Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company’s public news and information website.

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Methods: We performed a cross-sectional observational study of ED records from (1/2010 to 3/2018). Using propensity score matching, GEDI patients were matched to non-GEDI patients. Logistic regression, random forest, support vector machine, gradient boosting, and neural network techniques were used to predict hospital admission using demographic data, medical history, ED visit chief complaint, vitals, and geographic data.

Hospital admission was then predicted with and without GEDI assessment during the ED visit. Visits were classified into one group with a predicted change in hospital disposition with the GEDI assessment and another group with no predicted change in disposition with GEDI assessment. In this second analysis feature importance was performed on the tree-based models. Final model performance was reported as the area under the curve (AUC) using receiver operating characteristic (ROC).

Results: We included 55,056 patients age 65+ who accounted for 134,361 ED visits. Of these, 3,860 visits were included in the training set and 10,142 in the testing set to predict hospital admission. 5,071 visits were used in the training and testing sets to predict change in disposition with GEDI. The random forest model had the best performance with an AUC of 0.81 (95% CI 0.79-0.83). In the random forest model, 9,756 (96.2%) ED visits were predicted to have no change in disposition with GEDI assessment, and 386 (3.8%) ED visits were predicted to have a change in disposition with GEDI assessment (Table 1). Of those with a predicted change in disposition from admitted to discharged with GEDI assessment the top 5 most influential variables out of 86 variables with their relative importance are in Table 2. The higher relative importance the more it influenced the model’s outcome, however ranking does not imply the direction of influence. All importance values add up to a total of 1.

Conclusion: Our machine learning models were able to predict who is likely to be discharged with GEDI assessment with good accuracy and thus select a cohort appropriate for GEDI care. Future implementation of this machine learning model into the electronic health record may assist in the identification of older adults who should be prioritized for GEDI care.

Table 1. Number of ED visits classified into hospital disposition groups with and without GEDI assessment by the random forest model

| Without GEDI assessment | Admitted | Discharged |
|-------------------------|----------|------------|
| Admitted                | 7267     | 385        |
| Discharged              | 1        | 2489       |

Table 2. Feature Importance in random forest model

| Feature                          | Relative Importance |
|----------------------------------|---------------------|
| Chief Complaint Rank             | 0.092               |
| Acuity                           | 0.081               |
| Shortness of Breath              | 0.064               |
| Triage Systolic Blood Pressure    | 0.058               |
| Abdominal Pain                   | 0.056               |

59 Artificial Intelligence Occult Sepsis Detection in the Emergency Department: A Large, Multicenter Real-World Data Study

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Study Objective: Various sepsis alerts are used to reduce time-to-antibiotics in the emergency department (ED), but existing algorithms are primarily based on readily recognizable and non-specific criteria, leading to alert fatigue while adding little new information for frontline providers. Our purpose was to determine if artificial intelligence (AI) models can learn physiological patterns associated with sepsis before it is evident by current practice, based solely on objective and routine ED data.

Methods: We trained a gradient boosting AI model to predict a sepsis composite endpoint of in-hospital mortality, extended ICU stay (>2 days), or discharge with sepsis diagnosis codes, in 679,940 ED encounters retrospectively collected from electronic medical records at 62 US hospitals. To ensure the model learned patient characteristics before sepsis was evident, patients satisfying the SIRS criteria at ED presentation were excluded from the training dataset (N=318,635,31 hospitals). In an external validation dataset, all comers in the ED were included regardless of SIRS status (N=361,305,31 hospitals distinct from the training set). C-statistic, sensitivity and specificity were computed to compare model performance vs. SIRS and the Quick Sepsis-related Organ Failure Assessment (qSOFA). Subgroup and sensitivity analyses were performed to ensure model robustness against SIRS status, patient demographics, month-year (including pandemic vs. pre-pandemic periods), and choice of endpoint.

Results: In the validation set, 2,681 (26.2%) of 10,231 encounters that had one sepsis outcome in the composite endpoint and did not satisfy SIRS criterion at ED presentation. Of these, 1,364 (50.9%) were identified as having “occult sepsis” at ED presentation. In the non-SIRS validation subgroup (N=287,626), C-statistic, sensitivity and specificity of the model for predicting the composite endpoint were 0.92, 50.9%, and 96.9% respectively, vs. 0.66, 11%, and 98.5%, respectively, for qSOFA. In the full validation set, which includes both SIRS and non-SIRS patients at ED presentation, the C-statistic, sensitivity, and specificity of the model were 0.94, 70.6%, and 93.9%, respectively, vs. 0.70, 18.2%, 98% for qSOFA, and 0.84, 70.3%, 86.6% for SIRS. The model’s C-statistic was >0.90 across all subgroups analyzed.

Conclusions: Artificial intelligence-based models can detect ED cases of sepsis before they are clinically evident, using only routinely collected data.

60 Telemedicine Critical Care for Rural Hospitals During the COVID-19 Pandemic

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Study Objective: The COVID-19 pandemic has caused many tertiary care centers to exceed their inpatient capacities, often resulting in long periods of transfer diversion. Transfer diversion has a dramatic impact on rural hospitals because these facilities are forced to care for critically ill patients who normally would have been transferred to tertiary care centers for higher levels of care. Many of these rural hospitals have the equipment to care for critically ill patients, but lack physicians trained and experienced in the management of critical care. To mitigate this issue, the academic medical center at which this research occurred instituted a telemedicine program to provide critical care services to rural hospitals within the state. This research evaluated the outcomes of this program.

Methods: A summative evaluation was conducted. The telemedicine critical care program was initiated at three rural hospitals, and rapidly expanded to four additional hospitals based on the immediate reduction in the number of transfers. Telemedicine services were provided by emergency physicians with a critical care-trained physician providing medical oversight. Telemedicine consults were initiated either in the emergency department or after the patient was admitted to the hospital. Patient care evaluations were conducted daily until the patient was either discharged, transferred, or transitioned to comfort care. If a patient’s care requirements exceeded the capability of a rural site despite critical care telemedicine involvement, the academic medical center accepted all transfers regardless of diversion status. The following data were collected: number of patient consultations, number of transfers, and mortality rates.

Results: From July 20, 2020 through May 20, 2021, 551 patients were evaluated and treated using the telemedicine critical care program (76.6% COVID-19 related, 23.4% non-COVID-19 related) (See Figure 1). Of the 551 patients 67.2% were discharged from the rural facilities, 8.3% were provided end-of-life care without...
transfer, and 24.5% were transferred to the tertiary hospital. This is a decrease in transfers of approximately 80.0%. On comparison COVID-19 mortality was similar across all sites: rural hospitals (including transferred patients) 29.0%, after transfer 30.1%, and at the tertiary hospital 32.4%.

Conclusion: This research demonstrated that a tertiary to rural hospital telemedicine critical care program can reduce transfers while providing optimal levels of care during a pandemic. Without this program all of the patients would have been transferred including some to out-of-state facilities. The reduction in transfers, while necessitated due to transfer diversion, had other benefits including keeping patients close to home and generating revenue for rural hospitals. The COVID-19 pandemic caused urban and suburban hospitals to exceed their inpatient capacity and required low-resource hospitals in rural areas to adopt new methods for caring for higher acuity patients. The telemedicine critical care program met this challenge. Future research will evaluate post pandemic telemedicine critical care utilization including recent changes which have lowered barriers for usage such as removal of the rural designation for billing, the addition of cooperative agreements by non-affiliated health systems and hospitals, and continued service reimbursement.

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Gestalt in Acute Trauma: Evaluating Clinician Accuracy in Predicting Abdominal Injuries Among Trauma Patients

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Study Objective: We sought to evaluate the accuracy of physician gestalt in predicting clinically significant abdominal injuries among trauma patients presenting to the emergency department (ED) by comparing physician predictions to patient outcomes based on computed tomography (CT) reports and hospital course, including admissions and procedures.

Methods: As part of an observational multi-center prospective study of CT use in acute abdominal trauma, we surveyed physicians regarding their estimated likelihood of clinically significant injuries. The study was conducted from January 2017 - March 2020 at EDs within three major trauma centers. Patients presenting with blunt trauma who received abdominal CTs were included in the study. Exclusion criteria consisted of penetrating trauma, presentation to ED > 72 hours after trauma, age <15, occurrence of emergency procedures prior to abdominal radiography, and viewing of radiographic scans or reports by physicians prior to patient evaluation. The primary outcome was clinically significant injury, defined as an injury on CT requiring either hospital admission or procedure. The primary predictor was clinician gestalt; physicians were asked to estimate the likelihood of clinically significant injury, with responses including <2%, 2-10%, 10-20%, 20-40%, >40%. We calculated sensitivity, specificity, interval likelihood ratios (LR), injury proportions, and the area under the receiver operating characteristic curve (AUROC).

Results: Of 1677 patients, 326 (19%) had an injury on CT and 222 (13%) had a clinically significant injury. The proportion of clinically significant injuries increased with estimated risk of injury: of those estimated to have <2% risk of injury, 5.6% had a clinically significant injury and among those estimated to have >40% risk, 29.8% had a clinically significant injury. When comparing physician predictions across estimates, the interval LR associated with clinically significant injuries increased with increasing suspicion of injury, with the interval LR for <2% likelihood of injury at 0.38, the LR for 2-10% at 0.45, the LR for 10-20% at 1.2, the LR for 20-40% at 1.4 and the LR for >40% at 2.8. The sensitivity for detecting clinically significant injuries using <2% as the threshold for low risk of injury was 95%, while the sensitivity for detecting clinically significant injuries using <10% as the threshold was 75%. Employing a <2% threshold, attending physicians showed 100% sensitivity and resident physicians showed 95% sensitivity. Using a <10% threshold, the sensitivity was 100% among attending physicians and 73% among resident physicians.

Conclusion: Clinician gestalt tracked monotonically with patient outcomes, but physicians overestimated likelihood of clinically significant injuries at the high end of predictions and underestimated likelihood at the low end of predictions. Results showed that clinically significant injuries were found even when clinicians predicted the likelihood of injury as <2%, which suggests that physician gestalt may not demonstrate sufficient sensitivity in detecting clinically significant injuries and should not be solely relied upon to determine whether or not to CT trauma patients. A clinical decision aid demonstrating higher accuracy than physician gestalt in predicting clinically significant injuries may help reduce the number of missed cases.

Table 1  Accuracy of physician gestalt in predicting clinically significant abdominal injuries

| Prediction Ranges | Interval LR | Probability of Injury (%) |
|-------------------|------------|---------------------------|
| <2%               | 0.38       | 5.6                       |
| 2-10%             | 0.45       | 6.4                       |
| 10-20%            | 1.2        | 15.6                      |
| 20-40%            | 1.4        | 29.1                      |
| >40%              | 2.8        | 29.8                      |

Figure 1: ROC curve for physician accuracy in detecting clinically significant abdominal injuries

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Comparative Analysis of Digital Camera Systems for the Documentation of Anogenital Injuries Following Sexual Assault

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Study Objectives: Photo-documentation is a standard of care and essential skill for forensic clinicians responding to patients affected by violence and trauma. Colposcope images have been shown to have poor accuracy as well as limited interobserver agreement for the classification and location of anogenital injuries following sexual assault. This prospective study compares the frequency and type of anogenital injuries