. Chi square tests were used to analyze the relationships between cardiac arrest etiology and the likelihood of rearrest in the prehospital setting. A multivariate logistic regression model calculated the odds ratio (OR) of cardiac arrest etiology while controlling for potentially confounding variables.

**Results**—Of the 4,818 patients meeting the inclusionary criteria, 59.7% were male, 34.7% were non-Caucasian, 30.4% presented with a shockable rhythm, and 52.8% received bystander and/or first responder CPR. Cardiac was the most frequent etiology (84.7%), followed by respiratory (12.6%) and trauma (2.7%). The mean patient age was 65.2 (±16.0) years and the mean EMS response time was 7.4 (±4.1) minutes. Overall, 27% of patients rearrested. The likelihood of rearrest increased by 4% for each minute of prehospital response time (OR 1.043, p=0.001), and males were more likely to rearrest than females (OR 1.417, p=0.003). Arrest etiology, age, minority status, witnessed arrest, initial rhythm and bystander CPR were statistically insignificant.

**Conclusion**—Cardiac arrest etiology does not appear to influence the likelihood of rearrest. Additional research is needed to better identify predictors of rearrest.

**Demonstration of a Perception “Gap” in Public Disaster Preparedness**

*Author: Joshua Bobko, MD*

*Associate Author: Mrinal Sinha, BA, Stephanie Torrez, BS*

**Introduction**—Following the massacre at Sandy Hook Elementary, academic consortiums and government groups alike have started making recommendations for improving outcomes to violent events. Recently these efforts have gained public and private funding and begun mass media campaigns. In this study we sought to perform the first evaluation of whether this effort is reflected in public awareness.

**Methods**—This study group comprised a cross-sectional public demographic that completed a 15-question survey. Surveys were completed in an academic environment. Topics included the participant’s understanding of trauma injuries, recommended interventions and subjective evaluation of disaster preparedness. Participants were also asked to identify whether they were licensed medical providers or had prior medical training.

**Results**—Two hundred-fifty surveys were completed. Of these, 69.2% indicated “calling 9-1-1” would be their “[primary] concern immediately following a disaster or emergency situation.” Approximately 5.2% indicated “treating victims” as their first priority, while 25.6% indicated “fleeing the area” or “ensuring personal safety.” While 64.7% correctly identified trauma as the leading cause of death in the population ages 1–44, only 78.5% of this group correctly identified exsanguination as a “pre-
ventable” cause of death in trauma. Also significantly, 100% of respondents stated they had previously attended a “disaster management” training presentation, yet more than 80% indicated that they were “not prepared” or only “somewhat prepared” for disaster events.

Conclusion—This small cross-sectional survey demonstrates a disconnect with the public’s perception of mortality in disasters. Despite 100% of those surveyed indicating having participated in some form of disaster training, 80% indicated they were “not prepared” or only “somewhat prepared” for an emergency. A significant number of participants did not identify trauma as a leading cause of death in either the young adult or pediatric population, and approximately half identified exsanguination as a “preventable” cause of death. Clearly currently available disaster training is inadequate, as a majority of those surveyed listed “calling 9-1-1” as their primary responsibility in an emergency. The results suggest the need for alternative methods to improve awareness of the morbidity and mortality associated with mannmade and natural disasters.

**Probability of Resuscitation of Sudden Cardiac Arrest Score for the Evaluation of Cardiac Arrest Outcomes**

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**Introduction**—Evaluation of paramedic care, particularly regarding out-of-hospital cardiac arrest (OHCA) patients, is an integral part of any EMS system. Quality management tools are needed for benchmarking that control for individual patient, scene and EMS response factors. However, no such standards exist that would enable an EMS system to compare actual to predicted field resuscitation outcomes.

**Objective**—To develop a predictive model of the probability of resuscitation of sudden cardiac arrest (pROSC) score based on patient, scene and EMS response factors that could be used to evaluate EMS system performance.

**Methods**—All adult OHCA patients in the North Carolina Prehospital Medical Information System (PREMIS) database from January 2012 to June 2014 who received resuscitative efforts were randomly divided into model development and validation data sets of equal proportions. Using the development data set, a logistic regression was used to identify predictors of field resuscitation, which was defined as return of spontaneous circulation. pROSC was defined as 1/(1 + e-x), where x is the weighted sum of the independent predictors from the logistic regression equation. Using the validation data set, an area under the receiver operating characteristic (AUROC) curve analysis was used to assess the accuracy of the pROSC model.

**Results**—A total of 11,503 patients met inclusionary criteria. Factors influencing pROSC included male gender (-0.12); Caucasian race (-0.19); age (-0.002 per year); traumatic (-0.57) and respiratory (0.54) causes of arrest; asystole (0.36); PEA (0.83) and VF or VT (1.29) as presenting ECG rhythms; layperson- (0.45) or healthcare provider (0.70)-witnessed arrest; EMS response time (-0.05 per minute); and bystander/first responder CPR (0.68). The AUROC of the validation set for pROSC was 0.71 (p<0.01).

**Conclusion**—The pROSC score predicts the outcome of field resuscitation efforts with moderate accuracy using variables that are easily measured. Such predictions can be used to assess the quality of EMS performance by comparing actual to expected outcomes. In addition, the pROSC score could potentially be used for risk-adjusting patients in future studies of OHCA. Further studies are needed that use national data and incorporate additional variables, such as comorbidities and prearrest medications, to improve predictive accuracy.

**The Effect of Etiology of Arrest on the Probability of Attaining ROSC Among Patients Presenting With Pulseless Electrical Activity**

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**Introduction**—Numerous studies have investigated factors affecting the likelihood of return of spontaneous circulation (ROSC) in out-of-hospital cardiac arrest (OHCA). One of the factors associated with ROSC is a shockable presenting rhythm whereby patients presenting in VF/VT have a higher likelihood of ROSC compared to patients presenting with asystole or PEA. However, little is known about the factors affecting the likelihood of ROSC among the subset of patients initially presenting in PEA.

**Objective**—This study seeks to identify the relationship between ROSC and arrest etiology for patients with a presenting rhythm of PEA.

**Methods**—The authors conducted a retrospective analysis of cardiac arrest using data from the North Carolina Prehospital Medical Information System (PREMIS). Inclusionary criteria were adult patients (≥18 years) who suffered cardiac arrest with an initial rhythm of PEA between January 2012 and June 2014. Multivariate logistic regression calculated the odds ratio (OR) of ROSC for cardiac arrest patients in PEA for etiologies of drowning, electrocution, cardiac, respiratory and trauma, while controlling for...
the potentially confounding variables of patient age, gender and minority status; layperson/first responder CPR; EMS dispatch to pressor administration interval; and witnessed arrest.

**Results**—Of the 1,894 patients meeting the inclusionary criteria, 59.2% were male, 37.9% were non-Caucasian, and 45.6% received bystander and/or first responder CPR. Cardiac was the most frequent etiology (75.8%), followed by respiratory (17.1%), trauma (6.9%), drowning (0.2%) and electrocution (0.1%). The mean patient age was 66.7 (±16.4) years, and the mean EMS response time was 7.8 (±4.1) minutes. Overall, 50.1% of patients attained ROSC. The likelihood of ROSC decreased by 3% for each minute of delay in epinephrine administration (OR 0.97, p<0.01). ROSC was more likely with layperson/first responder CPR (OR 1.64, p<0.01). Compared to traumatic arrests, arrests of cardiac (OR 1.85, p<0.01) and respiratory (OR 3.35, p<0.01) etiologies were more likely to attain ROSC. Age, gender, minority status, witnessed arrest and drowning and electrocution arrest etiologies were not statistically significant predictors of ROSC.

**Conclusion**—Cardiac arrest etiology is a statistically significant predictor of ROSC for patients presenting in PE. Compared to traumatic arrests, arrests of cardiac and respiratory etiologies were more likely to attain ROSC.

**Paramedic Out-of-Hospital Cardiac Arrest Case Volume as a Predictor of Return of Spontaneous Circulation**

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**Introduction**—Many factors contribute to the survival of out-of-hospital cardiac arrest (OHCA). These factors include the quality of resuscitation efforts, which in turn may be a function of OHCA case volume. However, few studies have investigated the OHCA case volume-survival relationship. Consequently, we sought to develop a model describing the likelihood of return of spontaneous circulation (ROSC) as a function of paramedic cumulative OHCA experience.

**Hypothesis**—The likelihood of ROSC increases with greater paramedic OHCA experience.

**Methods**—The authors conducted a statewide retrospective study of cardiac arrest using the North Carolina Prehospital Care Reporting System (PREMIS). Adult patients suffering a witnessed, nontraumatic cardiac arrest between January 2012 and June 2014 were included. Using logistic regression, an adjusted odds ratio was calculated for the influence of the preceding five-year paramedic OHCA case volume on ROSC while controlling for the potentially confounding variables identified a priori as patient age, gender and non-Caucasian race; shockable presenting rhythm; layperson/first responder CPR; and EMS response time.

**Results**—Of the 6,405 patients meeting inclusion criteria, 3,155 (49.3%) experienced ROSC. ROSC was more likely among patients treated by paramedics with ≥15 OHCA experiences during the preceding five years (OR 1.21, p<0.01). ROSC was also more likely among patients with shockable initial rhythms (OR 2.35, p<0.01) and who received layperson/first responder CPR (OR 1.77, p<0.01). Increasing patient age (OR 0.996, p=0.02), male gender (OR 0.742, p<0.01) and increasing EMS response time (OR 0.954, p<0.01) were associated with a decreased likelihood of ROSC. Non-Caucasian race was not an independent predictor of ROSC.

**Conclusion**—The study found a paramedic five-year OHCA case volume of ≥15 is significantly associated with ROSC. Further study is needed to determine the specific actions of these more experienced paramedics that are responsible for the increased likelihood of ROSC, as well as the influence of case volume on the longer-term outcome measures of survival to hospital discharge and neurological function.

**Effect of Organizational Commitment on the Relationship Between Job Satisfaction and Intent to Leave in EMS**

*Author: David Miles, PhD, EMT-P, NCEE*

**Introduction**—This research investigates the relationship between job satisfaction and an EMS provider’s intent to leave his or her current position (ITL-Job). Organizational commitment has been proposed as a mediator of the relationship between job satisfaction and ITL-Job. Pay was proposed as a possible moderator in the relationship between organizational commitment and ITL-Job, theorizing from the literature that lower levels of pay would produce lower levels of organizational commitment.

**Hypothesis**—A theoretical model developed from the literature was proposed and two hypotheses put forward to test: HI) Organizational commitment mediates the negative relationship between job satisfaction and intent to leave the job for EMS providers; and H2) pay negatively moderates the relationship between organizational commitment and ITL-Job (i.e., the lower the level of pay, the lower the level of organizational commitment).

**Methods**—The instrument administered incorporated the following components: demographic questions; NREMT LEADS compensation and nonresponder follow-up surveys; Minnesota Satisfaction Questionnaire (MSQ); Organizational Commitment Questionnaire (OSQ); and Intent to Leave Instrument (O’Reiley). Surveys were sent electronically to about 2,000 EMS providers in Virginia and North Carolina. Missing cases were excluded, leaving approximately 330 responses for analysis.

**Results**—The results of the study indicate that organizational
commitment is, in fact, a partial mediator of the relationship between job satisfaction and ITL-Job (H1 accepted) and that pay did not moderate the relationship in this research between organizational commitment and ITL-Job (H2 rejected).

**Conclusion**—The commitment of an EMS provider to his or her organization affects the decision of EMS providers who might be considering leaving a position or the profession. Leadership in EMS should pay particular attention to the results since their actions and influences are critical to the impression that EMS providers have of their organizations. As Marcus Buckingham stated, “People leave managers, not companies.”

**The Effects of a Multipatient Trauma Incident on the Probability of Treatment Intervention**

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**Introduction**—Multicasualty incidents (MCIs) can be taxing on EMS resources and personnel. In the setting of an MCI, a given patient’s probability of receiving a treatment intervention could differ due to simple time and resource constraints imposed on emergency responders.

**Objective**—To identify potential differences in treatment interventions between patients involved in a multipatient incident and those involved in a single-patient incident.

**Methods**—Multivariate logistic regression models were estimated using prehospital trauma data from the North Carolina Prehospital Medical Information System (PREMIS) from July 1, 2012 through December 31, 2012. Inclusionary criteria captured patients with a potential injury, treated and transported by EMS, and at least 18 years of age. The analyses excluded patients who experienced cardiac arrest.

**Results**—A total of 70,284 patients met the inclusionary criteria. Of these, 5,194 (7.4%) patients were involved in an MCI, while 65,090 (92.6%) patients were involved in a single-patient incident. Patients involved in a multipatient incident were 48% less likely to receive oxygen (OR 0.5178, p<0.001); 66% less likely to receive spinal immobilization (OR 0.3402, p<0.001); 51% less likely to receive a 12-lead ECG (OR 0.4899, p<0.001); 27% less likely to receive spinal immobilization (OR 0.7349, p<0.001); 76% less likely to receive morphine (OR 0.2408, p<0.001); and 58% less likely to receive fentanyl (OR 0.4173, P<0.001) compared to patients involved in a single-patient incident.

**Conclusion**—Analysis found that patients involved in an MCI were less likely to receive many treatment interventions (such as oxygen, spinal immobilization, IV attempt, fentanyl, morphine and 12-lead ECG).

**Teaching the eFAST Examination to Prehospital Providers: A Simulation-Based Point-of-Care Ultrasound Course**

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**Introduction**—In recent years the use of portable ultrasound has become a growing trend in EMS. There is increasing evidence for the use of point-of-care ultrasound (POCUS) by prehospital providers in the management of critically ill patients. Few institutions offer formal training in POCUS for EMS personnel. Our goal in this study was to evaluate the effectiveness of an innovative, hands-on POCUS course for paramedics and flight nurses who work in the prehospital setting.

**Methods**—The authors developed a one-day course incorporating didactic lectures, hands-on ultrasound scanning on standardized patients, simulation-based ultrasound cases and a final exam (played as a game of knowledge). The course was developed by subject matter experts in POCUS, emergency medicine, EMS and medical education and simulation. Before taking the class, participants were asked to complete e-learning modules on “Fundamentals of Ultrasound” and the “Extended Focused Assessment with Sonography for Trauma” (eFAST) utilizing the SonoSim platform (Santa Monica, Calif.). The participants were assessed with validated pre- and post-course examinations that included ultrasound image interpretation. Data were analyzed with a paired samples t-test using SPSS, v.24.

**Results**—Data from 37 participants who attended the course from February to July 2017 were analyzed. The participants were paramedics or flight nurses from 17 agencies throughout the United States. The average age of the participants was 40.2 years, and 37% of learners were female. There were 34 paramedics, two nurses and one physician. The mean pretest score was 65.8%. The mean post-test score was 87.0%, an improvement of 21.2 percentage points. The increase from precourse to postcourse assessment was statistically significant (p<.0001).

**Conclusion**—The early recognition of potentially life-threatening conditions in the prehospital setting is critical for providing appropriate care and timely management. In this context the training of EMS personnel to perform POCUS could have a major impact on patient care. Our data show that a one-day training course incorporating e-learning and simulation has a significant impact on theoretical knowledge and image recognition.
Predicting Response to Naloxone in Patients With Respiratory Depression in the Prehospital Setting

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Introduction—The authors sought to determine the utility of using levels of expired EtCO2 in the prehospital setting as a criterion for determining response to naloxone in patients with respiratory depression and comparing EtCO2 to current prehospital criteria that use Glasgow Coma Scale score as an indication for treatment.

Methods—This was a retrospective analysis of prospectively collected prehospital EMS data from a single EMS agency in Orange County, Fla., from January 2011 to December 2015. Patients included all patients given naloxone in the prehospital setting by paramedics for respiratory depression defined as a respiratory rate (RR) of <10 breaths/min. The current paramedic protocol by this agency uses a GCS score <12 as criteria to administer naloxone. The main outcome measure was the success of naloxone administration in reversing respiratory depression by increasing RR by ≥10 breaths/min. Data were adjusted to account for the dose of naloxone used. Logistic regression and ROC curve analysis were conducted and expressed using 95%CI.

Results—Of the 608 cases initially identified, 185 cases had both EtCO2 and GCS recorded and were included in the analysis. The mean patient age was 48 (SD 19). The mean dose of naloxone administered was 1.6 mg (maximum 10 mg), and the routes of administration included IV in 126 (68%), IO in 29 (16%), IM in 4 (2%) and nasal/oral in 26 (14%). Naloxone reversed respiratory depression in 106 (57%) of cases. The area under the ROC curve for predicting response to naloxone using EtCO2 was 0.72 (95% CI, 0.64–0.80), using GCS score was 0.57 (95% CI, 0.49–0.66) and using a dose of naloxone was 0.51 (0.43–0.60). The optimal cut point for EtCO2 was determined to be 35. Adjusted odds ratios for successful reversal by naloxone by using a criteria of EtCO2 >35 mmHg was 6.6 (95% CI, 3.4–13.0), for GCS <12 was 0.7 (95% CI, 0.2–2.7) and for dose of naloxone 1.3 (95% CI, 0.8–2.1).

Conclusion—Controlling for dose of naloxone, EtCO2 was a better predictor of response to naloxone than GCS score in a prehospital population with respiratory depression.

Best Research and Oral Presentation Which Cardiac Experiences Are Best for Paramedic Student Success? Do Hospital Exposures Do More Harm Than Good?

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Introduction—Clinical placements are increasingly hard to obtain, and optimizing paramedic student learning experiences is critical. This study explores the relationship between paramedic students’ exposure to cardiac patients during field, clinical and laboratory settings and odds of success on final comprehensive cognitive exams.

Methods—A retrospective analysis of student records in the Fisdap, an online database for EMS and health care education, was conducted using paramedic students with at least one score on a comprehensive cognitive exam. Success on comprehensive cognitive exams was defined as achieving a score at or above the suggested Angoff method of determining a passing score. Logistic regression models were fitted (alpha=0.05) using predictor variables: adult cardiac patients in field, and clinical and laboratory settings encountered before taking examinations. Ethics approval was granted by the University of the Sunshine Coast, Australia.

Results—A total of 1,290 student records with 157,971 cardiac patients and 2,150 Fisdap comprehensive cognitive exams (1094 PRE3, 489 PRE4, 567 CUE) attempts were analyzed. Field encounters of cardiac patients increased the odds of passing all three comprehensive cognitive exams: PRE3 Overall (OR 1.051), PRE3 Cardiac (OR 1.037) and CUE (OR 1.032). Laboratory simulation encounters also increased the odds of passing comprehensive cognitive exams: PRE4 Cardiac (OR 1.031) and CUE (OR 1.028). Clinical encounters had no observed effect on passing PRE3 and PRE4 and decreased the odds of passing the CUE (OR 0.964).

Conclusion—Field and laboratory cardiac patient encounters improved the odds of paramedic students passing comprehensive cognitive exams. Hospital clinical encounters either had no effect or a detrimental effect on odds of success. Paramedic programs should consider prioritizing field and laboratory cardiac patient encounters. Further research is needed to determine the utility of hospital placements.
The Big Flipping Question: Do Students Who Participate in a Flipped Classroom Model Perform Better Than Those in a Traditional Lecture-Style Model on Cognitive Exams?

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Introduction—Flipped classrooms—in which lectures are watched at home as homework and skills and content are done in the classroom—are believed by some to enhance student-teacher interaction, satisfaction and feedback. Evidence from other disciplines reports improved student learning in a flipped setting; however, no examples were found relating to the EMS classroom. The UCLA Flipped Classroom Project compared a traditional lecture-style delivery of obstetrics content to a flipped classroom delivery by measuring and comparing cognitive competency via examinations.

Hypothesis—Students assigned to the flipped classroom method will score higher on cognitive exams than students in a traditional lecture setting.

Methods—EMT programs from 12 educational institutions across the United States self-identified to participate in the study. Students under 18 were excluded. Students were randomly assigned to the control group, which received traditional lecture-style presentation, or the experimental group, which received a flipped classroom delivery. The flipped classroom used similar material online via Jones & Bartlett Navigate 2, followed by specific interactive learning activities in the classroom. After completion both groups of students took the 75-question Fisdap OB/Peds unit exam (KR-20 0.86). Differences in means between experimental and control groups were calculated via independent sample t-tests of the scores between experimental and control groups using SPSS.

Results—In all, 11,201 patients met inclusion criteria for this study. ETI was attempted in a statistically higher percentage of cases in which the patient was found in an initial rhythm of VT (66.0% of cases) in comparison to both v-fib (59.2% of cases, p = 0.002) and asystole (55.0% of cases, p = 0.001). The percentage of patients intubated by students is statistically significantly higher for VT (70.7%) than for both asystole (64.9%, p = 0.002) and v-fib (63.0%, p = 0.005). There were no statistically significant differences between asystole and v-fib with respect to ETI.

Initial Presenting Cardiac Arrest Rhythms and Paramedic Preceptor Decisions to Intubate

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Introduction—In cardiac arrest patients, anecdotal evidence suggests paramedic preceptors encourage their students to perform high-risk procedures, such as advanced airway management (ETI), in situations when the outcome is less likely to be successful. This study attempted to determine whether the presenting rhythm of a patient found in cardiac arrest influences the preceptor’s decision to allow the student to perform endotracheal intubation.

Hypothesis—Paramedic students are performing more ETI attempts on patients found in asystole as compared to ventricular fibrillation (VF) or ventricular tachycardia (VT).

Methods—Data were analyzed from January 1, 1999 to February 13, 2017 from Fisdap, an online database for EMS and healthcare education. Criteria for inclusion were: 18 years and older, presented in nontraumatic cardiac arrest, and an initial electrical rhythm of asystole, VF or VT in which ETI was attempted. SPSS was used for statistical analysis.

Results—in all, 11,201 patients met inclusion criteria for this study. ETI was attempted in a statistically higher percentage of cases in which the patient was found in an initial rhythm of VT (66.0% of cases) in comparison to both v-fib (59.2% of cases, p = 0.002) and asystole (55.0% of cases, p = 0.001). The percentage of patients intubated by students is statistically significantly higher for VT (70.7%) than for both asystole (64.9%, p = 0.002) and v-fib (63.0%, p = 0.005). There were no statistically significant differences between asystole and v-fib with respect to ETI.

Conclusion—ETI is more likely to be performed on cardiac arrest patients presenting in VT as opposed to asystole or VF. The paramedic student is more likely to perform the intubation intervention (rather than the preceptor) when an adult patient presents in VT. The theory for this study could not be proven.

Seeing Is Believing: Using Point-of-View Glasses to Provide Clinical Simulation Feedback

Author: Linda Ross, MHlthProfEd

Introduction—Research has highlighted the importance of effective feedback to enhance learners’ ability to reflect and improve. The objective of this study was to identify student perceptions of using point-of-view video glasses in providing feedback following clinical simulation.
**Methods**—A cross-sectional methodology incorporating a paper-based survey was used. Paramedic students were provided with point-of-view video glasses during clinical simulations. Following the simulations students were asked to view the video and provide a self-critique of their performance to supplement facilitator feedback. Students were later asked to complete a questionnaire on their perceptions of using video glasses for feedback and reflection. The survey consisted of demographic and Likert scale questions.

**Results**—Data analysis of participant responses (n=69) found that students agreed/strongly agreed that video footage of their simulation helped them identify issues or events they were otherwise unaware of (68.1%); weaknesses (66.7%); and strengths in their performance (66.7%). Students also agreed/strongly agreed that the footage helped them reflect on communication skills (73.5%) and overall performance (77.9%).

**Conclusion**—The results suggest students positively perceive the use of point-of-view video glasses for post-clinical simulation feedback and reflection. It has yet to be determined if the glasses have a positive influence on learning and future performance.

**Bodybuilding: An Anatomical Model Project in Paramedic Education**

*Author: Alan Batt, MSc, GradCertICP*

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**Introduction**—Anatomy is not sufficiently taught through books or handouts alone. The best method to teach anatomy continues to be widely debated. Previous research conducted mainly with medical students supports a model building exercise to improve anatomy knowledge retention. This research study investigated students’ perceptions on using model construction as a means to learn anatomical structures.

**Methods**—Paramedic students were assigned to groups, and each group was given an anatomical model to construct. These models were required to be 1) anatomically correct, and 2) useful as a teaching aid. Their perceptions of 3D modeling software and self-directed learning materials were also investigated.

**Results**—The survey had a 48% (n=22) response rate completing it in full. The majority of respondents (73%, n=16) enjoyed the model building and found it interesting. Half (n=11) of respondents indicated it affected their normal studying habits. Its utility in teaching and reinforcing anatomical knowledge appears questionable, with only 9 (41%) respondents indicating they found it useful for that. However, more than 90% (n=20) agreed it was useful in aiding them to visualize anatomy in 3D. A majority (73%, n=16) indicated it was easy to work within a group to build the model. The use of additional learning resources such as 3D anatomy software and podcasts varied among the respondents.

**Conclusion**—The results indicate that this is a potentially useful exercise in helping students to learn anatomy. The utility of this exercise in promoting teamwork and student collaboration appears to be encouraging. Suggestions to improve the assignment included a demonstration session of all models to aid understanding and the ability to pick groups rather than being assigned.

**Time for a Paradigm Shift in Paramedic Education?**

*Author: Frank Keane, BA Dip, EMT*

*Associate Author: Mark Dixon, BSc, MSc*

**Introduction**—For paramedics there is an ever-increasing extension of skills associated with their work. However, conventional didactic, protocol-driven theories dominate paramedic training. Transitioning to modern educational methodologies such as problem-based learning (PBL) has begun being accepted in similar healthcare professions. This study looked at such a process with an undergraduate paramedic cohort in Ireland’s University of Limerick (UL) and prescribes alternatives for paramedic education.

**Methods**—Willis, et al. (2003) document a system using PBL methodology, which remains static in its delivery over the educational timeframe. UL paramedic studies have developed this further in an escalating format in which students assimilated three stages of PBL development. Electronic cases were offered describing patient signs and symptoms; students then worked via differential diagnosis, evidence-based medicine and proposed treatment regimens to identify the morbidity and management plan. With familiarity, the complexity escalates as below:

1. Conventional case-based format with drip-fed information and development.
2. Video-driven scene development and research.
3. Student-driven cases without reference to external media.

Cases cover the range of the educational syllabus with required learning objectives achieved through critical thinking, assimilation of resource knowledge and sound group synergy.

**Results**—Post-program evaluation in the form of interviews, a group discussion and satisfaction survey demonstrates the overwhelming preference for PBL over conventional didactic lecture-based formats. This is matched by improved grade point average scores.

**Conclusion**—It is the opinion of the authors that a dynamic PBL model for paramedic education facilitates paramedic students in taking true ownership of their education.
**Paramedic Student Treatment of Intrapartum Pain**

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**Introduction**—There is a dearth of literature concerning out-of-hospital management of intrapartum pain by paramedics, and EMS drug therapy protocols offer little advice to guide administration. Although obstetric cases might often be uncomplicated, when complications do occur they can pose significant risk to the mother and baby if not properly managed. Safe management of childbirth by paramedics requires appropriate curriculum design and training opportunities. A lack of time spent on obstetrics within the curriculum has contributed to a lack of confidence among paramedics while managing obstetric cases (Dawson et al., 2003).

Data from the National EMS Information System (NEMSIS) in 2015 shows 136,370 (0.45% overall responses) obstetric cases attended by paramedics, with 65.4% reporting pain as the primary complaint. Risks of administering systemic analgesics during labor include maternal sedation and respiratory depression, loss of protective airway reflexes, and neonatal depression (Anderson, 2011). The aim of this study was to determine the frequency of obstetric in-field calls attended by student paramedics; to determine the proportion of patients receiving pharmacological pain relief; and to report the type of analgesia administered.

**Methods**—A retrospective review of data from Fisdap, an online database for EMS and healthcare education, between 1999 and 2016. Inclusion criteria included calls related to obstetrics, including labor or childbirth with pain relief. Descriptive analysis and chi square tests and phi correlations were used to test associations between variables.

**Results**—Data from Fisdap had 27,778 obstetric cases attended by student paramedics, with 577 (2.08%) receiving a narcotic analgesic [fentanyl (n=314), morphine (n=207), hydromorphone (n=53), meperidine n=3)]. For non-opioid administration, 82 (0.30%) received a “non-opioid” analgesic [ketamine (n=1), ketorolac (n=16), aspirin (n=56), acetaminophen (n=4), ibuprofen (n=2), nitrous (n=3)].

**Conclusion**—The number of obstetric-related responses indicates that these calls represent a small proportion of the case load. This study found that administration of analgesics is low, but there was no significant correlation between analgesic administration and pain. The data used in this study do not indicate how many patients requested pain relief but were refused, and we are unable to explain the low rate of analgesic administration. These questions require further investigation.

**Developing Paramedic Awareness and Interpersonal Communication with Aphasic Patients**

*Author: Linda Ross, MHealthProfEd*  
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**Introduction**—Aphasia is an acquired language impairment that can affect a person’s ability to speak, understand others, read, write and perform other cognitive processes. Providing healthcare students with communication skills training will significantly improve their ability to establish rapport and obtain relevant information from people with aphasia. Paramedics could encounter people experiencing a stroke or who have aphasia from a previous stroke or medical condition. This study evaluated the effectiveness of an interactive activity with real aphasic patients designed to improve paramedic student knowledge, familiarity and communication ability.

**Methods**—This pilot study utilized mixed methods incorporating an interventional study design. Paramedic students participated in an engagement activity with independently living people who have varying degrees of aphasia. Pre- and post-questionnaires and focus groups were used to evaluate the project.

**Results**—Eight third-year undergraduate paramedic students participated in this study; of the students, 75% were male, and the mean age was 24.5. The pre-activity survey found 50% (n=4) had never heard of aphasia or were not sure about its causes or symptoms. Before the activity all rated their knowledge at neutral or low, and seven (88%) rated their confidence as neutral or low. Post interaction, six (75%) rated their knowledge and confidence as high. Students commented they gained greater understanding of the use of communication aids and the need to allow patients time to respond.

**Conclusion**—Results suggest a successful pilot program from which paramedic students increase their knowledge and awareness of aphasia and increase their confidence and ability to communicate effectively with these patients.

**Influence of Simulation Team Leads on Paramedic Student Cognitive Exam Scores**

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**Introduction**—The National Registry of EMTs now requires paramedic graduates to demonstrate skill competency through completion of a psychomotor competency portfolio which includes simulated team leads. This study examined the rela-
tionship between the number of simulated team leads (STLs) performed in lab and students’ cognitive exam scores as measured by the Fisdap PRE3 exam.

**Hypothesis**—Performance of higher numbers of STLs will positively influence summative cognitive exam scores.

**Methods**—Retrospective data were obtained from Fisdap, an online database for EMS and healthcare education, for “lab”-identified team leads between March 1, 2011 and February 7, 2017. A total of 1,212 students completed STLs and a PRE3 exam score. A Spearman rank correlation test compared the number of STLs a student completed with the student’s cognitive score on the PRE3 exam. The Spearman test was used instead of the more common Pearson correlation because the distribution of STLs was not normal and because Spearman is less sensitive to the presence of outliers.

**Results**—A weak but statistically significant correlation between the number of STLs and cognitive exam scores was identified (r = 0.28). Students who completed more than 100 STLs (n=394) had an average exam score of 76.48%, while students who completed 1 to 100 STLs (n=818) had an average exam score of 71.5%; p < 0.01. Students represented 485 programs (155 programs had students who performed >100 STLs.)

**Conclusion**—Completion of higher numbers of STLs had a positive correlation with cognitive scores on the PRE3 exam.