Pilot study to teach residents about EMS scope of practice through reverse role simulations

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Abstract

Objective: To improve emergency physician trainee understanding of Emergency Medical Services´ (EMS) scope of practice, and physician confidence in performing EMS skills by conducting a simulation role reversal workshop. **Methods:** EMS clinicians and physicians created and facilitated a role-reversal workshop for seven pediatric emergency medicine (PEM) fellows designed to emphasize scope of practice of EMS clinicians using basic life support (BLS) and advanced life support (ALS) skills. Fellows role-played using BLS or ALS skills in three different case scenarios. Medication preparation and delivery were assessed. Pre, post, and retention surveys (provided at 1 month post-intervention) were performed to assess scope of practice knowledge, and the EMS skill set confidence of the fellows. **Results:** Fellows reported the curriculum had an impact on their understanding of EMS scope of practice. Confidence in differentiating ALS and BLS scope of practice improved as did the subjective understanding of local EMS protocols. The confidence in preparing and administering multiple types of medications (i.e., intramuscular epinephrine administration, nebulized medication preparation) significantly improved as well ($p<0.016$ with Bonferroni adjustment). **Conclusion:** Given improved confidence scoring in understanding EMS scope of practice and medication administration, role reversal methodology may offer intangible affective and psychomotor benefits for emergency medicine trainees by generating a sense of a "lived-experience" when role-playing EMS skill sets. The workshop may serve as a model to use in teaching pre-hospital scope of practice and generating interprofessional understanding for physician trainees.

Keywords: Pre-hospital, Trainees, Simulation, Role Reversal, Fellows

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Introduction

Pediatric emergency medicine (PEM) fellows often provide medical oversight to emergency medical service (EMS) clinicians, and therefore need to have a strong foundation in pre-hospital protocols and scope of practice.[1,2] The Accreditation Council for Graduate Medical Education (ACGME) mandates emergency medical services for children (EMSC) training for PEM fellowship programs. (2) Simulation-based training in medicine can be a powerful tool for acquiring knowledge and practical skills, especially where there are gaps in clinical experiences.[3–5] While no standard for interprofessional education delivery has been set,

data has shown positive outcomes with methodologies that incorporate high-fidelity simulators and various forms of roleplay.[6,7] To optimize our simulation experience, we utilized role reversal. This may be a useful technique given that often knowledge of an adjacent health professional's roles and responsibilities, such as an EMS clinician, might otherwise only be learned through passive experience by a physician trainee.[8] Role reversal, in the context of medical education, is when a medical professional role-plays an alternate, but related, health profession. It can help develop critical thinking skills, understand the barriers that other health professionals face, and broaden learner viewpoints, generating a "lived-experience" for the learner.[9] Other pilot interprofessional simulations have used this methodology with success. As there has been a relative lack of role-reversal methodology used in teaching pre-hospital EMS scope of practice for PEM fellows, our goal was to explore its benefit in this context.[8]

Our specific objective was to improve fellows´ understanding of EMS scope of practice and to increase confidence in providing direct medical oversight to EMS clinicians through role-reversal simulation.

Methods

Study overview and population

Our study population was a convenience sample of seven pediatric emergency medicine fellows of all three years of training (1st ,2nd 3rd). Seven fellows participated in a one-day workshop at the regional simulation center. Simulation facilitators included two emergency medicine- (EM) trained EMS physicians who were EMS medical directors; two senior PEM fellows; two paramedics; and a PEM EMS physician who was also an EMS medical director.

Curriculum Overview

We designed simulation scenarios to emphasize differences in BLS and ALS scope of care. We used standard EMS equipment including radiophones for direct medical oversight in conjunction with high-fidelity mannikins (Laerdal SimMan Classic). Participants rotated as either BLS or ALS providers for three separate cases and practiced skills within those roles (Table 1).

Simulation stations included anaphylaxis/ distributive shock, croup/pediatric respiratory distress, and COPD/adult respiratory distress. Each station consisted of BLS and ALS versions of the vignettes. The confines of an ambulance were replicated by use of tape along the parameter.

For each scenario, a pair of fellows were assigned to enact an EMS clinician role, as either a paramedic or EMT, based on whether ALS or BLS care was provided. Each fellow worked within the EMS scope of practice as defined by the National Highway Traffic Safety Administration (NHTSA).[10] In addition, real EMS clinicians acted as scripted partners to the PEM fellows, allowing fellows to practice providing pre-hospital care. Each PEM fellow alternated between acting as a paramedic, EMT, or an observer. A fellow who performed the role as an observer, completed a checklist of key management steps that should have been performed as per Pennsylvania EMS protocols for that particular case. The observing fellow and EMS clinician were present in the room during the scenario. The PEM facilitator remained in the simulation control room during each case. A debrief followed with input from the fellow observer, EMS clinicians, and PEM facilitator.

Table 1. Number of participants and response percentages, *n=6 given one missing response

Fellow Postgraduate Year	**Response (%)**
Year 1	3(43%)
Year 2	2(29%)
Year 3	2(29%)
Completed an EMS Rotation	2(33%*)

We set up EMS skill stations to allow PEM fellows to perform common ALS and BLS skills on simulation mannikins. These EMS skill stations included: preparation and administration of medication via intranasal (IN), intramuscular (IM) and intravenous (IV) routes. In particular, the nuances involved in preparing IM epinephrine were stressed. Fellows were also expected to establish IV access for both fluid and medications, as well prepare and administer aerosolized breathing treatments. EMS physicians and senior PEM fellows served as facilitators at the simulation station.

Case Descriptions (Appendix A)

Analysis

The University of Pittsburgh School of Medicine Institutional Review Board approved this study. We enrolled participants from October 2021 to November 2021. Unpaired and anonymized pre, post, and retention surveys (provided at 1-month post-intervention) assessed scope of practice knowledge and confidence with EMS skillset. Survey questions were adapted from the Pediatric Emergency Medicine Question Review Book 2017.[11] We analyzed data and produced figures using IBM SPSS version 28 software. We reported descriptive data with median survey scores and demographic response frequencies. We used the Kruskal-Wallis test and Mann Whitney U test for comparative analysis of confidence and cognitive scoring with a Bonferroni correction. We used Excel version 16.64 software to generate figures.

Results

All seven fellows completed the pre, post, and retention surveys (Table 2). There was a non-statistically significant improvement in knowledge assessment over the course of the curriculum (Figure 1). However, there were notable improvements in the understanding of scope of practice, knowledge of local EMS protocols, as well as practical administration and preparation of multiple types of therapies (Figure 2–6). No significant difference was seen between post-survey and retention survey results for these variables. Fellows reported the workshop had given them the ability to better prioritize interventions when giving online medical oversight to EMS, increased their understanding of resources available in the pre-hospital setting, and helped them discern between EMS protocols and typical emergency department management. Fellows also reported increased confidence in transport and management of medical-legal issues.

Discussion

Our study suggests that role reversal simulation and EMS skill stations may be useful in helping physician trainees in understanding EMS scope of practice and in improving confidence with performing pre-hospital care. Survey responses indicated improved fellow confidence in delivering medical oversight through understanding of EMS scope of practice, limitations, and protocols. The deeper understanding of EMS scope of practice may benefit physician trainees who are engaged in pre-hospital care.

Fellows reported the curriculum improved clinical interactions with pre-hospital providers in the emergency department and transport calls. Incorporation of interprofessional education can promote a culture of improved communication and our paramedic facilitators, given their content experience, enriched the curriculum.[12] There are a few published studies demonstrating the effectiveness of using paramedics to improve physician trainees' understanding of EMS scope of practice, and protocols.[13] A future pre-hospital curriculum for physician trainees should consider integration of paramedic expertise as part of their EMS program simulation.

This study offers a proof of concept for program directors in emergency medicine training programs to incorporate into their pre-hospital curriculum. While our study utilized pediatric emergency medicine fellows, emergency medicine residents as well as other physicians providing medical direction, such as critical care fellows and trauma surgery trainees, may similarly benefit. Future work could incorporate a more diverse trainee population to see if other specialties have similar outcomes.

Role reversal has been useful in helping learners understand the challenges that others face and promotes learner immersion during simulation.[14,15] However, the paucity of data on the effect of role reversal in pre-hospital education is particularly relevant given that prior interprofessional simulations have involved professionals who often operate in the same clinical environment, whereas EMS clinicians and physicians operate in completely different venues, resulting in different constraints, challenges—but also opportunities.

While our study identified some notable benefits, there may be further unrecognized cognitive, patient safety and quality of care benefits to role reversal simulation in the EMS context. Future

Figure 1: Median knowledge assessment scores for the PEM fellows, test consisted of seven PEM board examination practice questions (pre IQR 57, post IQR 22 retention IQR 43)

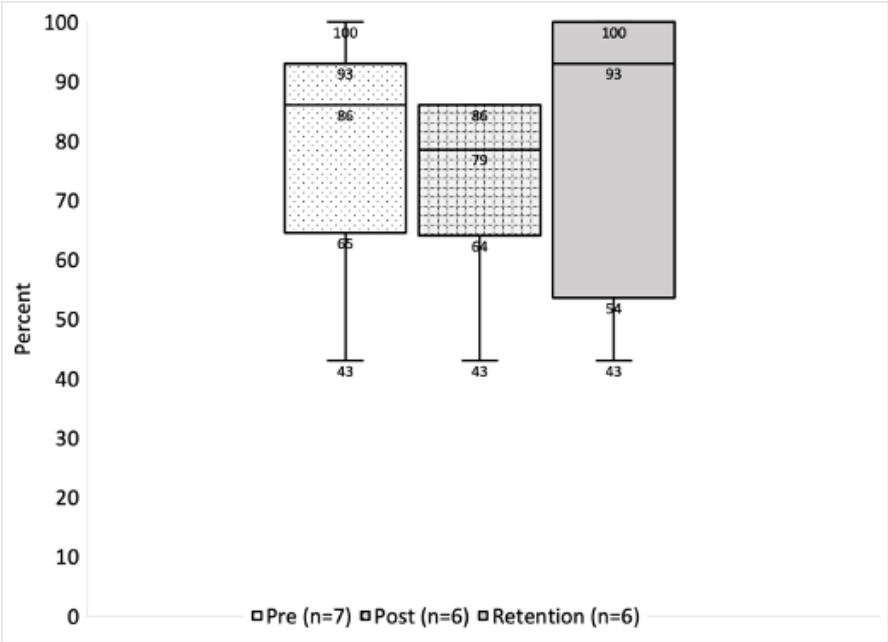


Figure 2: Statistically significant improvement in confidence in differentiating EMS scope of practice from pre-survey through retention survey (p<0.016 with Bonferroni correction)

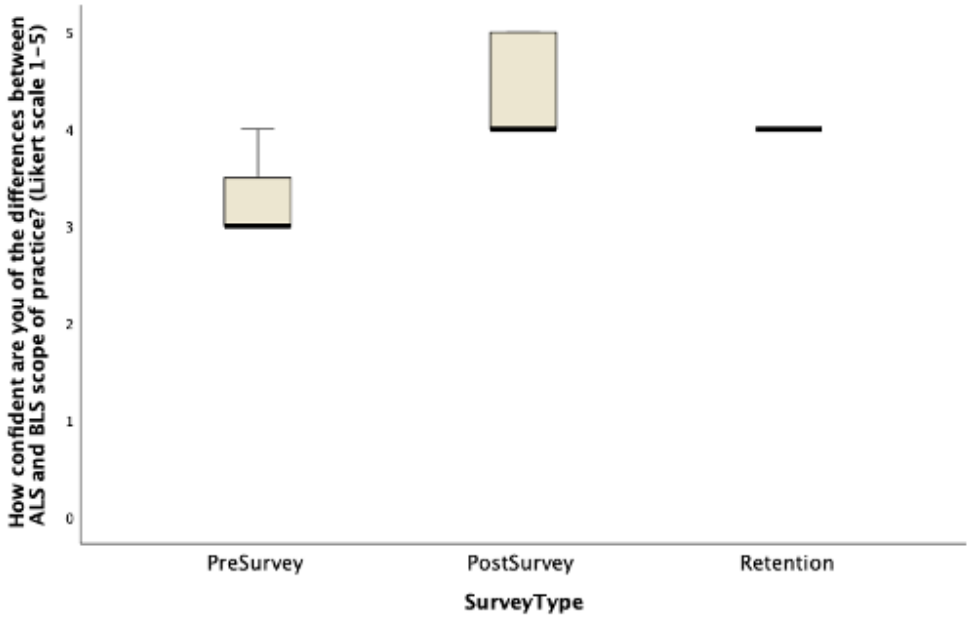


Figure 3 Supplement: Statistically significant improvement in confidence in preparing intramuscular epinephrine from pre-survey through retention survey (p<0.016 with Bonferroni correction)

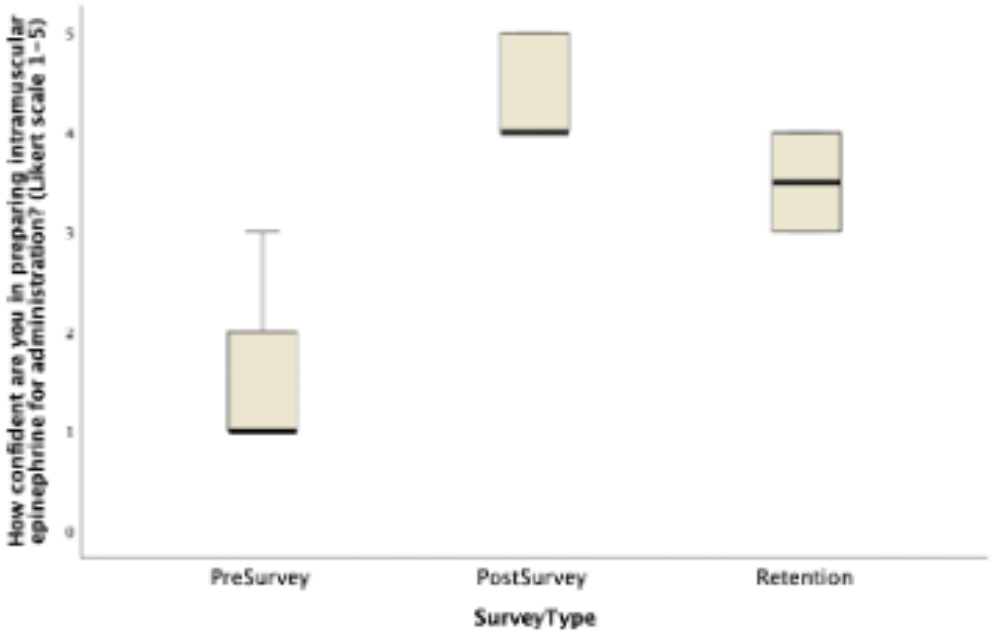


Figure 4 Supplement: Statistically significant improvement in confidence in providing non-invasive positive pressure ventilation from pre-survey through retention survey (p<0.016 with Bonferroni correction)

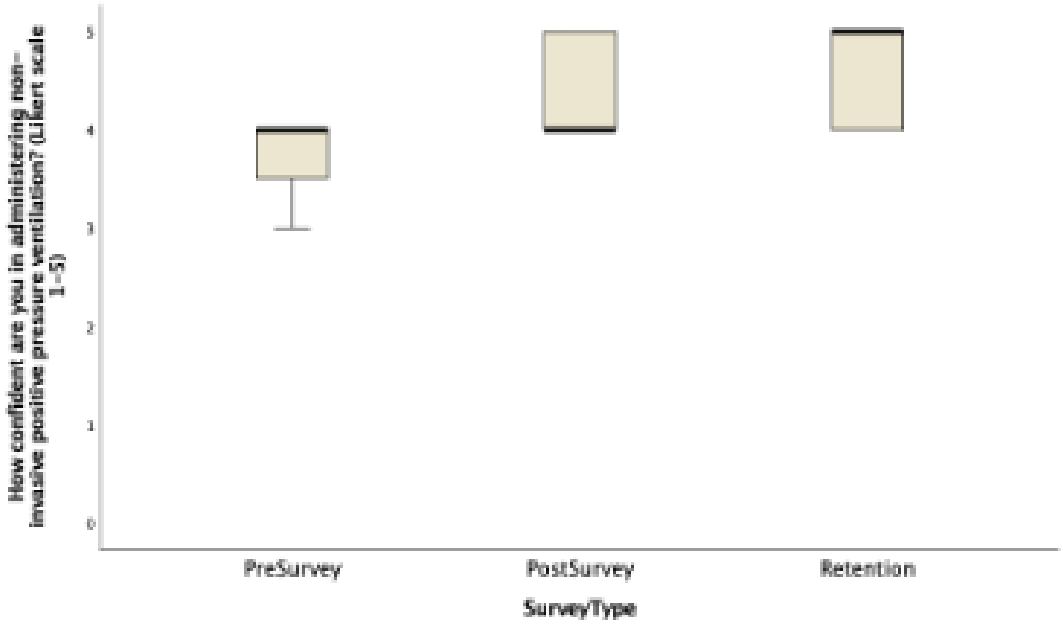


Figure 5 Supplement: Statistically significant improvement in confidence in preparing nebulized respiratory treatments from pre-survey through retention survey (p<0.016 with Bonferroni correction)

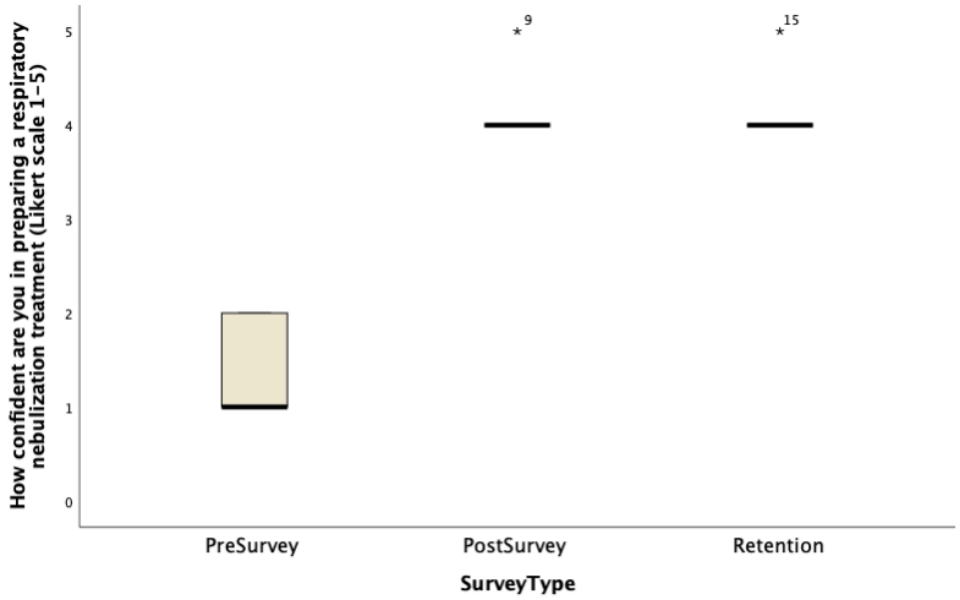
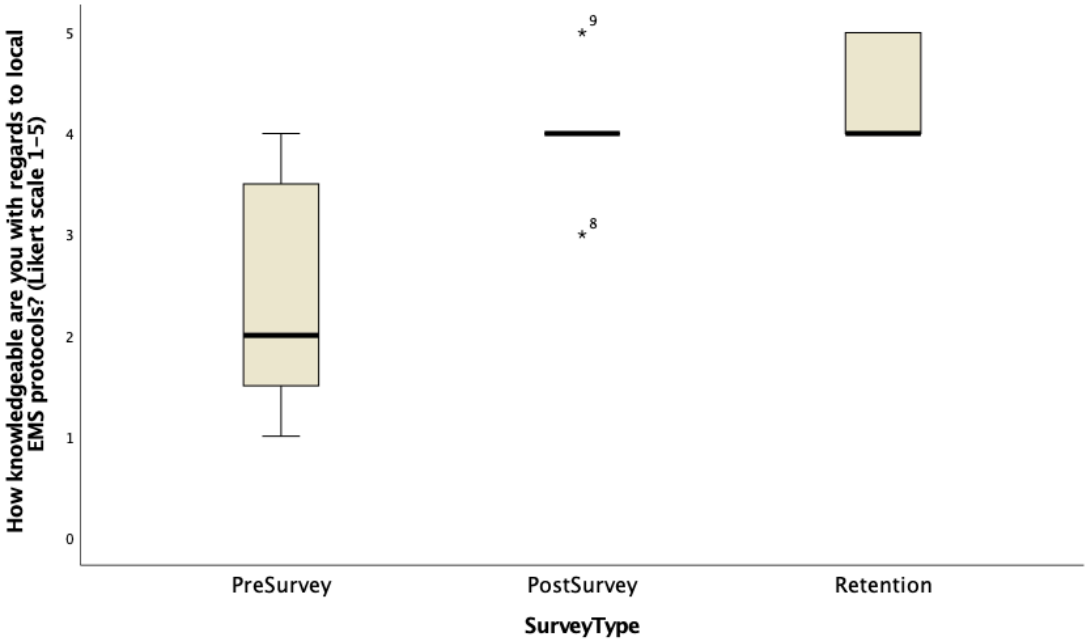


Figure 6 Supplement: Statistically significant improvement in subjective understanding of local EMS protocols from pre-survey through retention survey (p<0.016 with Bonferroni correction)



work can investigate whether role-reversal simulation increases knowledge in these domains as well as effectiveness in providing online medical direction in clinical settings. Our curriculum may serve as a model for other training programs to use in teaching pre-hospital scope of practice and medical command.

Limitations

Our study did not compare simulation without role reversal to simulation with role reversal, to assess for any significant benefit of role reversal above and beyond traditional simulation. As this was a pilot study, our goal was to assess feasibility of this novel curriculum with pediatric emergency medicine trainees. There were a small number of participants in our study generating bias in educational outcomes; however, given the qualitative feedback and survey responses we do believe that other PEM fellows would similarly be interested in role-reversal education to learn more about prehospital medicine.

Conclusions

Knowledge of pre-hospital medicine is a core content area and is essential to patient care for pediatric emergency medicine trainees. Through role-reversal simulation and direct instruction by pre-hospital providers, this pilot curriculum is associated with increased PEM fellow understanding of pre-hospital protocol-driven care and confidence in providing pre-hospital medical direction. It may serve as a model for other PEM fellowships or emergency medicine residency programs. Future work should determine applicability to wider audiences and evaluate knowledge retention on larger sample sizes.

Appendix A: Case Descriptions

Case Descriptions (Appendix A)

Anaphylaxis: In the BLS role, learners practiced conducting a focused history and exam and needed to recognize escalation in care. The case covered an adult patient, with anaphylaxis secondary to a peanut allergy. During the initial exam, the patient presented with chest pain, trouble breathing, and intermittent changes in his mentation. Learners practiced applying supplemental oxygen devices such as non-rebreathers and simple face masks. Participants also learned how to properly assist the patient in administering his own epinephrine auto injector. After recognizing declining mental status, learners were also expected to recognize the need for a higher level of care, and to call for ALS backup accordingly.

In the ALS role, trainees encountered the same adult patient with anaphylaxis. This scenario included the complication of concomitant beta-blocker use. In addition to the airway adjuncts reviewed during the BLS case, participants were required to prepare and administer medications such as IM epinephrine in the prehospital setting. They were also expected to establish IV access for both fluid and medications as well administer aerosolized breathing treatments, within the prehospital setting, and without ultrasound guidance. Trainees were expected to altered level of mentation requiring rapid transport and a potential blunted response to epinephrine secondary to the presence of a beta-blocker. Fellows also needed to consider glucagon administration while en route to definitive care.

Chronic Obstructive Pulmonary Disease (COPD): Overall fellows needed to be able to recognize COPD in the EMS environment and demonstrate management of respiratory distress in a COPD patient. Fellows in the BLS role were required to demonstrate pulse ox monitor placement, administration of oxygen, oxygen titration for a COPD patient, and assistance with prescribed Albuterol inhaler, and recognizing the need for ALS backup.

Fellows in the ALS role were required to demonstrate the skills noted in the BLS session in addition to use and administration of CPAP on an adult patient along with albuterol and ipratropium nebulized solutions. Fellows also needed to recognize respiratory distress leading to respiratory failure in an adult patient with COPD.

Croup: In the BLS role, learners were called for a pediatric patient with croup and audible stridor with respiratory distress. Initial expected tasks included optimizing airway mechanics and providing

supplemental oxygen via a face mask. Trainees were also required to estimate her weight with the Broselow ™ tape for medication administration. After these interventions, the fellows called "medical command" (as per protocol in Pennsylvania) and discussed transport to the nearest emergency department.

In the ALS role, learners encountered the same patient as above. Following initial airway interventions, the trainees prepared and administered nebulized racemic epinephrine. They also administered ibuprofen that was available in their EMS medication bag to treat the patient's fever prior to calling medical command. Ultimately, the patient was transferred to the nearest Emergency Department.

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