Plenary Oral Presentations – CAEP 2016

1) Plenary Oral

Derivation of a 2-hour high-sensitivity troponin T algorithm for rapid rule-out of acute myocardial infarction in emergency department chest pain patients

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Introduction: Chest pain and symptoms of acute coronary syndrome are responsible for a large proportion of ED visits and acute hospitalizations. However, only about 15% of patients presenting to the ED with high-risk symptoms do, in fact, have an acute coronary syndrome. The objective of this study is to derive a 2-hour high-sensitivity Troponin T (hsTnT) testing algorithm with outcome-based cut-offs to rapidly rule out acute myocardial infarction (AMI) in a large proportion of ED chest pain patients. **Methods:** Patients included consecutive ED patients with a chief complaint of cardiac chest pain who had an hsTnT assay performed at ED arrival and 2 hours after ED arrival. Administrative databases were queried to identify troponin results and major adverse cardiac outcomes (MACE) including death, MI, and revascularization. Test characteristics of iterative combinations of initial troponin level and absolute change in troponin level were quantified in order to identify the testing algorithm that identified the greatest proportion of patients eligible for early discharge while maintaining a target sensitivity of 98.5% for the primary outcome of 7-day AMI. **Results:** 755 eligible patients had hsTnT assays performed at ED arrival and at 2 hours. 91 patients (12.1%) had a 7-day AMI while 108 (14.0%) had 7-day MACE. An initial hsTnT level of less than 14 ng/L, in combination with a 2-hour absolute change of less than 10ng/L had a sensitivity of 98.9% (95% CI 94.0,99.8) and an NPV of 99.8% (95% CI 98.7, 100.0) for 7-day AMI. This identified 58.5% of all patients as being suitable for early discharge. Sensitivity and NPV for 7-day MACE were 90.0% (95% CI 83.3, 94.2) and 97.3% (95% CI 95.3,98.4) respectively. Sex-specific differences in test characteristics were not clinically important. Rule-in hsTnT cutoffs were also evaluated, with specificities ranging from 85-95%, although cut-offs with higher specificity had less ability to rapidly rule-in AMI, leaving more patients with indeterminate results after 2 hours. **Conclusion:** A hsTnT algorithm can safely and accurately rule out AMI in 58.5% of ED chest pain patients within 2 hours of ED arrival. The lower sensitivity of this algorithm for MACE compared to AMI speaks to the importance of clinical assessment and ECG findings in identifying patients at risk for acute coronary syndromes.

Keywords: troponin, acute coronary syndromes, acute myocardial infarction

Oral Presentations – CAEP 2016

2) Lightning Oral

Can you trust administrative data? Accuracy of ICD-10 codes for diagnosis of pulmonary embolism

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Introduction: Administrative data is a useful tool for research and quality improvement; however, the validity of research findings based on these data depends on their reliability. Diagnoses are recorded using diagnostic codes, as defined by the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10). Several groups have reported coding errors associated with ICD-10 assignments to patient diagnoses; these errors have serious implications for research, quality improvement, and policymaking. As part of a quality improvement project targeting emergency department (ED) diagnostic appropriateness for pulmonary embolism (PE), we sought to validate the accuracy of ICD-10 codes for studying ED patients diagnosed with PE. **Methods:** Hospital administrative data for adult patients (age ≥18 years) with an ICD-10 code for PE (I26.0 and I26.9) were obtained from the records of four urban EDs between July 2013 to January 2015. A review of medical records and imaging reports was used to confirm the diagnosis of PE. In the case of discrepancy between ICD-10 coding and chart review, the diagnosis obtained from chart review was considered correct. The physicians' discharge notes in the administrative database were also searched using 'pulmonary embolism' and 'PE', and patients who were diagnosed with PE but not coded as PE were identified. Coding discrepancies were quantified and described. **Results:** 1,453 ED patients had a PE ICD-10 code during our study period. 257 (17.7%) of these patients' diagnoses were improperly coded. 211 patients assigned an ICD-10 PE code had ED discharge diagnoses of 'rule-out PE' or 'query PE'. 64 other patients were miscoded as having a PE and should have been assigned an alternate code, such as chest pain, hypoxia, or dyspnea. The physician did not include a discharge diagnosis in 4 of the 64 miscoded patients; however, triage and physician assessment notes indicated no suspicion of PE. Furthermore, 117 patients who had an ED discharge diagnosis of PE were not assigned a PE code, meaning that 8.91% of true PEs were missed by using ICD-10 codes alone. Thus, 1,313 ED patients truly had a PE. **Conclusion:** Our work suggests the need for more accuracy in ICD-10 coding of ED diagnoses of PE. Caution should be exercised when using administrative data for studying PE, and validation of the accuracy of ICD-10 coding prior to research use is recommended.

Keywords: pulmonary embolism, ICD-10

3) Lightning Oral

Can we use administrative data to define an emergency department population at risk for pulmonary embolism? Development and validation of an algorithm to identify a research population

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Introduction: Pulmonary embolism (PE) is a potentially life-threatening condition that is in the differential diagnosis of many emergency department (ED) presentations. However, no diagnostic code for suspected PE exists. Thus, identifying the population of patients undergoing PE workup from administrative data for use as a denominator in clinical research and quality improvement can be difficult. To overcome this, we used standardized triage complaint codes and investigations to develop search algorithms useful to identify patients undergoing PE workup from an administrative dataset. Our objective was to quantify the sensitivity, specificity, and case yield of these search algorithms in order to identify a superior search strategy. **Methods:** Hospital administrative data for adult patients (age ≥18 years), which included standardized triage complaint codes and ICD-10 diagnostic codes for PE, were obtained from four urban EDs between July 2013 to January 2015. Standardized triage complaint codes were evaluated for the proportion of patients diagnosed with PE. Combinations of highyield presenting complaints, in combination with D-dimer testing or imaging orders, were evaluated for sensitivity, specificity, and predictive values for PE. **Results:** Of 479,937 patients presenting with 174 different complaints, 1,048 were diagnosed with PE. The best-performing search strategy was the combination of standardized CEDIS complaints of Cardiac Pain, Chest Pain (Cardiac Features), Chest Pain (Non- Cardiac Features), Shortness of Breath, Syncope/Pre-syncope, Hemoptysis, and Unilateral Swollen Limb/Pain, along with D-dimer testing and/or CTPA, or V/Q scan. This combination captured 808 PE diagnoses for a sensitivity of 77.1% (95%CI 74.4-79.5%) and specificity of 86.8% (95%CI 86.7-86.6%). **Conclusion:** We identified a high-yield combination of presenting complaints and test ordering that can be used to define an ED population with suspected PE. This population of patients can be used as a denominator in research or quality improvement work that evaluates the utilization of diagnostic testing for PE.

Keywords: pulmonary embolism

4) Lightning Oral

In support of Choosing Wisely: variation in CT ordering for patients presenting to emergency with minor head injury

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Introduction: Individual and institutional disparities in CT imaging rates for patients with head injuries have long been recognized, leading to the development of well-validated clinical decision rules designed to standardize clinical practice. To assess their impact on current practice, we sought to evaluate variation in CT imaging by emergency physicians for patients presenting with head injury across the province of Alberta. **Methods:** A unique data warehouse merging administrative, clinical, and imaging platforms for 11 Alberta emergency departments (EDs) was created. Unique identifiers were obtained for all emergency physicians who were included in this analysis if they evaluated in excess of ten ED patients presenting with a chief complaint of "head injury". Patients with high triage acuity (CTAS 1) were excluded, as were patients who were admitted to hospital. Descriptive statistics were employed to describe variation between physicians and sites for a 24 month period from 2013-2015. **Results:** 311 emergency physicians treating 20,797 patient encounters for head injury were included. Overall a total of 8,245 head injury patients (40%) received one or more CT scans. Physician variation across the 11 sites ranged from 4% -100% of head injury patients receiving a CT. Within sites CT ordering between physicians varied from 9-fold (4% - 36%) at the lowest variation site, to more than 20-fold (4% - 90%) at the highest variation site. After removing the 5% lowest and highest ordering physicians, variation in ordering continued to range from 10% - 72%. No trends were observed across the two years examined. **Conclusion:** This is the largest study to date examining physician level variation in CT ordering practices for ED head injury patients. We have identified marked persistent practice variation despite the presence of well-validated clinical decision rules and a relatively low risk medicolegal environment. Variable risk tolerance and limited use of validated clinical decision rules are likely contributors making this area an ideal focus for targeted interventions to improve imaging appropriateness and reduce practice variation.

Keywords: Choosing Wisely, CT scans, practice variation

5) Lightning Oral

Use of pharmacological sleep aids among emergency medicine staff physicians in a Canadian tertiary-care setting: a web based survey

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Introduction: Emergency medicine by its nature requires shift-work that often follows an erratic and unpredictable pattern. Faced with this ongoing challenge we hypothesized that many ED physicians may have taken steps to minimize their personal sleep deprivation through the use of a pharmacological sleep aid (PSA). The extent and nature of PSA use in this population is not well studied. We sought to describe the use of PSAs amongst practicing ED physicians in a Canadian tertiary-care setting. We also hoped to determine the specific substances being used, their frequency and predictive factors contributing to their use. **Methods:** A cross-sectional descriptive web-based survey was sent via e-mail to all practicing staff emergency physicians within the Calgary zone of Alberta Health Services. Participation was entirely voluntary and all responses were anonymous. Descriptive statistics were used to assess frequencies and summary measures. Logistic regression was used to explore associations between key variables. **Results:** Of the 198 eligible ED physicians, 144 (73%) completed the survey. 132 (92%) felt that shift-work negatively affected their ability to sleep and 121(84%) had experienced insomnia at some point in their medical career. 96 (67%) ED physicians had used a PSA at some time in their career and 82(57%) were currently using a PSA with any frequency. The most frequent sleep aids currently being used were non-benzodiazepine hypnotics (65%), alcohol (31%) and melatonin (27%). 66(46%) respondents required a prescription for their PSA and 37(56%) of those had obtained a prescription from an ED physician colleague. Physician self-reporting of experience with insomnia was strongly associated with prior use of any PSA (OR 4.0; 95% CI 1.6-10.0) and prior use of non-benzodiazepine hypnotics (OR 14.4; 95% CI 3.2-64.2) There was no statistically significant association between current use of a PSA and physician age, physician gender, number of night shifts worked per month or co-habitation with children. None of the physicians who responded felt that their use of a PSA adversely affected their ability to provide quality patient care. **Conclusion:** Pharmacological sleep aid use among Canadian ED physicians may be more common than previously assumed. This could have implications for physician wellbeing and performance.

Keywords: sleep, shiftwork, wellbeing

6) Lightning Oral

Attitudes of emergency physicians towards homeless and substance using patients

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Introduction: Patients who are homeless and/or using substances rely heavily on emergency departments (ED) for medical care, and present with complex medical and social needs. Negative physician attitudes towards this population undermine the therapeutic relationship, compromising the quality of medical care provided. The objective of this study was to determine the attitudes of emergency physicians towards homeless and substance-using patients. **Methods:** Using a Modified Total Design approach, we conducted a cross-sectional survey of emergency physicians at five different healthcare locations in Calgary, Alberta, Canada. Attitudes were assessed using two validated measures, the Health Care Providers Attitudes Towards the Homeless Inventory (HPATHI), and the Short Understanding of Substance Use Scale (SUSS). Surveys were self-administered by respondents between March and December 2013. **Results:** A total of 117 physicians completed the survey (response rate 48%). 28% of respondents resented the amount of time it takes to see homeless patients, and 32% believed caring for homeless patients was not financially viable; 57% felt overwhelmed by the complexity of problems that homeless people have. Physicians with extra training in addiction medicine or health care for the homeless had more positive attitudes than physicians with no extra training; physician attitudes worsened over time towards both populations. **Conclusion:** Physicians feel overwhelmed when caring for patients who are homeless and/or substance using and negative attitudes worsened over time. Extra training in addiction medicine or healthcare for the homeless is associated with more positive attitudes. Possible strategies to improve attitudes should include a multifaceted approach addressing individual physician knowledge deficits, as well as expanded access to resources in the ED and community, designed to deal with the complex needs of these populations.

Keywords: substance use disorders, homeless persons, attitude of health personnel

7) Lightning Oral

Does head injury matter? Comparison of functional outcomes in elderly who have sustained a minor trauma with or without head injury: a prospective multicenter cohort study

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Introduction: The older adult population is growing. The consequences of minor trauma involving a head injury (MT-HI) in independent older adults are largely unknown. This study assessed the impact of a MT-HI on the functional and cognitive outcomes six months post injury of older adults who sustained a minor trauma. **Methods:** This multicenter prospective cohort study in eight sites included patients who were: aged 65 years or older, presenting to the emergency department (ED) within two weeks of injury with a chief complaint of a minor trauma, discharged within 48 hours, and independent for their basic activities of daily living prior to the ED visit. Participants underwent a baseline evaluation and a follow-up evaluation at six months post-injury. The main outcome was the functional decline measured with the Older Americans' Resources and Services (OARS) scale six months after the trauma. **Results:** All 926 eligible patients were included in the analyses: 344 MT-HI patients and 582 without head injury. After six months, the functional decline was similar in both groups, 10.8% and 11.9% respectively (RR = 0.79 [95% CI: 0.55-1.14]). The proportion of participants with mild cognitive disabilities was also similar, 21.7% and 22.8% respectively (RR = 0.91 [95% CI: 0.71-1.18]). Furthermore, for the group of patients with a MT-HI, the functional outcome was not statistically different with or without the presence of a co-injury (RR = 1.35 [95% CI: 0.71-2.59]), or with or without the presence of a mTBI as defined by the WHO criteria (RR = 0.90 [95% CI: 0.59-1.13]). **Conclusion:** This study did not demonstrate that the occurrence of a MT-HI is associated with a worse functional or cognitive prognosis than other minor injuries without a head injury in an elderly population six months after injury.

Keywords: head injury, elderly, functional outcomes

8) Lightning Oral

Predictors of treatment failure in renal colic patients discharged from the emergency department

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Introduction: Most patients with acute renal colic are discharged from the ED after initial diagnosis and symptom control, but 20-30% require repeat ED visits for ongoing pain, and 15-25% require rescue intervention (ureteroscopic intervention or lithotripsy). If patients destined for failure of outpatient management could be identified based on information available during their ED visits, they could be prioritized early for intervention to reduce short term pain and disability. Our objective was to identify predictors of outpatient treatment failure, defined as the need for hospitalization or rescue intervention within 60 days of ED discharge. **Methods:** We collated prospectively gathered administrative data from all Calgary region patients with an ED diagnosis of renal colic over a one-year period. Demographics, arrival mode, triage category, vital signs, pain scores, analgesic use and ED disposition were recorded. Research assistants reviewed imaging reports and documented stone characteristics. These data were linked with regional hospital databases to identify ED revisits, hospital admissions, and surgical procedures. The primary outcome was hospitalization or rescue intervention within 60 days of ED discharge. **Results:** Of 3104 patients with first ED visit for acute renal colic, 1296 had CT or US imaging and were discharged without intervention. Median age was 50 years and 69% were male. 325 patients (25.1%) required an ED re-visit and 11.8% required admission or rescue intervention. Patients with small (<5mm), medium (5-7mm) and large (>7mm) stones failed in 9.0%, 14.4% and 9.9% of cases respectively. The only factor predictive of treatment failure in multivariable models was stone position in the proximal or mid-ureter. Age, sex, vital signs, pain score, WBC, creatinine, history of prior stone or intervention, stone side, stone size, presence of stranding and degree of hydronephrosis were not associated with outpatient failure. **Conclusion:** Outpatient treatment failure could not be predicted based on any of the predictors studied.

Keywords: renal colic, treatment failure, pain management

9) Lightning Oral

Reducing unnecessary coagulation studies in suspected cardiac chest pain patients

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Introduction: In light of escalating health care costs, initiatives such as Choosing Wisely have been advocating the need to "reduce unnecessary or wasteful medical tests, treatments and procedures". We have identified coagulation studies as one of those low cost, but frequently ordered items, where we can decrease unnecessary testing and costs by leveraging our Computerized Practitioner Order Entry (CPOE). Considerable evidence exists to suggest a low yield of doing coagulation studies (herein defined as PTT AND INR's) in suspected cardiac chest pain patients (SCCP). **Methods:** Using administrative data merged with CPOE we extracted data 90 days pre- and 90 post-intervention (Pre-intervention: May 20, 2015 to August 19th 2015, Post-intervention: August 20th, 2015 to November 18th 2015). The setting for the study is a large urban center (4 adult ED's with an annual census of over 320,000 visits per year). Our CPOE system is fully integrated into the ED patient care. The intervention involved modifying the nursing CPOE to remove the pre-selected coagulation studies in SCCP and providing education around appropriate usage of coagulation studies. Patients were included in the study if the bedside nurse or physician felt 1. The chest pain may be cardiac in nature and 2. Labs were ordered. The primary outcome was to compare the number of coagulation studies ordered pre and post-intervention. **Results:** Our analysis included 10,776 patients that were included in an SCCP pathway as determined by the CPOE database. Total number of visits in these two phases were similar (73,551 pre and 72, 769 post). In the pre-intervention phase, 5255 coagulation studies were done (4246 ordered by nursing staff and 1009 studies ordered by ED physicians). In the post-intervention phase, 1464 coagulation studies were ordered (1211 by nursing staff and 253 additional tests were ordered by ED physicians). With our intervention, we identified a net reduction of 3791 coagulation studies in our postintervention phase for a reduction of 72.14% reduction ($p = <0.0001$) At a cost of 15.00$ (CDN$ at our center), we would realize an estimated cost -savings of 56,865$ for this intervention over a 90 day period. **Conclusion:** We have implemented a simple, sustainable, evidence based intervention that significantly minimizes the use of unnecessary coagulation studies in patients presenting with SCCP.

Keywords: chest pain, coagulation, decision support

10) Lightning Oral

Diagnostic and prognostic value of hydronephrosis in emergency department patients with acute renal colic

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Introduction: Hydronephrosis is a marker of stone-related ureteral obstruction. Our objective was to assess the diagnostic and prognostic value of hydronephrosis in ED patients with renal colic. **Methods:** We used an administrative database to identify all renal colic patients seen in Calgary's four EDs in 2014. Research assistants reviewed imaging reports to identify proven ureteral stones, and to document hydronephrosis and stone size. Surgical interventions, ED and hospital visits within 60-days were collated from all regional hospitals. The primary outcome was sensitivity and specificity of hydronephrosis (moderate or severe) for detecting stones >5mm. We also assessed the association of hydronephrosis with index admission-intervention, and with outcomes at 7 and 60 days. **Results:** In 2014, 1828 patients had a confirmed ureteral stone plus assessment of hydronephrosis and stone size (1714 CT, 114 US). Hydronephrosis was absent, mild, moderate or severe in 15%, 47%, 34% and 4% of patients respectively. Median stone size was 4.0, 4.0, 5.0 and 7.0mm for patients in these categories. Mild, moderate and severe hydronephrosis were highly associated with admission (OR = 2.0, 4.6, 9.8; $p<0.001$) and index visit surgical intervention (OR = 2.1, 3.7, 6.0; $p<0.001$). The presence of moderatesevere hydronephrosis was 54.7% sensitive and 65.4% specific for stones > 5mm, with positive and negative predictive values of 51% and 74.2%. Of 1828 patients, 748 had an index visit surgical procedure and 1080 were discharged with medical management. In the latter group, hydronephrosis was absent, mild, moderate or severe in 20%, 50%, 27% and 3%. Corresponding median (IQR) stone size was 3.0, 4.0, 4.0 and 5.0mm. Of 1080 medically managed patients, 19% and 25% had an unscheduled ED revisit by 14 and 60 days, 9% and 10% were hospitalized by 7 and 60 days, and 13% had a rescue procedure within 60 days. In the medically managed group, degree of hydronephrosis had no statistical association with any outcomes at 7 or 60 days. **Conclusion:** Hydronephrosis has poor sensitivity, specificity and predictive value for stones >5mm. Degree of hydronephrosis is highly associated with MD decisions for admission and intervention, but not associated with patient outcomes in the absence of these decisions. Despite poor diagnostic and prognostic performance, hydronephrosis is likely guiding critical early management decisions.

Keywords: hydronephrosis, renal colic, diagnosis

11) Lightning Oral

A restrictive transfusion strategy decreases mortality, re-bleeding and adverse events in hemodynamically stable patients with acute upper gastrointestinal bleeding: findings from a systematic review and meta-analysis of randomized controlled trials

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Introduction: Acute upper gastrointestinal bleeding is a potentially life-threatening medical emergency that frequently requires red blood cell (RBC) transfusions. However, the optimal hemoglobin thresholds for transfusion is controversial. The objective of this study was to establish the most efficacious transfusion threshold. **Methods:** A systematic review of the published literature was completed. MEDLINE, Health technology assessment database, Cochrane central register, Cochrane database of systematic reviews, and EMBASE were searched from inception to May 2015 using search terms including “blood transfusions”, “hemoglobin”, and “red blood cell”. Studies were included if they: reported original data, were peer-reviewed, studied adult populations, were randomized controlled clinical trials and primarily focused on clinical efficacy or effectiveness of liberal and restrictive pre-transfusion hemoglobin level thresholds. Quality was assessed using the Cochrane Risk of Bias tool. Data were extracted and meta-analysis was conducted using a random effects model to determine the risk ratio for: all-cause mortality, further bleeding and any adverse events. All steps were completed independently by two reviewers. **Results:** The literature search identified 4037 unique abstracts. Of these, 156 abstracts proceeded to full text review. 154 articles were excluded during full-text review resulting in 2 articles for final analysis. The total number of participants included was 701. The hemoglobin threshold to transfuse RBC varied between 70-80g/L versus 90-100g/L in restrictive and liberal policies, respectively. Both studies were at low risk of bias. Meta-analysis resulted in a pooled decreased risk of all-cause mortality (RR 0.65, 95% CI 0.44-0.96), re-bleeding (RR 0.63, 95% CI 0.46-0.85) and adverse events (RR 0.83, 95% CI 0.73-0.95) in the restrictive blood transfusion group versus the liberal blood transfusion group. **Conclusion:** While the evidence is limited, the risk of death is lower and there is no significant harm for a restrictive strategy. In this context, there is a decreased risk of transfusion associated adverse events among those receiving a restrictive strategy and should be considered for its impact on patient safety and health system resources.

Keywords: upper gastrointestinal bleeding, blood transfusions, hemoglobin

12) Lightning Oral

Canadian in-hospital mortality for patients with emergency-sensitive conditions

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Introduction: The emergency department (ED) hospital standardized mortality ratio (ED-HSMR) measures risk-adjusted mortality for patients admitted to hospital with conditions for which ED care may improve outcomes (emergency-sensitive conditions). This study aimed to describe in-hospital mortality across Canadian provinces using the ED-HSMR**. Methods:** Data were extracted from hospital discharge databases from April 2009 to March 2012. The ED-HSMR was calculated as the ratio of observed deaths among patients with emergency-sensitive conditions in a hospital during a year (2010-11 or 2011-12) to the expected deaths for the same patients during the reference year (2009-10), multiplied by 100. The expected deaths were estimated using predictive models fitted from the reference year for different hospital peer-groups (teaching, large, medium and small hospitals) adjusted for comorbidities, age, diagnosis, and hospital length of stay. Thirty-seven validated emergency-sensitive conditions were included (e.g., stroke, sepsis, shock). Aggregated provincial EDHSMR values were derived from patient-level probabilities of death. A HSMR above or below 100 respectively means that more or fewer deaths than expected occurred in hospital within a province. **Results:** During the study period, 1,335,379 patients were admitted to 629 hospitals across 11 provinces and territories with an emergency-sensitive condition as the most responsible diagnosis, of which 8.9% died. More in-hospital deaths (95% confidence interval) than expected were respectively observed for the years 2010-11 and 2011-12 in Newfoundland [124.3 (116.3-132.6) & 117.6 (110.1-125.5)] and Nova Scotia [116.4 (110.7- 122.5) & 108.7 (103.0-114.5)], while mortality was as expected in Prince Edward Island and Manitoba, and less than expected in other provinces and territories [Territories 67.3 (48.3-91.3) & 73.2 (55.0-95.5); New Brunswick 87.7 (82.5-93.1) & 90.4 (85.2-95.8); British Columbia 92.0 (89.6-94.4) & 87.1 (84.9-89.3); Saskatchewan 92.3 (87.1-97.4) & 90.8 (86.2-95.6); Ontario 94.0 (92.6-95.4) & 88.0 (86.6-89.3); Alberta 94.1 (91.1-97.2) & 91.0 (88.2-93.9); Québec 95.7 (93.8-97.6) & N/A]. **Conclusion:** Our study revealed important variation in risk-adjusted mortality for patients admitted to hospital with emergency-sensitive conditions among Canadian provinces. The results should trigger more in-depth evaluations to identify the causes for these regional variations.

Keywords: all-cause mortality, performance, quality indicators

13) Lightning Oral

The utility of an inpatient diagnosis-derived Charlson Comorbidity Index to create an emergency department workload model

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Introduction: A previous Canadian emergency department (ED) model determined predictors of increased workload using a manual chart review to elucidate comorbidities. We designed an electronic algorithm to capture all comorbidities based on the Charlson Comorbidity Index (CCI) for a 5 year period preceding the ED visit from the regional inpatient database. Our objective was to identify predictors correlating with physician time require to treat patients and thus develop a multivariable model to predict physician workload. **Methods:** From May to September 2015, two research assistants (RAs) shadowed a random sample of physicians from the six urban EDs in a single health region. They documented time spent performing clinical and non-clinical functions for patient visits. A linkage with the previously validated regional ED database was used to obtain triage acuity, age, gender, mode of arrival, and CCI scores. Multiple linear regression was used to describe the associations between predictor variables and total physician time per patient visit as well as time spent on history and physical exam and to derive an equation for physician workload. RA inter-rater reliability was assessed on 107 MD-patient interactions. **Results:** Over the 4-month period, 873 patient encounters were documented. Data from 599 completed encounters were included in the model. The median age was 49.4 (SD 22.8) and 52.2% were female. Overall, 16.0% were admitted to hospital, 64.9% of patients were CTAS 1-3, 19.6% of patients arrived by ambulance, and 15.5% of patients had a CCI score of ≥ 1. The mean time spent on history and physical was 7.0 minutes (SD 4.73) and mean total time was 19.4 minutes (SD 11.6). Using a linear regression model with total time as the dependent and EMS arrival, CTAS, and age as the independent variables, having any CCI score is a significant predictor of total time ($p = 0.03$). with a difference of 2.9 minutes between CCI positive versus negative patients. Higher acuity was the most significant factor associated with time spent with a mean difference of 4.4 minutes per CTAS category. The intraclass correlation coefficient value was 0.99 (95% CI 0.97-1.00) indicating excellent reliability. **Conclusion:** The electronically derived CCI does have value in the development of a physician workload model and can replace the use of manual chart review to define patient comorbidities.

Keywords: Charlson Comorbidity Index, emergency department workload model, administrative database

14) Lightning Oral

Predicting short-term risk of arrhythmia among patients with syncope: the Canadian Syncope Arrhythmia Risk Score

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Introduction: Suspicion of arrhythmias among syncope patients is the leading cause of emergency department (ED) referrals and hospitalization. However, the risk factors for short-term arrhythmias are not well defined. We sought to develop a risk prediction tool to identify syncope patients at risk for 30-day arrhythmia or death after ED disposition. **Methods:** This prospective cohort study involved 6 academic EDs that enrolled adult syncope patients. We collected standardized variables at index presentation from history, clinical examination, investigations including ECG, and patients' disposition. Adjudicated outcomes included death (due to arrhythmia or unknown cause), arrhythmia or procedural intervention to treat arrhythmias within 30-days after ED disposition. Multivariable logistic regression was used to derive the model; bootstrap sampling for internal validation and to estimate shrinkage and optimism. **Results:** 5,010 adult syncope patients (mean age 53.4 years, 54.8% females, and 9.5% hospitalized) were enrolled with 106 (3.6%) patients suffering arrhythmia or death within 30-days after ED disposition. Of 39 candidate predictors examined, eight were included in the final model: vasovagal predisposition, heart disease, any ED systolic blood pressure <90 or >180 mmHg, troponin (>99%ile), QRS duration >130msec, QTc interval >480msec and ED diagnosis of cardiac, or vasovagal syncope [Optimism corrected c-statistic: 0.91 (95%CI 0.87-0.93); Hosmer-Lemeshow p = 0.08]. The Canadian Syncope Arrhythmia Risk Score had a risk ranging from 0.2% for a score of -2 to 74.5% for a score of 8. Sensitivity for threshold score ≤-1 was 100% (95% CI 96.5-100) and specificity for a score of ≥4 was 97.0% (95% CI 96.5-97.5). **Conclusion:** The Canadian Syncope Arrhythmia Risk Score can improve acute management of ED patients with syncope by better identification of those at higher-risk for short-term arrhythmia or death. Once validated, the tool can be used to guide disposition decision and can also aid in selection of patients for out-of-hospital cardiac monitoring if discharged home.

Keywords: syncope, arrhythmia, risk stratification

Moderated Posters Presentations – CAEP 2016

15) Moderated Poster

Using GRADE-based recommendations for analgesia and antiemetics in electronic order sets to influence physician behaviour towards best practice and cost-savings

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Introduction: The addition of computerized physician order entry (CPOE) to Emergency Departments in recent years has led to speculation over potential benefits and pitfalls. Recent studies have shown benefits to CPOE, though there lacks sufficient evidence on how it could change physician behaviour. Physician practices are known to be difficult to change, with getting evidence into daily practice being the main challenge of knowledge translation. Our study aims were to determine if well-designed electronic order sets for CPOE improved MD practices. **Methods:** The Calgary Zone Pain Management in the Emergency Department Working Group relied on a GRADE-based literature review for identifying best practices for analgesia and antiemetics, resulting in soft changes to the dedicated analgesia and antiemetic electronic order set noting working group preference, and emphasizing hydromorphone over morphine, as well as 4 mg ondansetron over 8 mg. The new electronic order set was started in the only Calgary Region order entry system on December 11th, 2014. Data was collected from July 2014 - May 2015. A Yates chi-squared analysis was completed on all orders in a category, as well as the subgroups of ED staff and residents, and orders placed using the new order set. **Results:** A total of 100460 orders were analyzed. The use of hydromorphone increased significantly across all 4 EDs. IV hydromorphone use increased (5.82% of all opioid orders up to 26.93%, $P<0.0001$) with a reciprocal decline in IV morphine (67.81% of all opioid orders down to 46.56%, $P<0.0001$). Similar effects were observed with ondansetron 4 mg IV orders increasing (1.37% of all ondansetron orders to 18.64%, $P <0.0001$) with a decrease in 8 mg dosing (15.75% of all ondansetron orders to 7.23%, $P<0.0001$). These results were replicated to a lesser degree in the non-ED staff and non-order set subgroups. Implementation of the new order set resulted in an increase of its use (37.64% of all opioid orders up to 49.29%, $P <0.0001$). Finally, a cost-savings analysis was completed showing a projected annual savings of $185,676.52 on medications alone. **Conclusion:** This data supports the manipulation of electronic order sets to help shape physician behaviour towards best practices. This provides another strong argument towards the benefits of CPOE, and can help maintain best practices in Emergency Medicine.

Keywords: analgesia, electronic order sets, knowledge translation

16) Moderated Poster

Impact of physician payment mechanism on wait times and ED length of stay

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Introduction: Vancouver Coastal Health (VCH) emergency physicians have been on contract based funding models for two decades. On October 1, 2015, physicians at one hospital (SPH) switched to fee-forservice (FFS) payments. Conventional wisdom is that FFS physicians are motivated to see more patients quickly and achieve higher throughput. Our hypothesis was that FFS payment would reduce patient wait times. **Methods:** This interrupted time series analysis with concurrent control was performed in VCH Region, where there are two tertiary EDs. During the 20-week study period (July 15-Nov 30), VGH remained on contract, while SPH converted to FFS (the intervention). VCH administrative data was aggregated by week. Our primary outcome was median wait time to MD. Secondary outcomes were ED LOS and left-without-being-seen (LWBS) rates. **Results:** Interrupted time series plots will be presented for the data. Data from 67,214 ED visits were analyzed (31,733 SPH, 35,481 VGH). Figure 1 shows that baseline wait time was 74 minutes at the control and 53 minutes at the intervention site. During the pre-intervention period, there was a non-significant downward trend of 0.4 minutes per week at the intervention hospital relative to control ($p = 0.26$). After FFS conversion, there was a 4.1 minute increase in wait time at the control site ($p = 0.18$), and a significant downward trend of 1.4 minutes per week ($p = 0.001$). After FFS conversion, wait times at the intervention site increased by 4.8 minutes more than control (p-value for the difference = 0.27), and the wait time trend increased significantly by 1.3 minutes per week relative to the expected counterfactual trend ($p = 0.02$). Baseline EDLOS for discharged patients was 227 minutes at the control hospital and 193 minutes at the intervention site. There were similar preintervention LOS increases at both hospitals. Post-intervention, both sites saw significant increases in EDLOS, followed by a similar downward trends of -2.68 minutes per week ($p = 0.001$). Baseline LWBS rate was 3.86% at the control hospital and 3.56% at the intervention site. Pre-intervention trends, and post-intervention level/ trend changes did not differ by site**. Conclusion:** Conversion to FFS payment was associated with an increase in wait time trend of 1.3 minutes per week relative to control. There were no significant changes in EDLOS or LWBS rates. In this preliminary analysis, FFS payment had little effect on wait times or patient throughput.

Keywords: physician compensation, efficiency, fee for service

17) Moderated Poster

Systematic review of the management of lateral epicondylitis using transdermal nitroglycerin

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Introduction: Lateral epicondylitis (LE), also known as tennis elbow, is an overuse-underuse tendinopathy originating from the forearm extensor tendons of the elbow. An emerging therapy for the treatment of LE is the use of transdermal nitroglycerin (NTG) patches for pain relief and improved function. Our systematic review assesses 18 to 65 year old patients with clinically diagnosed LE and no structural damage or longstanding elbow injury to determine if transdermal NTG patches provide improved short term and long term pain relief as well as improved function in comparison with placebo. **Methods:** We included randomised controlled trials (RCT's) of NTG patch use versus placebo for the treatment of LE. Prospective comparison studies were also eligible for assessing the long term pain relief of NTG patch use. We performed a literature search using MEDLINE, EMBASE, SportDiscus and the Cochrane Database of Systematic Reviews. English language articles were retrieved for review up to November 2015. Risk of bias within the studies was assessed regarding randomisation, allocation sequence concealment, blinding and selective outcome reporting. **Results:** Three RCT's were included that compared transdermal NTG patch use (two studies with 1.25mg/24h and one study comparing 0.72, 1.44 and 3.6mg/24h) versus a placebo to treat LE. One prospective comparison study of five years duration was included as a follow-up to one of the included RCT's to assess pain and function five years after the discontinuation of therapy. Data was not pooled because of heterogeneity in study methods and outcomes. The use of transdermal NTG patches provided short term pain relief (2-6 weeks for dosing of 0.72mg/24h or 1.25mg/24h) compared with placebo as suggested by three RCT's. Long term pain relief was improved by NTG patch use compared with placebo at six months in one RCT, but not at five years in a prospective comparison study. Function improved in two different RCT's with NTG patch use at 0.72mg/24h and 1.25mg/24h when compared to placebo. Five years after cessation of treatment, there was no difference between NTG patch and placebo. **Conclusion:** Overall, the included studies demonstrate that the use of NTG patches compared to placebo improves short term and long term pain relief, as well as elbow function. However, more studies are required to bridge the gaps between the existing studies and reduce heterogeneity between the study designs.

Keywords: lateral epicondylitis, nitroglycerin

18) Moderated Poster

Does your patient really need intravenous therapy? A multicenter variation analysis of physician practice in low-acuity presentations

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Introduction: The decision to treat with parenteral therapy may reflect a variable practice pattern among emergency physicians and represent an opportunity to standardize care. Our objective was to describe physician level practice variation for IV therapies in patients with low-acuity presentations and quantify the contribution of IV therapy to prolonging ED LOS. **Methods:** Using administrative data merged with computerized physician order entry information we sampled 48 months of patient variables across four urban EDs (Jan 1, 2014 - Dec 22, 2015). Eligible patients: 1. presented with complaints of abdominal pain, nausea and vomiting or diarrhea or had a discharge diagnosis of cellulitis 2.were in a low acuity category (Canadian Triage and Acuity Scale - CTAS 3 or 4) 3.were triaged to non-stretcher zones of the ED and 4.were not admitted to hospital. The primary outcome was the physician-level variation in the decision to order IV therapies for this patient group; namely one or more of the following: IV fluids, opioid analgesia, antiemetics and antibiotics. Secondary outcomes were a comparison of ED LOS, ED revisits at 7 days and ED revisits resulting in admission at 7 days for the IV and non-IV groups. **Results:** Our analysis included 31 802 patient visits treated by 185 physicians. The average patient age was 37.8 years with 64.3% being female and the majority triaged as CTAS 3 (82.5%). On average 24% of these visits were treated with IV therapies; 90th percentile; 34%. For physicians seeing in excess of 100 cases, the variation in IV therapy use ranged from 1% to 47%. Patients receiving IV therapies demonstrated a 44% greater average LOS (6.2 hours vs 4.3 hours) and those receiving IV therapies had higher 7-day ED revisit rates (12.0% vs 8.8%) as well as 7-day ED revisits resulting in readmission (2.4% vs 1.0%). 'mso-spacerun:yes' > Secondary outcomes were a comparison of ED LOS, ED revisits at 7 days and ED revisits resulting in admission at 7 days for the IV and non-IV groups. **Conclusion:** This is the first study to examine physician preference for the use of IV therapies in a low-acuity population and has demonstrated in excess of a 47-fold variation between both extremes of use. Reducing practice variation in this area of ED care by standardizing indications for IV therapies could result in more rational resource utilization and improved throughput.

Keywords: resource utilization, low-acuity visits, IV therapies

19) Moderated Poster

Synovial fluid analysis in the diagnosis of septic arthritis: comparing local data to the literature

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Introduction: A hot, painful, swollen joint is a common presentation to the emergency department. Of the potential etiologies, septic arthritis (SA) is the most devastating. Prompt diagnosis and treatment are essential to improve outcomes. Both culture proven and clinically suspected SA are thought to have the same prognosis, with similar morbidity and mortality estimates. No clinical exam or serum lab finding has the sensitivity or specificity to diagnose or exclude SA. Instead, diagnosis relies mainly on joint aspiration and synovial fluid analysis. A synovial white blood cell count (sWBC) greater than 50,000 cells/ microliter is suggestive of SA and organisms seen on gram stain or growing in culture effectively makes the diagnosis. However, culture and gram stain are positive in only 67% and 50% of cases respectively. The objective of this study was to analyze the accuracy of synovial fluid analysis in our local practice environment. **Methods:** All those encounters with diagnoses related to SA at four adult emergency departments in Calgary between 2013-2014 were reviewed. Hospital records were analyzed for synovial analysis, antibiotic usage and surgical procedures. **Results:** Of 286 encounters, 87 were determined to satisfy the definition for SA in that culture was positive, gram stain was positive or clinical findings lead to treatment with antibiotics and/or surgical intervention. Gram stain was positive in 22% of cases with cultures positive in 51% of patients. sWBC were less than 50000 in 55% of cases and less than 25000 in 24% of cases. Of 88 gram stains performed, 28% were negative but had positive culture. All positive gram stains were associated with positive cultures. **Conclusion:** Culture, gram stain and sWBC of patients diagnosed with SA in Calgary show differences compared with the published literature. In Calgary, the majority of SA diagnoses were made clinically. The sWBC is central to making the diagnosis. Interestingly, 55% of patients diagnosed with SA had a count less than 50,000. It remains unclear what features of history, physical exam, imaging and lab analysis lead to the diagnosis of SA in these cases. Future studies will focus on these outliers to see if a more appropriate diagnostic algorithm would be useful in Calgary. Collaboration between infectious disease specialists, orthopedics, and emergency departments guided by local data is needed to ensure accurate and timely diagnosis.

Keywords: septic arthritis, diagnosis

Poster Presentations – CAEP 2016

20) Poster

A novel use of a point-of-view camera for teaching lateral canthotomy and cantholysis to emergency physician trainees

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Introduction / Innovation Concept: Orbital compartment syndrome (OCS) is a vision threatening ocular emergency that occurs when there is a sudden rise in orbital pressure resulting in damage to intraocular structures. Lateral canthotomy and cantholysis (LCC) is a simple procedure used to decompress the orbit. Emergency physicians should be comfortable evaluating and diagnosing OCS, and performing a LCC to decrease the risk of vision loss in the event that consultation and intervention by an ophthalmologist is not possible in a timely manner. Developing this skill is challenging as this procedure is seldom performed, therefore resources need to be available. Current training videos are an excellent learning tool but are limited by several factors, such as not capturing from the perspective of the physician performing the procedure. Point-of-view (POV) cameras show the physician's perspective, which is more conducive to training as it mimics the experience for trainees. We report our novel technique of recording a LCC using a headmounted POV camera as a resource for emergency physician trainees in learning this procedure. **Methods:** We used a head mounted POV GoPro Hero 4 Silver camera (GoPro, San Mateo, CA, U.S.A.) with a modified 5.4mm f/2.5 aftermarket lens with a 60° field of view (Peau Productions Inc, San Diego, CA, U.S.A.). This lens was pre-focused to a working distance of 17 inches, set to 1080P on narrow recording at 48 frames per second, and had spot metering and the low light functions turned on. The camera functions were controlled remotely by an assistant with the use of GoPro App on a tablet computer to ensure proper framing of the camera. Curriculum, Tool, or Material: Our novel use of a POV camera for recording LCC is an efficient, cost effective tool useful for medical education at an academic institution as well as a valuable resource for emergency room clinicians. The POV recording system can be a training device in an emergency setting for performing a LCC or other procedures that emergency physicians may seldom encounter. **Conclusion:** Point-of-view cameras have great potential in assisting the education at the post-graduate level within residency training programs. Video recording from the physician's perspective simulates the experience for trainees and could leave them feeling more confident in their ability to perform the procedure.

Keywords: innovations in EM education, simulation, online educational resources

21) Poster

A clinical decision support intervention to increase usage of probenecid in the ED

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Introduction: In certain circumstances, skin and soft tissue infections are managed with intravenous (IV) antibiotics. In our center, patients initiated on outpatient IV antibiotics are followed up by a home parental therapy program the following day. A significant number of these patients require a repeat visit to the ED because of clinic hours. Probenecid is a drug that can prolong the half-life of certain antibiotics (such as cefazolin) and can therefore avoid a repeat ED visit, reducing health care costs and improve ED capacity. Our goal was to increase probenecid usage in the ED in order to optimize management of skin and soft tissue infections (SSTI) in the ED. The primary outcome was to compare the usage of probenecid in the pre and post-intervention phase. Secondary outcomes were to compare revisit rates between patients receiving cefazolin alone vs cefazolin + probenecid. **Methods:** Using administrative data merged with Computerized Physician Order Entry (CPOE), we extracted data 90 days pre- and 90 post-intervention (February 11, 2015 to August 11, 2015). The setting for the study is an urban center (4 adult ED's with an annual census of over 320,000 visits per year). Our CPOE system is fully integrated into the ED patient care. The multi-faceted intervention involved modifying all relevant SSTI order sets in the CPOE system to link any cefazolin order with an order for probenecid. Physicians and nurses were provided with a 1 page summary of probenecid (indications, contra-indications, pharmacology), as well as decision support with the CPOE. Any patients who were receiving outpatient cefazolin therapy were included in the study. **Results:** Our analysis included 2512 patients (1148 and 1364 patients in the pre/post phases) who received cefazolin in the ED and were discharged during the 180 day period. Baseline variables (gender, age, % admitted) and ED visits were similar in both phases. In the pre-intervention phase 30.2% of patients received probenecid and in the post-intervention phase 43.0%, for a net increase of 12.8% ($p = <0.0001$). Patients who received probenecid had a 2.2% (11.4% vs 13.6%, $p = 0.014$) lower re-visit rate in the following 72H. **Conclusion:** We have implemented a CPOE based clinical decision support intervention that demonstrated significant increase in probenecid usage by emergency physician and resulted in a decrease in ED revisits. This intervention would result in health care cost-savings.

Keywords: probenecid, decision support, infection

22) Poster

A novel administrative database solution for capturing ED patient co-morbidity - the derived Charlson Comorbidity Index

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Introduction: ED patient comorbidity is difficult to ascertain for research. Traditional surrogates such as triage acuity, admission rate, and age have been used to approximate patient complexity. Differences between EDs for the management of similar conditions are nevertheless difficult to reconcile. The Charlson Comorbidity Index (CCI) contains 19 categories and is a validated predictor of the ten-year mortality for a patient who may have a range of comorbid conditions. CCI is based on the International Classification of Diseases (ICD) diagnosis codes found in administrative data such as the Discharge Abstract Database (DAD). The DAD collects this, and other inpatient information, for all Canadian hospitals. We sought to develop a linkage between the regional ED database and the regional inpatient DAD in order to derive a CCI score for each ED patient as a surrogate of comorbidity. **Methods:** We used regional data from Vancouver Coastal Health (VCH) over a 2.5 year period from April 2013 - September 2015. An algorithm was created to identify CCI conditions in the regional DAD. Whenever a patient visited the ED a query was made to the DAD going back for 5 years to acquire CCI relevant diagnoses and enter these diagnoses as well as the CCI weighting into the ED database. Patient DAD records from VCH were utilized no matter in which ED a patient presented. No information from admissions outside the region was available. **Results:** There were 931,596 regional ED visits made by 446,579 unique patients in a total of 11 EDs (6 urban and 5 rural). In total there were 127,233 patients with a CCI score (13.7% of total visits). The average CCI was 0.40 (SD 1.31) with a range of 0.12 at the urban urgent care centre to 0.52 at the urban tertiary care centre. More isolated rural EDs tended to have higher percentages of patients with CCI scores than community urban EDs. Higher acuity, age, and ambulance arrival, ED death, all correlated to higher CCI scores. The most common CCI conditions were “diabetes with complications” (10/11 EDs) and was present in 35,816 (3.8%) visits and “cancer” (10/11 EDs) present in 34,624 (3.7%) ahead of COPD (26,451 visits) and CHF (25,233 visits). **Conclusion:** Use of the CCI is a novel way to passively capture patient comorbidities without reliance on a data entry technician. Limitations include the inability to link to hospitalization data outside a specific health region.

Keywords: comorbidity, Charlson Comorbidity Index, international classification of diseases (ICD)

23) Poster

Electronic health record perceptions and utilization by physicians in urban emergency departments

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Introduction: In 2006, Alberta implemented an Electronic Health Record called the Alberta Netcare Portal (ANP). The ANP provides provincial read-only access to lab tests, diagnostic imaging, medication information and numerous text reports. There is no computerized order entry, and care is coordinated using a hybrid of paper charting and various electronic systems. Here, we quantify observed ANP use by physician participants providing care in four urban Emergency Departments (EDs) in Alberta. The results form part of a larger mixed methods research project aimed at detecting broader implications of ANP use for patient care. **Methods:** Between October 2014 and July 2015, ED physicians at four EDs (University of Alberta Hospital [UAH], Grey Nuns Community Hospital [GNCH], Foothills Medical Centre [FMC], Peter Lougheed Centre [PLC]) participated in structured clinical observations. Observations were purposively sampled during the first hours of shifts, when physicians orient themselves to the patients they will see during the rest of their shift, including reviewing available historic patient information. Observers used a tablet based tool to generate a time-stamped record of the information tools used alongside patient care. Information tools included permanent paper records, paper excluding permanent documentation, the ANP, clinical and other applications accessed via desktop computers, and mobile devices. Observers also recorded contextual data, including participant commentary, on paper field notes. **Results:** Across the 4 sites, 142 physicians participated in 376 sessions for a total of 566 observed physician-hours. Participants accessed information in different computerized applications and on paper (i.e., a 'hybrid' care environment). The highest proportion of observed physician time interacting with ANP was observed at the UAH (7.0%-8.1%, all values 95% Confidence Intervals). Physicians spent less time using ANP at GNCH (4.1%-4.8%), which was similar to the Calgary EDs (FMC: 4.4-5.3% and PLC: 5.2%-5.9%). Thematic analysis of field notes showed that ANP acceptance was very high. Patient safety concerns were recorded related to care provided alongside 'hybrid' patient records. **Conclusion:** We found high physician acceptance of ANP based on documented comments and observed usage. We posit a high potential for EHRs such as ANP to support improved care coordination which remains partly realized.

Keywords: electronic health record, medical informatics, decision making

24) Poster

Is triage score a valid measure of emergency department case mix?

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Introduction: In the Canadian province of Alberta, (pop. 4,227,879), the publicly-funded health care system uses the five level Canadian Triage and Acuity Scale (CTAS), to prioritize emergency department (ED) patients. Health system decision makers and policy makers currently use CTAS as an isolated metric to describe ED patient case-mix and to compare EDs. **Methods:** Using the National Ambulatory Care Reporting System dataset, we reviewed the distribution of patient CTAS scores and the proportion of inpatient admissions by CTAS level for the 16 highest volume Alberta hospital EDs during FY 2013/2014. **Results:** Collectively, the EDs received 1,027,976 patients, with 1%, 18%, 44%, 30% and 7% classified as CTAS 1-5, respectively. The proportions by CTAS level ranged from 0.2% to 2.8% in CTAS 1; 3.3% to 33.3% in CTAS 2; 29.1% to 54.1% in CTAS 3; 16.7% to 49.0% in CTAS 4; and 3.1% to 12.3% in CTAS 5. Admission proportions by CTAS level ranged from 43.9% to 75.2% in CTAS 1; 18.9% to 42.1% in CTAS 2; 5.4% to 24.7% in CTAS 3; 0.8% to 9.3% in CTAS 4; and 0.1% to 9.1% in CTAS 5. **Conclusion:** Inter-hospital differences in CTAS acuity distributions reflect triage variability and real differences in case-mix. Wide variation in admission proportions by CTAS level reflects differing admission thresholds between sites, but also suggest intra-level differences in patient severity, comorbidity and complexity. Triage levels cannot be used as an isolated metric to describe and compare ED case-mix. Further work is required to accurately characterize ED patient case-mix.

Keywords: triage, case mix

25) Poster

Handover education in Canadian adult and pediatric emergency medicine residencies: a national survey and needs assessment

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Introduction: Emergency department handover is a high-risk period for patient safety. A recent study showed a decreased rate of preventable adverse events and errors after implementation of a resident hand-off bundle on pediatric inpatient wards. In a 2013 survey by the Canadian Associations of Internes and Residents, only 11% of residents in any discipline stated they received a formal teaching session on handover. Recently, the CanMEDS 2015 Physician Competency Framework has added safe and skillful transfer of patient care as a new proficiency within the collaborator role. We hypothesize that significant variation exists in the current delivery and evaluation of handover education in Canadian EM residencies. **Methods:** We conducted a descriptive, cross-sectional survey of Canadian residents enrolled in the three main training streams of Emergency Medicine (FRCP CCFP-EM, PEM). The primary outcome was to determine which educational modalities are used to teach and assess handover proficiency. Secondarily, we described current sign-over practices and perceived competency at patient handover. **Results:** 130 residents completed the survey (73% FRCP, 19% CCFP-EM, 8% PEM). 6% of residents were aware of handover proficiency objectives within their curriculum, while 15% acknowledged formal evaluation in this area. 98% of respondents were taught handover by observation of staff or residents on shift, while 55% had direct teaching on the job. Less than 10% of respondents received formal sessions in didactic lecture, small group or simulation formats. Evaluation of handover skills occurred primarily by on shift observation (100% of respondents), while 3% of residents had received assessment through simulation. Local centre handover practices were variable; less than half of residents used mnemonic tools, written or electronic adjuncts. **Conclusion:** Canadian EM residents receive variable and sparse formal training and assessment on emergency department handover. The majority of training occurs by on shift observation and few trainees receive instruction on objective tools or explicit patient care standards. There exists potential for further development of standardized objectives, utilization of other educational modalities and formal assessments to better prepare residents to conduct safer patient handoffs.

Keywords: handover, education, residency

26) Poster

Correlation between serum and blood gas: a review on the accuracy of electrolyte readings obtained blood gases

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Introduction: In the Emergency Department (ED), increasing time pressures and acuity require physicians to have access to quick and reliable data to guide patient care decisions. Blood gases (BGs) allow quick access to key information, and are used frequently in the ED. Our objective was to review the literature on reliability and accuracy of electrolyte measurements obtained from BGs in high acuity settings. **Methods:** A comprehensive literature review was conducted in September of 2015. The search strategy, done in conjunction with a medical librarian, identified studies that assessed the accuracy of BGs when compared to traditional laboratory serum measurements. Prior to the review we determined sodium and potassium would be the area of focus. Eligibility parameters for the studies included samples from acute care areas - the ED and ICU - and a comparison of BG and serum values taken simultaneously from the patient. **Results:** Our review included 12 studies, 9 in adult and 3 in pediatrics. There were approximately 1,135 patients included, consisting of 851 adult and 284 pediatric cases. The results were mixed; 9 studies agreed that sodium and potassium readings from BGs were accurate enough to guide acute care decisions, 5 did not. Furthermore, important questions were raised regarding the varying accuracy of BGs depending on what physiological level the electrolytes were at during the time of collection, i.e. at critical vs non-critical levels. **Conclusion:** This is the first literature review to examine the existing evidence on the accuracy of BGs in acute care environments. Given the variability in the results, a larger study needs to be done to determine the validity and reliability of blood gases for electrolytes in acute care settings. Only by ensuring the accuracy of data collected via point-of-care BGs can the most informed decisions be made surrounding patient care in acute care settings.

Keywords: blood gas, electrolytes

27) Poster

Accuracy of the Ottawa Ankle Rules when applied by allied health providers in a pediatric emergency department

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Introduction: The Ottawa Ankle Rules (OAR) are a clinical decision tool used to minimize unnecessary radiographs in ankle and foot injuries. The OAR has been shown to be a reliable rule to exclude fractures in children over 5 years of age. However, there is limited data to support its use by other health care workers in children. Our objective was to determine the sensitivity and specificity of the OAR, to detect clinically significant fractures, when applied by allied health providers (AHPs). **Methods:** Children aged 5 to 17 years presenting with an acute ankle or foot injury were enrolled. Patients assessed by a physician prior to an AHP, presenting for reassessment or >24 hours after the injury, having open, penetrating or neurovascular injury, or multiple injuries were excluded. Patients with metabolic bone disease, a previous x-ray, or the inability to communicate or ambulate before the injury were also excluded. Baseline data on x-ray use was collected in a convenience sample of 100 patients. AHPs then completed an OAR learning module. Then in phase 2, AHPs applied the OAR to a convenience sample of 186 patients. Both AHPs and physicians performed inter-observer assessments. **Results:** When AHP's applied the ankle portion of the OAR, the sensitivity was 88% (95% CI 46.7-99.3) and the specificity was 32.5% (95% CI 24.5-41.6) for clinically significant fractures. When AHP's applied the foot portion of the OAR, the sensitivity was 87.5% (95% CI 46.7-99.3) and the specificity was 15.6% (95% CI 7.0-30.1) for clinically significant fractures. In total, 2 clinically significant fractures (1 foot fracture and 1 ankle fracture) were missed by AHP's. Inter-observer agreement was $\kappa = 0.24$ for the ankle rule and $\kappa = 0.32$ for the foot rule. The missed ankle fracture had a positive OAR when performed by a physician as an inter-observer assessment. The missed foot fracture was a distal metatarsal fracture that was outside of the "foot zone" as defined by the OAR. **Conclusion:** The sensitivity of the OAR when applied by AHP's was very good. Both clinically significant fractures that were missed by AHP's would likely have been picked up by a physician assessment. More training and practice using the OAR would likely improve AHP's inter-observer reliability. Our data suggest the OAR may be a useful tool for AHP's to apply as a screening tool prior to physician assessment.

Keywords: Ottawa Ankle Rule, radiography, allied health providers

28) Poster

The effect of Alberta's new impaired driving legislation on motor vehicle-related trauma

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Introduction: Motor vehicle collisions (MVCs) resulting in injuries and death disproportionately involve impaired drivers. Those under the influence of alcohol also have a much higher rate of presentation and admission to hospital for traumatic injuries. In an attempt to decrease impaired driving and consequently alcohol related MVCs and injuries, the government of Alberta recently introduced more strict legislation in the summer of 2012 for drivers found to be under the influence of alcohol. However, it has yet to be seen what impact the enforcement of this new legislation has had on traumatic injuries secondary to MVCs and alcohol impairment. The objective of this study was to assess the relationship between the implementation of Alberta's new impaired driving legislation and the number of alcohol-related motor vehicle traumatic injuries presenting to the emergency department of a Level I Trauma Centre. **Methods:** A retrospective single centre cross-sectional chart review examining all adult patients presenting to the ED of a major trauma centre who: a) require trauma team activation or consultation and b) have a MVC related injury. Of those charts meeting these criteria, the proportion of patients with positive ethanol screens will be compared between the year before and after the new legislation being implemented. Patients will be identified using electronic medical record logs. **Results:** 938 total MVC related trauma patients were identified during the study period (468 prior to legislation enactment [2010-2012], 470 after [2012-2014]). 33.3% of these MVC trauma patients had positive ethanol screens prior to the legislation enactment and 32.4% after (a non significant decrease). Interestingly, with a secondary analysis on a year by year basis, the trends appear to be more noteworthy. When comparing between 2010 and 2013 there was a statistically significant drop in the number of cases over legal limit by 7.74%. Subgroup analysis also demonstrated a large, statistically significant drop in 16-24 yr old cases between 2010 and 2013, from 29 to 11% (a 62% drop). **Conclusion:** While an impact was not seen immediately following the enactment of Alberta's new impaired driving legislation, a year by year analysis demonstrates a statistically significant decrease in MVC related trauma involving alcohol in the years following the new law. Of note, a substantial 62% drop was seen in the 16-24 year old age category.

Keywords: motor vehicle, trauma, alcohol

29) Poster

Does an age-adjusted D-dimer threshold provide adequate sensitivity in ED patients investigated for pulmonary embolism?

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Introduction: The D-dimer assay is a high sensitivity, low specificity test used to rule out pulmonary embolism (PE) in low risk ED patients. Patients with a positive D-dimer result will likely undergo CT imaging to confirm the diagnosis. Given the time, cost, and radiation exposure associated with CT, and the higher false-positive rate in older patients, an age-adjusted D-dimer threshold may be preferred. Our objective was to evaluate the sensitivity and specificity of an age-adjusted D-dimer and approximate the downstream effect on CT imaging utilization. **Methods:** This was a retrospective cohort study conducted using administrative data from Calgary emergency departments between July 2013 and January 2015. Eligible patients were individuals aged 50 and older who were undergoing PE workup including D-dimer testing. Outcomes were ascertained using CT imaging reports and by searching the regional administrative database for subsequent diagnosis of PE within 30 days of the index visit. These data were used to calculate the sensitivity, specificity, positive predictive value, and negative predictive value of the D-dimer test using the standard threshold (500 ng/mL) and an age-adjusted threshold (10 ng/mL x patient age as an integer). From this, the potential reduction in CT imaging use and missed PE diagnoses were modeled. **Results:** Of 6669 patients aged 50 or older who had D-dimer testing for possible PE, 1504 (22.6%) underwent a CT scan, and 217 (14.4% of CT) received a discharge diagnosis of pulmonary embolism, which was confirmed on chart review. When test results were re-interpreted using an age-adjusted threshold, D-dimer specificity increased from 63.9% to 75.4%, while sensitivity decreased from 96.5% to 89.9%. This translates to 888 new true negatives, representing CT scans potentially avoided (a 59% reduction in CT utilization), but with 18 new missed PE diagnoses. **Conclusion:** The age-adjusted threshold may reduce use of CT imaging among older patients suspected of PE, but at the cost of more missed PE diagnoses.

Keywords: pulmonary embolism, D-dimer, diagnostic imaging

30) Poster

The utility of serum markers for diagnosing septic arthritis in the emergency department: do rigid cut-offs improve diagnostic characteristics?

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Introduction: Septic arthritis represents one of the most severe diagnoses for a presentation of an acutely swollen joint, with a high level of morbidity and mortality associated with delayed management. There is continued interest in the utility of serum markers of inflammation in diagnosing this dangerous condition, however there is a lack of clear consensus for cut-offs that optimize diagnostic performance for these tests. The objective of this study was to perform a systematic search of the literature to identify optimal cut-offs for commonly ordered serum markers and to assess how these cut-offs perform in a cohort of patients with a diagnosis of septic arthritis. **Methods:** We performed a systematic literature search aimed at identifying optimal cut-offs for serum makers (white blood cell count (WBC), erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP)) used for diagnosing septic arthritis. We assessed the use of these markers within a retrospective cohort (n = 87) of patients diagnosed with septic arthritis (based on positive gram stain, culture, or treatment with a prolonged antibiotic course and/or surgical intervention) that presented to one of four emergency departments in Calgary over a two-year period. We then compared published values to local data. **Results:** We identified 10 articles that evaluated diagnostic characteristics for serum markers. Although there was variability for cut-offs reported in the literature, classically WBC >11 x 109/L, ESR >30 mm/h, and CRP >100 mg/L were reported to modestly increase the likelihood ratio of diagnosing septic arthritis. In our cohort, a complete blood count was ordered in the emergency department in 97% (n = 84) subjects. ESR and CRP were ordered in 66% (n = 57) and 85% (n = 74) of patients, respectively. When comparing the classic literature based cut-offs to our population group, a WBC <11 x 109/L was found in 38% (n = 32), ESR <30 mm/h in 51% (n = 38), and CRP <100 mg/L in 30% (n = 17). Sensitivity was found to be poor (61% for WBC >11 x 109/L; 70% for ESR >30 mm/h; 48% for CRP >100 mg/L). **Conclusion:** Data collected from the Calgary Emergency Department supports the published literature suggesting that serum tests are not helpful in the diagnosis of septic arthritis. Future work should evaluate these diagnostic characteristics in relation to patients with non-infectious monoarticular joint pain.

Keywords: septic arthritis, serum markers, diagnosis

31) Poster

The Ottawa Chest Pain Rule would increase stretcher capacity if implemented for cardiac chest pain patients

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Introduction: Reducing the number of patients requiring cardiac monitoring would increase system capacity and improve emergency department (ED) patient flow. The Ottawa Chest Pain Rule helps physicians identify chest pain patients who do not require cardiac monitoring and is based on a 'normal or non-specific' ECG and being pain-free on initial physician assessment. Our objective was to measure the impact that the implementation of this decision rule would have on cardiac monitoring bed utilization in adult EDs in Calgary. **Methods:** A convenience sample of patients was prospectively obtained at each of the four Calgary adult emergency sites. All patients presenting with the Canadian Triage Acuity Scale chief complaint of "cardiac pain", or "chest pain with cardiac features" were captured for inclusion in the study. Real time interviews and survey assessments were conducted with the primary nurse and physician involved in each patient's care. **Results:** A total of 61 patients were captured by the study. Physicians identified cardiac as the primary rule-out pathology in 51% of these patients. The average Heart Score of all study patients was 4.2, and 30% of patients were ultimately admitted. Physicians believed that 39% of the 61 patients needed cardiac monitoring, while primary nurses believed that 59% needed monitoring. Of the 61 patients, 59% were triaged to areas providing cardiac monitoring. The application of the Ottawa Rule would have allowed 47% of patients triaged to cardiac monitoring to be taken off cardiac monitoring. This would translate to a total of greater than 74 hours saved or a reduction of 30% of the total cardiac monitored patient time. **Conclusion:** The Ottawa rule appears to be a low-risk emergency department flow intervention that has the potential to help reduce resource utilization in emergency departments. This change may result in increased emergency department capacity and improved overall patient flow. This simple rule based only on ECG findings and absence of chest pain can easily be applied and implemented without increasing physician workload or increasing risk to patients.

Keywords: cardiac monitoring, chest pain, clinical decision rule

32) Poster

Emergency department discharge information sheets – a prescription for success?

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Introduction / Innovation Concept: Effective communication between health providers and patients is central to patient safety, health education and patient empowerment. Previous studies in the Calgary Zone demonstrated that less than fifty percent of emergency department patients thought discharge handouts communicated health information well and even fewer thought the handout information would aid them in care at home. A partnership between the Department of Information Design, Mount Royal University and the Department of Emergency Medicine, University of Calgary, seeks to provide an innovative solution to this problem. **Methods:** The Calgary Zone Department of Emergency Medicine has partnered with the Mount Royal University Department of Information Design community service learning course. Information design students will work to develop infographics based on the "Choosing Wisely Alberta" Campaign Topics, with content expertise provided by the Department of Emergency Medicine. Curriculum, Tool, or Material: The five "Choosing Wisely Alberta" topics are: CT scans for adults with head injuries, CT scans to find Blood Clots in the lung, Imaging Tests for Headaches, Imaging tests for lower back pain, Treating Sinusitis. The target audience for the project will involve staff physicians, patients, public and government. Student involvement will direct their individual projects to these target audiences and will consider important issues such as non-English speaking patients, patients with low health- literacy (marginalized populations) and "super-users" of emergency departments, health policy (government and not-for-profit), physicians (emergency and primary care) and other health care workers. Infographics will be available for presentation at CAEP 2016. **Conclusion:** Information graphics will be used to facilitate clinician-patient discussions for empowered decision making, facilitate clinician-learner decisions based on evidence based guidelines, and improve knowledge translation for health system administrators and policy makers regarding appropriate emergency department resource allocation.

Keywords: innovations in EM education, knowledge translation, patient centered