

Letter to the Editor

The effect of provision of an adrenaline auto-injector on quality of life in children with food allergy

To the Editor:

Management of food allergy involves allergen avoidance and for some patients, provision of an adrenaline autoinjector (AAI). Food allergy is associated with a reduced quality of life.¹ The type of food allergen, sex or age of subject, and number of foods allergic to have been reported to further impair food allergy-related quality of life (FAQOL).^{1,2} It is unclear whether the provision of an AAI affects FAQOL.

We applied a validated FAQOL questionnaire³ to investigate the specific impact of the provision of an AAI on quality of life (QOL), adjusting for other clinical parameters that could potentially affect FAQOL. Of the parents completing the questionnaire, 86 (83%) were mothers. Roughly half (53 of 103, 51%) of the subjects had been issued an AAI (see Table E1 in this article's Online

Repository at www.jacionline.org); in each case, the AAI was an EpiPen (Dey Laboratories, Napa, Calif), the only device available in Australia at the time. Children aged 12 years or younger ($n = 103$), presenting to the Royal Children's Hospital Allergy Immunology Department, Melbourne, Australia, with a physician diagnosis of food allergy (history of reaction together with positive skin prick test [SPT] result; positive food challenge and SPT; or SPT wheal size greater than 95% positive predictive value thresholds for clinical allergy) were recruited over a 6-week period. Univariate associations were calculated by using linear regression. Stepwise forward multiple regression ($P < .10$) was then used to allow adjustment for factors found to influence FAQOL in univariate analysis and previous reports.^{1,2}

When examined in a univariate fashion, the FAQOL score increased (reflecting an apparent worse FAQOL) with increasing age of subject, sensitization to more than 4 foods, or allergy to peanut, tree nut, or sesame (Table I). FAQOL also worsened with increased severity of allergic reaction, with subjects with previous

TABLE I. Univariate associations: potential predictors of FAQOL

Variable	n	Mean FAQOL score	(SE)	P value	Variable	n	Mean FAQOL score	(SE)	P value
Sex					No. of food allergies				
Male	70	2.51	(0.14)		1-4	86	2.31	(0.12)	
Female	33	2.51	(0.20)	.98	>4	17	3.57	(0.24)	<.001
Age group (y)					Peanut allergy				
0-3	38	1.95	(0.14)		No	36	2.23	(0.18)	
4-6	41	2.58	(0.17)	.01	Yes	67	2.67	(0.15)	.07
7-12	24	3.30	(0.27)	<.001					
Ethnicity					Tree nut allergy				
Non-Australian	13	2.67	(0.39)		No	36	2.19	(0.19)	
Australian	90	2.49	(0.12)	.62	Yes	67	2.69	(0.14)	.04
Responder					Sesame allergy				
Father	17	2.38	(0.23)		No	86	2.33	(0.12)	
Mother	86	2.54	(0.13)	.60	Yes	17	3.44	(0.31)	<.001
AAI issued					Egg allergy				
No	50	2.04	(0.12)		No	47	2.36	(0.18)	
Yes	53	2.97	(0.17)	<.001	Yes	56	2.64	(0.15)	.23
Previous anaphylaxis					Milk allergy				
No	69	2.25	(0.13)		No	72	2.48	(0.14)	
Yes	34	3.06	(0.20)	.001	Yes	31	2.60	(0.20)	.65
Severity of reaction*					Atopic dermatitis				
1	15	1.82	(0.14)		No	37	2.86	(0.24)	
2	40	2.37	(0.19)	.11	Yes	66	2.32	(0.12)	.02
3	14	2.35	(0.31)	.21					
4 (anaphylaxis)	34	3.06	(0.20)	.001	Asthma				
					No	65	2.37	(0.14)	
					Yes	38	2.76	(0.19)	.11
					Allergic rhinitis				
					No	93	2.50	(0.13)	
					Yes	10	2.63	(0.25)	.75

*Grade of severity of reaction: 1 = presumed food allergy—sensitization only and avoiding those foods, no clinical reaction; 2 = oral/skin symptoms only; 3 = moderate allergic reaction, not meeting criteria for anaphylaxis; 4 = anaphylaxis as per Category 1 National Institute of Allergy and Infectious Disease criteria (which is skin and/or gastrointestinal symptoms plus (a) any lower respiratory or severe upper respiratory tract symptoms and/or (b) cardiovascular symptoms⁴).

TABLE II. Multiple regression analysis: effect of different determinants on FAQOL

FAQOL score	Coefficient	SE	P value	95% CI	
AAI	0.43	0.22	.05	−0.001	0.86
Anaphylaxis	0.48	0.22	.03	0.04	0.91
Sensitization to >4 foods	0.83	0.26	<.01	0.30	1.35
Age (y)					
4-6	0.19	0.24	.43	−0.28	0.67
7-12	0.93	0.26	<.01	0.41	1.45
Atopic dermatitis	−0.38	0.20	.06	−0.77	0.02

anaphylaxis having a worse FAQOL (3.06; SE 0.20; $P = .001$). Subjects who had been issued an AAI had a worse FAQOL than subjects without one (2.97 vs 2.04; SE 0.17; $P < .001$).

A multiple regression model was used to adjust for the confounding effect of different parameters (Table II). Although the type of food a subject was allergic to (peanut, tree nut, or sesame) appeared in univariate analysis to have an effect on FAQOL, this effect was lost following the application of a multiple regression model, indicating that the type of food was not an independent predictor of FAQOL. Being aged 7 to 12 years old or having more than 4 food allergies were the strongest predictors of poorer FAQOL (0.93 and 0.83; $P < .01$, respectively). Subjects who had anaphylaxis at any time previously had significantly lower FAQOL than those who had never had anaphylaxis (0.48; $P = .03$), even after controlling for having an AAI, number of food allergies, age, and atopic dermatitis. Subjects who had been issued an AAI had significantly worse FAQOL than those without an AAI (0.43; $P = .05$) after controlling for anaphylaxis, number of food allergies, age, and atopic dermatitis.

We specifically investigated whether having been issued an AAI differed with the presence of anaphylaxis by inserting an interaction term between having been issued an AAI and anaphylaxis into the regression model. Use of an interaction term addresses any potential differential effect of anaphylaxis (ever or never) on the effect of being issued an AAI. We found no evidence that the effect of having been issued an AAI differed between those subjects with previous anaphylaxis or not (AAI and anaphylaxis: -0.41 ; 95% CI -1.34 to 0.53 ; $P = .39$). This indicates that having been issued an AAI and anaphylaxis are independent predictors of FAQOL. The finding that the effect of an AAI on FAQOL was not influenced by past anaphylaxis suggests that a negative impact exists even in the setting of previous severe reaction. The effect of an AAI on a subject's FAQOL may be multifactorial, with studies reporting that subjects may have fear and uncertainty of using the device, a lack of a plan for its use, and note the burden of having to carry the device. It should be noted that from our current study, we are not able to determine whether the reduction in FAQOL observed with the provision of an EpiPen is related to having been prescribed the AAI or having to carry it.

Current practice regarding prescribing of AAIs varies widely, with some practitioners prescribing them to all children with food allergy, including those who have not had a previous allergic reaction to that food (with positive SPT or food-specific IgE alone). Recently published guidelines sponsored by the National Institute of Allergy and Infectious Disease⁵ recommend that consideration should be given to prescribing an AAI for all patients with food allergy having IgE-mediated reactions. Alternatively, other expert guidelines suggest more selective prescribing of

AAIs to children who have had a systemic allergic reaction to a food and one or more risk factors for anaphylaxis or fatal anaphylaxis.^{6,7} While the decision to provide an AAI will depend on the practice patterns in each country, our findings emphasize that physicians should take into account the risks of having an AAI (diminished QOL) versus benefits (preparedness for treating a potential life-threatening event). A reasonable approach may be to recommend an AAI if (1) there is a history of anaphylaxis or (2) there is a generalized reaction and one or more risk factors for anaphylaxis or fatal anaphylaxis (such as a history of asthma, adolescent or young adult, tree nut or peanut allergy, or geographic remoteness from medical care).⁸ Provision of an AAI may be avoided if there is no history of previous allergic reaction to a food and diagnosis of food allergy has been made solely on the basis of positive food-specific IgE alone. Moreover, the decision to prescribe an AAI is not fixed and can be reviewed at regular intervals. For example, a child younger than 5 years of age who had not been issued an AAI may later develop poorly controlled asthma or move to a remote geographic location and an AAI could be issued at that time.

In conclusion, the presence of food allergy can markedly affect the QOL of an individual. By using a validated FAQOL questionnaire, we have shown that having been issued an AAI is associated with impaired FAQOL. We suggest that particular attention be paid to education, training, retraining, and follow-up to minimize the effect of provision of an AAI on an individual's QOL.

Gideon D. Pinczower, MBBS, FRACP, PhD^{a,b}

Nadine A. Bertalli, BHSci(Hons), GDipEpi&Biostat^{c,d}

Neiden Bussmann, MB, BCh, BAO^d

Melisa Hamidon, MB, BCh, BAO^d

Katrina J. Allen, MBBS, FRACP, PhD^{a,b,c}

Audrey DunnGalvin, PhD, MSc^e

Jonathan O'B. Hourihane, MB, FRCPI, FAAAAI, DM^e

Lyle C. Gurrin, PhD^{c,d}

Mimi L. K. Tang, MBBS, FRACP, FRCPA, FAAAAI, PhD^{a,b,c}

From ^athe Department of Allergy and Immunology, Royal Children's Hospital, ^bthe Department of Paediatrics, University of Melbourne, ^cMurdoch Children's Research Institute, and ^dthe Centre for Molecular, Environmental, Genetic, and Analytic (MEGA) Epidemiology, School of Population Health, Melbourne, Australia; and ^ethe Department of Paediatrics and Child Health, University College, Cork, Ireland. E-mail: mimi.tang@rch.org.au.

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TABLE E1. Comparison of subjects who had been issued an AAI with those who had not

	Adrenaline autoinjector		No adrenaline autoinjector	
	n	%	n	%
Sex				
Male	35	66	35	70
Female	18	34	15	30
Responder				
Father	10	19	7	14
Mother	43	81	43	86
Age (y)				
0-3	9	17	29	58
4-6	29	55	12	24
7-12	15	28	9	18
Anaphylaxis				
Yes	26	49	8	16
No	27	51	42	84
Severity of reaction*				
1	7	13	8	16
2	16	30	24	48
3	4	8	10	20
4 (anaphylaxis)	26	49	8	16
Asthma				
Yes	24	45	14	28
No	29	55	36	72
Number of food allergies				
1-4	40	75	46	92
>4	13	25	4	8
Peanut allergy				
Yes	41	77	26	52
No	12	23	24	48
Tree nut allergy				
Yes	36	68	31	62
No	17	32	19	38

*Grade of severity of reaction: 1 = presumed food allergy—sensitization only and avoiding those foods, no clinical reaction; 2 = oral/skin symptoms only; 3 = moderate allergic reaction, not meeting criteria for anaphylaxis; 4 = anaphylaxis as per Category 1 National Institute of Allergy and Infectious Disease criteria (which is skin and/or gastrointestinal symptoms plus (a) any lower respiratory or severe upper respiratory tract symptoms and/or (b) cardiovascular symptoms⁴).