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Opportunities and Challenges for Social Justice Initiatives

Potential Relationship Between E-Cigarette Use and COVID-19

Patient Evaluations by Municipal vs Collegiate EMS

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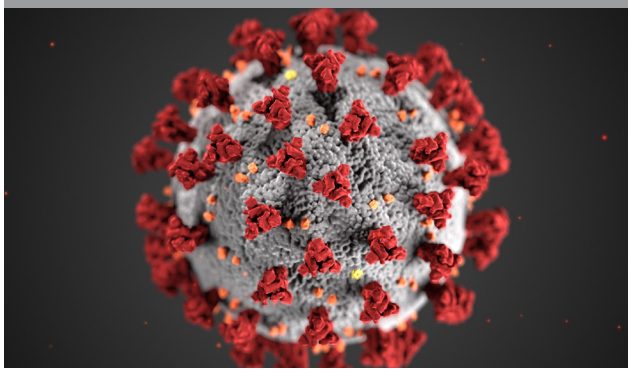

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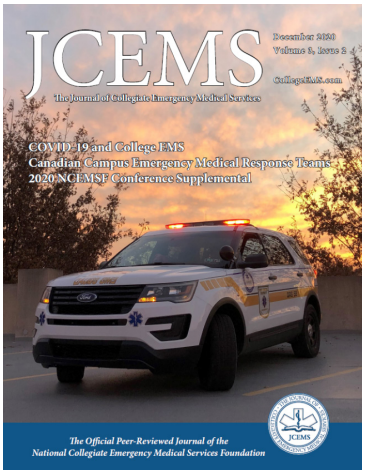

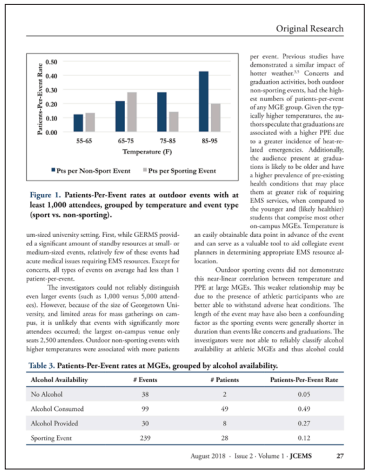
Original Research

Figure 1. Patients-Per-Event rates at outdoor events with at least 1,000 attendees, grouped by temperature and event type (sport vs. non-sporting).

um-sized university setting. First, while GERMS provided a significant amount of standby resources at small- or medium-sized events, relatively few of these events had acute medical issues requiring EMS resources. Except for concerts, all types of events on average had less than 1 patient-per-event.

The investigators could not reliably distinguish even larger events (such as 1,000 versus 5,000 attendees). However, because of the size of Georgetown University, and limited areas for mass gatherings on campus, it is unlikely that events with significantly more attendees occurred; the largest on-campus venue only seats 2,500 attendees. Outdoor non-sporting events with higher temperatures were associated with more patients per event. Previous studies have demonstrated a similar impact of hotter weather.[13] Concerts and graduation activities, both outdoor non-sporting events, had the highest numbers of patients-per-event of any MGE group. Given the typically higher temperatures, the authors speculate that graduations are associated with a higher PPE due to a greater incidence of heat-related emergencies. Additionally, the audience present at graduations is likely to be older and have a higher prevalence of pre-existing health conditions that may place them at greater risk of requiring EMS services, when compared to the younger and (likely healthier) students that comprise most other on-campus MGEs. Temperature is an easily obtainable data point in advance of the event and can serve as a valuable tool to aid collegiate event planners in determining appropriate EMS resource allocation.

Outdoor sporting events did not demonstrate this near-linear correlation between temperature and PPE at large MGEs. This weaker relationship may be due to the presence of athletic participants who are better able to withstand adverse heat conditions. The length of the event may have also been a confounding factor as the sporting events were generally shorter in duration than events like concerts and graduations. The investigators were not able to reliably classify alcohol availability at athletic MGEs and thus alcohol could

Table 3. Patients-Per-Event rates at MGEs, grouped by alcohol availability.

Alcohol Availability	# Events	# Patients	Patients-Per-Event Rate
No Alcohol	38	2	0.05
Alcohol Consumed	99	49	0.49
Alcohol Provided	30	8	0.27
Sporting Event	239	28	0.12

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Towards Anti-Racist Prehospital Healthcare: Opportunities and Challenges for Social Justice Initiatives in Emergency Medicine

Brittany Cleary, EMT; **Janelle Annor**; **Sarah Barnett**, EMT; **Regan Harnois**; **Jay Kang**; **Sahaj Shah**; **Leah Zamansky**; **Megan Zhou**, EMT

Keywords: collegiate-based emergency medical services; anti-racism, social justice | **Corresponding Author and Author Affiliations:** Listed at the end of this article.

Emergency medicine relies on gut instinct and intuition. Every adrenaline-fueled decision is based upon what we as emergency medical providers have learned and experienced in the past. This evolutionary instinct is sometimes helpful—when we deem a scene unsafe to enter or recognize the signs of a serious medical condition—but is nearly always marred with implicit biases.[1,2] How do we reconcile the innate human impulse for judgment based upon mental shortcuts with the fact that these heuristics bring dangerous bias to our medical care, often to the detriment of our patients?

It's a big question, one that we at Dartmouth EMS began to grapple with in May of 2020. As the Black Lives Matter movement sprawled across national headlines following the deaths of Ahmaud Arbery and George Floyd, our Dartmouth community was served a harsh reminder of the state of racial inequity and injustice permeating virtually every structure of American society. Like so many other medical professionals, we as members of Dartmouth EMS engaged in self-reflection and determined it was imperative to re-evaluate our role as providers of conscious, anti-racist healthcare.

We learned that Black, Hispanic, and Asian patients are routinely denied access to pain medications;[3,4] that non-White patients are often transported to different hospitals than White patients of the same zip code;[5] that pulse oximetry devices may deliver lower accuracy measurements for dark-skinned patients compared to light-skinned patients.[6–8]

As emergency medical providers, it is our responsibility to assess a patient's condition and determine the necessary care. It would be negligent to fail to acknowledge our implicit biases, which we bring to every call. As such, we must actively decrease our bias to deliver more conscious care and integrate anti-racist practices into the fabric of our organization. Social justice cannot be an afterthought: racism permeates the lived experience of countless individuals. As we continue to contemplate the positions and privileges we hold, we must be committed not just as EMTs but as community leaders and advocates to driving meaningful structural change.

This article outlines the steps which Dartmouth EMS has taken to educate our members on socially just and racially inclusive emergency medicine. Our work is far from over, and our methods are far from perfect. Therefore, we welcome any feedback and suggestions for improvement.

About Dartmouth EMS

Dartmouth EMS is a student-run, non-transport, Basic Life Support squad licensed by the state of New Hampshire. We were founded in 1991 by a group of motivated students looking to improve pre-hospital care and education for the local community. Over the years, we have expanded to provide a variety of services to Dartmouth College and the surrounding Upper Valley community including campus emergency response, community CPR and First Aid training, maintenance of the Dartmouth public-access AED program, and event standby coverage.

Every fall, Dartmouth students are invited to apply for membership to Dartmouth EMS. In 2020, we received 73 applications and accepted a new member class of 28 first- and second-year students. All Dartmouth EMS members are trained to provide life-saving interventions, about half leading shifts as licensed EMTs.

Our organization fails to adequately represent the demographic profile of the Dartmouth student body. Upon rough estimation, a disproportionately large percentage of the Dartmouth EMS membership are of Caucasian or Asian American descent, whereas a disproportionately small percentage are of African American, Latino, or Native American descent. We recognize that this is unacceptable and likely detrimental to the quality of care which we deliver to our patients.

The Dartmouth EMS Social Justice Committee (SJC) was founded in September of 2020, to be composed of a small group of self-selecting members passionate about the subject matter. The SJC has three overarching goals: (1) to engage Dartmouth EMS members in meaningful discussions of race and inequity in medicine, (2) to minimize bias and discrimination in the Dartmouth EMS

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new member recruitment process, and (3) to promote structural change in the emergency medical field such that anti-racist practices become the norm rather than the exception. These initiatives are in their infancy; we are constantly iterating and innovating in response to academic literature, news articles, and constructive feedback.

Training Program

The SJC first sought to increase awareness of and open dialogue about the scientific evidence of bias in medicine through a training session for the Dartmouth EMS membership. Our first training session occurred in November of 2020 and was attended by most Dartmouth EMS members. We began by prompting participants to take the Implicit Association Test (IAT) from Harvard University, which "measures the strength of associations between concepts (e.g., black people, gay people) and evaluations (e.g., good, bad) or stereotypes (e.g., athletic, clumsy). The main idea is that making a response is easier when closely related items share the same response key".[9] We opened with this activity to highlight the unconscious manifestations of bias and thus the importance of addressing the topic as healthcare providers.

Next, participants were rotated through small-group breakout rooms on Zoom focused around six topics: diversity within the EMS profession,[10] the racial maternal mortality gap,[11-13] perceptions of pain tolerance,[14-16] skin color and biased symptoms,[17-18] disparities in cardiac arrest care,[19-22] and the physiological effects of racial bias.[23] In each breakout room, a member of the social justice committee gave a short presentation, followed by a group discussion. The small size of these discussions (about eight participants) was critical for allowing all individuals the time and comfort to speak openly. The full group was then brought together for a wrap-up on the major takeaways from the breakout room discussions, the implications of the IAT, and future steps we can take to minimize the influence of bias in our medical care. For example, we now incorporate inclusive skin evaluations into our weekly internal training sessions, ensuring that our members are equipped to recognize critical symptoms on skin of all shades.

During December of 2020, when all Dartmouth students are on break from classes, the SJC initiated further engagement with issues of social justice in emergency medicine by hosting casual Sunday afternoon discussions. Each week, the SJC chose a relevant TED talk, lecture, and/or news video for interested Dartmouth EMS members (usually about eight members) to collectively watch and connect to our role as prehospital healthcare providers.

Our second Zoom training session occurred in March of 2020. We maintained the small group learning and discussion format as implemented in the first Zoom training session, with three breakout rooms each focusing on a unique topic: implicit bias in triage[24-25] distrust in medicine within communities of color,[26-28] and gaps in healthcare for transgender patients.[29-31] The training concluded with a full-group brainstorm of new member recruitment methods, allowing all participating members of Dartmouth EMS to contribute their thoughts and ideas for admitting a class of new members representative of the demographic makeup of the Dartmouth student body. Moving forward, all applications for membership will be reviewed anonymously to address potential implicit bias based on the name of applicants. In addition, we aimed to build connections with on-campus organizations which support students from under-represented backgrounds, such that all students have access to information about membership opportunities.

Following each training and discussion session, we gathered and thoroughly reviewed anonymous feedback to be implemented into the structure of future programming. Overall, our initiatives were well received by the membership and the opportunities for small-group discussion were frequently cited as the most effective aspect of the programs. Multiple participants suggested that the SJC facilitators be clearer when relating broad trends in the medical field to our day-to-day work as healthcare providers with Dartmouth EMS, valuable feedback which we are working to implement moving forward.

Outstanding Challenges

Social justice in EMS is a field in its infancy—so when we set out to review the scholarly literature on the topic, we found few results. Without literature precedent and evidence-based strategies specifically tuned towards our profession, we had to get creative and extrapolate. Often, we drew on research pertaining to physicians and attempted to make compelling connections to prehospital care, with successful but imperfect results. In order to demonstrate clearly the importance of social justice awareness and improvement in EMS, it is necessary to draw on high-quality research taken directly from the prehospital field. Therefore, more research must be conducted to elucidate the impact of racial bias on patient experience and health outcomes in the prehospital setting, develop an evidence-based anti-racist training program tailored to medical first responders, and quantitatively evaluate the efficacy of the program.

The process of selecting specific topics to cover during training came with tough decision making. Given how many unique social issues exist in the medical field, we were tasked with prioritizing which topics seemed most pertinent and relevant to our organization. It was important for us to choose issues which were accessible to a wide range of Dartmouth EMS members, as every individual is at a unique place in their journey of learning and growth. Due to the intersectional nature of social justice issues in medicine, we had to accept that our discussions could not feasibly cover all the nuances and multitude of factors at play.

SJC facilitators also encountered pushback from well-intentioned individuals who questioned the practical applications of our social justice initiative. These students brought up the important point that, even if our state protocols contain implicit bias and coded language for White favoritism, we unfortunately are legally bound to work within these protocols. This is a frustrating truth which

applies to nearly all fields: large regulatory institutions wield control over the standardized protocols, lengthening the path towards change.

Concluding Remarks

As emergency medical providers, it is our responsibility to assess a patient's condition and determine the necessary care. It would be negligent to fail to acknowledge our implicit biases, which we bring to every call. As such, we must actively decrease our bias to deliver more conscious care and integrate anti-racist practices into the fabric of our organization.

Dartmouth EMS has developed a training curriculum and initiated organizational reforms to promote socially just and racially inclusive emergency medicine. Our work is far from over and our methods will never be perfect. We welcome any feedback and suggestions for improvement.

Issues of social justice and inequality in emergency medicine are not just relevant during periods of national racial reckoning. Every single day, patients die as a result of entrenched discrimination in the American healthcare system and biases of individual emergency medical providers. It is imperative that all collegiate emergency medical agencies—and the broader emergency medical community—take concrete steps towards anti-racist healthcare.

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CASE REPORT

COVID-19 Sequelae in a Nineteen-year-old Male: A Potential Relationship Between E-Cigarette Use and COVID-19 Infection

Christopher Gaeta, EMT-B; **Joseph Zarraga**, DO; **Joseph Cesarine**, MD

ABSTRACT

Coronavirus Disease 2019 (COVID-19), the disease caused by the SARS-CoV-2 virus, has become a massive public health crisis causing severe acute respiratory illness in humans. Despite the rapid pace of research, much remains unknown regarding sequelae and long-term outcomes of COVID-19 due to the recency of the pandemic. We report a variant of post-COVID-19 syndrome associated with vaping an e-cigarette. A previously healthy 19-year-old university student was diagnosed with COVID-19 in July 2020. He completely recovered approximately 3 weeks later. He used an e-cigarette daily prior to infection and reported that vaping in the weeks and months post-infection caused a re-emergence of COVID-19 symptoms. He reported mild fever, pharyngitis, dyspnea, and non-productive cough persisting for an estimated two to five hours after use of an e-cigarette beginning within several hours of use. The symptoms recur consistently after use of an e-cigarette up to present day (nearly nine months post-recovery).

Keywords: collegiate-based emergency medical services, covid-19, e-cigarette

Corresponding Author and Author Affiliations: Listed at the end of this article.

A 19-year-old Asian male university student contracted COVID-19 in July of 2020 after suspected exposure at a large gathering among classmates. The patient reports e-cigarette use of approximately seven to eleven vaping sessions daily prior to his diagnosis. A nasopharyngeal swab confirmed the diagnosis that was prompted after he was informed of potential exposure to COVID-19. His COVID-19 illness was characterized by seven days of low-grade fever (101 degrees Fahrenheit), intermittent dyspnea, and temporary anosmia which all subsided within two weeks of onset. Nearly two months after recovery, the patient struggled with severe nicotine withdrawal and a reference of the array of symptoms that he experienced during his COVID-19 illness including dyspnea and fever.

In September of 2020, nearly ten weeks post COVID-19 infection, the patient presented to the emergency department (ED) for evaluation after a fall from a skateboard with right shoulder injury. He denied head trauma or loss of consciousness. The patient noted that he recovered from COVID-19 without sequelae two months prior. The patient's physical exam was unremarkable with normal vital signs: pulse, 88/min; respiratory rate, 17 bpm; blood pressure, 124/76 mmHg; temperature, 37°C; SpO2 on room air, 99%. He was of medium build and well-appearing. Head, eyes, ears, nose, and throat (HEENT) exam was unremarkable with no apparent abrasions or lacerations. Cardiac exam was unremarkable with no cardiomegaly or thrills, regular rate and rhythm, and no apparent murmurs or gallops. There was no respiratory distress upon presentation, chest wall moved symmetrically, and clear lung sounds were appreciated on auscultation bilaterally in all lung fields. Radiologic imaging of the chest was unremarkable. Abdominal exam demonstrated normal bowel sounds, no tenderness, organomegaly, or hernia. Musculoskeletal exam demonstrated mild sternoclavicular tenderness to palpation on the right side. There was mild discomfort with passive anterior, posterior, and lateral movement of the right arm.

Just prior to discharge from the ED, he expressed concerns of "shortness of breath" that he noticed only when he vapes. His care team advised to follow-up with a pulmonologist as his reported symptomatology was not present unless an e-cigarette was used. He was provided conservative treatment for his right shoulder pain until he was able to consult his university's team physician later in the week.

He was counseled to avoid further use of e-cigarettes and was referred to physical therapy for his acute shoulder injury. Of note, pertinent negatives from the ED and from follow-up visits thereafter include a negative rapid strep test (RST) and a high sensitivity C-reactive protein (hsCRP) within normal limits. Within one week, the patient's fever and pulmonary complaints resolved after he tried to use an e-cigarette again after discharge and three months of unsuccessful transition back to use of the device.

In November of 2020, he was able to perform remote Pulmonary

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Function Testing (PFTs) utilizing a ZephyRX spirometer with a telehealth respiratory therapist post-recovery of COVID-19 to aid with data collection for this case report. Upon review, the PFTs were within normal limits. Nearly nine months after first symptom presentation, he reported that he was unable to vape and overcame nicotine dependence because of the "intolerable" side effects of vaping post-COVID-19 infection. He stated that vaping induced low-grade fever (estimated to be 101 degrees Fahrenheit), nonproductive cough, headache, and shortness of breath roughly one to two hours after any use of a vape. From what we know, this continues to be the case at present.

Complexities raised by the patient's limited access to medical care due to his location on a college campus without transport complicated the patient's ability to follow-up on his medical issues. Ultimately, he was seen by a pulmonologist and is yet to undergo more robust pulmonary function testing.

Discussion

We report a novel presentation of post-COVID syndrome in an otherwise healthy 19-year-old male with vaping history. The recurrent onset of fever, dyspnea, pharyngitis, and non-productive cough following the use of an e-cigarette caused significant morbidity in this patient. We explore if vaping-induced symptoms can be attributed to prior COVID-19 infection or whether the vaping-induced symptoms may just be a result of the buildup and amplified effect of this patient's vaping history. COVID-19 might serve a role in the suspected presence of vaping associated pulmonary illness (VAPI) or, perhaps, this was facilitated simply

Table 1: Proposed criteria for EVALI

Confirmed case
▪ Use of an e-cigarette ("vaping") or "dabbing" in the previous 90 days*
▪ Lung opacities on chest radiograph or computed tomography
▪ Exclusion of lung infection based on: • Negative influenza PCR or rapid test (unless out of season) • Negative respiratory viral panel • Negative testing for clinically-indicated respiratory infections (eg, urine antigen test for *Legionella* and *Streptococcus pneumoniae*, blood cultures, sputum cultures if producing sputum, and bronchoalveolar lavage if performed) • Negative testing for HIV-related opportunistic respiratory infections (if appropriate)
▪ Absence of a plausible alternative diagnosis (eg, cardiac, neoplastic, rheumatologic)
Probable case
▪ Use of an e-cigarette ("vaping") or "dabbing" in the previous 90 days*
▪ Lung opacities on chest radiograph (diffuse hazy or consolidative opacities) or computed tomography (ground glass or consolidative opacities)
▪ Infection identified via culture or PCR, but clinical team believes this infection is not the sole cause of the underlying lung injury **OR** Minimum criteria to rule out pulmonary infection not met (testing not performed) and clinical team believes infection is not the sole cause of the underlying lung injury
▪ Absence of a plausible alternative diagnosis (eg, cardiac, neoplastic, rheumatologic)

EVALI: E-cigarette, or Vaping, product use Associated Lung Injury; PCR: polymerase chain reaction; THC: tetrahydrocannabinol; CBD: cannabidiol.
* Using an electronic device (eg, electronic nicotine delivery system [ENDS], electronic cigarette, e-cigarette, vaporizer, vape[s], vape pen, dab pen, or other device) or dabbing (eg, nicotine, marijuana, THC, THC concentrates, CBD, synthetic cannabinoids, flavorings, or other substances). Dabbing refers to the use of a pipe to smoke substances (eg, nicotine, THC) that have been concentrated into a wax.

Adapted from:

1. *Schier JG, Meiman JG, Layden J, et al. Severe Pulmonary Disease Associated with Electronic-Cigarette-Product Use - Interim Guidance. MMWR Morb Mortal Wkly Rep 2019; 68:787.*
2. *Layden JE, Ghinai I, Pray I, et al. Pulmonary Illness Related to E-Cigarette Use in Illinois and Wisconsin - Preliminary Report. N Engl J Med 2019.*

Graphic 122905 Version 1.0

by the patient's continued use of vaping pre- and post-infection. Although we cannot conclude if VAPI may have occurred even without COVID-19 infection in this case, we note a possible association between vaping and COVID-19 illness.

We believe this presentation represents a new variant of VAPI, sometimes referenced as an e-cigarette or vaping use-associated lung injury (EVALI) exacerbated by COVID-19 infection. Indeed, VAPI presents with a wide-ranging symptom profile, making it a challenging diagnosis.[1-3] The proposed diagnostic criteria are derived from a case series of only 98 subjects as adopted from Table 1 in the VAPI summary of treatment and presentation on UpToDate. Although the literature regarding vaping and COVID-19 is still emerging, it has been reported that those using e-cigarettes are five times more likely to get COVID-19 compared to non-users.[3] It is important to acknowledge that this statistic cannot imply causality due to the possibility of confounding variable; for example, the population that engages in vaping may be more inclined to engage behaviors that increase their exposure to SARS-CoV-2.[4] McAlinden et al. directly suggests that vaping has not only acute cytotoxic findings but highlights the need for research on the longer-term impacts of prior COVID-19 virus exposure as a compounding risk factor for any host of pulmonary findings that are associated with respiratory diseases like VAPI or asthma.[5] Our patient's presentation offers a perspective on this condition in the new era of COVID-19. It is worth further investigating the pathological findings in those that use e-cigarettes who have contracted COVID-19 compared to those that have not contracted COVID-19. Connecting the clinical presentation in this case to a more robust understanding of possible associations with, for example, cytotoxic findings can empower the research community to explain the link between COVID-19 infection and pulmonary sequelae for patients.

For EMS providers, particularly those with patient populations concentrated in a younger demographic such as on university campuses, it is critical to be aware of the possibility of atypical presentations associated with prior COVID-19 infection. Post-COVID-19 sequelae are emerging phenomena that providers have yet to fully appreciate and understand. Collegiate EMS providers should seek to incorporate a thorough history of past respiratory conditions in conjunction with COVID-19 symptoms, focusing on the presence and prevalence of vaping. The prevalence of this practice in college populations warrants further screening protocols for on-campus calls related to pulmonary distress. Trends often make it common for EMS providers to be more inclined to take history related to substance use disorder or alcohol intake, and for similar reasons due to population use, vaping use should be an added criteria for review of systems on college campuses in a post-COVID-19 world.

In synthesis, providers should consider a plethora of possible diagnoses that are beginning to present in the literature that are possibly related to COVID-19 infection. Even if patients deny typical symptomatology of fever or fatigue, the provider can sharpen their skill set with a deeper understanding of possible long-term complications that may present following recovery from COVID-19. With increasing rates of e-cigarette use on campuses, collegiate EMS organizations should also seek to keep updated on the advances in literature investigating the possible connection between e-cigarette users and COVID-19.[4]

Disclosure

This information was collected with the patient's consent. Signed authorization to share the de-identified case report is available to the journal upon request.

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CASE REPORT

Labor Trafficking and the Role of the EMS Professional

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"They (EMS providers) see me, and they know that something is wrong with me. They are trying to help, but they didn't ask me questions. It was a long ride. A lot of time to ask questions and get as much information from me so that they could help me. The whole time I was transported by EMS they never asked me." - Fainess; labor trafficking survivor

Like Fainess, many trafficked persons interact with EMS professionals before being identified as a trafficked person. Trafficked persons are often hidden in plain sight, with their exploitation going undetected in their respective communities. Many EMS professionals have not received any training in human trafficking; however, EMS professionals are in a unique position to identify trafficked persons, gaining a view of the patient's out-of-hospital environment not visible to most other healthcare providers. With appropriate training, EMS personnel can be well-equipped to intervene and connect these patients to the necessary community resources.

Introduction

Human trafficking is a widespread though underrecognized problem, affecting individuals locally, nationally, and globally. Human trafficking takes many forms, but it typically involves sexual or labor exploitation. The United States (U.S.) federal law defines sex trafficking as "the recruitment, harboring, transportation, provision, obtaining, patronizing, or soliciting of a person for the purposes of a commercial sex act, in which the commercial sex act is induced by force, fraud, or coercion, or in which the person induced to perform such an act has not attained 18 years of age."[1] Comparatively, under United States (U.S.) federal law, labor trafficking is defined as "the recruitment, harboring, transportation, provision, or obtaining of a person for labor or services, through the use of force, fraud, or coercion for the purposes of subjection to involuntary servitude, peonage, debt bondage, or slavery. "[1] As many as 40.3 million people are victims of modern slavery, with 29.4 million people currently experiencing labor exploitation.[2] Despite the prevalence of labor trafficking in the world, sex trafficking continues to dominate much of the conversation.[3]

This article aims to bring much needed attention to labor trafficking as it often goes unnoticed and under reported.[3] Labor trafficking occurs in many industries including domestic work, agricultural and construction work, and fishing and factory labor.[2] People of all ages, backgrounds, and genders are affected by labor trafficking, including both U.S. citizens and foreign nationals. Although certain populations are disproportionately affected by labor trafficking. Traffickers exploit vulnerable populations-such as people experiencing poverty, instability, wars, and those with a history of abuse or trauma.[4] The traffickers capitalize on this vulnerability and use it as a means to control their victims. Traffickers are known to control their victims through physical, emotional, and sexual violence.[4] Additionally, traffickers often confiscate any identifying documents such as passports. Lack of identification and threats of retaliation by traffickers make it difficult for trafficked persons to leave their situation or receive help.[4]

Studies suggest that up to 88% of trafficked persons accessed one or more healthcare providers while they were being trafficked.[5] Of those who sought care, the most frequent point of medical contact was an emergency department (ED).[5] Despite this high level of interaction with trafficked persons, less than 5% of emergency department personnel have received formal education on human trafficking.[5] A 2018 study revealed that less than half of EMS providers had been educated on human trafficking.[6] This gap in education presents an opportunity for emergency providers to receive formal training to better recognize and address persons experiencing trafficking and dispel common myths surrounding trafficking.[6] Prior to arrival in the ED, EMS personnel may be the first healthcare providers to evaluate a labor trafficked person; this brief encounter in the isolation of the ambulance may be a trafficked person's only chance to privately ask for help. The goal of an encounter with a potentially labor trafficked person is to educate and establish a trusting relationship. It is important that trafficked persons see the ED and other facets of healthcare as a place of refuge where resources are available.[4] The goal of this article is to offer an overview for collegiate EMS providers on labor trafficking and to build confidence in providers' ability to

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recognize and address patients who may be experiencing labor trafficking (Figure 1). It is essential that EMS personnel be educated on labor trafficking and how it may present in a pre-out-of-hospital setting.

Educating collegiate EMS providers on labor trafficking is imperative for a variety of reasons. First, some EMS providers are likely to encounter persons experiencing trafficking and need to feel confident in their ability to treat these patients. Secondly, many collegiate EMS providers are just beginning their careers in healthcare and aspire to continue in healthcare in various capacities. It is likely that collegiate EMS providers will go on to encounter potential trafficking situations on the college campuses served, but also in future clinics, hospitals, and ambulances. Early education in EMS careers is necessary as it will foster confidence in identification and treatment of people experiencing labor trafficking and help disrupt the cycle of violence that human trafficking perpetuates.

Assessing the Scene

While it is important to recognize that labor trafficking takes many forms and can present in numerous ways, certain observations should heighten suspicion that labor trafficking is occurring. The settings for labor trafficking are diverse and include, but are certainly not limited to private homes, restaurants, agricultural fields, and hotels.[7] A pertinent aspect of scene size-up is prioritizing provider safety. As you arrive on scene, account for people that are on scene and may be near the patient. People who experience trafficking are often trafficked outside of their home state or country and may be unfamiliar with the language and their surroundings.[8] Therefore, it is of utmost importance to employ a professional interpreter for patients to ensure that the trafficker does not serve as the interpreter. The behavior of bystanders and others on scene can offer important insight. Traffickers may begin acting defensively, refuse to leave the patient's side, and try to speak for the patient.[9] When conducting your exam and history,

Figure 1: PEARR Tool

PEARR Tool — Trauma-Informed Approach to Victim Assistance in Health Care Settings

Dignity Health recommends universal education about various forms of abuse, neglect, and violence in all of its health care settings, particularly in settings that offer longitudinal care and services. For urgent and emergency care settings, a universal education approach may be most appropriate and effective when a patient presents with risk factors and/or indicators of victimization. **The PEARR Tool** offers key steps on how to provide such education to a patient and how to offer assistance in a **trauma-informed and victim-centered manner.** A double asterisk ** indicates points at which this conversation may come to an end. Once this conversation ends, refer to the double asterisk** at the bottom of this page for additional steps. **Note:** The patient's immediate needs (e.g., emergency medical care) should be addressed before use of this tool.

P — Provide Privacy

1. Discuss sensitive topics **alone** and in **safe, private setting** (ideally private room with closed doors). If companion refuses to be separated, then this may be an indicator of abuse, neglect, or violence.** Strategies to speak with patient alone: State requirement for private exam or need for patient to be seen alone for radiology, urine test, etc.
   - **Note:** Companions are not appropriate interpreters, regardless of communication abilities. If patient indicates preference to use companion as interpreter, see your entity's policies for further guidance.**
   - **Note:** Explain **limits of confidentiality** (i.e., mandated reporting requirements) before beginning any sensitive discussion; however, do not discourage person from disclosing victimization. Patient should feel in control of all disclosures. Mandated reporting includes requirements to report concerns of abuse, neglect, or violence to internal staff and/or to external agencies.

E — Educate

2. Educate patient in manner that is **nonjudgmental** and **normalizes** sharing of information. Example: "I educate all of my patients about [fill in the blank] because violence is so common in our society, and violence has a big impact on our health, safety, and well-being." **Use a brochure or safety card** to review information about abuse, neglect, or violence, and offer brochure/card to patient. [Ideally, this brochure/card will include information about resources (e.g., local service providers, national hotlines)]. Example: "Here are some brochures to take with you in case this is ever an issue for you, **or someone you know.**" If patient declines materials, then respect patient's decision.**

A — Ask

3. Allow time for discussion with patient. Example: "Is there anything you'd like to share with me? Do you feel like anyone is hurting your health, safety, or well-being?"** If available and when appropriate, use **evidence-based tools** to screen patient for abuse, neglect, or violence.
   - **Note:** All women of reproductive age should be intermittently screened for intimate partner violence (USPSTF Grade B).**
4. If there are indicators of victimization, **ASK** about concerns. Example: "I've noticed [insert risk factor/indicator] and I'm concerned for your health, safety, and well-being. You don't have to share details with me, but I can connect you with resources. Would you like to speak with [insert advocate/service provider]? If not, you can let me know anytime."**
   - **Note: Limit questions** to only those needed to determine patient's safety, to connect patient with resources (e.g., trained victim advocates), and to guide your work (e.g., perform medical exam).

USPSTF = US Preventive Services Task Force

R R — Respect and Respond

5. If patient denies victimization or declines assistance, then **respect patient's wishes.** If you have **concerns about patient's safety,** offer information about resources that can assist in event of emergency (e.g., local shelter, crisis hotline).** Otherwise, if patient accepts/requests assistance with accessing services, then **provide personal introduction** to local victim advocate/service provider; or, **arrange private setting** for patient to call hotline:

   National Domestic Violence Hotline, 1-800-799-SAFE (7233);
   National Sexual Assault Hotline, 1-800-656-HOPE (4673);
   National Human Trafficking Hotline, 1-888-373-7888 **

** Report **safety concerns** to appropriate staff/departments (e.g., nurse supervisor, security). Also, **REPORT** risk factors/indicators as required or permitted by law/regulation, and continue **trauma-informed** health services. Whenever possible, **schedule follow-up appointment** to continue building rapport and to monitor patient's safety/well-being.

The PEARR provides an outline for healthcare provider on how to best care for patients in a trauma informed and victim centered manner.[22]

ensure that the patient is alone unless an in-person interpreter is needed. Assessing the patient alone can increase the likelihood that the patient will disclose concerns and ask for help.[10]

If there are safety concerns, it is best to request police assistance. EMS providers should also be aware of the implications of involving law enforcement on potential trafficking cases. Trafficked persons may have an innate discomfort and aversion to the presence of law enforcement personnel on a scene, especially in situations when trafficked people have been forced to commit crimes or the trafficked person is undocumented.[11] Law enforcement may not be educated on labor or sex trafficking which could lead to the patient's arrest or deportation. When law enforcement presence is needed to ensure provider safety, speak directly to on-scene officers discretely to explain one's concern for trafficking. Further, communicating that the patient's medical care is essential, can be helpful in limiting the patient's interactions with law enforcement.

Due to the nature of the call, law enforcement may already be present on scene upon EMS arrival, and they may request information from the EMS provider. Laws vary from state-to-state so it is best to familiarize yourself with your respective state's policies. While the law may permit or require disclosure of a patient's name, any additional information should be deferred to hospital staff upon arrival. Optimally, an interprofessional protocol for managing suspected trafficking cases has been established. In the rare cases where media may be present, defer any media inquiries to your public information officer or university's media relations office.

The History and Exam

To ensure privacy, the patient should ideally be transported alone. Even unassuming acquaintances should be left on scene if at all possible, as another trafficked person may function as a "minder" for the trafficker.[12] If the patient is a non-native English speaker, when possible, have an interpreter present or access a virtual interpreter by telephone or application so that you can conduct a history and assessment in the patient's native language. This allows for not only greater accuracy in the history and exam but can help provide some comfort for the patient as well.

Labor trafficked persons may be reluctant to disclose their situation for fear of retribution, arrest, deportation or threats on their families. There are a variety of indicators of labor trafficking that you can look for while conducting an assessment. Victims of trafficking can display a range of responses that can vary between elusiveness and appearing withdrawn to agitation and aggressive responses due to trauma experienced. Their responses to questions may be well rehearsed and unwavering or may change repeatedly and be inconsistent. This may be frustrating for the EMS provider, but it is important to maintain a professional demeanor. A trauma-informed approach can help to not only provide some comfort to the patient, but also help to avoid re-traumatizing the patient and may bring some clarity to the patient's responses. (Figure 2).

Figure 2: Aspects of a Trauma Informed Approach

- Acknowledge that many patients have a history of trauma
- Ensure physical and emotional safety for patients and providers
- Recognize symptoms of trauma
- Care for patients in a supportive non-judgmental manner
- Empower patients and give them control and choice over healthcare decisions
- Promote self-care among clinicians and staff

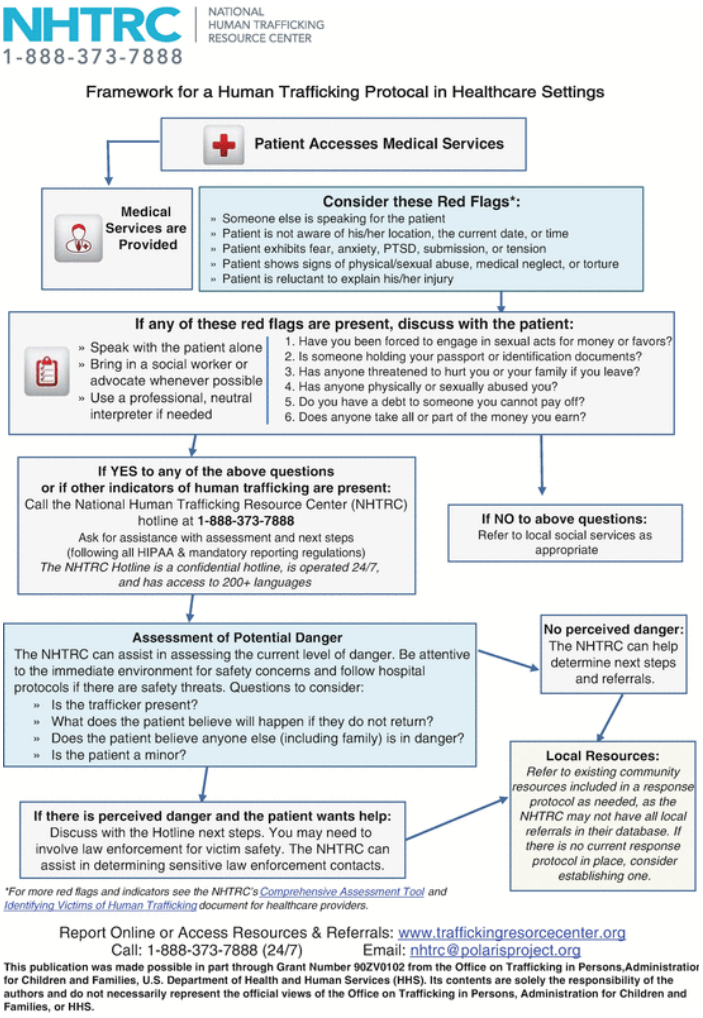
Principles of Trauma-Informed Care

Implementing a trauma-informed approach that is victim centered is necessary when treating people who you suspect may be experiencing labor trafficking. The key tenets of trauma-informed care include acknowledging the patient's life experiences and creating an environment that is safe—both emotionally and physically—, collaborative, trusting, empowering, and by allowing the patient to make educated choices about their care.[13] While engaging with your patient, approach questions and education without judgment—an important tenet of trauma-informed care. Ask questions that can better inform you of potential victimization or exploitation the patient may be experiencing.

The goal of trauma-informed inquiry is to educate the patient and provide them with knowledge of resources, and not for the patient to disclose their trafficking situation. For minors, EMS providers should inform the patient of limits of confidentiality. A great resource for EMS providers to refer to regarding a trauma informed approach is the PEARR Tool, (Provide Privacy, Educate, Ask, Respect, and Respond) (Figure 1). The PEARR Tool provides an evidence-based tool for providers to address abuse, neglect, and violence, including trafficking.[14] The PEARR tool can be used in conjunction with the National Human Trafficking Research Center (NHTRC) Framework for a Human Trafficking Protocol in Healthcare Settings, which includes suggestions for trafficking-specific red flags, potential questions to ask (Figure 3).

Lastly, respect the patient's wishes whatever they may be, and reiterate resources that are available to them if an emergency occurs or choose to seek out resources at a later date. In the situation where a trafficked person does disclose their trauma, EMS providers should share resources that are available in their community, and if EMS providers are not aware of these resources, they may call the National Human Trafficking Hotline (Figure 4). EMS Providers can utilize the National Human Trafficking Hotline to assist in identifying local, regional, and national

Figure 3: National Human Trafficking Resource Center Algorithm for Medical Professionals



The National Human Trafficking Resource Center has developed this algorithmic framework for healthcare providers to refer to when caring for people who may be experiencing trafficking.[24]

organizations who offer anti-trafficking services. If a patient is suspected of being, or identifies as, a person being labor trafficked, EMS providers should make a concerted effort to provide brief education on the National Human Trafficking Hotline. The National Human Trafficking Hotline reports extensive statistics on human trafficking. EMS providers can look at the specific statistics for the state in which they practice to get a better idea of what labor trafficking may look like in their region.

Physical Signs That Suggest Labor Trafficking

Above all else, the physical exam should focus on identification and management of immediate life-threatening issues. While examining the patient, certain physical findings might suggest abuse or trauma, and reveal potential trafficking situations. Common health problems reported by persons experiencing labor trafficking include post-traumatic stress disorder (PTSD), anxiety, depression, suicide attempts, and injuries and illness related to the type of labor they perform. For example, trafficked persons may have chronic or acute heat and cold exposure or may be malnourished or dehydrated, especially if they are working and living in hazardous environmental conditions.[15] Physical complaints also often include headaches, dizziness, dental problems, loss of consciousness, nausea, back pain, and fatigue.[16] Any concerns or suspicions you may have that the patient is a potential trafficked person should be communicated to your partner and any other providers to whom you transfer care.

Transport

There are several considerations when transporting a patient who is suspected of experiencing labor trafficking. Domestic violence research informs us that the most dangerous time for a victim is during the separation from an abusive partner.[18] Therefore, the EMS provider should keep in mind that the trafficked person has the best understanding of what will impact their safety in their trafficking situation and their relationship with their trafficker. Individuals may have several phones in their possession, which in some cases may be direct links to a trafficker, including potential GPS trafficking. The EMS provider should defer to the trafficked person's judgment on answering incoming calls or texts on these devices, as a potential change in expected communication with a trafficker may in some situations cause retaliation against the trafficked person.[17]

While treating potential labor trafficked persons, it is important to remember that our job as EMS providers is to provide medical care and offer resources. If a trafficked person is not ready to leave their trafficking situation, we must respect their decisions and keep in mind we are not aware of all details regarding the situation.[4] An exception to this is when minors are involved, which would usually fall under state mandatory reporting laws. In this situation, in a trauma-informed manner, the provider should follow their jurisdiction's regulations for reporting labor trafficking.

Clothing may be inadequate or inappropriate for weather or social conditions. Consider providing a warm blanket or other items

Figure 4: National Human Trafficking Hotline Number

The National Human Trafficking Hotline is a resource to report suspected trafficking and receive information about local resources available to people experiencing trafficking.[23]

appropriate for weather conditions. When feasible, limit patient transport through high visibility or public places. For example, if the individual is being transported from a hotel, consider using a service entrance for transport to the ambulance instead of the main lobby.

Lastly, if local policy dictates a call-in to the emergency department, provide only the necessary details of the medical complaints or injuries. Avoid indicating that the person is a potentially labor trafficked person as the call-in may be a public transmission.

Hospital Interactions

It is important for EMS providers to communicate their concerns about potential trafficking to hospital staff. Proactively, EMS should engage with local hospitals and anti-trafficking service organizations to develop evidence-based, trauma-informed, multi-disciplinary practices and policies so that care can be empathetic, compassionate, and in the best interest of the patient. The organization Health, Education, Advocacy, Linkage (HEAL) Trafficking is comprised of multidisciplinary professionals dedicated to applying a public health perspective to end human trafficking and support survivors. HEAL has developed a toolkit that is an excellent resource for how to develop an interdisciplinary team to address trafficking.[19]

The EMS provider can play an important role in identifying concerns around labor trafficking.[8] An EMS provider can share their first-hand accounts of information from the scene including work conditions. Additionally, EMS providers have had time with the patient to privately discuss medical and psychiatric concerns. It is important that this information is relayed to the hospital staff to help ensure the patient receives appropriate care.

Patients do have certain protections while in the hospital and it is important to communicate this with patients to assuage fears they may have.[21] Advise hospital staff of the situation and explain the importance of limiting visitors or making the patient "anonymous" on the clinical record. In the case of a minor patient, EMS providers should take appropriate actions to file with the required agencies in their jurisdiction. This should involve integrating the appropriate authorities including law enforcement and child protective services, as applicable. Similarly, providers should file with the appropriate agency if there is suspected elder abuse. EMS providers should stay up to date with their jurisdiction's mandated reporting requirements and know where to find the contact information of reporting agencies.

Any belongings transferred to and received by the hospital staff should be documented. In the setting of important documents, sums of money or other valuables, it is reasonable to document an itemized list.

After the call, it is important to take care of yourself and your crew members. These calls involve victims of trauma and may have a significant impact on the mental health of providers.[21] Time to discuss and debrief the call may be necessary, including the involvement of additional support services that include department counselors, crisis incident debriefing, or related programs.

Discussion

Most people who experience labor trafficking seek out healthcare, especially emergency medical care, at some point while being trafficked.[6] There is limited research available regarding EMS and interaction and identification of persons experiencing labor trafficking. However, research does suggest that EMS providers who receive formal education are less likely to support myths surrounding human trafficking and were able to more frequently identify human trafficking indicators.[25] It is crucial that EMS providers be educated to the best extent possible on labor trafficking and confident in their abilities to serve patient populations affected by labor trafficking.

Emergency medical service providers are in a unique position to identify persons experiencing trafficking, especially labor trafficking. Details about the scene, interactions with supervisors or other employees, and working conditions are important aspects of the overall picture that may only be visible to the EMS providers on scene. Recognizing these details and raising the index of suspicion are important aspects of care. Using a trauma-informed approach during your patient interview and exam that is guided by the PEARR tool, it is important to avoid re-traumatization and give the patient a voice to discuss their concerns. An interdisciplinary approach to care that involves EMS, the hospital and social services, and potentially specialized law enforcement can help ensure that labor trafficked patients receive appropriate care in a safe environment. Access to resources like the HEAL Trafficking Toolkit or the National Human Trafficking Hotline (Figure 4) can assist individual EMS agencies in developing protocol and plans of care for individuals suspected of being trafficked.

A collegiate agency should strive to offer or attend local continuing education courses on labor trafficking to stay educated on best practices. In addition to continuing education courses, the U.S. Department of Health and Human Services, Polaris, HEAL Trafficking, and the National Human Trafficking Hotline offer labor trafficking training courses. Consider posting helpful algorithms, numbers for local resources, and the National Human Trafficking Hotline Number around the EMS station. Furthermore, many colleges and universities have anti-trafficking coalitions and organizations that collegiate EMS agencies could partner with for education or outreach events. Collegiate EMS professionals receiving labor trafficking education early in health care careers is paramount.

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Comparing Patient Evaluations by a Municipal and a Collegiate-Based Emergency Medical Service: A Statistical Analysis from the University of Arizona

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ABSTRACT

Background: The University of Arizona Emergency Medical Services (UAEMS) is a collegiate EMS agency that responds to 911 medical calls on the University of Arizona campus in a basic life support (BLS) non-transport capacity. **Objective:** This study assesses UAEMS' patient evaluations when referenced to Tucson Fire, the municipal agency they respond in tandem with. **Methods:** In this study, agreement between Tucson Fire and UAEMS regarding final patient dispositions is examined across multiple categories with Cohen's kappa test and a sensitivity/specificity analysis to evaluate how similar UAEMS is in their patient evaluations. **Results:** When compared to Tucson Fire, UAEMS' evaluation for transport necessity shows high sensitivity and moderate specificity. **Conclusion:** UAEMS demonstrates a more conservative evaluation of patient transport necessity and provides a case-study showing the value of Collegiate-Based Emergency Medical Services.

Keywords: collegiate-based emergency medical services, patient evaluations

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Emergency Medical Services (EMS) agencies in the United States play an important role in ensuring public health and safety by responding to medical emergencies.[1] EMS agencies can vary both in the level of care provided (basic life support [BLS] and advanced life support [ALS])[2] and by who runs them (commercial, municipal, etc.).[3] The field of EMS, like other healthcare sectors, is facing an efficacy challenge as a result of healthcare reform as part of the evolution of evidence-based medicine.[4] Because of the variability inherent in EMS, a significant amount of research is needed to re-analyze the effectiveness and preparedness of individual agencies, and the system as a whole.[4,5]

Within the emergency healthcare system, it is common for EMS agencies, especially those in rural locales, to assist or request assistance from other organizations that are part of neighboring jurisdictions.[6,7] The city of Tucson has one such system in place, a mutual-aid agreement created between Tucson Fire Department (TFD) and two nearby fire agencies, that helps prioritize emergency response regardless of jurisdiction.[8] In total, this agreement includes more than 40 fire stations, spans 640 square miles, and is expected to reduce response times by 15 percent.[8] Such agreements and understanding between EMS agencies are important for the delivery of effective EMS care.[9,10]

Collegiate-based emergency medical services (CBEMS) are EMS agencies that are created to help contribute to healthy and safe communities on college or university campuses.[11] The capabilities of CBEMS agencies vary across universities; some organizations strictly function during school events, while others operate 24/7, 365 days a year.[12] While some organizations have the ability to transport their patients, other agencies serve solely in a rescue unit capacity, necessitating they work in tandem with another EMS agency to provide transport.[12] The University of Arizona Emergency Medical Services (UAEMS) is a CBEMS agency that was established at the University of Arizona in 2012.[13] UAEMS responds to emergency medical calls on a 24/7, 365-day basis within the bounds of the University of Arizona's main Tucson campus, while additionally providing standby services for special events hosted within the university's jurisdiction.[13]

Currently, UAEMS provides emergency medical services in a

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BLS non-transport capacity.[14] In the event of a 9-1-1 emergency medical call on the university campus, UAEMS responds jointly with a TFD unit;[15] both work in unison to provide emergency medical care. This cooperation is made possible due to the integration of UAEMS into Tucson Fire's Computer-Aided Dispatch system, allowing UAEMS to be dispatched as if they were a response unit with Tucson Fire. For ALS-level acuity calls, an ALS-level transport unit is dispatched to respond and for BLS-level acuity calls, a non-transport unit (usually a fire engine staffed with a paramedic fire captain) is dispatched to respond.

Responding ALS transport units are usually quicker to arrive to campus than BLS transport units as there are about four ALS medic units within a few mile radius of campus while BLS transport units are about six miles away. Regardless of whether the call was deemed BLS or ALS, patients transported by an ALS transport unit were considered as an ALS disposition for Tuscan Fire.

This study's primary purpose is to examine UAEMS' capability to determine patient acuity and transport necessity in comparison to Tucson Fire units by comparing the overall patient disposition determined by both agencies. Due to the nature of collegiate EMS and the high turnover for providers due to graduation, this study will also assess the evaluation capabilities of individual supervisors to determine if significant variation exists. Additionally, as little literature exists regarding comparisons of collegiate and municipal EMS agencies, a tertiary objective is to provide a case study about collegiate EMS effectiveness and evaluation capabilities with municipal EMS as a reference.

Materials and Methods

A total of 599 call records were generated for the calendar year of 2020 by the University of Arizona Emergency Medical Services. Data from these call records was extracted using the Report Writer functionality of ImageTrend, an interface that allows for the generation of reports containing the minimal information requested. The data collected did not include identifiable markers, and thus access to Personal Health Information (PHI) was avoided using this method. A waiver of consent for the data used in this study was obtained from the University of Arizona Institutional Review Board (see Appendix A).

Of these 599 call records, 368 were complete Patient Care Reports (PCRs), 160 were designated as missed calls (a result of situations where UAEMS does not make patient contact due to cancellation or other reason), 35 were designated public assists (low-acuity calls that do not require full PCRs to be generated), 23 were designated late arrivals (PCRs which are potentially incomplete due to arrival after Tucson Fire's evaluation has begun) and 13 are uncharacterized (Figure 1).

Every PCR includes a section for the final patient disposition (ALS transport/BLS transport/patient refusal) as independently determined by both UAEMS and TFD; this information will be used to compare both agencies' assessment of the same patients. While only complete PCRs containing Tucson Fire and UAEMS's patient dispositions were used to analyze the effectiveness of UAEMS' medical evaluations, an additional 37 PCRs were excluded due to inaccurate data for patient disposition. Upon retrospective review, one supervisor was found to have conflated final patient disposition and UAEMS operating capacity, resulting in "BLS" being selected for every patient disposition. This was confirmed upon review with said supervisor, and verbal confirmation was made with every other supervisor who responded to a 911 call in 2020 to ensure this mistake was isolated to one supervisor only. With the exclusion of these 37 reports, a total of 331 PCRs were used for this statistical analysis.

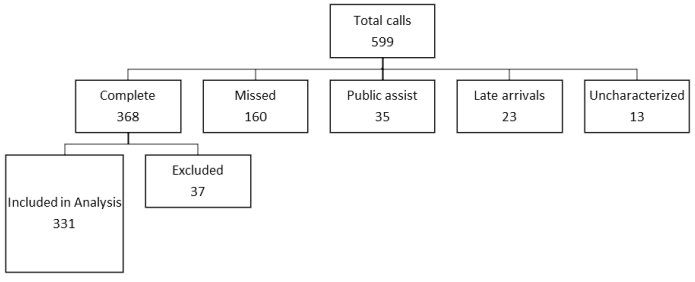
Each PCR used for this study was sorted into seven distinct call types: Assault, Behavioral, Ethanol/Overdose, Falls, Medical, Motor Vehicle Accident (MVA) and Other Trauma; a call type of Not Applicable (N/A) was also included for any call that does not fall under the preceding types. Each PCR was also sorted by the level of resources dispatched (ALS or BLS) and by "primary impression", or what was determined to be the main cause of the emergency.

To determine statistical correlation between Tucson Fire and UAEMS patient disposition decisions, Cohen's kappa test was performed, using Tucson Fire's disposition as the baseline for comparison. The kappa result of each test will be between -1 and 1, with 1 implying perfect agreement and any negative number showing imperfect agreement, more than what would be expected by chance16. The sensitivity and specificity of UAEMS' judgment was also evaluated to determine where the bulk of any disagreements lie. For this analysis, a "false positive" is when UAEMS has a transport disposition compared to TFD's non-transport disposition; when comparing ALS vs. BLS transport decisions, a "false positive" is when UAEMS has an ALS disposition compared to TFD's BLS disposition.

Results

Figures 1 and 2 present the kappa value, sensitivity, and specificity of UAEMS' decision of transport vs. non-transport in each call category; the values for UAEMS' ALS and BLS decisions are

Figure 1: A visual representation of the total call categorization



also shown for comparison. Note that the "Assault" call type is not shown on the κ value graph, as the small sample size prohibited the usage of Cohen's kappa test. UAEMS' decision-making between ALS and BLS by specific call type is likewise not shown above, also due to small sample size concerns. While the transport decision sample includes all 331 calls from above, only calls in which UAEMS and TFD both agreed on transport were utilized for the level of care comparison. As a result, the ALS vs. BLS analysis has a sample size of 157 calls. Figures 3 and 4 illustrate an evaluation of transport decision-making for each of the 11 UAEMS shift supervisors who responded to more than 10 included calls over the 2020 calendar year. Figures 5 and 6 show the kappa value, sensitivity, and specificity of UAEMS' decisions regarding transport and level of care for calls separated by initial dispatch acuity. The sample used for these two figures contains only 312 calls, as only calls with recorded and valid dispatch codes were included. Additionally, only 140 of the 312 calls contained a transport disposition for both TFD and UAEMS, and these calls solely were a part of the sample used to evaluate patient acuity decisions.

Finally, an evaluation of UAEMS' transport decisions was made for each primary impression used for a total of 10 calls or more, shown in Figures 7 and 8. While all 331 calls were included in this analysis, only 6 primary impressions were indicated in 10 or more calls, due in part to a total of 64 different impressions being selected across all calls included.

Discussion

Recent research suggests that, for medical research particularly, kappa values of $\kappa \geq 0.8$ and $\kappa \geq 0.9$ should be considered strong and "almost perfect" agreement respectively.[17] As such, agreement regarding transport decision-making was shown to be "almost perfect" when considering calls of a Medical, MVC/MVA and unknown (N/A) nature (although the "N/A" call type suffers from a relatively small sample size); further, agreement between UAEMS and TFD regarding whether to transport a patient was considered strong for every call type evaluated.

Most of the variation in UAEMS and TFD transport decisions resulted from having a dissenting evaluation of "transport" for a patient. This is supported by the near-perfect sensitivity rates for each type of call, even when looking across all dispatch levels, primary impressions, and call types evaluated. Looking specifically at calls separated by primary impression, while kappa values fluctuate between 0.6 and 1 (representing "moderate" and "near perfect" agreement respectively), sensitivity is a perfect 100% for all but one patient disposition.

This trend is mirrored in the evaluation of individual supervisors; while the values for the comparison of primary impressions decrease compared to TFD impressions when grouped by individual supervisor, the sensitivity of "transport" decisions is a perfect 100% for 13 of the 15 supervisors included in this analysis. The two supervisors with sub-100% percentages (sensitivities of 87.5% and 90%) had one call each where they gave a "non-transport" disposition for a patient TFD determined should be transported.

One potential confounding factor central to this analysis that should be addressed is the independence of UAEMS' evaluations. While TFD's transport and patient acuity determinations are largely independent, UAEMS is cognizant of TFD's decisions when inputting their final patient assessments in the post-call PCR, even if TFD's evaluation has no physical bearing on UAEMS' evaluation. With respect to individual supervisor evaluations, 6 of the 15 supervisors examined gave identical "transport" decisions as TFD; however, 3 of these 6 supervisors disagreed with TFD in regard to "patient acuity" evaluations, leaving only 3 supervisors with no disagreements. While UAEMS consistently demonstrates high sensitivity for "transport" evaluations across all categories, the disagreement in "patient acuity" evaluations demonstrates that UAEMS shows independent evaluation skills when assessing a patient's condition.

The low specificity of UAEMS' patient acuity evaluation (75%) is likely a result of several factors. One specific factor is the difference in BLS transport standing orders between UAEMS and TFD before Fall 2020 (See Limitations). Additionally, UAEMS is staffed exclusively by EMTs, while TFD's "BLS" non-transport response units are occasionally staffed by paramedics7; this means that while TFD will send paramedics to evaluate situations dispatched at an ALS priority, they sometimes also send paramedics to evaluate BLS priority situations. As such, it is possible that a predilection exists for acuity decisions to match the level of training of the evaluator, causing UAEMS' evaluations to lean towards BLS, and TFD's to lean towards ALS. No firm conclusions can be made at this juncture without further investigation.

While transporting patients not requiring ambulance transport to an ED isn't desirable, it is preferable to situations where a patient requiring ambulance transport to an ED is deemed stable enough to not necessitate emergency transport. Based on the consistently high sensitivity rates, it can be concluded that UAEMS provides a statistically similar patient assessment when compared to assessments by TFD.

Limitations

Some limitations were encountered during this experiment that should be addressed. While UAEMS' yearly call volume is normally around 900 calls, the COVID-19 pandemic kept many students at home and reduced the population on campus, which in turn reduced the number of calls available for statistical analysis. In addition, the data used for this study is second-hand information, whose accuracy is reliant on the provider writing the PCR. Finally, UAEMS and TFD possessed different standing orders until Fall 2020 when UAEMS adopted TFD's standing orders (See Appendix A); as such, some disposition differences can be attributed to differences in standing orders regarding patient disposition and not differing evaluations of the same patient.

Conclusion

With TFD's evaluation set as the standard, UAEMS's evaluations of a patient's transport necessity has been demonstrated to possess near-perfect sensitivity. When paired with a lower (but still high) specificity, UAEMS demonstrates a more conservative evaluation of patient transport necessity. This case study has also shown, albeit with one example, that collegiate emergency medical service agencies can provide safe patient evaluations. Additionally, shift supervisors were generally consistent in sensitivity, indicating the effectiveness of the training of supervisors.

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Supplementary Materials

Appendix A: This research project was approved by the University of Arizona's Institutional Review Board, project ID# 2103647633. A waiver of consent was obtained for the data in this study. Due to the patient population studied herein, specific permission for inclusion of patient records of minors was sought and approved by the IRB board.

Appendix B: Tuscan Fire Standing Orders - Excerpt (Available Online)

Appendix C: UAEMS Standing Orders prior to Fall 2020 - Excerpt (Available Online)

Appendix D: Supplemental Material (Available Online)

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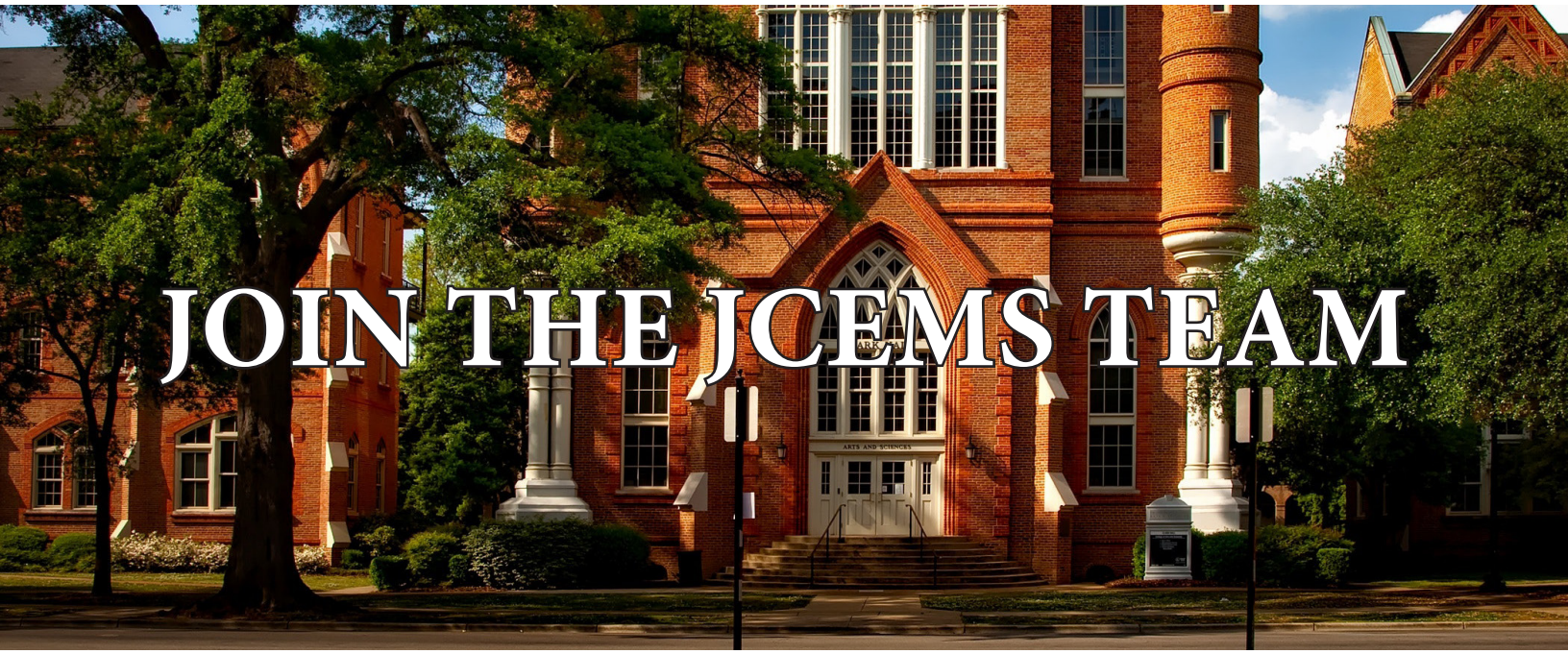

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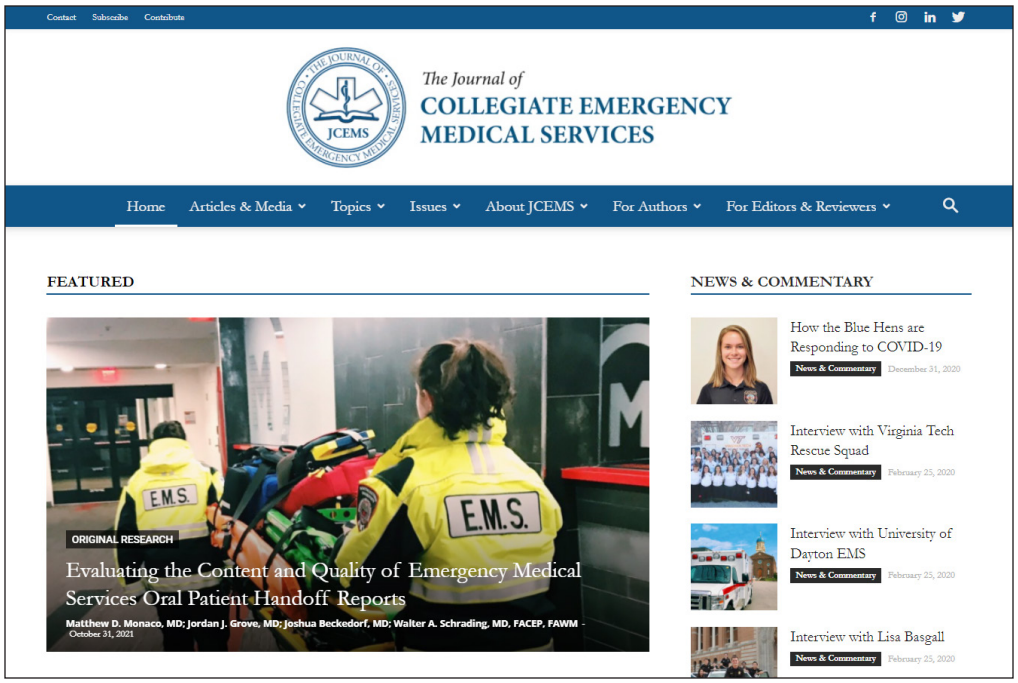

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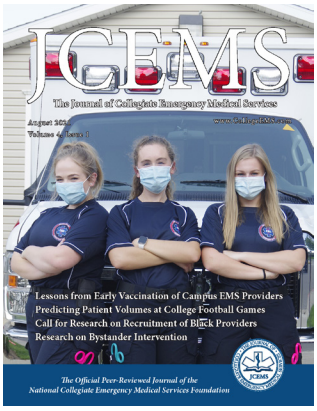

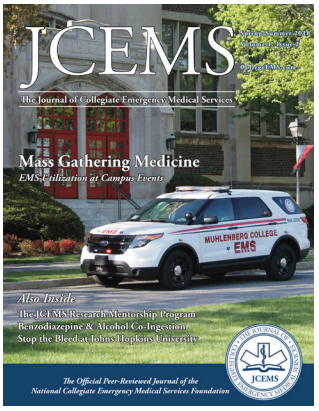

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