

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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Introduction: Planning for the future emergency physician (EP) workforce will be a significant challenge for decision makers given the rise in emergency department (ED) visits and no concurrent increase in resident positions. EP workforce planning must incorporate physician supply, as well as current and forecasted patient demand. Nova Scotia has undertaken the process of developing a planning model to support policy decision making. We hypothesize that Nova Scotia will require increased resident positions and recruitment from other provinces to meet future patient demand. **Methods:** We have developed an age structured population model that tracks the number of clinical full-time equivalent (FTE) EPs by their age and shows the “variance” (i.e., supply – demand = variance) over a 30 year planning horizon. This model represents all Level 1, 2, 3, and 4 EDs in Nova Scotia. Current physician supply was calculated based on FTE staffing levels. The current patient demand was based on historical volume and acuity of patients and converted to an FTE demand estimate. Forecasted demand was predicted to increase at an average rate of 0.5% per year. We varied the number of residents trained and the number of EPs recruited from outside the province to examine the effect on the EP workforce. Our initial model will reflect the current training environment and will be referred to as the “current state”. In our 3 scenarios, we increased the number of residents and recruited physicians by 50%, individually and then together. Our outcome measure will be the variance in FTE. **Results:** The current state showed that the province will have a deficit of 51 FTE EPs over the next 30 years. In scenario 1, a 50% increase in both resident training streams eliminated all variance, while in scenario 2, the increase in recruitment reduced the FTE variance to 34 FTE positions unfilled. In scenario 3, the variance was 0. **Conclusion:** We feel that this CTAS weighted volumes perspective is important for clinical services planning but the siting, sizing, and synergizing of EDs in a region will involve other inputs. Its important to recognize that we have made the assumption that all physicians starting to work in Nova Scotia will be a 1 FTE. Future iterations will examine the effect of more realistic FTE definitions that account for administrative, teaching and research activities.

Keywords: emergency department staffing, emergency physician, health human resource planning

LO78

A qualitative evaluation of a mandatory provincial program auditing emergency department return visits

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Introduction: The Ontario emergency department (ED) Return Visit Quality Program (RVQP) launched in 2016 and aims to promote continuous quality improvement (QI) in the province’s largest EDs. The program mandates routine audits of cases involving patients who had ED return visits within 72hrs that led to admission to hospital, in order to identify quality issues that can be tackled through QI initiatives. Our objective was to formally evaluate how well the RVQP achieved its aim of promoting continuous QI at participating sites using the constructivist grounded theory. **Methods:** Using a semi-structured interview guide, we employed a maximum variation sampling approach to ensure diverse representation across several geographical and institutional experiences (e.g., urban vs. rural, academic vs. community). Selected RVQP program leads were invited

to participate in a phone interview to yield maximal insight, additionally using a snowball sampling approach to reach non-lead physicians to capture the penetration of the program. Interviews were conducted until thematic saturation was reached and no new insights were gleaned. Interviews were initially cross-performed by two members of the research team, recorded, transcribed, and de-identified. Data analysis was conducted using a constant comparative approach through the development of a coding framework and triangulation with the respondents’ ED setting. We then grouped, compared and refined our analytic categories through an inductive, iterative approach. **Results:** Between June and August 2018, we interviewed 32 participants, including 21 RVQP program leads and 11 non-lead physicians, from a total of 23 diverse sites (out of 84). Our analysis suggests that the RVQP provides a structured method for EDs to frame the continuous collection of data in order to channel activities towards quality improvement projects based on identified needs. Success factors included: greater involvement with QI processes prior to the RVQP leading to more openness to improvement, a more collaborative approach to RVQP implementation which led to greater front-line workers’ understanding and engagement, and more resources dedicated to implementing the RVQP as well as tackling the quality issues it identified. **Conclusion:** This study evaluated the impact of an innovative and large-scale program aimed at improving the culture of quality in Ontario EDs. While the program is still relatively new, early results show that there are key elements of EDs that support building a culture of QI.

Keywords: audit & feedback, quality improvement, return visits

LO79

The impact of access block on consultation time in the emergency department

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Introduction: Access block (AB) is the most important indicator of Emergency Department (ED) crowding, but the impact of AB on consultation time has not been described. Our objectives were to determine if ED AB affects inpatient service consultation time, and operational and patient outcomes. **Methods:** We conducted a health records review of all ED patients referred and admitted at a university-affiliated tertiary care hospital over 60-days. A computational algorithm determined hourly ED AB at the time of consultation request, and observational cohorts were determined based on ED AB high (>35% ED bed capacity occupied by admitted patients) or low (<35%). The outcomes included total consultation time (TCT), ED physician initial assessment (PIA) time, ED length of stay (LOS), transfer time to inpatient bed (TTB), hospital LOS, return to ED (RTED) within 30 days, and 30-day mortality. **Results:** We included 2,871 patients (48% male; M = 63 years, IQR 45–78), and the low AB cohort were higher acuity (N = 1,692; 50.4% CTAS 1–2) than the high AB cohort (N = 1,179; 47.1% CTAS 1–2). Median TCT was not significantly different (low = 209min, high = 212min; p = 0.09), and there was no difference in consults completed within the 3-hour institutional time target (low = 41.1%, high = 40.9%; p = 0.89). Median ED PIA time was not significantly different (low = 66min, high = 68min; p = 0.08), however, patients seen within the funding-associated provincial ED PIA time target was significantly less during high AB (high = 82.2%, low = 89.2%; p < 0.001). Median ED LOS was significantly longer during high AB (high = 12.1hr,