

impetus to continue and expand the CREMS program. Future studies will evaluate if the implementation of this program has reduced patient reliance on 911 requests for paramedic care as well as Emergency Department transports.

**Keywords:** emergency medical services

### LO36

#### Out-of-hospital cardiac arrest in British Columbia: Ten years of increasing survival

B.E. Grunau, MD, MHSc, W. Dick, MD, MSc, T. Kawano, MD, F.X. Scheuermeyer, MD, C. Fordyce, MD, MSc, D. Barbic, MD, MSc, R. Straight, MEd, R. Schlamp, H. Connolly, J. Christenson, MD, St. Paul's Hospital and University of British Columbia Department of Emergency Medicine, Vancouver, BC

**Introduction:** Survival for victims of out-of-hospital cardiac arrest (OHCA) is typically between 8 and 12%. We sought to report the trends in survival in British Columbia (BC) over a 10-year period. **Methods:** The BC Resuscitation Outcomes Consortium prospectively collected detailed pre-hospital and hospital data on consecutive non-traumatic OHCA's from 2006 to 2016 within BC's four metropolitan areas. We included EMS-treated adult patients without DNR orders. To describe baseline characteristics we organized patient characteristics in three time periods: 2006-09, 2010-13, and 2014-16 (first and last periods reported below). The primary and secondary endpoints were survival at hospital discharge and return of spontaneous circulation (ROSC). We tested the significance of year-by-year trends in baseline characteristics, and performed multivariable Poisson regression, using calendar year as an independent variable, to calculate risk-adjusted rates for survival. **Results:** Between January 1, 2006 and March 31, 2016 there were a total of 26 433 non-traumatic OHCA's, with 15 145 included in this study. There were significant decreases in the proportion with initial shockable cardiac rhythms (28% to 23%) and bystander witnessed arrests (42% to 39%), however significant increases in the proportion with bystander CPR (40% to 49%) and ALS treatment (86% to 97%), and the median chest compression fraction (0.81 to 0.87). There was a significant increase in the median time until termination of resuscitation in those who did not achieve ROSC (27 to 32 minutes), and a significant decrease in the proportion of patients who were transported in absence of ROSC (17% to 6.5%). There was a significant improvement in achieving ROSC (44% to 48%; adjusted rate ratio per year 1.02, 95% CI 1.01 to 1.02) and survival at hospital discharge (10% to 14%; adjusted rate ratio per year 1.05, 95% CI 1.04 to 1.06). Both subgroups of initial shockable (adjusted rate ratio per year 1.04, 95% CI 1.03 to 1.05) and non-shockable (adjusted rate ratio per year 1.08, 95% CI 1.06 to 1.12) cardiac rhythms demonstrated survival improvement. **Conclusion:** Despite a significant decrease in those with initial shockable rhythms, out-of-hospital cardiac arrest survival in BC's metropolitan regions increased by approximately 40% over a 10-year period. During this time there were system changes and quality of care improvements as provided by bystanders and professionals.

**Keywords:** cardiac arrest, cardiopulmonary resuscitation

### LO37

#### Routine application of defibrillation pads and time to first shock in prehospital STEMI complicated by cardiac arrest

S.L. Felder, BSc, MD, M. Davis, MSc, MD, Western University, Windsor, ON

**Introduction:** ST-segment elevation myocardial infarction (STEMI) remains a significant cause of morbidity and mortality in North America, with recent studies suggesting that between 4 to 11% of patients diagnosed

with STEMI suffer an out-of-hospital-cardiac arrest (OHCA). Previously published research has shown that shorter time to initial defibrillation in patients with VF/VT OHCA increases functional survival. The purpose of this study is to assess whether the routine application of defibrillation pads in STEMI decreases the time to initial defibrillation in those who suffer OHCA. **Methods:** Ambulance call records (ACR) for patients diagnosed with STEMI in Middlesex-London in the prehospital setting from Jan 1, 2012 to Jun 30, 2016 were reviewed. Patients were included in the study if they were 18 years of age or older with a confirmed diagnosis of STEMI and suffered an OHCA with an initial shockable rhythm (VF or VT) while in paramedic care. The pre-pad protocol (routine application of defibrillation pads in STEMI patients) was implemented by Middlesex-London EMS in July 2014. If inclusion criteria were met, ACRs were reviewed to determine whether the pre-pad protocol was implemented and to extract the time to initial defibrillation and relevant demographic and event features. Associated hospital charts were reviewed to evaluate inpatient event features and survival. T-test was used to assess the difference between mean times to defibrillation. **Results:** 446 patients were diagnosed with prehospital STEMI. Of those, 11 patients experienced a paramedic witnessed cardiac arrest. Four of the 11 had defibrillation pads applied upon diagnosis of STEMI. In patients who received pre-pad application, the mean time to initial defibrillation was 17.71 sec, compared to 72.71 sec in patients who had pads applied following arrest (MD 54.97 sec CI 22.69 to 87.24 sec). All patients treated with the pre-pad protocol survived to discharge from hospital, while one patient in the routine care group died in the ED. **Conclusion:** Routine application of defibrillation pads decreases the time to initial defibrillation in STEMI patients who suffer OHCA. Larger studies are required to evaluate whether this decreased time to defibrillation translates into mortality benefit in this subset of patients who experience OHCA.

**Keywords:** cardiac arrest, ST-segment elevation myocardial infarction, pre-hospital

### LO38

#### Hypoglycemia is a rare peri-seizure finding in pre-hospital patients

D. Eby, MD, PhD, J. Woods, BHSc, Western University, Owen Sound, ON

**Introduction:** Conventional wisdom states that hypoglycemia is a frequent peri-seizure phenomenon and must be tested for. Conventional wisdom also lists hypoglycemia as a cause of seizures. Recent literature disputes this. Paramedic medical directives continue to direct paramedics to determine the blood sugar level on all seizure patients. The purpose of this study was to determine the frequency of hypoglycemia in patients identified as having "seizure" as the primary or final problem code in Ambulance Call Reports (ACRs) from a large regional paramedic base hospital program. **Methods:** We conducted a retrospective analysis of iMedic platform, electronic ACRs, for a 2 year period (Jan 01, 2014 to Dec 31, 2015), from 8 Paramedic Services serving a rural and urban population of 1.4 million. 5854 calls, had "seizure" listed as a primary or final problem code. A 10% sample was generated using a random number table. ACRs were manually searched, data abstracted onto spread sheets, and the results analyzed using descriptive statistics (Wizard ver 1.8.16 for Mac). **Results:** 582 calls were analyzed. 430 (73.9%) were adults and 152 (26.1%) were paediatric (age <18). A blood sugar was determined in 501/582 (86.1%) of all calls; adults 388/430 (90.2%), paediatric 113/152 (74.3%). The Glasgow Coma Score, when measured, was 15 in 280/575 (48.7%) cases. Seizures were witnessed by paramedics in 47/582 (8.1%) calls; adults 33/430 (7.7%), paediatric 14/152 (9.2%). In calls where paramedics witnessed a seizure a blood sugar was determined 36/47 (76.6%) of the time; adults 25/33 (75.8%), paediatric 11/14 (78.6%). Hypoglycemia (BS <4.0 mmol/L in

an adult and 3.0 mmol/L in child < age 2 ) was found in 1 case when BS was checked-overall 1/501 (0.2%); adults 1/388 (0.3%), paediatric 0/113 (0.0%). Case 1-age 70 yr, GCS 12, BS 3.8 mmol/L. **Conclusion:** Hypoglycemia was rarely found in patients who had a pre-hospital seizure. It did not require treatment. When it was found, hypoglycemia was unlikely to be the cause of the seizure. The results are similar to the findings from other recent, retrospective, reviews. The routine determination of blood sugars in all patients who have had a seizure prior to paramedic arrival should be reconsidered.

**Keywords:** paramedic, seizure, hypoglycemia

### LO39

#### **Healthcare costs among homeless and/or substance using adults presenting to the emergency department: a single centre study**

V.V. Puri, BSc, K. Dong, MD, MSc, B.H. Rowe, MD, MSc, S.W. Kirkland, MSc, C. Vandenberghe, MEd, G. Salvalaggio, MD, MSc, R. Cooper, A. Newton, PhD, C. Wild, PhD, S. Gupta, MD, J.K. Khangura, MD, MSc, C. Villa-Roel, MD, MSc, C. McCabe, PhD, University of Alberta, Edmonton, AB

**Introduction:** Active substance use and unstable housing are both associated with increased emergency department (ED) utilization. This study examined ED health care costs among a cohort of substance using and/or homeless adults following an index ED visit, relative to a control ED population. **Methods:** Consecutive patients presenting to an inner-city ED between August 2010 and November 2011 who reported unstable housing and/or who had a chief presenting complaint related to acute or chronic substance use were evaluated. Controls were enrolled in a 1:4 ratio. Participants' health care utilization was tracked via electronic medical record for six months after the index ED visit. Costing data across all EDs in the region was obtained from Alberta Health Services and calculated to include physician billing and the cost of an ED visit excluding investigations. The cost impact of ED utilization was estimated by multiplying the derived ED cost per visit by the median number of visits with interquartile ranges (IQR) for each group during follow up. Proportions were compared using non-parametric tests.

**Results:** From 4679 patients screened, 209 patients were enrolled (41 controls, 46 substance using, 91 unstably housed, 31 both unstably housed and substance using (UHS)). Median costs (IQR) per group over the six-month period were \$0 (\$0-\$345.42) for control, \$345.42 (\$0-\$1139.89) for substance using, \$345.42 (\$0-\$1381.68) for unstably housed and \$1381.68 (\$690.84-\$4248.67) for unstably housed and substance using patients ( $p < 0.05$ ). **Conclusion:** The intensity of excess ED costs was greatest in patients who were both unstably housed and presenting with a chief complaint related to substance use. This group had a significantly larger impact on health care expenditure relative to ED users who were not unstably housed or who presented with a substance use related complaint. Further research into how care or connection to community resources in the ED can reduce these costs is warranted.

**Keywords:** unstable housing, substance use, emergency department cost

### LO40

#### **Designing for the future: machine learning software in the age of competency-based medical education**

T.M. Chan, MD, R. Patel, BHSc, A. Ariaeinejad, BE, MSc, R. Samavi, PhD, McMaster University, Hamilton, ON

**Introduction/Innovation Concept: Background:** Competency based medical education (CBME) is a method of assessing resident performance through standardized tasks and milestones. The Royal College of

Physicians and Surgeons of Canada has started phasing in CBME as the preferred training method, but no tool support exists to process this data. Approximately 400 data points are collected per resident per year at McMaster's Division of Emergency Medicine. This is an unwieldy amount of data to analyze. **Objective:** Recognizing that collection and analysis of resident data is an important facet to postgraduate medical education, McMaster University began developing a program to provide predictive automated data analysis of resident performance. **Methods:** To achieve the stated objective, we adapted a design thinking methodology, which emphasizes the importance of human-centered design. By interviewing stakeholders, we collected user requirements and "pain points" that allowed us to build and evaluate multiple prototypes addressing their problems, such as the ability to process data into reports, real-time reporting, and predictive analytics. We solicited feedback from our stakeholders to iteratively refine the prototypes, ensuring that it was user intuitive and met user needs. **Curriculum, Tool, or Material:** We developed a software platform that collects, aggregates, reports, and has the possibility of analyzing resident data in real time. It also can present performance data via a real-time dashboard. Having automated the report generating process, administrative workload is reduced to a monitoring capacity. Quantitative data on resident performance has been analysed using artificial Neural Network to identify patterns in resident performance. It performs with a sensitivity of 81% and a specificity of 43%, and accurately predict which residents require remedial support 43% of the time. When built into a learning management system, this allows for the provision of additional support to residents-at-risk. **Conclusion:** Combining machine learning with resident assessment data has allowed us to build a promising predictive model to predict resident outcomes. This gives us the potential to decrease administrative workload and improve data quality by providing real-time performance dashboards and eliminating the redundancies of manual data processing. If scaled, this innovation might assist program directors in determining competency of residents and human resource planning for the healthcare systems at large.

**Keywords:** design thinking, predictive analytics, machine learning

### LO41

#### **Disrupting quality improvement: integrating design thinking in the emergency department**

S. Gupta, MD, P.M. von Hauff, BA, BFA, University of Alberta, Edmonton, AB

**Introduction/Innovation Concept:** Quality Improvement (QI) remains a challenge and has been identified as a key competency by the Royal College of Physicians and Surgeons. Hospitals can be dehumanized environments, both for patients and the staff working there. The distant understandings of each other's expectations during their health care encounter often create a sense of futility, frustration, and moral distress in therapeutic relationships. The transient nature of interactions and workplace culture in emergency departments (ED) enhances this distress. **Methods:** Working in a cross-disciplinary fashion, we explored how residents could develop quality improvement initiatives as a way to engage personal interests for QI measures. Key goals for developing these tools were 1) Learn cross-disciplinary tools for observation, inquiry, and improvement, 2) Develop reflective practice for residents, and 3) create ownership for the work and ongoing areas for improvement in local EDs for learners. **Curriculum, Tool, or Material:** We developed a process that would connect designers, residents, and content experts to an area of QI. Residents will be asked to identify an area in the ED that they field would benefit from a QI project (examples