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Research article

Assessment of Knowledge on The Use of Adrenaline Autoinjectors in A Paediatric Portuguese Population

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Abstract

Objective: To assess the knowledge and confidence of parents and patients regarding the use of adrenaline autoinjectors.

Methods: A cross-sectional, observational study was conducted, including 53 patients with food allergies and prescribed adrenaline autoinjectors, who were seen in Pediatric Allergy consultations between January 2022 and February 2024. Demographic and clinical data were collected, and telephone interviews were conducted with parents and patients aged 5 years or older.

Results: Among the 53 patients, 52.8% were male, and 50.9% were aged 1 to 4 years. One patient did not own an autoinjector, while 88.7% had at least two adrenaline autoinjectors. However, 28.3% did not carry any autoinjector, and only 1.9% consistently carried two. At school, 32.1% of the patients did not have their autoinjectors. Proper storage was reported by 96.2% of parents, but only 18.9% replaced the device when precipitate appeared in the viewing window. Regarding administration, only 7.5% of parents mentioned all the steps, and no patient was able to do so. Only 20.8% of parents indicated they would administer a second autoinjector if symptoms persisted. The majority of parents (81.1%) and patients (61.5%) felt capable of administering adrenaline autoinjectors, yet 50.9% and 38.5%, respectively, felt apprehensive about its use.

Conclusion: Significant gaps in knowledge and confidence regarding the use of adrenaline autoinjectors were identified among parents and pediatric patients. Educational and psychological interventions are necessary to empower families and ensure effective management of anaphylaxis in children.

Keywords: Anaphylaxis; Food Allergy; Adrenaline Autoinjectors

Abbreviations: EMA: European Medicines Agency; Mdn: Median; IQR: Interquartile Range

Introduction

Anaphylaxis is a serious systemic hypersensitivity reaction, potentially life-threatening, which occurs rapidly after exposure to an allergen. This medical emergency requires early identification and prompt treatment, which can be lifesaving [1,2].

The prevalence and incidence of anaphylaxis is difficult to estimate, since this condition is frequently underdiagnosed or not adequately reported. Among children, the global estimated prevalence is increasing, currently ranging between 0.04% and 1.8%. In Europe, the incidence ranges from 2.3 to 761 cases per 100,000 person-

years [3]. Anaphylaxis may be triggered by ingestion, injection, inhalation, or contact with an allergen, and exacerbated by cofactors such as physical exercise, emotional stress, changes in daily routine (such as travel), premenstrual period, infections, and medications like nonsteroidal anti-inflammatory drugs [1,2,4,5] Food allergens are the leading cause of anaphylaxis in children [5-9].

According to diagnostic criteria defined by the World Allergy Organization, anaphylaxis is highly likely when at least one of the following clinical criteria is met:

A. Acute onset of illness (minutes to several hours) with involvement of skin and/or mucosal tissues (eg, generalized hives, pruritus or flushing, swollen lips/tongue/uvula), and at least one of the following:

1. Respiratory compromise (eg, dyspnea, wheezing, stridor, reduced peak expiratory flow, hypoxemia);

2. Reduced blood pressure or symptoms of end-organ dysfunction (eg, hypotonia, syncope, incontinence);

3. Severe gastrointestinal symptoms (eg, severe crampy abdominal pain, repetitive vomiting), especially after exposure to non-food allergens.

B. Acute onset of hypotension, bronchospasm or laryngeal symptoms after exposure to a known or highly probable allergen for that patient (minutes to several hours), even in the absence of skin involvement [1].

The diagnosis of anaphylaxis can be supported by determining serum tryptase levels 30 minutes to 2 hours after the reaction onset, followed by a repeat measurement at least 24 hours after complete symptom resolution (baseline tryptase) [1,2,6]. Intramuscular adrenaline is the first-line treatment for an anaphylactic reaction and should be administered as early as possible to reduce associated morbidity and mortality [1,2]. The initial recommended dose is 0.01 mg/kg (maximum dose of 0.5 mg above 40 kg or 0.3 mg under 12 years or below 40 kg) at a 1:1000 dilution (1 mg/mL), and it can be repeated every 5 minutes if symptoms persist [6] Portable adrenaline autoinjectors enable treatment immediately upon symptom recognition [2,6] The European Medicines Agency (EMA) recommends prescribing two autoinjectors for any at-risk patient, who should carry them at all times [10]. In Portugal, the available adrenaline autoinjectors are Epipen® and Anapen®, with doses of 0.15mg/0.3mL and 0.3mg/0.3mL [11]. Additionally, it is crucial to provide an individualized anaphylaxis management plan for the patient and caregivers, detailing warning signs, necessary medications, and instructions for proper autoinjector use [1, 2].

A Portuguese study conducted between 2007 and 2017, which evaluated 533 pediatric patients with anaphylaxis, showed that 78% had an adrenaline autoinjector prescribed, but only 12% of those used it successfully [8]. Identified obstacles for autoinjector underuse include caregivers' inability to recognize reaction severity, fear of administration, uncertainty about whether it was necessary, and unavailability of an autoinjector [6,12,13]. Thus, the effectiveness of anaphylaxis treatment relies on patients' and caregivers' ability to recognize reaction signs and correctly administer adrenaline [2]. Previous studies indicate that many parents and patients do not feel sufficiently empowered or confident to use autoinjectors, which may delay treatment [12-15]. This study aims to evaluate the knowledge and practices of parents and pediatric patients in using adrenaline autoinjectors, identifying areas of difficulty and opportunities for educational improvement.

Materials and Methods

A cross-sectional observational study was conducted involving patients aged 1-17 years diagnosed with food allergies and prescribed an adrenaline autoinjector. Participants were selected from the pool of patients followed at the Paediatric Allergy Consultation at Braga's Local Health Unit between January 2022 and February 2024. A total of 60 patients met the inclusion criteria and were invited by e-mail to enroll in the study for a telephone interview. Of these, five were excluded due to loss of follow-up, one due to refusal to participate, and one due to inability to contact, resulting in a final sample of 53 patients.

Demographic and clinical data for each patient were collected from electronic medical records. Telephone interviews were conducted with one of the parents and with the patients if they were aged 5 years or older. The interviews assessed knowledge of administration steps, storage practices, and confidence in using the device.

Ethical considerations

Informed consent was obtained from the parent and the patients if they were over five years of age. The study was approved by the Ethics Committee for Research in Life and Health Sciences of the University of Minho with the identification number 057/2024, and by the Ethics Committee of the Local Health Unit of Braga with identification number 73_024. Data confidentiality was ensured and maintained throughout the project.

Statistical analysis

Statistical analysis was performed using IBM® SPSS® Statistics (International Business Machine, Statistical Package for the Social Sciences), version 26.0. The normality of quantitative variable distributions was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests, in addition to analyzing asymmetry, kurtosis, and graphical distributions. Quantitative variables did not meet normality assumptions and were reported as the median (Mdn) and interquartile range (IQR). Categorical variables were described using absolute (n) and relative (%) frequencies.

Results and Discussion

A total of 53 patients with food allergy and an adrenaline autoinjector prescription were included in the study, of whom 52.8% (n=28) were male. The median age was 4 years (IQR 6 years), with approximately half of the sample (n=27, 50.9%) aged between 1 and 4 years. The most common allergic comorbidity was atopic dermatitis, present in 49.1% (n=26) of the patients. Regarding food allergens, about a quarter of the patients showed an allergy

to more than one food item. Most patients (n=32, 60.4%) had no history of anaphylaxis, and the Epipen® was the most prescribed autoinjector, given to 92.5% (n=49) of the patients. The complete sociodemographic characteristics of the sample are provided in Table 1.

Table 1: Sociodemographic characterization of the study sample.

Sex		**n**	**%**
Male		28	52.8
Female		25	47.2
Age (years)		**n**	**%**
01-Apr		27	50.9
05-Aug		15	28.3
09-Dec		4	7.6
13-17		7	13.2
History of anaphylaxis		**n**	**%**
No		32	60.4
Yes		21	39.6
Allergic comorbidities		**n**	**%**
Asthma	No	43	81.1
	Yes	10	18.9
Allergic rhinitis	No	38	71.7
	Yes	15	28.3
Atopic dermatitis	No	27	50.9
	Yes	26	49.1
Family history of atopy		**n**	**%**
No		18	34
Yes		35	66
Number of identified allergens		**n**	**%**
One allergen		40	75.5
More than one allergen		13	24.5
Prescribed autoinjector		**n**	**%**
Anapen®		4	7.5
Epipen®		49	92.5

n – absolute frequencies; % – relative frequencies

Telephone interviews with the parents

Telephone interviews were conducted with one parent of each patient in the sample (n=53). Most interviewees (n=43, 81.1%) were female, and 60.4% (n=32) held a higher education degree. It was found that 90.6% (n=48) believed the school or nursery would be prepared to administer the adrenaline autoinjector in the event of anaphylaxis, while 35.8% (n=19) of the patients would be able to self-administer, corresponding to 73.1% (n=19) of patients aged 5 years or older (n=26).

In this study sample, 1.9% (n=1) of patients had no autoinjector (prescribed, but not purchased), 28.3% (n=15) did not carry it with them, and only 1.9% (n=1) always carried two autoinjectors. At school, 32.1% (n=17) of the patients did not have any adrenaline autoinjector available. Regarding parental knowledge, 96.2% (n=51) reported proper storage of the autoinjector. For replacement, 96.2% (n=51) reported changing the device when the expiration date passed, 92.5% (n=49) after use, but only 18.9% (n=10) cited replacing it when precipitate appeared in the viewing window.

All parents received training on how to administer the autoinjector, mostly (n=47, 88.7%) at the hospital. For the administration procedure, the least frequently mentioned steps

were massaging after injection (n=11, 20.8%), the grip position (n=15, 28.3%) and waiting 3-10 seconds after injection (n=36, 67.9%). Only 7.5% (n=4) of the parents correctly mentioned all steps. Regarding actions to take if the patient's symptoms improved after adrenaline administration, most parents (n=48, 90.6%) answered correctly. However, when asked what they would do if symptoms did not improve, only 20.8% (n=11) indicated they would administer a second dose. Most parents found training sessions helpful for parents (n=49, 92.5%), patients (n=52, 98.1%), and the general community (n=52, 98.1%). Detailed interview results are shown in Table 2.

Table 2: Results of parent responses regarding sociodemographic data, knowledge, and training related to adrenaline autoinjectors.

Respondent's sex		**n**	**%**
Male		10	18.9
Female		43	81.1
Education level		**n**	**%**
Elementary school or lower		0	0.0
Middle school		5	9.4
High school		16	30.2
Higher education		32	60.4
Does the parent administer the autoinjector if necessary?		**n**	**%**
No		0	0.0
Yes		53	100.0
Does the school/daycare professional administer the autoinjector if necessary?		**n**	**%**
No		5	9.4
Yes		48	90.6
Does the patient administer the autoinjector if necessary?		**n**	**%**
No		34	64.2
Yes		19	35.8
Total number of autoinjectors owned		**n**	**%**
0		1	1.9
1		5	9.4
2		31	58.5
≥3		16	30.2
Number of autoinjectors carried at all times		**n**	**%**
0		15	28.3
1		37	69.8
2		1	1.9
Patient carries at least one autoinjector to school?		**n**	**%**
No		17	32.1
Yes		36	67.9
How is the autoinjector stored?		**n**	**%**
Incorrectly		5	9.4
Correct (Call 112 or go to the emergency department)		48	90.6
WhenCorrectlyshould(initsthepackagingautoinjectoratroombetemperature)replaced?		**n**	**%**
Mentions replacing it after use	No	4	7.5
	Yes	49	92.5
Mentions replacing it when expired	No	2	3.8
	Yes	51	96.2
Mentions replacing it when precipitation appears in the viewing window	No	43	81.1
	Yes	10	18.9
Have you received training on autoinjector administration?		**n**	**%**

No		0	0.0
Yes, at the hospital		47	88.7
Yes, at the Family Health Unit		2	3.8
Yes, at school		4	7.5
Can you describe the procedure step-by-step, starting with which hand holds the autoinjector?		**n**	**%**
Mentions using the dominant hand	No	3	5.6
	Yes	50	94.4
Mentions removing the cap(s)	No	5	9.4
	Yes	48	90.6
Mentions grip position	No	38	71.1
	Yes	15	28.3
Mentions correct administration site	No	2	3.8
	Yes	51	96.2
Mentions holding for 3-10 seconds after injection	No	17	32.1
	Yes	36	67.9
Mentions performing a massage	No	42	79.2
	Yes	11	20.8
Mentions all steps correctly	No	49	92.5
	Yes	4	7.5
What would you do if symptoms improved after administration?		**n**	**%**
Incorrect		5	9.4
Correct (Call 112 or go to the emergency department)		48	90.6
What would you do if symptoms did not improve after administration?		**n**	**%**
Mentions administering a second autoinjector	No	42	79.2
	Yes	11	20.8
Mentions calling 112 or going to the emergency department	No	0	0.0
	Yes	53	100
Do you believe training sessions in this area would be useful for parents?		**n**	**%**
No		4	7.5
Yes		49	92.5
Do you believe training sessions in this area would be useful for patients?		**n**	**%**
No		1	1.9
Yes		52	98.1
Do you believe training sessions in this area would be useful for the community?		**n**	**%**
No		1	1.9
Yes		52	98.1
n – absolute frequencies; % – relative frequencies			

a Variable created from the answers to the interview question in which it is included

The interview also included questions on parental confidence and anxiety regarding the administration of the adrenaline autoinjector. Regarding these questions, 81.1% (n=43) of interviewees felt capable of administering the autoinjector, and 66.1% (n=35) felt confident about administration by another family member or a school/nursery staff member. However, 50.9% (n=27) reported feeling apprehensive or reluctant about this procedure. All these findings are presented in Table 3.

Table 3: Results of parent responses on confidence and reluctance in administering an adrenaline autoinjector.

Do you feel capable of administering an autoinjector?	n	%	Mdn	IQR
1 – Strongly disagree	2	3.8	4.0	1.0
2 – Disagree	5	9.4		
3 – Neither agree nor disagree	3	5.7		
4 – Agree	20	37.7		
5 – Strongly agree	23	43.4		
Do you feel confident in the administration by another family member/school professional?	**n**	**%**	**Mdn**	**IQR**
1 – Strongly disagree	4	7.5	4.0	1.0
2 – Disagree	8	15.1		
3 – Neither agree nor disagree	6	11.3		
4 – Agree	25	47.2		
5 – Strongly agree	10	18.9		
Do you feel reluctant to administer an autoinjector?	**n**	**%**	**Mdn**	**IQR**
1 – Strongly disagree	18	34	4.0	3.0
2 – Disagree	7	13.2		
3 – Neither agree nor disagree	1	1.9		
4 – Agree	22	41.5		
5 – Strongly agree	5	9.4		

n – absolute frequencies; % – relative frequencies; Mdn – median; IQR – interquartile range

Telephone interviews with patients

Additionally, 26 pediatric patients aged 5 years or older were interviewed. Most patients (n=21, 80.8%) reported receiving instruction on using the adrenaline autoinjector in the hospital, and 46.2% (n=12) at home. Regarding the administration procedure description, the least mentioned steps were massaging after injection (n=5, 19.2%), grip position (n=5, 19.2%) and waiting 3-10 seconds after injection (n=16, 61.5%). Furthermore, none of the patients mentioned all the administration steps. These results are presented in Table 4.

Table 4: Results of patient responses on training and knowledge regarding adrenaline autoinjectors.

Have you ever been taught how to use an adrenaline autoinjector at the hospital?		n	%
No		5	19.2
Yes		21	80.8
Have you ever been taught how to use an adrenaline autoinjector at the Family Health Unit?		**n**	**%**
No		25	96.2
Yes		1	3.8
Have you ever been taught how to use an adrenaline autoinjector at home?		**n**	**%**
No		14	53.8
Yes		12	46.2
Have you ever been taught how to use an adrenaline autoinjector at school?		**n**	**%**
No		24	92.3
Yes		2	7.7
Can you describe, step by step, the procedure and start by saying which hand you hold the autoinjector with?		**n**	**%**
Mentions using the dominant hand	No	3	11.5
	Yes	23	88.5
Mentions removing the cap(s)	No	7	26.9
	Yes	19	73.1
Mentions grip position	No	21	80.8
	Yes	5	19.2

Mentions correct administration site	No	3	11.5
	Yes	23	88.5
Mentions holding for 3-10 seconds after injection	No	10	38.5
	Yes	16	61.5
Mentions performing a massage	No	21	80.8
	Yes	5	19.2
Mentions all steps correctly	No	26	100
	Yes	0	0

n – absolute frequencies; % – relative frequencies

Variable created from the answers to the interview question in which it is included

During patient interviews, questions were also asked about confidence and fear in using the adrenaline autoinjector. Most (n=16, 61.5%) patients reported feeling capable of self-administering an adrenaline autoinjector, while 38.5% (n=10) admitted feeling afraid. These results are presented in Table 5.

Table 5: Results of patient responses on confidence and reluctance in administering an adrenaline autoinjector.

Do you feel capable of using an adrenaline autoinjector on yourself?	n	%	Mdn	IQR
1 – Strongly disagree	4	15.4	4	3
2 – Disagree	4	15.4		
3 – Neither agree nor disagree	2	7.7		
4 – Agree	5	19.2		
5 – Strongly agree	11	42.3		
Are you afraid of using an adrenaline autoinjector?	**n**	**%**	**Mdn**	**IQR**
1 – Strongly disagree	6	23.1	2	2
2 – Disagree	9	34.6		
3 – Neither agree nor disagree	1	3.8		
4 – Agree	4	15.4		
5 – Strongly agree	6	23.1		

n – absolute frequencies; % – relative frequencies; Mdn – median; IQR – interquartile range

Discussion

In the study sample, most patients (60.4%) had no prior history of anaphylaxis. According to current recommendations, an adrenaline autoinjector should be prescribed to all patients with a history of anaphylaxis or at high risk of severe allergic reactions, justifying the large percentage of patients with a prescribed autoinjector without a prior history of anaphylaxis [1,2,16-18].

The results revealed important information regarding adrenaline autoinjector usage, notably the low adherence to always carrying it, with 28.3% reporting that they did not always carry it with them. Furthermore, although 88.7% of patients had at least two autoinjectors, only 1.9% always carried both, as recommended by the EMA [2]. Other studies in the literature report similar findings. A study conducted in Spain reported that, despite all patients having at least one adrenaline autoinjector, 40.6% did not always carry it with them [15]. Another study in Turkey found that only 21.6% of patients had two adrenaline autoinjectors [14]. In a study conducted in the United States, among patients who had two autoinjectors, only 18% always carried both [19]. Early administration of adrenaline is crucial in the treatment of an anaphylactic reaction, and literature suggests that a second autoinjector dose is necessary in 16% to 36% of patients with anaphylaxis. Thus, both the absence of an autoinjector and the lack of a second one increase the risk of morbidity and mortality associated with anaphylaxis [19,20].

Additionally, although 90.6% of parents believed that the daycare/school would be prepared to administer the autoinjector if necessary, 32.1% of patients did not have any adrenaline autoinjector available in these places. Considering the number of hours that children/adolescents spend in these settings, it is essential to have an autoinjector in a pre-defined and easily accessible location for emergencies.

Beyond the availability of adrenaline autoinjectors, ensuring that devices are always in ideal working condition is critical. Knowledge of proper storage and timely replacement of the autoinjector is essential [21]. In this study, most parents reported correct storage (96.2%) and proper replacement of the autoinjector, particularly when it expires (96.2%) or after use (92.5%). Similarly, in the

Turkish study, 88.9% of participants reported proper storage of the autoinjector, and 89.5% replaced it under these two circumstances [14]. However, in the present study, only 18.9% mentioned the need to replace the autoinjector if there was precipitate in the viewing window, suggesting that this information may not be communicated or understood correctly by parents, risking the use of adrenaline that is no longer in ideal condition.

Correct administration of the adrenaline autoinjector is crucial for the effectiveness of anaphylaxis treatment. The Spanish study, observing participants' administration on a practice model, demonstrated that only 13% performed all the administration steps correctly, with the most commonly omitted step being massage after injection [15]. In this study, the assessment of autoinjector administration was conducted through verbal descriptions of the steps. Only 7.5% of parents mentioned all steps correctly, and none of the patients did so. Massage after injection, the holding position, and waiting 3–10 seconds after injection were the most frequently forgotten steps by both parents and patients. These findings highlight significant gaps in autoinjector administration, indicating an evident need to reinforce practical training on autoinjector usage for patients and caregivers.

After administering an adrenaline autoinjector, parents must know what actions to take. After using adrenaline, regardless of circumstances, the patient must be evaluated by a physician and remain under observation for a few hours due to the risk of a biphasic reaction, a potentially more severe second anaphylactic reaction. Furthermore, if symptoms persist, a second adrenaline autoinjector should be administered 5 to 15 minutes after the first administration [2]. In this study, all parents reported taking the patient to an emergency service or calling the emergency number if symptoms did not improve. However, 9.4% would not do so if symptoms improved. The Turkish study reported that 98.4% of participants would go to the emergency room immediately after using an adrenaline autoinjector, without distinguishing between cases in which symptoms improved or not [14]. By making this distinction, the present study identified parents who were unaware that the patient should be seen by a doctor after using the autoinjector, even if symptoms improved. On the other hand, only 20.8% of parents reported administering a second adrenaline autoinjector if symptoms did not improve, reflecting, once again, the risk of patients needing a second autoinjector but not receiving it due to lack of one. This finding may also help explain why many patients do not carry a second autoinjector with them.

These results emphasize the need to constantly remind patients at every consultation about the recommendations on carrying, maintaining, and using the adrenaline autoinjector to optimize treatment and improve prognosis in cases of anaphylaxis. Additionally, to ensure correct administration of adrenaline, it is essential to invest in training and practical drills on how to use the device.

Using an adrenaline autoinjector often involves a significant psychological burden, as the need to be constantly prepared for an emergency creates anxiety and stress among patients and their caregivers. Studies show that the psychological stress faced by parents has been underestimated, as it affects the success of training and decision-making in emergencies [14,22,23]. Additionally, literature suggests that fear may be an important factor in underuse of adrenaline autoinjectors [14,22]. Accordingly, this study assessed parents' and patients' perception of confidence in using the adrenaline autoinjector. Results showed that most parents (81.1%) felt capable of administering it and confident in having it administered by another family member or school staff (66.1%). However, 13.2% did not feel as capable, and about half of the parents (50.9%) felt apprehensive about administering the autoinjector. Regarding the patients, while most (61.5%) felt competent in administering an adrenaline autoinjector, a significant number (30.8%) did not feel capable, and 38.5% felt fear in using it. These data suggest that, as described in the literature, emotional and psychological factors may influence and even delay the necessary intervention in anaphylaxis [12,14]. Therefore, it is essential to invest in psychological support for patients and their caregivers to better manage the anxiety and fear associated with emergencies in which they may need to intervene. Moreover, investing in knowledge and practical simulations can help them feel more prepared to act effectively if necessary. Furthermore, in June 2024, the EMA recommended granting authorization for the introduction of the first intranasal adrenaline in the European Union, which could represent a significant paradigm shift for parents and patients who feel fear/apprehension about administering intramuscular adrenaline, thereby improving therapeutic adherence [24].

When interpreting the results, it is important to acknowledge the study's limitations, including the small sample size and its single-center design, making it difficult to draw conclusions on a population level. Additionally, the objectivity of the study could have been enhanced through in-person interviews and the use of simulation models to assess autoinjector skills, rather than relying solely on descriptions of usage steps. Responses to questions regarding confidence or reluctance in autoinjector use might also have been influenced by social desirability bias.

Despite these limitations, the study offers significant value by providing insights into patients' and parents'

knowledge of adrenaline autoinjector use, as well as the psychological factors involved. These findings underscore critical areas for intervention and education to improve outcomes.

Conclusion

In summary, although parents and patients demonstrated a general satisfactory level of knowledge about adrenaline autoinjector usage, there are several areas for improvement, particularly in proper procedure execution, autoinjector carriage, and confidence in administration. Thus, it is essential to invest in continuous training and education for parents and patients. Educational sessions should be implemented to address key gaps identified and provide hands-on training in autoinjector administration under medical guidance. A prospective study could then evaluate knowledge progress after training sessions. Beyond hospital-based education, audiovisual tools such as training videos can be made available, and training sessions should be promoted

in familiar and school environments. Empowering educational institutions, where children spend a large portion of time, should be a priority, given the potential risk of anaphylaxis episodes during school hours. Additionally, parents' and patients' apprehension and lack of confidence in using the adrenaline autoinjector could impact decision-making in emergencies. Therefore, psychological support should also be prioritized through psychology consultations, needle-phobia desensitization therapy, and experience-sharing groups, among other strategies. This study underscores the critical role of education and psychological support in improving the use of adrenaline autoinjectors among pediatric patients and their families, paving the way for safer anaphylaxis management.

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Conflict of Interest

There are no conflicts of interest to disclose.

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