didactic time. UCSF clinical psychology faculty with formal training in contemplative science guide groups of learners through sessions that incorporate didactics, group discussion, personal reflection and meditation. Between monthly sessions, residents are encouraged to practice the self-reflection, attention and meditation practice they have learned during their clinical and nonclinical experience as well as participate in online modules designed to reinforce discussion topics. There is no formal evaluation of learners during this seminar, and course feedback is solicited periodically through surveys and in-person debriefing.

Conclusions: After completion of this curriculum, residents will have a framework for identifying and discussing personal burnout, empathy and core emotions, and practice techniques to mitigate burnout in their careers.

TF 380 The Emergency Medicine Research Rotation

Fant AL/Northwestern, Chicago, IL

Study Objectives: The Residency Review Committee for Emergency Medicine (EM) requires that all residents a scholarly project prior to graduation. This curriculum is intended to provide EM residents with baseline knowledge and skills to design and conduct a research project and to provide protected time for residents to design the scholarly project that they will complete over the remainder of the tenure in residency.

Objectives: At the end of this rotation, the resident will be able to 1) demonstrate proficiency in basic research methodology and study design, 2) formulate a testable research question, 3) construct a study to answer that question, 4) perform a preliminary literature search on the research topic, 5) construct a one-page research proposal document

Methods: During the beginning of the second post-graduate year (PGY), three residents at a time are scheduled for the research rotation. The rotation takes place over five consecutive weekdays during which residents are free of all clinical duties. Residents use online modules in statistics, epidemiology and research design. They also participate in moderated small-group brainstorming sessions to scope their research question. Experiential learning includes attending a workshop run by medical librarians on searching the literature and using bibliography software and spending a half day enrolling patients in clinical trials with department research associates. Residents are provided with office space and computers and have access to departmental research coordinators. At the end of the curriculum, residents must submit a one-page research proposal document that is graded by departmental research faculty according to a rubric modified from the Society for Academic Emergency Medicine. The rubric includes assessment of the project's clarity, applicability of methods and metrics, approach, feasibility, significance, innovation and presentation. Residents are also given the opportunity to evaluate the curriculum via an anonymous online survey.

Conclusions: Completing a research rotation during the beginning of PGY2 year allows residents time to a scholarly project by graduation. An intensive experience using mixed learning methods introduces tools that residents can reference throughout residency to aid in successful completion of the scholarly project. Residents find the sessions helpful and enjoyable, but the results of the grading rubric demonstrate that residents often develop research projects that are too large in scope to be completed during residency.

	Pre-Work	Day 1	Day 2	Day 3	Day 4	Day 5
Asynchronous Online Lectures	CITI Training CLIMB	Statistics 1 Epidemiology 8, 10 & 12	Statistics 2	Epidemiology 11 & 13	Statistics 4	
Workshop		Literature Search & EndNote			Patient Recruitment	
Seminar		Scoping the Project with the Course Director		Methodology with Research Faculty or Mentor	Qualitative Methodology with MedEd Fellow	
Deliverable	Formulate PICO question	Resident Research Grant Opportunities	Literature Search	First Draft of Specific Aims (or IRB/grant proposal)		Final Draft of Specific Aims (or IRB/grant proposal)

381 Predictors of Good Outcomes After Pediatric Cardiac Arrest

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Study Objectives: To determine which aspects of out-of-hospital care impact outcomes after pediatric cardiac arrest.

Methods: Pediatric cardiac arrest remains a major public health problem, with over 5000 cases per year in the United States alone. The chain of survival focuses on bystander intervention, high-quality CPR, and aggressive post-resuscitation care. In this study, the authors examine 5 years of consecutive data from their county emergency medical system (EMS), to identify predictors of good outcome, including return of spontaneous circulation (ROSC), survival to hospital admission (HA) and survival to hospital discharge (HD). Logistic regression models were performed using JMP 12.0 for Mac.

Results: From January 1, 2012 to December 31, 2016, a total of 133 children suffered cardiac arrest. The median age was 12 months, with an IQR of 3 to 24 months, and a range of 0 to 10 years.

In 95% of cases, the arrest was determined by a bystander, rather than EMS. The cause of arrest was drowning (41%); respiratory (44%); trauma (8%); seizure (3%) cardiac/medical (2%); and choking (2%). 58% were ventilated with either a non-rebreather mask (NRM) or a bag valve mask (BVM). 40% of children were intubated, either by ETT (predominantly), or a supraglottic airway (I-gel). There was ROSC in 29% of cases overall, with 26% making it to hospital admission, and 20% making it alive out of the hospital.

The interquartile range (IQR) for time to arrival was 16-47 min, with a range of 0-490 minutes. A shorter time from arrest to EMS arrival was significantly associated with ROSC, HA, and HD (all $P<0.0001$).

In 95% of cases, the arrest was determined by a bystander, rather than EMS. Chest compressions were performed by a bystander in 59% of cases, and by EMS personnel in 41% of cases. CPR by EMS personnel was significantly associated with ROSC, HA, and HD (all $P<0.0001$).

There was some form of treatment before EMS arrival in 54% of cases. Any treatment before EMS arrival was significantly associated with ROSC, HA, and HD (all $P<0.0001$).

An AED was placed 50% of the time, and 13% of the arrests were witnessed. Neither of these factors was statistically significant with regard to any of the outcomes.

Conclusions: Shorter EMS arrival; times from time of arrest, performance of CPR prior to EMS arrival, and any treatment before EMS arrival resulted in significantly higher rates of return of spontaneous circulation, survival to hospital admission, and survival beyond hospital discharge.

382 Lifevac: A Novel Device for the Resuscitation of the Adolescent Choking Victim

Lih-Brody L, Singer M, Brody E, Jr./ProHealth Care Associates, Rockville Centre, NY; Lifevac LLC, Springfield Gardens, NY

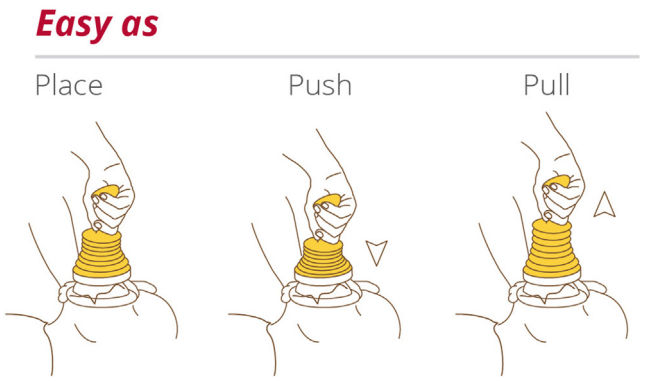
Study Objectives: Choking remains a leading cause of tragic death in children and adolescents. Currently there are no devices that assist in the resuscitation of an adolescent choking victim. Therefore we studied the Lifevac, a new apparatus that previously has been shown in a simulator model to successfully resuscitate an adult choking victim, in an adolescent simulator model.

Methods: The Laerdel choking adolescent simulator system was utilized and a hot dog piece was inserted one and one half inches into the airway. The Lifevac was then used per operating guidelines with the pediatric mask attached to attempt to remove the lodged object and the outcome was recorded.

Results: The Lifevac successfully removed the obstructing hot dog in 472 out of 500 attempts in one attempt, in 497 out of 500 in two attempts, and all obstructions were removed in three attempts. The 95% confidence intervals for the point estimate of the probability that the device will remove the obstruction (calling the point estimate "S") shown for three scenarios depending on how you define success: success 1 attempt: $0.92 \leq S \leq 0.96$, success 2 attempts: $0.98 \leq S \leq 1.0$, success 3 attempts: $0.99 \leq S \leq 1.0$ 99% confidence intervals for the point estimate of the probability that the device

will remove the obstruction (call the point estimate "S") shown for three scenarios depending on how you define success: success 1 attempt: $0.91 \leq S \leq 0.97$, success 2 attempts: $0.98 \leq S \leq 1.0$, success 3 attempts: $0.99 \leq S \leq 1.0$.

Conclusions: The Lifevac is an apparatus that can successfully remove a hot dog, which is a food that commonly leads to choking, lodged in an adolescent choking victim's airway in this simulator model. This apparatus deserves further study as there is potential to save lives if abdominal thrusts fail to resuscitate the choking victim.



383 A Novel Technique for Improving Fluid Resuscitation in Septic Shock

Piehl M, Spangler H, Robertson G, Chenet K/WakeMed Health & Hospitals, Raleigh, NC; UNC Hospitals, Chapel Hill, NC; 410 Medical, Durham, NC

Study Objectives: Rapid fluid delivery is commonly required in sepsis and other conditions leading to shock and hypotension. Since gravity flow and infusion pumps are unable to deliver a fluid bolus rapidly, pressure bags are commonly used to increase flow rates. Disadvantages of this technique include progressive decrease in flow rate without continuous re-inflation of the bag, difficulty administering accurate doses, particularly with smaller volumes, and the risk of inadvertent air embolism. LifeFlow is an intuitive single-use device that provides rapid and controlled infusion, enabling a health care provider to administer a measured fluid bolus and quickly assess clinical response. This study will compare the LifeFlow to pressure bag in simulated out-of-hospital and hospital settings.

Methods: Registered nurses and paramedics participated in a simulated septic shock resuscitation and were randomly assigned to administer repeated fluid boluses with the LifeFlow or pressure bag. Training was provided if the participant was not familiar with either method. Participants were given a clinical sepsis scenario that required administration of three, 500 ml boluses (totaling 1500 ml) through a 20G IV catheter into simulated patient. The scenario involved a variety of clinical tasks including a physical exam, vitals assessment, delivery of oxygen via nasal cannula, medication administration, manual charting, and fluid administration. Total scenario time and fluid infusion times were determined by video recording of the scenario. Fluid volume was measured by weight to determine the accuracy of each bolus. Variance was defined as difference between actual and desired fluid bolus volume.

Results: Fourteen providers (8 RNs, 6 Paramedics) delivered three 500 ml normal saline boluses during the septic shock scenario. Average time to completion of each bolus was 2.5 minutes for LifeFlow vs. 7.6 minutes for pressure bag. Total infusion time for 1500 ml was almost 3 times as fast for LifeFlow vs pressure bag (7.8 vs 22.8 minutes). Total time to completion of the sepsis scenario was 1.8 times as fast for LifeFlow compared pressure bag (20 vs. 36.3 minutes). Total fluid amount variance, above or below 1500ml, was greater for pressure bag infusion (1500 + 39.1 vs 184 ml, p=0.04).

Conclusions: When compared to pressure bag, use of the LifeFlow device resulted in significantly faster time to completion of the septic shock resuscitation scenario. Times to completion of each bolus, and infusion time for the total 1500 ml, were significantly faster. The LifeFlow also reduced variance in the size of fluid bolus administered, indicating that clinicians can more accurately deliver the correct fluid volume and avoid inadvertently providing more fluid than is needed. This technique may offer a faster and more efficient method of fluid resuscitation in sepsis and septic shock.

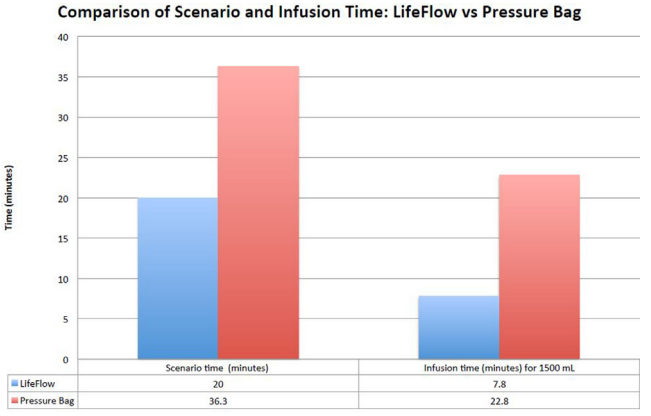


Figure 1. Comparison of Scenario and Infusion Time: LifeFlow versus Pressure Bag.

384 Delineating the Value-Added Inclusion of the Impedance Threshold Device During Head-Up CPR

Pepe PE, Debaty G, Yannopoulos D, Moore JC/The University of Texas Southwestern Medical Center, Dallas, TX; University of Grenoble Alps, Grenoble, France; University of Minnesota, Minneapolis, MN; The Hennepin County Medical Center, Minneapolis, MN

Study Objectives: Previous experimental studies have determined that a "head-up CPR" approach is capable of improving cerebral perfusion pressure (CerPP) and, in turn, blood brain flow. In those early studies, however, a whole-body tilt was performed and simultaneous application of automated CPR (using the LUCAS^{TM} technique) and an impedance threshold device (ITD) were both used with the intent of further augmenting circulatory flow into and out of the heart and brain. Preclinical and clinical CPR studies have now indicated that the ITD can be very effective when used with high-quality CPR but ineffective when applied with suboptimal performance of CPR. Therefore, the purpose of the current study was to determine if the ITD maintains a specific value-added contributory effect in terms of helping to maintain systolic blood pressure (SBP), coronary perfusion pressure (CorPP), CerPP and end-tidal CO2 ($ETCO_2$) during "head-up CPR" conditions.

Methods: Using additional data that were gathered (per routine) during implementation of a previously published swine study (Debaty et al. *Resuscitation* 2015; 87:38-43), SBP, CorPP, CerPP and $ETCO_2$ values were determined for the +30° whole body tilt position (head-up) and those measurements taken when an ITD (ResQPOD-16^{TM}) was in place were compared to those taken when it was removed. In the study, female farm pigs (n = 8) each weighing ~40 kg were anesthetized with isoflurane and instrumented to measure aortic (Ao), right atrial (RA), and intracranial (ICP) pressures. All subjects were treated with a LUCAS^{TM} CPR device (100 compressions/min) and mechanically ventilated through an endotracheal tube at 10 breaths/min with a tidal volume of 10 ml/kg. After 6 minutes of untreated VF, all of the subjects were treated with 18 minutes of LUCAS^{TM} + ITD at different tilt angles followed sequentially by LUCAS^{TM} + ITD with whole body head-up tilt at +30° for 2 minutes and then LUCAS^{TM} alone for 2 minutes in the same +30° position. All animals therefore served as their own controls and the measured results were combined for aggregate analysis. A Student's t-test was used to compare the key hemodynamic variables during head-up CPR ± ITD and results were expressed as a mean ± SEM. The study was approved by the institutional animal care committee and conducted in compliance with applicable regulatory guidelines.

Results: Among the 8 subjects, calculated values (in mmHg) for both CorPP (decompression phase Ao minus RA pressure) and CerPP (Ao minus ICP) consistently showed a significant contribution from the ITD. When comparing the LUCAS^{TM} combined with the ITD (at +30°) versus use of the LUCAS^{TM} CPR device alone (at +30°), SBP fell significantly (78 ± 5 to 64 ± 5 mmHg; p <0.001) as did CorPP (25 ± 2 to 23 ± 2; p=0.012); CerPP (29 ± 3 to 25 ± 2; p=0.001) and $ETCO_2$ (33 ± 4 to 22 ± 3; (p <0.001).

Conclusions: Over a prolonged period of head-up CPR treatment in pigs, the combined application of LUCAS^{TM} and an ITD provided significantly higher SBP,