

cases. These findings do not address the potential impact of using the CCR to evaluate all sport-related injuries in collegiate or pro athletes evaluated by sport medicine therapists and physicians, as these patients are rarely assessed by paramedics or transported to a hospital. It does support the safety and benefit of using the CCR in sport-injured patients for which paramedics are called.

Keywords: cervical spine, pre-hospital, sports

LO72

Assessing non-technical skills in prehospital ad hoc team resuscitation

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Introduction: Successful resuscitation in the ED cannot occur without a viable patient, and in many cases patient viability is dependent upon optimal prehospital resuscitation performed by ad hoc teams formed in real time. Currently, little is known about the cognitive and interpersonal skills, or non-technical skills, that are essential for effective team collaboration under these conditions. We have completed a scoping review to provide a state of the literature and develop a taxonomy of the non-technical skills pertinent to ad hoc teams in prehospital settings. **Methods:** Our scoping review searched four databases (EMBASE, Medline, Cinahl, and Psychinfo) for articles related to resuscitation in acute care settings. No date criteria were applied, but only full text articles written in English were included. Articles underwent two-reviewer title & abstract screening, full text screening, and analysis. A quality review asked three questions: Are keywords defined? Is the article well-situated within the existing literature? Does the article contribute back to the existing body of knowledge? Although statistical analyses are not appropriate for this scoping review, analysis included a descriptive-analytical framework for organizing data. **Results:** Of 6932 screened articles, 38 were included in analysis, five articles examined prehospital teams, and one addressed the ad hoc nature of these teams. Only one of these articles met our three quality criteria. Nevertheless, our analysis suggests a rudimentary taxonomy whereby the primary objective of a team leader is to overcome this barrier by facilitating the development of optimal team situational awareness, fostered through timely and accurate briefings with closed-loop communication. **Conclusion:** This scoping review has identified that non-technical skills pertaining to resuscitation in acute care settings are becoming a widely examined phenomenon; however, few studies contribute in any meaningful way to our understanding of how non-technical skills training can be tailored to those performing as members of ad hoc prehospital resuscitation teams. As the need for interprofessional training is becoming more pressing, we anticipate this review will provide essential guidance for future inquiry as well as design for both educational models and organizational systems-based interventions.

Keywords: non-technical skills, prehospital, resuscitation

LO73

The state of the evidence for emergency medical services care of adult patients with sepsis: an analysis of appraised research from the Prehospital Evidence-Based Practice (PEP) program

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Introduction: The Prehospital Evidence-Based Practice (PEP) program is an online, freely accessible, continuously updated Emergency

Medical Services (EMS) evidence repository. This summary describes the research evidence for the identification and management of adult patients suffering from sepsis syndrome or septic shock. **Methods:** PubMed was searched in a systematic manner. One author reviewed titles and abstracts for relevance and two authors appraised each study selected for inclusion. Primary outcomes were extracted. Studies were scored by trained appraisers on a three-point Level of Evidence (LOE) scale (based on study design and quality) and a three-point Direction of Evidence (DOE) scale (supportive, neutral, or opposing findings based on the studies' primary outcome for each intervention). LOE and DOE of each intervention were plotted on an evidence matrix (DOE x LOE). **Results:** Eighty-eight studies were included for 15 interventions listed in PEP. The interventions with the most evidence were related to identification tools (ID) (n = 26, 30%) and early goal directed therapy (EGDT) (n = 21, 24%). ID tools included Systematic Inflammatory Response Syndrome (SIRS), quick Sequential Organ Failure Assessment (qSOFA) and other unique measures. The most common primary outcomes were related to diagnosis (n = 30, 34%), mortality (n = 40, 45%) and treatment goals (e.g. time to antibiotic) (n = 14, 16%). The evidence rank for the supported interventions were: supportive-high quality (n = 1, 7%) for crystalloid infusion, supportive-moderate quality (n = 7, 47%) for identification tools, prenotification, point of care lactate, titrated oxygen, temperature monitoring, and supportive-low quality (n = 1, 7%) for vasopressors. The benefit of prehospital antibiotics and EGDT remain inconclusive with a neutral DOE. There is moderate level evidence opposing use of high flow oxygen. **Conclusion:** EMS sepsis interventions are informed primarily by moderate quality supportive evidence. Several standard treatments are well supported by moderate to high quality evidence, as are identification tools. However, some standard in-hospital therapies are not supported by evidence in the prehospital setting, such as antibiotics, and EGDT. Based on primary outcomes, no identification tool appears superior. This evidence analysis can guide selection of appropriate prehospital therapies.

Keywords: emergency medical services, prehospital medicine, sepsis

LO74

Exploring emergency physicians' ability to predict patient admission and decrease consultation to admission time

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Introduction: Delay of hospital admission until completion of assessment by consultants is a major contributor to emergency department (ED) crowding. We measured emergency physicians' (EP) ability to predict patient admission, and estimated potential time saved if EPs could request a bed at the time of consultation. **Methods:** This is a prospective cohort study in a tertiary care center over 4 months using a convenience sample of ED patients requiring consultation. We consecutively recruited patients from purposefully selected shifts to balance day of the week and time of day. We excluded patients younger than 18 years or those likely to be admitted (traumas, strokes, STEMI codes, and CTAS1). We asked EPs to predict patient disposition (admission or alternate disposition) just before consultation. We defined admission as: admission to any service, admission within 48 hours of ED discharge, patients held overnight without bed request, or if bed request was delayed by 12 or more hours, and alternate disposition as any other disposition. We present EP prediction test

characteristics using sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) with 95% confidence intervals (CI). The potential time saved was calculated from consultation to bed request for admitted patients. **Results:** Characteristics for the 454 included patients were: mean age 60.1 years, 48.4% male, 46.9% evening presentation, 69.4% were admitted (most commonly by Internal Medicine 26.9%), and median consult to bed request time was 3.5 hours (interquartile range 2.0 – 5.3 hours). Overall EP prediction sensitivity, specificity, PPV and NPV were 90.5% (95% CI 86.7-93.5), 84.2% (95% CI 77.0-89.8), 92.8% (95% CI 89.8-95.0) and 79.6% (95% CI 73.4-84.7) respectively. In other words, EPs correctly predicted 92.8% of patient admissions. The PPV for Internal Medicine was 95.7% (95% CI 89.7-98.4) and ranged from 78.9% (95% CI 53.9-93.0) for Psychiatry to 100% (95% CI 78.1-100) for Family Medicine. A total of 1113.5 hours of ED stretcher time (37.1 hours per shift) could have been saved if EPs initiated a concurrent bed request at time of consultation. **Conclusion:** EPs correctly predicted 92.8% of patient admissions across a broad field of disciplines. We estimate 1113.5 hours of ED stretcher time could have been saved over the study period if EPs triggered an inpatient bed request at the time of consultation, rather than waiting for the consultants' disposition decision.

Keywords: admission delay, crowding

LO75

The impact of snowfall on patient attendance at an urban academic emergency department

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Introduction: Accurate forecasting of emergency department (ED) patient visits can inform better resource matching. Calendar variables such as day of week and time of day are routinely used as predictors of ED volume. Further improvement in forecasting will likely come from dynamic variables. The effect of snowfall on ED volumes in colder climates remains poorly understood. We sought to determine whether accounting for snowfall improves ED patient volume forecasting. Our secondary objective was to characterize the magnitude of effect of snowfall on ED volume. **Methods:** This was a retrospective observational study using historical patient volume data and local snowfall records from April 1st, 2011 to March 31st, 2018 (2,542 days) at a single urban ED. We fit a series of four generalized linear models: a baseline model which included calendar variables and three different snowfall models which contained the variables in the baseline model plus an indicator variable for modelling snowfall. Each snowfall model had a different daily threshold for its indicator variable: any snowfall (>0cm), moderate snowfall (> = 1 cm), or high snowfall (> = 5 cm). We modeled daily ED volume as the dependent variable using a Poisson distribution. To evaluate model fit, we examined the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) in each of the four models. In both cases, a lower number indicates better model fit. Incident rate ratios were calculated to determine the effect of snowfall. We used the delta method to calculate confidence intervals. **Results:** A total of 2542 days were used to develop the model. All three snowfall models demonstrated improved model fit compared to the baseline model with lower AIC and BIC values. The best fitting model included a binary variable for moderate snowfall (> = 1cm/day). This model showed a statistically significant decrease in ED volume of 2.65% (95% CI: 1.23% -4.00%) on

snowfall days, representing 5.4 (95% CI: 2.5 -8.2) patients per day at our hospital with an average daily volume of 205 patients. **Conclusion:** The addition of a snowfall variable results in improved forecasting model performance in ED volume forecasting with optimal threshold set at 1 cm of snow in our setting. Snowfall is associated with a modest, but statistically significant reduction in ED volume.

Keywords: forecasting, patient volume, weather

LO76

Impact of high emergency department occupancy on time to physician initial assessment: a traffic theory analysis

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Introduction: Emergency department (ED) congestion is an ongoing threat to quality care. Traditional measures of ED efficiency use census and wait times over extended time intervals (e.g. per year, per day), failing to capture the hourly variations in ED flow. Borrowing from the traffic theory framework used to describe cars on a freeway, ED flow can instead be characterized by three fundamental parameters: flux (patients traversing a care segment per unit time), density (patients in a care segment per unit time), and duration (length of stay in a care segment). This method allows for the calculation of near-instantaneous ED flux and density. To illustrate, we examined the association between stretcher occupancy and time to physician initial assessment (PIA), seeking to identify thresholds where flux and PIA deteriorate. **Methods:** We used administrative data as reported to government agencies for 115,559 ED visits from April 1, 2014 to March 31, 2016 at a tertiary academic hospital. Time stamps collected at triage, PIA, and departure were verified by nosologists and used to define two care segments: awaiting assessment or receiving care. Using open-source software developed in-house, we calculated flow measures for each segment at 90-minute intervals. Graphical analysis was supplemented by regression analysis, examining PIA times of high (CTAS 1-3) or low (CTAS 4-5) acuity patients against ED occupancy (=density/staffed stretchers) adjusting for the day of the week, season and fiscal year. **Results:** At occupancy levels below 50%, PIA times remain stable and flux increases with density, reflecting free flow. Beyond 50% occupancy, PIA times increase linearly and flux plateaus, indicating congestion. While PIA times further deteriorate above 100% occupancy, flow is maintained, reflecting care delivery in non-traditional spaces (e.g. hallways). An inflection point where flux decreased with increased crowding was not identified, despite lengthening queues. **Conclusion:** The operational performance of a modern ED can be captured and visualized using techniques borrowed from the analysis of vehicular traffic. Unlike cars on a jammed roadway, patients behave more like a compressible fluid and ED care continues despite high degrees of crowding. Nevertheless, congestion begins well below 100% occupancy, presumably reflecting the need for stretcher turnover and saturation in subsegmental work processes. This methodology shows promise to analyze and mitigate the many factors contributing to ED crowding.

Keywords: congestion, flow, traffic

LO77

Assessing the long-term emergency physician resource planning for Nova Scotia, Canada

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