

Short Communication

Factors determining the ability of parents to effectively administer intramuscular adrenaline to food allergic children

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Intramuscular adrenaline is the treatment of choice for food-related anaphylactic reactions. Although auto-injectable adrenaline devices are routinely prescribed for patients at risk of serious reactions, previous studies have shown that only one-third to one and a half of patients or their carers are able to properly use these devices. The aim of this study was to determine which factors are most strongly associated with the effective use of these devices. A 122 children with food allergies who had previously been prescribed EpiPens and were attending a single specialist pediatric allergy center in the UK, were studied prospectively. A 69% of parents were unable to use the EpiPen, did not have it available, or did not know when it should be administered. A prior practical demonstration was associated with a 4–5 fold greater chance that parents would be able to use the device ($p < 0.005$). Prior consultation with an allergy specialist rather than a general physician, and parents who independently sought additional information from the national self-help allergy organization were also four to six times more likely to be competent with these devices ($p < 0.005$). The study clearly shows that for EpiPens to be used safely and effectively it is essential to educate the carer at the time the device is prescribed.

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Although uncommon, it is impossible to completely exclude the chance of a near-fatal/fatal reaction in children with allergies to foods (1, 2). It is therefore recommended that children at risk of food-induced anaphylaxis, particularly to nuts, have access to injectable adrenaline devices (2). To be effective, these devices should (1) be prescribed at the right dose, (2) be accessible, (3) the patient and/or carer should be competent or at least be able to trigger the device and (4) know when to use it (3). Although a number of previous studies have examined these issues, only a few are prospective and directly assessed the parents/carers competence and knowledge by testing in the clinic, rather than by questionnaire

or telephone interview (3, 4). These latter studies found that only a third to a half of carers were able to correctly demonstrate the use of these devices. Kapoor et al.'s study (4) also found that parental education in a multidisciplinary pediatric allergy clinic improved parent's ability to use devices from 52% to 96%. The current study prospectively and directly examines what are the major factors, which determine a carer's ability to use an auto-injectable adrenaline device.

Clinical records of 122 consecutive children with food allergies who had previously been prescribed injectable adrenaline devices attending a single specialist pediatric allergy clinic in Manchester, UK between November 2004 and

August 2005 were studied prospectively. The survey was assessed and passed by the local research ethics committee.

No patient was excluded from the analysis. Data relating to injectable adrenaline use was collected and entered onto a standardized one page proforma by a pediatric allergy specialist as part of the routine clinical records at the outpatient consultation. Competence with the adrenaline device was standardized and assessed by handing the key carer an EpiPen trainer pen (without needles or medication) and asking him or her to demonstrate its use. In all cases the carer being assessed was the main carer who was responsible for administering the EpiPen in an emergency. The carer was assessed as being unable to use the device if he or she (1) had no idea how to inject the adrenaline, (2) did not know the correct site to inject adrenaline, (3) failed to remove the safety cap, (4) failed to apply enough pressure to trigger the device or (5) took the needle out of the skin immediately after the device had been triggered. Analysis of data was performed using the SPSS 12.0 software package (SPSS Inc, Chicago, USA). Carers were assessed as knowing when to use the device if they indicated they would use it if the child had any breathing problems or faintness.

The median age of the children was 10 years (inter-quartile range: 6–13) and 73 (60%) were male. Ninety (74%) had allergies to peanuts, 10 (8%) to other nuts/legumes and 5 (4%) to milk/eggs. General practitioners prescribed EpiPens to 56 (46%) children, non-allergy specialists to 35 (29%) and allergy specialists based at the study centre to the remaining 31 (25%). Thirteen (11%) children had one device, 31 (25%) two, 18 (15%) three, 49 (40%) four and 11 (9%) more than four devices. Children had been prescribed injectable adrenaline devices (all had EpiPens) a median of 3.0 years previously (inter-quartile range 0.5–6.0). In only two cases had the device exceeded its recommended expiry date. No parent had ever used their device. 61 (50%) of parents were aware of, and 27 (22%) were members of the national self-help allergy group in the UK (Anaphylaxis Campaign: <http://www.anaphylaxis.org.uk>).

Twenty-eight (23%) children had experienced local or generalized skin reactions only, the remainder also had respiratory and/or circulatory symptoms, of which 26 (22%) had been severe (significant airway compromise or disturbed conscious level). Fifty-three (43%) patients had asthma requiring regular inhaled corticosteroids. Seventeen (32%) of asthmatics had previously had severe reactions compared

with only 9 (13%) patients who did not have asthma ($p < 0.05$).

When compared with parents of children prescribed EpiPens by allergy specialists, significantly more parents of children given EpiPens by General Practitioners and non-allergy specialists were (1) unable to trigger the device, (2) never carried the device, (3) had been prescribed the 0.15 mg dose when the 0.3 mg dose was indicated or (4) did not know when to use the device (Tables 1 and 2). There were no significant differences in the performance of parents of children referred to GPs and non-allergy specialists.

Twenty-three (19%) of the cohort had never been shown how to use the device, and of this subgroup, 18 (78%) were unable to trigger it, compared with 35 (35%) of parents who had been given at least one demonstration. There was no difference in the performance of parents who were last shown how to use their EpiPen less than 12 months compared with ≥ 24 months ago (Table 2). Parents who were aware of the national allergy self-help group were also

Table 1. Competence and accessibility of the cohort with injectable adrenaline devices in relation to prescribing physician

	Prescribed by			Total (n = 122)
	General practitioner (n = 56)	Non-allergy specialist (n = 35)	Allergy specialist (n = 31)	
Unable to trigger device*	33 (59)	14 (40)	6 (19)	53 (43)
Device never with patient*	26 (46)	15 (43)	3 (10)	44 (36)
Wrong dose prescribed	13 (23)	4 (11)	5 (16)	22 (18)
Indications for use unknown*	21 (38)	9 (26)	2 (6)	32 (26)
One or more the of above*	47 (84)	24 (69)	13 (42)	84 (69)

Number (percentage).

*Chi square statistic between prescriber groups $p < 0.01$ (two tailed).

Table 2. Factors determining whether or not parents/carers are able to effectively use adrenaline autoinjector device (EpiPen)

Variable	OR (95% CI)	p value
Prescriber (compared with GP)		
Non-allergy specialist	2.0 (0.9–4.9)	0.1
Allergy specialist	5.7 (2.0–16.3)	0.001
Demonstration (compared with no demonstration)		
With last 12 months	4.8 (1.6–13.7)	0.003
≥ 24 months ago	4.8 (1.6–13.7)	0.003
Severity of reaction (compared with skin reaction only)		
Severe respiratory or circulatory compromise	1.0 (0.3–13.7)	1.0
Length of time with the device (years)	1.2 (1.0–1.3)	0.01
Knowledge/member of UK national self-help group (anaphylaxis campaign)	4.4 (2.0–9.6)	0.001

Binary logistic regression (odds ratio (95% confidence interval)).

significantly more likely to be able to use an EpiPen. Children who had previously had a severe reaction were no more likely to regularly carry their EpiPens, nor be competent in the use of their EpiPens than children who had not had severe reactions.

In conclusion, this study confirms that education is a key factor in the parent's ability to effectively use these devices. Spending time with the family in order to explain the importance of carrying the device and when it should be used, as well as giving a practical demonstration of the device significantly improved the ability of parents to use the EpiPen correctly. Compared with general practitioners, a practical demonstration was six times more likely if the doctor was a specialist, and 17 times more likely if the doctor was an allergist. Self-motivated parents who sought to extend their knowledge of the management of allergic conditions using internet and national patient-support groups were also significantly more likely to be able to provide effective emergency care for their child.

Previous studies have shown that first aid management with adrenaline does have a role in the management of children with anaphylaxis (5). In children, EpiPen usage has been shown to decrease the subsequent use of adrenaline in hospital and the need for admission (6). Appropriate education is essential if parents and caregivers are to be competent in the use of these auto-injectors. However, even when the obstacle of lack of knowledge is overcome, many parents still do not feel empowered to use their EpiPens in an emergency (7). Regular practice with a EpiPen trainer device at home and assessment by an appropriately trained practice nurse or doctor is likely to provide carers with additional con-

fidence to effectively use these devices. If these practical issues are not addressed, then calls for the more universal prescription of these devices to patients with food allergies are unlikely to save these patients lives in an emergency (8).

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