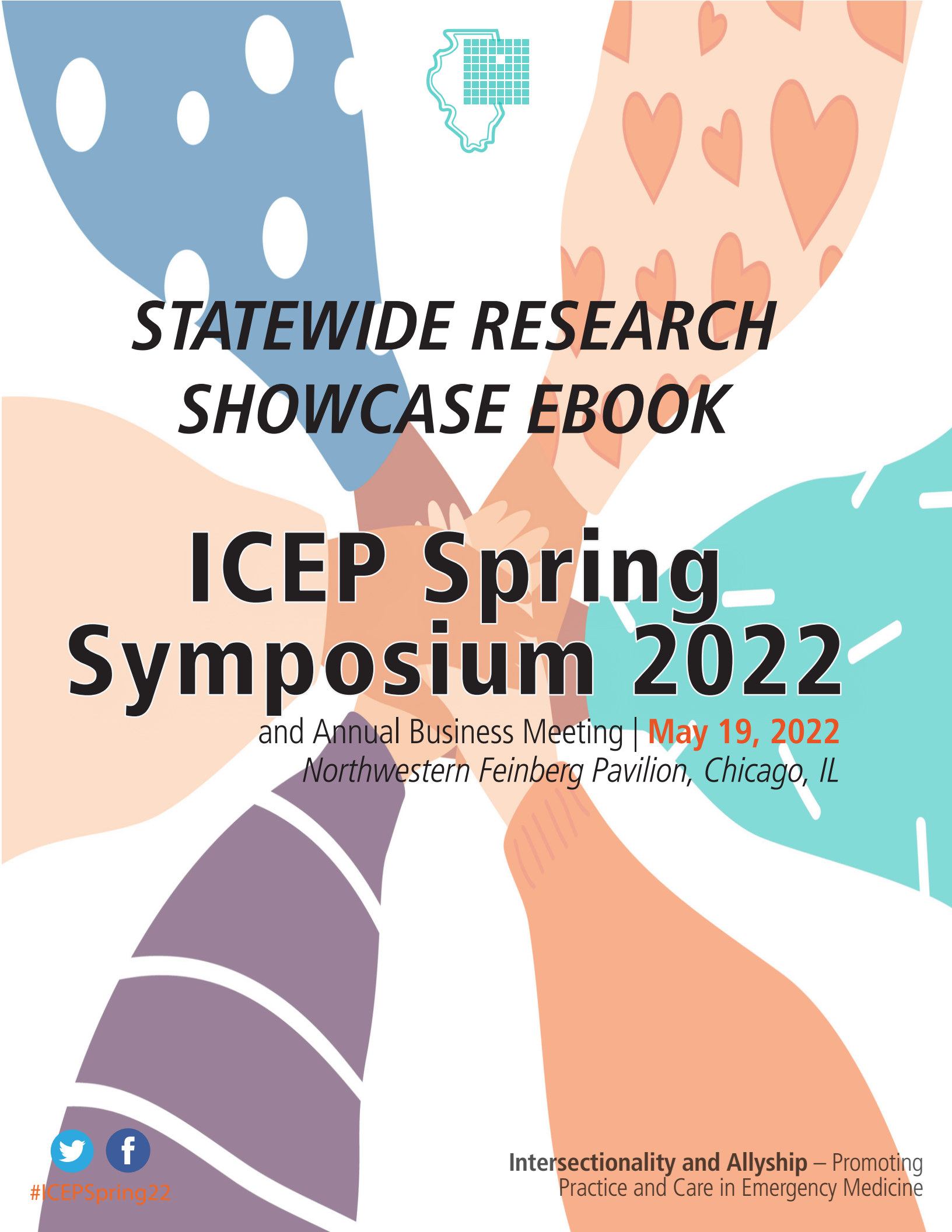

STATEWIDE RESEARCH SHOWCASE EBOOK

ICEP Spring Symposium 2022

and Annual Business Meeting | **May 19, 2022**

Northwestern Feinberg Pavilion, Chicago, IL

#ICEPSpring22

Intersectionality and Allyship – Promoting Practice and Care in Emergency Medicine

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Video Estimation of Respiratory Rate in Emergency Department Patients with Respiratory Complaints

Mustafa Alam, MD, Kunal Patel, MD, Moitreya Chatterjee MS, Shaveta Khosla, PhD MPH, John Harvill BS, Sandeep Nagar MS, Narendra Ahuja, PhD, Mark Allen Hasegawa Johnson, PhD, David Chestek, DO, David G. Beiser, MD, MS*

Background:

The rapid expansion of telemedicine during the COVID-19 pandemic has highlighted the limitations of virtual care visits where providers have limited access to physical exam findings including patient vital signs. Clinical approaches to estimating respiratory rate involve manual counting of respirations by providers during a 30-60 second interval which can be time-consuming and potentially difficult under the conditions of a telemedicine visit.

Objective:

We hypothesized that machine vision methods could be used to accurately estimate respiratory rate from video images of emergency department (ED) patients with respiratory complaints.

Design/Methods:

This was a prospective observational study. A convenience sample of patients presenting with shortness of breath were enrolled from an urban academic ED from 4/15/2021-2/11/2022. Video recordings were performed using a consumer grade digital camera while patients were led through a virtual physical exam. Patients were asked to take 5-10 deep breaths with their mouths closed. Respiration rate was simultaneously recorded from patient clinical monitors. Visual signals derived from pixel intensities in the thoracic region were analyzed using autocorrelation with peak correlation scores used to estimate respiratory rate. We assessed the correlation between the ground truth and the predicted estimates and also examined the distribution of the difference. Bland-Altman Plots were generated for pairwise differences.

Results:

Samples were obtained from 24 ED patients. Mean absolute error between and clinical monitor measurements was 2.02 respirations. We also got a Pearson coefficient of 0.796 ($p < 0.0001$). The mean difference was 1.04 breath per minute (95% Confidence Interval: -0.068, 2.15 breaths per minute) with a standard deviation of 2.6 breaths per minute. The Bland Altman plot shows the pairwise average differences (Figure 1).

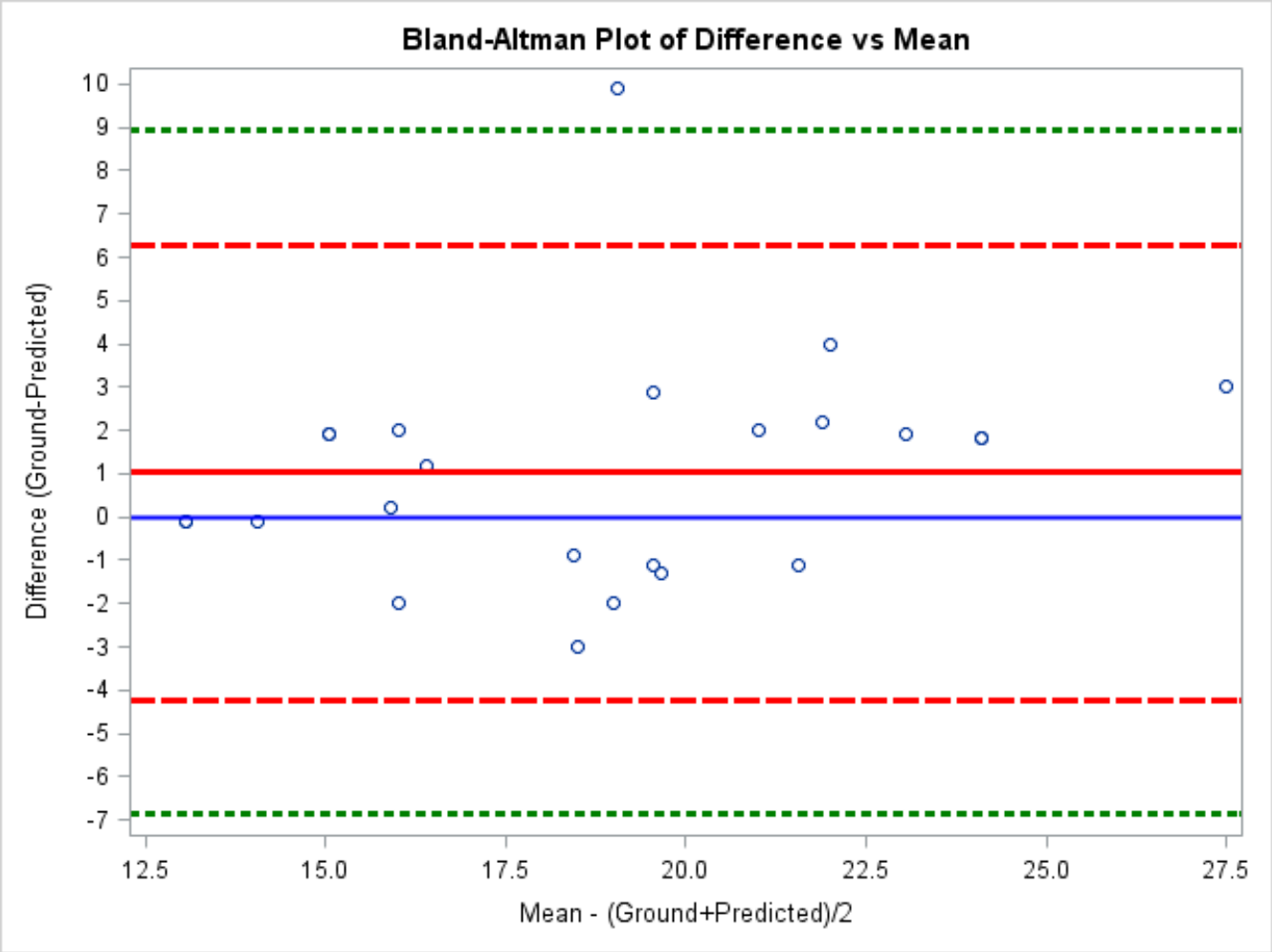
Conclusion:

Machine vision methods can be used to estimate respiratory rate from videos of ED patients with primary respiratory complaints. Additional work is necessary to establish the robustness of this approach under a variety of lighting, motion artifact, and shot angle conditions before such algorithms can be applied to telemedicine visits.

Impact:

Estimation of patient respiratory rate during a telemedicine visit can be difficult and time-consuming. Automated video estimation of respiratory rate could improve patient assessments without the need for deploying costly home health equipment or consumer health wearables which may not be readily available during a pandemic or affordable for patients with low socioeconomic status.

Figure 1: Bland Altman plot for RR visual dataset with 24 observations. Solid red line represents the mean of the difference. Dashed red line represents +/- 2 breaths per minute SD of the mean of the difference and dashed green line represents +/- 3 breaths per minute SD of the mean of the difference.



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Children Under 12 Presenting to the ED with COVID-19

Nicole Colucci, DO Casey Collier, MD, FACEP, Shu B Chan, MD, MS, FACEP*

Background:

The Winter 2022 Omicron surge of COVID-19 caused significant disease among children, with the reported rate of infection as high as 1 in 10. Common pediatric symptoms include fever, cough, vomiting, and decreased appetite.

Objective:

The study objective is to determine the extent of the recent Covid-19 surge on children under 12 years. The secondary objectives are to review the chief complaints of the infected patients and determine if they are age related.

Design/Methods:

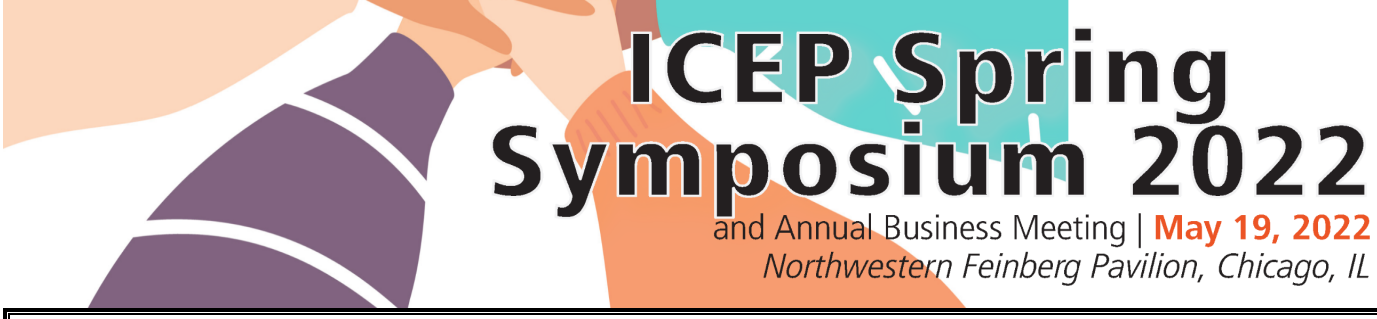
Retrospective electronic record review over 13 months from four community hospital Emergency Departments (ED). Included are patients under the age 12 with positive PCR or antigen tests done in the ED. Excluded are patients with incidental positive screening tests. In patients with multiple ED visits, only cases more than two weeks apart were used. Data includes age, gender, past medical history, chief complaints, ED diagnoses and disposition. Significance testing on chief complaints was performed using Pearson's Chi-squared. Only chief complaints with incidence >5% were tested. Alpha is set at 0.008, given the Bonferroni effect.

Results:

There were 207 cases included in the study from December 2021 to February 2022 for an average caseload of 103.5 patients per month. The average caseload for the preceding 11 months was 9.0 patients per month. 47.3% of the cases were female and 98.6% were discharged from the ED. Patients under one were 24.1% of the cases seen with 32.4% between one and five, and 43.5% between five and twelve. The top five presenting symptoms were fever (54.1%), cough (25.1%), sore Throat/URI symptoms (20.8%), nausea/emesis (15.0%), and headache (8.2%). There was one loss of smell/taste, three croup like presentations (1.4%) and four febrile seizures (1.95%). Children under one had significantly more fevers ($p<0.001$) while children over five had more headaches ($p<0.001$).

Conclusion:

During the Covid-19 surge December 2021 to February 2022, there was a greater than 10-fold increase in patients under 12 years old. This increase included all children but infants under one year old were particularly affected. Fever, cough, sore throat, nausea, and headaches were the most common presenting symptoms. Children under one had more fever than the other age groups.



Impact:

Children, especially those under one, can be very much impacted during a Covid-19 surge. Knowing the common symptoms in children will allow Emergency Physicians to better anticipate future surges in children.

Table 1: Chief Complaints of ED Covid-19 Positive Patients by Age Groups

	all	under 1	1-5 yo	5-12 yo	
n	207	50 (24.1%)	67 (32.4%)	90 (43.5%)	
Female	47.3%	52.0%	46.3%	45.6%	
Discharged from ED	98.6%	98.0%	98.5%	98.9%	
Symptoms					p-value
Fever	54.1%	72.0%	59.7%	40.0%	<0.001
Cough	25.1%	18.0%	31.3%	24.4%	0.253
URI symptoms	21.7%	12.0%	17.9%	30.0%	0.031
Nausea/Emesis	14.5%	12.0%	20.9%	11.1%	0.192
Headache	8.2%	0.0%	0.0%	18.9%	<0.001
Flu like symptoms	5.3%	2.0%	1.5%	10.0%	0.031
Abdominal symptoms	3.9%	0.0%	1.5%	7.8%	
Other respiratory symptoms	1.4%	4.0%	1.5%	0.0%	
Seizure	1.9%	0.0%	3.0%	2.2%	
Croup like symptoms	1.4%	0.0%	3.0%	1.1%	
Rash	1.4%	0.0%	0.0%	3.3%	

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Emergency Department Mass Casualty Triage Training in Virtual Reality

Elizabeth M. Regan MD, Bridget A. Regan, ODT, Dylan J. Rupska MD, Kenneth W. Dodd, MD*

Background:

Mass casualty events are a growing reality that emergency departments (EDs) need to prepare for. One of the most difficult aspects of mass casualty preparation is training for a surge of patients and having an organized approach to triage and flow coordination. The Covid-19 pandemic made training for mass casualty events incredibly difficult due to infection prevention measures and operational limitations of overcrowded, understaffed EDs.

Objective:

We assessed the efficacy of a novel virtual reality (VR) mass casualty triage module.

Design/Methods:

In this prospective study, our emergency preparedness department partnered with a VR education company to recreate the hospital's ED in VR, and to construct a mass casualty triage exercise. The 90-minute exercise was based on START triage principles and our departmental response plan. It consists of a 15-minute training lecture followed by an introduction to VR and, finally, a 30-patient mass casualty triage drill. Sessions were held between October 2021 and February 2022 with groups of 4 participants per session. Identical 14-question, pre- and post-tests evaluated participants' knowledge of mass casualty triage principles and the departmental response plan. Accuracy and timing data were collected by the VR software, including a count of errors for incorrect triage, incorrect use of airway adjuncts and tourniquets, and interactions longer than 60 seconds per patient. Statistics are reported as mean with standard deviation (SD); paired Student's t-test was utilized to compare pre- and post-survey responses.

Results:

Sixty ED attending physicians (n=8), resident physicians (n=41), nurses (n=8), technicians (n=3) and pharmacists (n=1) participated. Motion sickness was experienced by 7 (11.6%) subjects, resulting in 3 (5%) subjects unable to complete the training. The mean (SD) time to drill completion was 15.9 (4.3) minutes. Participants averaged 21 (7.2) errors. Pre- and post- test scores were 10.4 (1.5) vs 13.5 (0.93; $P < 0.00001$). Training sessions were completed throughout the pandemic without any transmitted cases of Covid-19. Many participants (44/48; 92%) reported they would voluntarily participate in future training sessions.

Conclusion:

We report the successful use of an interactive, "in situ" VR environment for hospital-based mass casualty triage training. Subjects demonstrated more knowledge of mass casualty scenario management, based on pre- and post-session test scores. Future studies of the use of VR for mass casualty training should compare VR to other training modalities and evaluate the duration of knowledge retention.

Impact:

This VR training environment demonstrated a feasibility, adaptability, and repeatability not commonly experienced in disaster training drills.

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Role of Flexible Laryngoscopy in Disposition of Patients Presenting to the Emergency Department with Angioedema

*Andrew T. Reiter, MD, Department of Emergency Medicine; *Theresa Nguyen, MD, FACEP, Center, Department of Emergency Medicine: Aaron M. Domack, MD, Department of Otolaryngology - Head and Neck Surgery; Loyola University Medical' Maywood, IL; Christopher Britt, MD, Ear Nose & Throat Specialty Care; Dallas, TX*

Background:

Patients presenting to the Emergency Department (ED) with angioedema can potentially have life-threatening consequences. Risk stratification of angioedema is challenging due to the multiple etiologies and plethora of symptoms. Previous studies have suggested that symptomatic patients with oropharyngeal/oral cavity involvement (OI) should be assessed by flexible laryngoscopy (FL).

Objective:

The purpose of this study is to compare the rate of laryngeal findings on FL for patients presenting to the ED with angioedema, which can then be used as a clinical aid for patient intervention and disposition.

Design/Methods:

This was a retrospective chart review of adult patients presenting to the ED from 2009 to 2019 with a diagnosis of angioedema, which were required to be evaluated by an otolaryngologist with FL. Basic demographics were collected along with reported symptoms, physical exam findings, FL findings, airway intervention, and disposition. Univariable analyses were performed on the 209 selected patients to determine risk factors and then multivariable analysis was performed to create a best fit model with select multiple regression analysis.

Results:

Two hundred and five patients were excluded because they did not undergo evaluation by FL. The mean age of patients was 56.3 years with 61.2% being female. Dyspnea and dysphonia were the subjective symptoms most closely related to laryngeal swelling, but not predictive alone. Eighty-six of the 102 patients with OI were admitted to the intensive care unit. Twenty of the 21 who required airway intervention had OI ($p<0.00001$). Oral cavity ($p<0.001$, 95% CI 1.41 [1.24-1.61]) and oropharyngeal ($p=0.001$, 95% CI 1.28 [1.11-1.47]) edema were positive predictors of laryngeal findings on multivariate analysis, while lip and face swelling were negative predictors for FL findings ($p<0.002$) on univariate analysis.

Conclusion:

Compared to oropharyngeal angioedema, cases isolated to the lips and face were not predictive of laryngeal findings on FL. This supports the utility of performing FL on all symptomatic patients with OI, as suggested by previous studies.

Impact:

Despite the limitations of being a single center study and not being able to account for subjectivity with FL, this study still provides further insight into how physical exam findings and FL may assist with risk-stratification for intervention and disposition planning for patients presenting to the ED with angioedema.

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Risk Factors for NSTEMI secondary to CAD in ED Patients Under 45

Kristi Peterson, MD Anish Patel, MD, FACEP, Shu B. Chan, MD, MS, FACEP*

Background:

The HEART score is one of the most utilized decision-making tools in the risk stratification of chest pain patients presenting to the Emergency Department (ED). Although the HEART score has been validated for all age groups, the youngest age group in the HEART score (patients younger than 45 years old), is historically a poorly studied group for acute coronary syndrome. We performed a retrospective chart review of young patients diagnosed with NSTEMI from the ED. We hope to demonstrate that greater importance should be placed on the presence of certain risk factors when evaluating these younger patients in the ED.

Objective:

The objective of this study is to identify which of the Risk Factors delineated on the HEART score most strongly predict CAD in patients under 45 years of age who present to the ED with NSTEMI.

Design/Methods:

Three-year retrospective electronic chart review, at two community Emergency Departments, of all patients presenting with chest pain, had final primary diagnosis of NSTEMI and underwent coronary angiography prior to hospital discharge. Excluded were cases in which NSTEMI was not the primary diagnosis, cases missing data or left AMA from the hospital. In this cohort of 34 patients who underwent coronary angiography, we compared the prevalence of risk factors between patients who were diagnosed with coronary artery disease and those who were not. Comparisons were tested using Student-t or Chi-squared as appropriate. Significance was defined as a p-value <0.05.

Results:

There were 34 patients meeting all inclusion and exclusion criteria. Of these 34 patients who underwent angiography, 58.8% (20 patients) had documented coronary artery disease and 41.2% (14 patients) did not. Patients with CAD had twice the prevalence of diabetes (15.0% versus 7.1%; p=0.484) and tobacco use (45.0% versus 21.4%; p=0.157) compared to patients without CAD.

Conclusion:

Although the small sample size limited statistical significance in this study, there is some evidence that in patients under the age of 45 who are admitted for NSTEMI and undergo cardiac angiogram, the incidence of diabetes and tobacco use are twice as high in those with CAD than those without.

Impact:

This study suggests that not all cardiac risk factors are equal. Specifically, diabetes and tobacco use should be carefully reviewed when calculating the HEART score in younger patients presenting with chest pain and may identify more young patients who would benefit from cardiac angiogram when presenting to the ED with chest pain.

Table 1: Risk Factors in Patient <45 With and Without CAD

	Total (34)	CAD (20)	No CAD (14)	p-value
Age	37.6 (5.3)	38.0 (5.1)	37.1 (5.6)	0.620
Gender % male	79.4%	80.0%	78.6%	0.919
Cholesterol	14.7%	15.0%	14.3%	0.954
Hypertension	38.5%	40.0%	35.7%	0.800
Diabetes	11.8%	15.0%	7.1%	0.484
Family History	29.4%	35.0%	21.4%	0.393
Tobacco	35.3%	45.0%	21.4%	0.157
Obesity	41.2%	35.0%	50.0%	0.382
% Normal ECG	32.4%	40%	21.4%	0.496
Mean Troponin score	1.8 (0.4)	1.9 (0.4)	1.7 (0.5)	0.351
Initial HEART score	4.6 (1.3)	4.8 (1.2)	4.5 (1.5)	0.595

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Estimating Heart Rate from Videos of Emergency Department Patients with Non-Caucasian Skin Tones

Kunal Patel, MD, Mustafa Alam, MD, Sandeep Nagar, MS, Moitreya Chatterjee, MS, John Harvill, BS, Shaveta Khosla, PhD, MPH, Narendra Ahuja, PhD, Mark Allen Hasegawa Johnson, PhD, David Chestek, DO, David G. Beiser, MD, MS*

Background:

Telemedicine virtual visits, which experienced a rapid expansion during the COVID-19 pandemic, represent an important care delivery channel for patients with limited access to care. Significant limitations to this approach, such as the lack of access to patient vital signs, may contribute to reduced quality of care during telemedicine visits. Remote, video-based heart rate (HR) estimation through remote photoplethysmography (rPPG) has been demonstrated under video studio conditions in primarily Caucasian population samples. Little is known about the performance of rPPG algorithms in clinical settings.

Objective:

We hypothesized that accurate video assessment of heart rate in patients could be achieved through machine vision methods.

Design/Methods:

This was a prospective observational study. A convenience sample of patients presenting with shortness of breath was enrolled from an urban academic emergency department (ED) from 4/15/2021-2/11/2022. Video recordings were performed using a consumer-grade digital camera while patients were led through a virtual physical exam. Machine vision algorithms were applied to 30 second segments of each video to automatically select regions of interest from the patient's forehead and cheeks for rPPG analysis. Video HR predicted estimates were compared with ground truth HR measurements from patient clinical monitors (Philips, CareScape B650). Accuracy was assessed through examination of absolute difference, correlation, and pairwise agreement (Bland-Altman Plots).

Results:

Video samples were obtained from 9 emergency department (ED) patients with non-Caucasian skin tones. The rPPG method algorithm achieved a Pearson correlation coefficient of 0.967 ($P<0.0001$) with a mean difference of -1.44 beats per minute (bpm) with 95% confidence interval: -3.2, 0.39 bpm) and a standard deviation of 2.384 bpm (Figure 1).

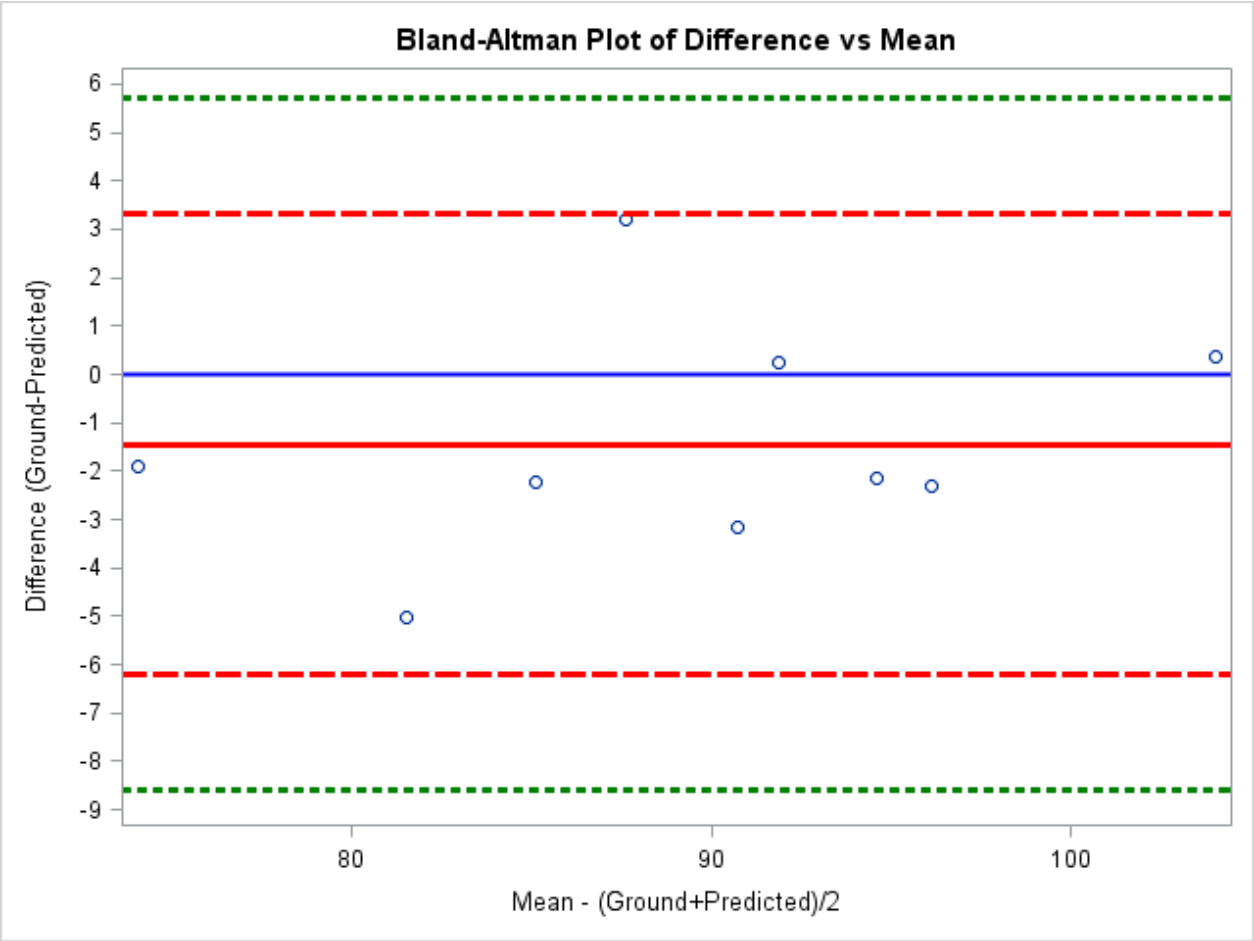
Conclusion:

Accurate HR assessment in patients with non-Caucasian skin tones is feasible through video-based rPPG algorithms. Further work is necessary to compare the accuracy of this approach under a variety of real-world conditions of different lighting, motion artifact, and video shot angles.

Impact:

Accurate remote video assessment of patient vital signs has the potential to improve the quality of telemedicine care virtual visits and proper triaging of patients by the primary provider. This can help providers determine the severity of illness and deliver focused and timely care, including patient referrals to the emergency department.

Figure 1: Bland Altman plot for HR visual dataset with 9 observations. Solid red line represents the mean of the difference. Dashed red line represents +/- 2 bpm SD of the mean of the difference and dashed green line represents +/- 3 bpm SD of the mean of the difference.



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Death of a Private Medical Toxicology Practice: A Postmortem Analysis

Jerrold B. Leikin, MD, FACEP, Joseph Kennedy MD*

Background:

In the year 2020, the COVID-19 pandemic applied financial pressure to the largest and oldest dedicated medical toxicology practice in the state of Illinois. We hypothesized that changes in reimbursement patterns, increasing clinician comfort with Electronic medical record (EMR)-based order sets, and decreasing direct patient care consultation volumes contributed to eventual closure of this unique practice.

Objective:

To identify & evaluate financial pressures on a stand-alone Medical Toxicology service as it pertains to the viability of this practice.

Design/Methods:

We conducted a retrospective review of financial data of a medical toxicology practice encompassing four hospitals and one outpatient clinic site from July 2001 through September 2020. All patients were evaluated regardless of ability to pay and there was no change in practice policy during this period. Each of the patient encounters were billed by current procedural terminology (CPT) codes through the biller designated by the medical group. Some patients had more than one CPT code charge per encounter. For years where data was available, charges, revenue, EMR- order set usage, reimbursement rates (RR), and consultation volume were reviewed. Addiction medicine, forensic, and industry consultations were excluded from this analysis.

Results:

In fiscal year 1 (FY1), there were 291 clinic billed CPT consultations and 347 billed inpatient CPT consultations for a total of 638 billings. This peaked in FY9 to 2007 total CPT billings (571 clinic & 1436 inpatients), which declined to 643 total CPT billings in FY18 (271 clinic & 372 inpatient). By September 2020, there was an almost 80% decline in number of encounters with an over 60% decline in charges and revenue from peak years. This was accentuated by a decrease of 58% in charges from April to September 2020 (beginning of COVID-19 pandemic) when compared to the previous six-month period. We did not observe any significant change in RR (approximately 60% for clinic & 40% for inpatients) during the final 15 years of practice and observed a stable final billing denial rate of <2.5%. EMR-based medical toxicology inpatient order set usage started in year six and has been utilized over 10,000 times since its inception (approximately 1,100 times/year; Fig 1) – this has been associated with a sharp reduction of inpatient consultations after FY 9. During the study period, CPT code 99291 (critical care, coded for 25% of inpatient consultations) billing declined from a peak of $1033 in 2003 to only $655 in 2018. Beginning around 2016, CPT codes 99358 and 93042 (for prolonged non-face-to-face care and rhythm strip interpretation, respectively) were eliminated and further decreased clinical income.

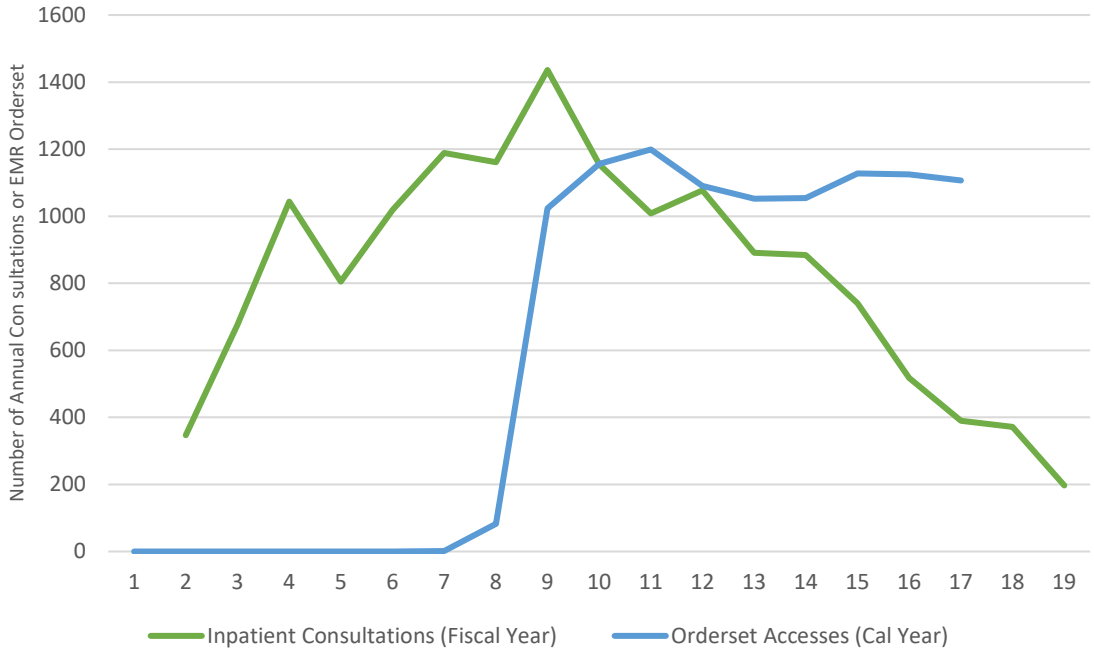
Conclusion:

Despite a low final denial rate suggestive of efficient billing and stable RR, the practice's number of encounters, charges, and revenue declined substantially over the final ten-year period. These changes were related to declining reimbursement, success of a toxicology-led EMR order set program, and finally with the near elimination of an outpatient practice in the setting of the COVID-19 pandemic.

Impact:

Several financial metrics need to be addressed when designing a business model for a full-time clinical medical Toxicology service. Revenue decreases due to EMR based Toxicology order sets, along with decreased revenue due to elimination of certain CPT modifiers and decreased third party billing/reimbursement over the past twenty years have placed enormous financial pressures on stand-alone private Medical Toxicology services - the COVID pandemic has essentially been the "death knell" for this practice.

Figure 1: Inpatient Consultations and EMR Orderset Use vs. Time



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Respiratory Rate Estimation from Audio Signs from a Public Sound Database

*Kunal Patel, MD, Mustafa Alam, MD, Moitreya Chatterjee MS, Shaveta Khosla, PhD, MPH, John Harvill BS, Sandeep Nagar MS, Narendra Ahuja, PhD, Mark Allen Hasegawa Johnson, PhD, David G. Beiser, MD, MS, David Chestek, DO**

Background:

The rapid expansion telemedicine during the COVID-19 pandemic has raised the possibility that virtual care may become a substitute for clinic-based follow-up care. Yet, the lack of convenient access to patient vital signs during virtual visits remains a significant barrier to delivering quality care. This barrier is especially pronounced in low-resource settings where telephone-based, audio-only, visits are the standard of virtual care.

Objective:

Our objective was to develop an audio-based signal processing algorithm for remotely estimating respiratory rate (RR).

Design/Methods:

This was a retrospective analysis of audio files from the Respiratory Sound Database from ICBHI 2017, an open-source collection of labelled audio files from patients with respiratory disorders. We trained a Long Short-Term Memory (LSTM) neural network with a binary framewise supervision signal to predict breathing intervals. Our training set consisted of 335 samples and our test consisted of 84 samples. Correlation between the labelled ground truth and the predicted estimates and distribution of the differences was assessed. Bland-Altman Plots were generated for pairwise differences.

Results:

Within the validation set of 84 samples, predicted model estimates were strongly correlated with ground truth labels (Pearson correlation coefficient, $r=0.96$, $p<0.001$) and mean difference of -0.44159 (95% confidence interval: -0.86, -0.02 breaths per minute) and a standard deviation of 1.918 breaths per minute. Figure 1 shows the Bland Altman Plot for Ground Truth/Predicted Estimate pairs.

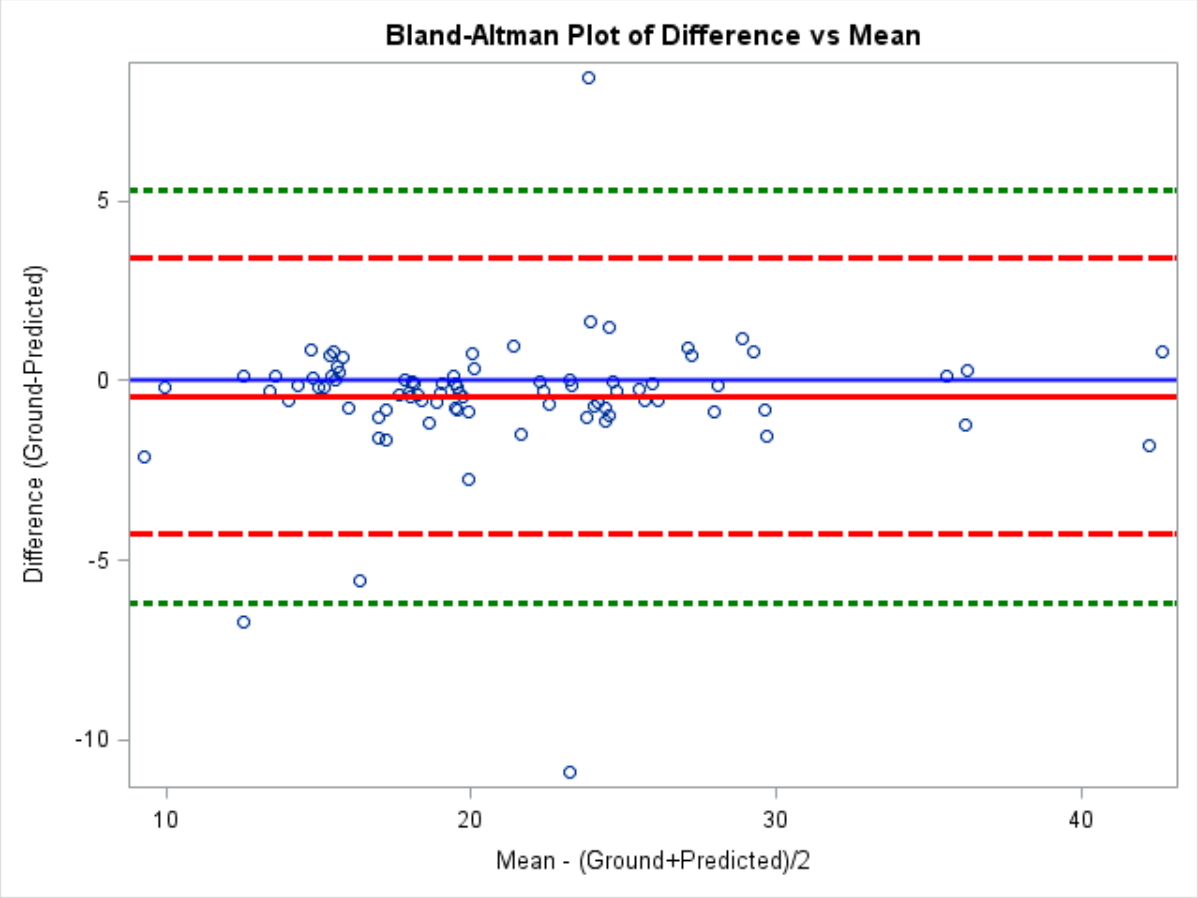
Conclusion:

Accurate estimation of respiratory rate from audio samples is feasible when applied within a standardized dataset. Work is underway to validate this approach in audio samples obtained from patients under real-world conditions

Impact:

Lack of convenient access to patient vital signs is a critical barrier to quality telemedicine care. Automated audio-based algorithms for estimating respiratory rate could be widely applied to telephone visits to help bridge this quality barrier.

Figure 1: Bland Altman plot for RR audio dataset with 84 observations. Solid red line represents the mean of the difference. Dashed red line represents +/- 2 breaths per minute SD of the mean of the difference and dashed green line represents +/- 3 breaths per minute SD of the mean of the difference.



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Envisioning Trauma Informed Care in the Emergency Department: Evaluating a Brief Educational Intervention

*Shruthi Basireddy, BA, Kristen Donaldson, MD, MPH, FACEP**

Background:

Emergency department (ED) physicians often face patients with a history of trauma or post-traumatic stress disorder (PTSD). Jaramillo et al. (2019) found 38% of ED patients screened positive for PTSD. However, given acuity and time limits in the ED, it is not always possible or appropriate to collect a trauma history. Thus, trauma-informed care (TIC) has been proposed, a form of universal precaution that assumes everyone has experienced trauma. TIC entails knowing the signs and effects of trauma and avoiding retraumatizing protocols. While many studies recommend TIC, none have studied TIC practice in the ED.

Objective:

The objective of our study was to understand and improve knowledge and practice of TIC among ED staff via survey and workshop delivery and evaluate the efficacy of educational programming in increasing the implementation of TIC.

Design/Methods:

Before we delivered a 1-hour workshop about TIC, ED attendings, residents, and nurses answered a survey about knowledge, opinions, self-rated competence, perceived barriers, and recent practice of TIC. The same survey was completed 1 month later. Patient restraint data in the 8 weeks before and after the workshop was collected via retrospective review. Changes in survey scores were assessed for statistical significance using Wilcoxon signed-rank tests and restraint data was compared with a Mann Whitney U test.

Results:

Forty-nine participants initiated a pre- or post-survey and 34 completed both and were included for analysis. There were significant improvements in median knowledge scores (83.3 vs 100, $p<0.001$), opinion scores (69.1 vs 78.1, $p<0.001$), competence scores (56.3 vs 71.5, $p< 0.001$), and implementation scores (59.7 vs 74.9, $p<0.001$). Perceived barriers decreased from 4 to 3 ($p=0.29$). The total number of restraints decreased by 33.8% (68 vs 45) and average weekly restraints decreased from 8.5 to 5.63 ($p=0.092$).

Conclusion:

Results suggest that even a brief, interprofessional educational intervention can improve and sustain TIC practice one month later. Knowledge, opinions, competence, and practice of TIC improved. Patient restraint, one example of retraumatization, had reduced

Impact:

While our study was limited in length and sample size and restraint data should be further studied, it illustrates the value of future work exploring TIC education. Our study supports the feasibility of TIC in the ED and reveals the impact TIC education may have on patient care in the ED..

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Examining Barriers to Treatment Among Patients with Syphilis

*Abigail Clarkson-During, MD, Dylan Eller, MPH, and Kimberly A. Stanford, MD, MPH**

Background:

Rates of sexually transmitted infections (STI) in the United States continue to uptrend, and many are diagnosed through the emergency department (ED). Testing and treatment are key to preventing further spread of infection.

Objective:

This study aims to describe patient characteristics associated with syphilis infection and treatment completion.

Design/Methods:

A retrospective chart review was performed of all patients diagnosed with syphilis at a large, urban, tertiary care hospital from January through November 2018. Patient demographics (age, race/ethnicity, gender identity, sexual orientation), insurance status, location of testing (ED, inpatient, Labor and Delivery, outpatient clinic), and completion of syphilis treatment were examined.

Results:

During the examined period, 171 patients were diagnosed with syphilis. Of these, 110 (64.3%) were male and 157 (91.8%) were Black. People aged 50 or older comprised about half (50.3%) of syphilis diagnoses, followed by those ages 30-39 (20.5%). The majority (63.2%) of diagnoses originated in the ED. Overall, only 89 patients (52.0%) completed syphilis treatment. Patients ages 40-49 were the least likely to complete treatment (RR 0.36; 95%CI, 0.13-0.99, $p<0.05$) compared to the youngest age group 18-24. Although 60% of the study population identified as heterosexual, those who did not were significantly more likely to complete treatment (RR 1.5; 95%CI, 1.06-2.12, $p=0.02$). Patients with private insurance were most likely to complete treatment (aOR 7.1; 95%CI, 1.20-41.83, $p=0.03$), while those with Medicaid were least likely. Patients diagnosed in the ED were less likely than those from any other location to complete treatment, although this association was not statistically significant. There was no significant association between likelihood of treatment completion and race, sex, or pregnancy status.

Conclusion:

Many patients are diagnosed with syphilis through the ED, however treatment completion rates are low.

Impact:

Understanding the factors associated with treatment completion can aid in improving linkage to care, with far-reaching benefits to population health.

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Emergency Department Utilization: The Effect of COVID-19 on Patients Without Primary Care Physicians and/or Health Insurance Visiting a Suburban Community Emergency Department

Eric Tam, DO, Qi Charles Zhang, MD*

Background:

The emergency department (ED) has always been a safety net for patients who require medical attention. Since the inception of emergency medical care, the number of visits has steadily increased over the years. Having health insurance and access to primary care are important in accessing health care both to reduce out-of-pocket cost for patients and in providing preventative and non-emergent conditions often encountered in the ED. Not having access to these entities may hinder patients from accessing the health care they need. The COVID-19 pandemic has caused significant disruptions in volume and access to both primary care and the ED.

Objective:

The objective of this study is to examine if there are any differences in the percentages of patients visiting the ED through the waiting room without PCPs, health insurance, or both during the same time periods in two separate years before and after the onset of the COVID-19 pandemic.

Design/Methods:

This is a retrospective chart review examining the percentages of patients without PCPs, health insurance, or both who visited a local suburban ED between October to December of 2019 and October to December 2020. Patients of any age who arrived at the ED via the waiting room were included, while those who arrived via EMS were excluded. Average ED daily visits, insurance status, and primary care status were collected. Student t-test was used to identify significant differences.

Results:

This study demonstrated that when comparing the 3-month period before and after onset of the pandemic, there was an approximately 25% decrease in ED volume. On average 41.3% of patients did not have primary care, 10.2% without health insurance, and 6.8% without both. There were no significant statistical differences in these values between the 2 years.

Conclusion:

The three-month periods from October to December 2019 demonstrated no significant statistical differences in the percentage of patients arriving through the waiting room without primary care, health insurance, or both compared to the same time-periods in 2020.

Impact:

The COVID-19 pandemic caused significant disruptions in the healthcare system. Efforts can be made to refer patients without PCPs to the local internal medicine residency clinic and to provide patients without health insurance with information on establishing access to health insurance.

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Patient Perspective Taught Through Use of High-Fidelity Simulation and Embedded Learners

*Jasmine S. Ginn, MD, Jerome Martin, MD, Leah Brodsky, Mary H. Walcott, Kendrick Brown, Sara Hock, MD, FACEP**

Background:

Understanding patient perspective and developing a healthy relationship with the emotions involved in caring for patients and their families, also known as empathy, is critical to a successful career in emergency medicine and positive patient outcomes. Unlike many technical skills learned in medical training, empathy is not readily taught through memorization, but can be thought of as an inherent personal trait which can be strengthened and modified through repetition and practice.

Objective:

This study aims to demonstrate a method for the experiential learning of empathy and patient perspective by combining high-fidelity simulation with role play using medical students in their pre-clinical years of training as “embedded learners”.

Design/Methods:

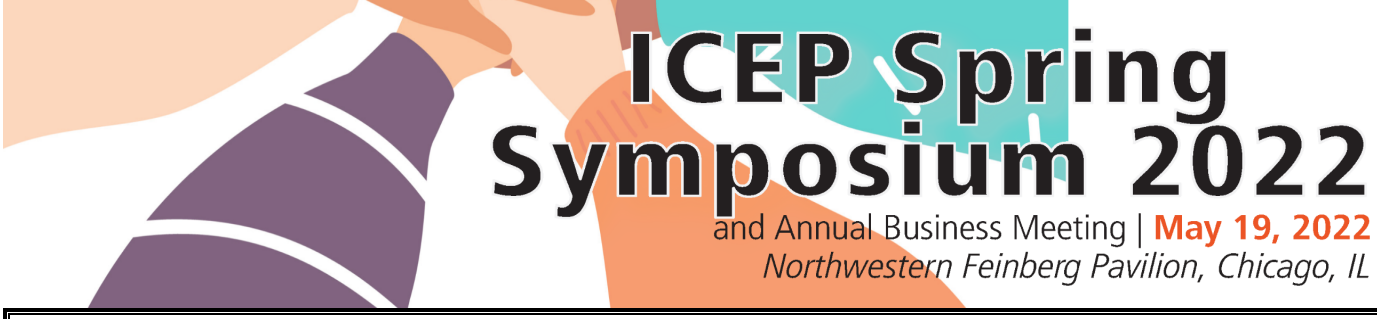
This retrospective study was conducted as part of an ongoing pilot high-fidelity simulation program for pre-clinical medical students only. During cases, students were given background information to play the role of the patient or the part of a caregiver, either as a family member, close friend, or member of the physician team. Students portraying the patient were placed on a simulated monitor, provided simulated intravenous access, and administered mock medications and therapies. Participants enrolled between 10/13/21-12/1/21 were asked to complete both a pre- and post-survey. We included the Toronto Empathy Questionnaire (TEQ), a validated self-assessment tool to measure empathy, in both surveys, while questions targeting knowledge gained and overall satisfaction were included in the post-survey only. Descriptive statistics and t-test analysis were used to analyze the data.

Results:

Sixty-one participants were included in this study, with 56% completing at least one survey given the day of their participation. Data revealed 85% of respondents scored higher than normal levels of empathy on the TEQ prior to participating, increasing to 88% following the scenarios. Of respondents, 97% felt they obtained practice changing information after participation. Common themes in post-survey feedback included those revolving around communication and how patient-centered awareness could significantly improve the physician-patient relationship for students as they proceed through training.

Conclusion:

Based on the responses provided, high-fidelity simulation and the employment of embedded learners can be implemented as a method of teaching patient perspective and improving the less easily taught emotion of empathy. Most students surveyed found the experiential learner experience useful and stated they would recommend this simulation program to others of similar levels of training.



Impact:

The addition of high-fidelity simulation with embedded learners into medical school curriculum can produce more empathetic physicians, which may lead to enhanced patient satisfaction in the emergency department.

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Prodrome to Rash: A Retrospective Study of Shingles in the Emergency Department

Shu B. Chan, MD, MS, FACEP, Jennifer Smith-Garcia, MD, Fatma Ciftci, MD, Erin Angell, MD, Kavish Thakkar, MD*

Background:

Herpes Zoster or shingles is the re-activation of the varicella zoster virus and its spread from a single dorsal root ganglion to corresponding neurons in the dermatome, causing the characteristic herpes zoster painful vesicular rash. In many patients Herpes Zoster starts as prodromal pain preceding the rash although prodromal symptoms can include flu-like symptoms, fatigue, and headache. It is not known if prodromal pain is associated with patient's age or other risk factors. Timing of prodrome to rash also seems to vary dramatically and literature review results in little data though it is thought that prodrome lasts 1-3 days.

Objective:

The study objectives are to determine the incidence of prodromal pain in ED patients presenting with typical Zoster rash and to test the association with age and other risks. Secondary objectives are to determine the median time between pain prodrome and rash onset.

Design/Methods:

This is a one-year retrospective electronic medical record review of all ED patients 18 and older from three community hospitals diagnosed with Herpes Zoster. Only the initial index cases were included for patients with multiple ED visits. Data collection included prior history, prodromal symptoms, time to rash, co-morbidities, smoking status, age, and gender. Differences between patients with and without prodromal pain were tested using Student-t or Chi-squared as appropriate. Significance is set at $p<0.05$.

Results:

170 patients met inclusion and exclusion criteria. The mean age was 56.7 years (SD: 18.8) with 60.0% females (102/170). Prodromal pain was found in 38.2% (65/170). In patients with prodromal pain, 71.9% occurred within 4 days prior to the zoster rash. There were no significant associations found between incidence of a pain prodrome and age, gender, diabetes, hypertension, or smoking history.

Conclusion:

In this multi-center review of Herpes Zoster in the Emergency Department, the incidence of prodromal pain was 38.2%. Patients' age, gender, diabetes, hypertension, and smoking history did not alter the incidence of prodromal pain. The majority of patients reported prodromal pain one to four days prior to the appearance of the typical rash.

Impact:

Emergency Physicians very often evaluate non-specific pain in vague dermatomal type distribution. It is good to keep in mind that the prodromal pain of Herpes Zoster may precede the appearance of the rash by at least several days.

Table 1: Patients with Prodromal Pain and Patients without Prodromal Pain

	Prodromal Pain n=65	No Prodromal Pain n= 105	Difference	p-value
Mean age (SD)	56.1 (16.5)	57.1 (20.2)	1.07	0.706
Gender (% F)	56.9%	61.9%	5.0%	0.519
Diabetes history	24.6%	22.9%	1.7%	0.793
Hypertension history	44.6%	44.8%	0.2%	0.985
Hyperlipid history	27.7%	25.7%	2.0%	0.776
Smoking history	34.4%	42.4%	7.6%	0.315

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Of the Women, for the Women and by the Women: A Resident-Led Curriculum

Jennifer Eun Lee, MD, Asma S Hashim, DO, Tarlan Hedayati, MD, FACEP*

Background:

Women were first admitted to medical school in 1849, yet the discrepancies and disparities experienced by female physicians still persist. The challenges facing women in medicine begin early in the education and training process. A resident-driven “Women in Emergency Medicine" curriculum was established at Cook County’s Emergency Medicine Residency Program to address these issues, promote mentorship and foster professional growth.

Objective:

The objective of the curriculum was to unveil specific inequities experienced by a cohort of female EM residents and create a resident-led curriculum to address these challenges. The curriculum promoted safe spaces for focused discussions, provided directed mentorship and culminated in an educational retreat featuring speakers and activities based on surveyed needs

Design/Methods:

In August 2020, using the Kern model, a needs assessment survey was created and distributed among the 20 female EM residents, with the goal of identifying common obstacles faced by this cohort. Small group discussions were implemented over 7 weeks to address these topics. Based on the initial survey and discussions, the first annual Women in EM Residency Retreat was held in June 2021. The educational retreat included faculty presentations on resident wellness, mentorship, combating micro/macroaggressions, women in leadership, resilience and resume building. Anonymous pre- and post-retreat surveys were distributed for session feedback and evaluation of efficacy.

Results:

100% of attendees (N=13) completed surveys. Of the survey participants, 90% desired discussions on obstacles to women in leadership, 85% on wellness, 85% on implicit/explicit gender bias, and 75% on negotiating contracts with fair wages and compensation. The post-attendance results demonstrated that 100% of participants felt that a female directed curriculum was crucial for professional and personal development. Interestingly, while 100% of residents felt they had female faculty mentors to support them, only 46% felt similarly about male faculty mentors. 100% of participants found the retreat vital and would re-attend.

Conclusion:

Our resident-led curriculum events were well-received, well-attended and deemed essential to the personal and professional development of female residents

Impact:

Promotion of this curriculum throughout residencies could expand both education and wellness. This data presents an obligation for departmental leaders to address the need for allyship by male faculty towards female trainees.

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Utilization Patterns Following Implementation of an Emergency Department Based Transesophageal Echocardiography Program

*Maria Loren Eberle, MD, Kenneth W Dodd, MD, Patrick Kishi, MD, Meghan Hurley, MD, Michael J Lambert, MD, Katharine M Burns, MD**

Background:

Point-of-care transesophageal echocardiography (TEE) has been described as a useful tool to guide cardiac arrest management and investigate hemodynamic instability or unexplained hypoxemia in critically ill patients. The use of TEE by emergency physicians has been limited by lack of experience and barriers to implementation of a high-quality TEE program in the emergency department (ED).

Objective:

The primary objective is to determine utilization patterns of TEE by emergency physicians following implementation of an ED TEE program. Secondary objectives evaluated safety, TEE findings, management changes resulting from TEE, clinical outcomes of patients, and complications.

Design/Methods:

Data from a TEE quality assurance (QA) database was analyzed retrospectively from September 2019 through February 2022; notably, the TEE program was paused from March 2020 to September 2020 due to the COVID-19 pandemic. Data collection included physicians involved, ED presentation, TEE findings, patient disposition, and notes regarding changes in patient management. Statistics are descriptive.

Results:

Over the study period, 35 ED TEEs were attempted on 35 adult patients. Four patients had missing data and in one case TEE insertion failed, leaving 31 cases for analysis. No TEE-related complications were identified. All TEE exams were supervised by at least one of 4 credentialed attendings, with additional involvement of 26 other physicians (16 attendings, 2 fellows, 8 residents). During the study period, the number of credentialed physicians increased from two to six. Indications for ED TEE included active cardiac arrest 17/31 (55%), recent cardiac arrest with return of spontaneous circulation 10/31 (32%), and severe hemodynamic instability or unexplained hypoxia in intubated patients 4/31 (13%). There were 27 total significant findings documented in 26 (84%) patients (Table 1). TEE was documented to change management in 10 (32%) cases. Of the patients who underwent TEE, 16 (52%) expired in the ED, 13 (42%) expired in the hospital, and 2 (6%) survived to hospital discharge.

Conclusion:

We describe utilization patterns and outcomes following the implementation of an ED based TEE program. TEE was primarily utilized intra-arrest, but also in peri-arrest states. Data was retrospectively analyzed from a QA database, which may not have captured the number of times TEE changed patient management. The number of credentialed physicians grew only slightly during the study period, suggesting a need to decrease barriers to credentialing.

Impact:

TEE can be performed by emergency physicians in critically ill patients, and it may impact patient management during resuscitation.

Table 1: Incidence of Significant Findings Identified During Point-of-Care Transesophageal Echocardiography

Ultrasonographic Finding	**Incidence** No. (%)
Sonographic asystole	11 (41%)
Ventricular dysfunction	7 (26%)
Hypovolemia	3 (11%)
Right ventricular dilation	2 (7%)
Right heart thrombus	2 (7%)
Saddle pulmonary embolism	1 (4%)
Aortic dissection	1 (4%)

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Evaluating Food Insecurity and Dietary Nutrition Quality of Patients at an Urban Emergency Department

Robert Needleman, MD, Larissa Unruh, MD*

Background:

To improve patient care, emergency departments have begun to address social determinants of health. Food insecurity, or the lack of reliable access to sufficient food, is associated with poor health outcomes. Diet quality also plays a large role in health, as recent literature attributed 10.9 million annual global deaths to poor diets. As social emergency medicine develops, both food insecurity and nutrition may provide areas for meaningful work.

Objective:

We examined both the prevalence of food insecurity and the nutritional quality of patient diets at a large, urban emergency department.

Design/Methods:

Participants were recruited from adult patients at an urban ED with over 130,000 annual visits. Data was collected from November 2019 to February 2020 and October 2021 to February 2022. Eligible participants were English or Spanish-speaking, ≥18 years old, with non-life-threatening complaints. Trained research assistants obtained consent and administered a 39-question survey. Measurements included demographic data, basic medical history, a validated two-question food insecurity tool, and the 16-question Rapid Eating Assessment for Participants [shortened] (REAP-S), a validated, nutritional quality measure that determines how closely a diet aligns with recommendations from the United States Department of Agriculture (USDA) Dietary Guidelines for Americans.

Results:

Of 197 participants, 52% were male and 48% female, 88% English-speaking and 12% Spanish-speaking. The food insecurity tool found 46% of participants were food insecure. The REAP-S nutritional quality measure noted 37% of participants met the high-quality diet standard. The food insecure group had lower quality diets (10% low-quality, 62% moderate-quality) compared to the food secure group (5% low-quality, 51% moderate-quality). Overall, 64% of participants were very willing to change their diets and 21% were somewhat willing.

Conclusion:

The prevalence of food insecurity (46%) was much higher than the national average (10.5%), highlighting an area of need. Additionally, only 37% of participants consumed high-quality diets. Given the strong correlation between diet and health, the majority of participants (63%) have an opportunity to improve their health by addressing their low- or moderate-quality diets. Participants are receptive to change, as 85% were either very or somewhat willing to change their eating habits.

Impact:

Emergency physicians are well positioned to act on the health impacts of food insecurity and poor nutrition. This study demonstrates the dire level of food insecurity among urban ED patients and that opportunity exists to improve patient diets.