

The management of anaphylactic shock by an advanced nurse-led rescue vehicle: a case report

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ABSTRACT

Introduction: anaphylaxis is an acute and potentially fatal systemic allergic reaction that manifests rapidly after exposure to an allergen, with symptoms such as respiratory difficulties, airway swelling, hypotension, and skin rash. Intramuscular administration of epinephrine is the first-line treatment for managing it.

Materials and Methods: a case report was conducted on a severe case of anaphylaxis managed by an emergency ambulance with emergency nurse on board in Tuscany, highlighting the effectiveness of the treatment and the critical aspects of the process.

Results: epinephrine and other drugs were administered according to advanced nursing procedures, with a rapid improvement in the patient's vital parameters during transport. The patient, a known allergic individual, did not have auto-injectors. Nonetheless, the prompt approach allowed for an early regression of symptoms.

Discussion: this case report highlights the importance of rapid and effective intervention by prehospital emergency nurses in managing anaphylaxis and underscores the need to promote education on the timely use of epinephrine auto-injectors at home.

Key words: anaphylaxis, systemic allergic reactions, Emergency Medical Services, case report.

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Introduction

Anaphylaxis is a severe systemic hypersensitivity reaction that can manifest rapidly after exposure to an allergen. The preferred terms for this condition are “anaphylaxis,” “anaphylactoid reaction,” or “pseudo-allergy,” rather than “anaphylactic shock,” as shock does not always occur in patients.¹ Anaphylaxis is a global issue primarily caused by foods, medications, or insect stings. In Europe, incidence rates vary from 1.5 to 7.9 per 100,000 people per year, with about 0.3% of the population experiencing an episode of anaphylaxis in their lifetime.² The severity of the reaction can compromise various body systems, primarily involving the skin, airways, and cardiovascular system.^{1,2} Anaphylaxis can lead to respiratory difficulties, airway swelling, hypotension, skin rashes, and shock. Signs and symptoms typically appear within hours of allergen exposure, but can occur within minutes, especially with intravenously administered medications.^{2,3} Treatment follows the ABCDE (Airway, Breathing, Circulation, Disability, Exposure) approach used in emergencies, with intramuscular adrenaline as the first-line treatment for its ability to cause peripheral vasoconstriction, reversing hypotension and reducing mucosal edema.^{1,4} Adrenaline acts on beta-1 and beta-2 receptors, improving cardiac contractility, reducing the release of inflammatory mediators, and relieving bronchoconstriction.¹ After administration of adrenaline, it may be appropriate to add pharmacological agents. These include H1 and H2 antagonists, corticosteroids, beta-2 agonists, and glucagon.⁵ Providing adrenaline auto-injectors to patients with a history of anaphylaxis and a comprehensive education program on the correct use of the medication is of paramount importance. Despite recommendations to always carry two auto-injectors, a significant percentage of patients do not, increasing the risk of severe outcomes if a later episode.⁶ Furthermore, it is imperative that patients undergo a thorough examination and observation for a minimum of 6-8 hours following the occurrence of an anaphylactic reaction. Patients should receive comprehensive instructions on how to avoid future allergen exposure and how to use auto-injectors effectively during this period.^{2,6} The application of specific protocols or operating instructions by the nurse on board advanced rescue ambulances can become an effective intervention tool to ensure uniformity of services provided throughout the regional territory.⁷ This case report describes an episode of anaphylactic shock in the prehospital setting, aiming to analyze the role of the nurse and the operational center in relation to the need for prompt and effective intervention, highlighting critical issues met and proposing useful strategies for their resolution.

Case Report

Emergency call

At 11:37, a regional emergency medical services operation center in Tuscany received a request for aid via Unique Emergency Number 112 (NUE). The caller reported that in a rural area about ten kilometers from a provincial capital, a swarm of hornets had attacked an 83-year-old woman, resulting in six stings around 11:00 AM. The woman, with a history of allergy to wasp venom, did not have an adrenaline auto-injector and unsuccessfully tried to obtain one from a nearby pharmacy. Before going to the pharmacy, she took two tablets of methylprednisolone, but her condition rapidly worsened. At the time of the call, the conscious patient presented with facial swelling, dyspnea, psychomotor agitation, and mental confusion. The operator recognized that the patient was

experiencing anaphylaxis, indicated by assigning a ‘red’ severity code. This code signifies a life-threatening situation that requires immediate attention. Consequently, an ambulance with a nurse in charge was dispatched to the scene, even though it had initially been assigned to respond to another case with a lower severity code.

Arrival of the rescue team

The ambulance arrived on-site at 11:43. Upon rapid first assessment, the nurse found the patient sitting, visibly dyspneic, with inspiratory stridor, jugular vein distension, central cyanosis, and an inability to speak due to facial and airway edema. Blood pressure was not detectable, heart rate was 110 bpm, capillary refill time was over 4 seconds, respiratory rate was forty-eight breaths per minute, with abdominal breathing and the use of accessory muscles, and oxygen saturation was 90% with an invalid plethysmography wave. The Glasgow Coma Scale (GCS) score was 15/15. According to the procedure for cases of anaphylaxis, the nurse administered 0.5 mg of intramuscular adrenaline and contacted the operational center to arrange a rendezvous with a medicalized vehicle due to severe airway compromise. The operational center communicated that no medicalized vehicles with a doctor on board were available in a timely manner, estimating a 35-minute arrival time, and suggested a “scoop and run” approach (rapid transport to the emergency department) with a target arrival time of 10 minutes. The nurse set up peripheral venous access (18G) in the left arm, administered 10 mg of intramuscular chlorphenamine, and consulted the operational center physician by phone to update the pharmacological treatment. Following this, intravenous administration of 1000 mg of hydrocortisone began (500 mg as a bolus and 500 mg as a slow infusion), along with aerosol therapy with 1 mg of adrenaline. At the start of the slow infusion therapy, the patient was placed in the ambulance, and the nurse proceeded to reevaluate the vital parameters: blood pressure 160/100 mmHg, heart rate 112 bpm, respiratory rate 40 breaths per minute, oxygen saturation 100% with ongoing oxygen therapy at 10 liters per minute and a valid plethysmography wave. In addition to the patient’s vital parameters, the nurse conducted a reevaluation of the physical examination: facial swelling persisted, with auscultation showing regression of inspiratory wheezing, decreased use of accessory muscles for breathing, regression of central cyanosis, and improved capillary refill time of 2 seconds; neurologically, the patient showed decreased psychomotor agitation and improved responsiveness to simple commands, with slight regression of aphonia allowing for the formulation of short sentences. Examination from head to toe revealed insect stings on the chest and neck.

Transport and arrival at the emergency department

The operational center alerted the destination Emergency Department of the imminent arrival of a patient with anaphylactic shock. The ambulance left the scene at 12:02 under code 3 (emergency: severe alteration of vital functions). During transport, the nurse infused approximately 750 ml of crystalloids and administered 0.5 mg of intramuscular adrenaline due to a resurgence of respiratory symptoms. Arrival at the Emergency Department occurred at 12:13, with the following first parameters: blood pressure 180/111 mmHg, heart rate 110 bpm, respiratory rate forty-four breaths per minute, oxygen saturation 100% with ongoing oxygen therapy (10 liters per minute). Upon physical examination: slight regression of facial swelling, with modest periorcular edema remaining; auscultation showed regression of inspiratory wheezing, complete regression of the use of accessory muscles for breathing, capillary refill time of less than 2 seconds; neurological-

ly, the patient followed simple commands with reduced mental confusion and slight regression of aphonia allowing for the formulation of short sentences.

Discussion

The examined case documents the management of an emergency intervention with the dispatch of an advanced rescue ambulance with nursing leadership, applying nursing protocols approved by the coordination of the regional emergency medical services operation centers in Tuscany, with the last revision dating back to 2021.⁸ The on-duty nurse applied advanced procedures, including the administration of life-saving medications (Figure 1). In response to the severity of the patient’s condition, the crew opted for the “scoop & run” approach, which favors rapid transport to the emergency department for timely initiation of hospital care, as opposed to the “stay & play” method, which involves more

extensive intervention at the scene before transport.⁹ The nurse contacted the operational center physician for clinical consultation, enabling prompt adjustments to interventions based on the patient’s clinical condition. Cooperation between the community nurse and the operational center physician was crucial for the positive outcome of the intervention. However, several critical issues emerged: the patient’s inability to communicate due to anaphylactic shock made it challenging to obtain a complete medical history. This limitation affected the use of the AMPLE mnemonic (Allergies, Medications, Medical History, Last Meal, Events).^{1,6} The patient, who has a known allergy to insect stings, did not have adrenaline auto-injectors and attempted to obtain them at the pharmacy. Immediate treatment with intramuscular adrenaline is essential for managing anaphylactic shock; other pharmacological therapies should only be introduced later, as advised by the latest guidelines from the European Academy of Allergy and Clinical Immunology (EAACI).

The clinical criteria for diagnosing anaphylaxis are the first

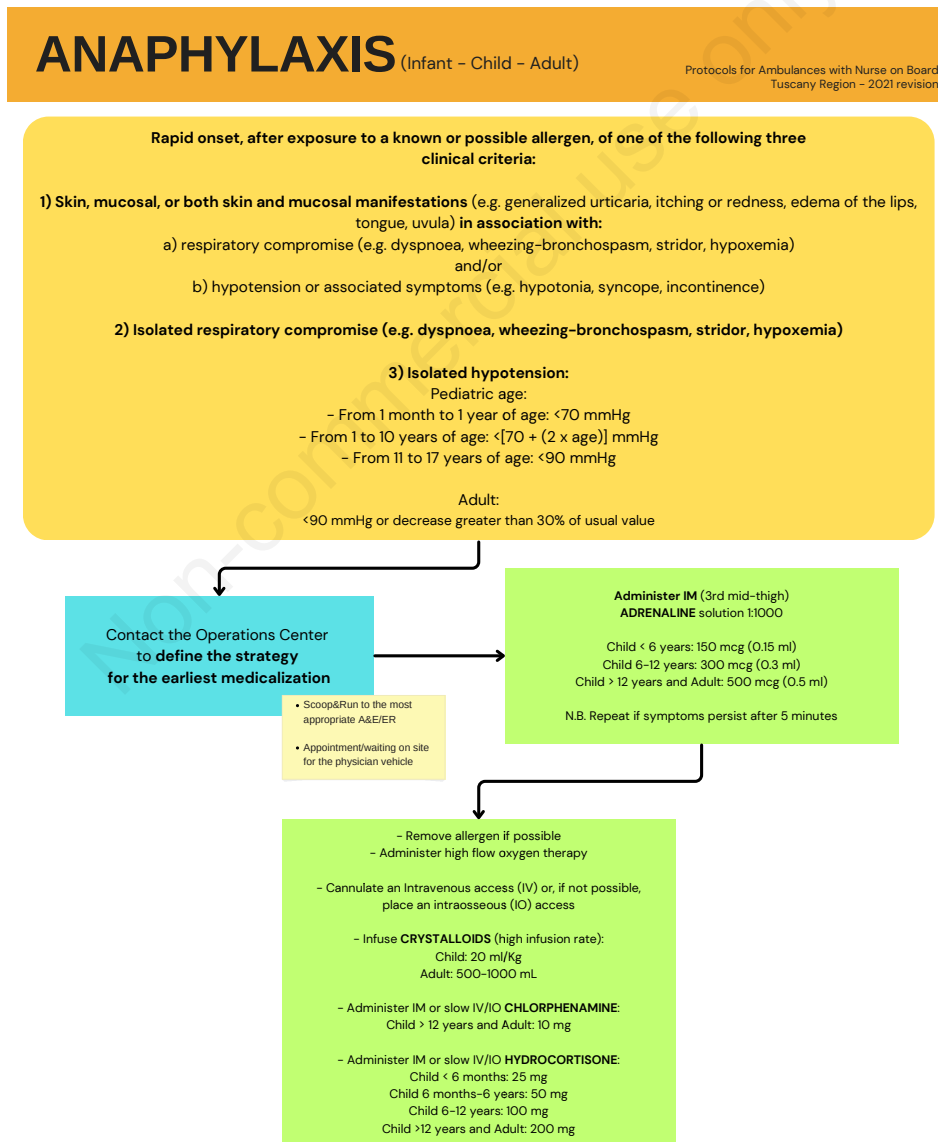


Figure 1. Procedures for ambulance with nurse on board - Anaphylaxis - Tuscany Region Revision 2021.

step in treatment, and immediate administration of intramuscular adrenaline must follow.¹⁰ The use of readily available auto-injectors is also a crucial part of first-line treatment. Given these factors, it is recommended that individuals at risk of anaphylaxis undergo structured and comprehensive training to help minimize the risk of serious clinical consequences.

Conclusions

This clinical case highlights that, in managing anaphylaxis in at-risk individuals, rapid and effective intervention by prehospital personnel is essential, alongside improved health education on the use and availability of adrenaline auto-injectors for patients, families, and caregivers.⁶ Adequate health training could perfect responses to allergic emergencies, reducing the risk of recurrent anaphylactic reactions and preventing hospitalizations and associated costs.

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Availability of data and materials: all data underlying the results are fully available.

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