

REVIEW ARTICLE

Review article: Quality of follow-up care for anaphylaxis in the emergency department

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Abstract

The prevalence of allergic disorders is rising, with a corresponding increase in patients presenting to an ED with anaphylaxis. Appropriate follow up is required for patients with anaphylaxis. We reviewed two potential performance indicators for the quality of post-discharge care: (i) the rate of self-injectable adrenaline prescription; and (ii) the referral rate for follow-up care with allergy specialists. A search of Cochrane Library, PubMed and Google Scholar was performed using the following initial search string: anaphylaxis and 'emergency department'. We considered any (interventional or observational design) study assessing post-discharge care in anaphylaxis, measured by either adrenaline self-injection prescription or allergist referral. Subjects were patients with (suspected) anaphylaxis or severe allergic reaction, with no age limit. This review summarises findings from 16 relevant papers, all retrospective analyses of post-discharge care for anaphylaxis. Weighted arithmetic means were calculated for rates of prescription of adrenaline auto-injector and referral to an allergist following admission to an ED in patients with (suspected) anaphylaxis or severe allergic reaction. Prescription rates for self-injected adrenaline at the time of discharge fol-

lowing anaphylaxis varied from 0% to 68%, with a mean of 44%. Allergist referral rates ranged from 0% to 84%, with a mean of 33%. This review demonstrates that there is room for improvement in post-discharge care for patients who present to the ED with an anaphylactic reaction.

Key words: *adrenaline, anaphylaxis, emergency medical services, epinephrine, patient discharge, referral and consultation.*

Introduction

An allergic disorder is a common reason to present to the ED. This can represent a wide spectrum of conditions, including rashes, atopic eczema, asthma and anaphylaxis.^{1,2} Allergic diseases (or hypersensitivities) represent an immune response to allergens, which are environmental substances that are normally considered harmless.³ The reactions are manifested by tissue inflammation and organ dysfunction. Allergies include acute and chronic reactions, and the clinical manifestations might be local and/or systemic.² The most serious systemic and potentially life-threatening manifestation is anaphylaxis.¹ Anaphylaxis involves the widespread release of histamine and other mast cell mediators, resulting in clinical findings

Key findings

- Two quality indicators for anaphylaxis follow-up care are suggested and measured.
- Less than half of patients with anaphylaxis are provided with a prescription of self-injectable adrenaline.
- One-third of patients with anaphylaxis are referred to an allergist.

such as cardio-respiratory compromise (tachycardia, hypotension, wheeze), gastrointestinal muscle contraction (vomiting and/or diarrhoea), and skin or mucosal findings (such as urticaria or angioedema).^{4,5} Definitions of anaphylaxis and generalised allergic reaction, according to the Australasian Society of Clinical Immunology and Allergy Inc., are shown in Table 1.

The most common known triggers for anaphylaxis or exacerbation of allergic diseases include insect stings (especially wasps, stinging ants and bees), drugs (especially β -lactam antibiotics), food (especially eggs, fish, shellfish, milk, the fruit-latex group, peanuts and legumes) and aeroallergens (e.g. pollens, mould spores, animal danders and house dust mite antigen).^{1,7–10}

The prevalence of allergies has increased;^{1,11–15} for example, an Australian study reported an estimated increase of 350% in the rate of admissions for food-induced anaphylaxis over an 11 year period.¹⁶ Other recent studies have reported the following: a 182% increase in hospital discharges with a primary diagnosis of

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TABLE 1. Definitions of anaphylaxis and generalised allergic reaction, according to the Australasian Society of Clinical Immunology and Allergy Inc.⁶

Anaphylaxis	Generalised allergic reaction
1. Any acute onset of hypotension or bronchospasm or upper airway obstruction where anaphylaxis is considered possible, even if typical skin features are not present	A generalised allergic reaction is characterised by one or more symptoms or signs of skin and/or gastrointestinal tract involvement without respiratory and/or cardiovascular involvement. • Skin: generalised pruritus, urticaria/angioedema, erythema • Gastrointestinal: abdominal pain, vomiting, loose stools Note: Vomiting and abdominal pain are signs of a severe allergic reaction to insect stings and bites.
OR	
2. Any acute onset illness with typical skin features:	
– Urticarial rash OR	
– Erythema/flushing OR	
– Angioedema	
PLUS involvement of:	
– Respiratory system† OR	
– Cardiovascular system‡ OR	
– Gastrointestinal system	

†Symptoms/signs of respiratory involvement are: difficulty/noisy breathing, swelling of tongue, swelling/tightness in throat, difficulty talking and/or hoarse voice, wheeze or persistent cough. ‡Symptoms/signs of cardiovascular involvement are: loss of consciousness, persistent dizziness, pale and floppy (in young children), hypotension.

anaphylaxis between 1991 and 1995 in England;¹⁷ a 700% increase in hospital admissions for anaphylaxis between 1990 and 2004 in the UK;¹⁵ a 124% increase in paediatric anaphylaxis admissions from 1986 to 1990 and from 2002 to 2006;¹⁸ and an annual increase of 8.8% per year in hospital admissions for anaphylaxis in Australia.¹⁹

ED clinicians play an important part in the care of patients with suspected or confirmed allergic disorders.¹ They are often responsible for making the initial diagnosis of an allergic condition, as well as providing acute care and referral for long-term management. Despite the noted high prevalence of allergic disorders in the community, and the potentially life-threatening nature of anaphylactic reactions, there is only limited data available regarding the rate or level of ED presentations with these conditions.

Reported ED presentation rates for anaphylaxis range from 0.04 to 0.33% of ED presentations.^{1,8,20–23} Although rates of fatality due to anaphylaxis are low (reports between 0.70%²² and 0.91%²⁴), there is some concern regarding the compliance with appropriate post-discharge care in anaphylaxis. One possible quality indicator for post-discharge care is the prescription rate for self-injected

adrenaline, as early use of this is an important factor in preventing anaphylaxis-induced fatalities. As outlined in Table 2, current Australian guidelines recommend that adrenaline auto-injector prescriptions should be provided for any patient with a history of anaphylaxis and might be provided for a patient with a history of a generalised allergic reaction with one or more risk factors for more severe or fatal reactions.⁶ A recent joint task force developed practice parameters for the diagnosis and treatment of anaphylaxis in the ED.²⁵ They also strongly recommended prescription of auto-injectable adrenaline for patients with an anaphylactic reaction and providing them with an action plan, including instructions on how and when to administer adrenaline.

Another quality measure that can be used is the referral for specialist follow up. Referral to an allergist for a review is important in the long-term management of allergic disorders, and might reduce morbidity and mortality.^{25,26} Appropriate care from an allergist after a life-threatening reaction is an important part of the management and might include: identification of trigger allergens, which is helpful in reducing subsequent reactions; identification of likely cross-reactive allergens; advice on allergen avoidance and safe

alternatives; identification of further risk factors and co-factors that contribute to the severity of reactions; addressing comorbid allergic factors; provision of tailored self-management plans, ensuring that patients receive treatment appropriate to the severity of their reactions; provision of desensitising immunotherapy; and proper training in the use of treatment devices.^{1,21}

To better understand the quality of post-discharge care for patients with acute allergic disorders, we aimed to review available literature regarding these two quality measures: (i) rates of prescription of adrenaline auto-injector; and (ii) rates of referral to an allergist after presentation with an anaphylactic reaction.

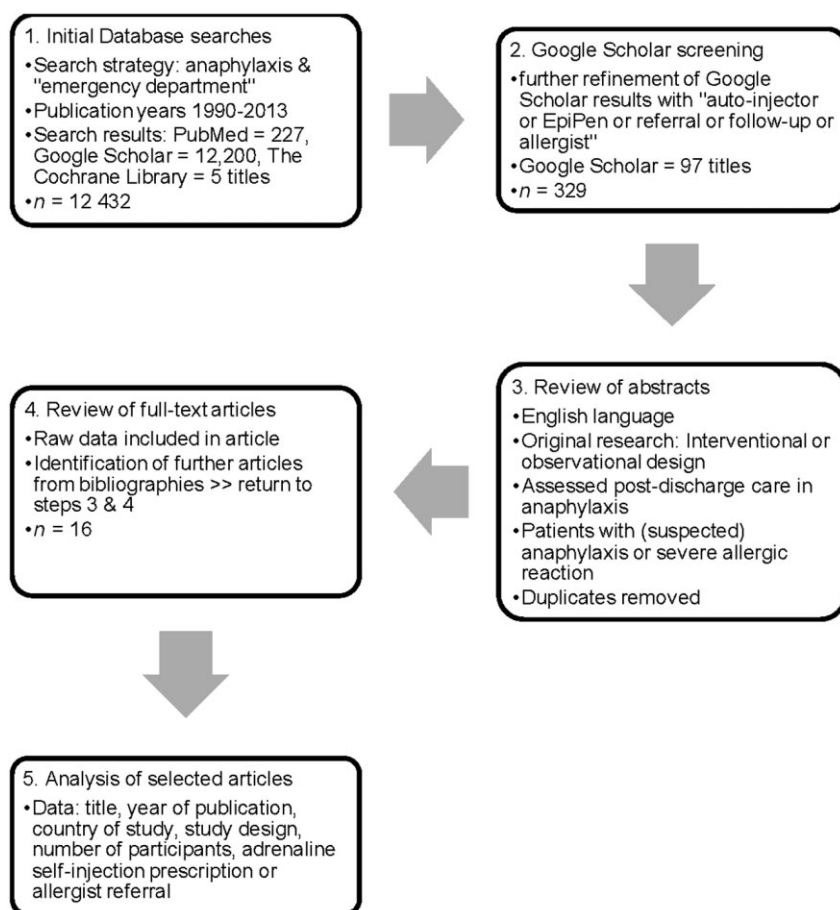
Methods

In August 2013, we performed a review of relevant English-language articles. Relevant studies were identified using electronic searches of Cochrane Library, PubMed and Google Scholar. The search strategy and outcomes are shown in Figure 1. The following string was used to conduct the initial search in all three databases: anaphylaxis and 'emergency department'. The high number of results in Google Scholar was further refined by using the string: auto-

TABLE 2. Guidelines for adrenaline auto-injector prescription, according to the Australasian Society of Clinical Immunology and Allergy Inc.⁶

Recommended	May be recommended
History of anaphylaxis† (if patient is considered to be at continuing risk)	History of a generalised† allergic reaction with one or more of the following factors: • Age – Adolescents and young adults have a greater risk of fatal food anaphylaxis ○ The majority of recorded fatal reactions to foods (~90%) occur in children over the age of 5 years. ○ Adults have a greater risk of fatal stinging insect anaphylaxis than children. • Specific allergic triggers ○ Nut allergy (to peanuts or other nuts) – most deaths from food anaphylaxis occur from nuts. ○ Generalised allergic reactions can be triggered by exposure to trace or small amounts of nuts, which can be difficult to avoid. Subsequent allergic reactions to nuts may be unpredictable. ○ Stinging insect allergy (bees, wasps, jumper ants) in adults. • Comorbid conditions – Asthma (concurrent or past history), history of arrhythmia. ○ This list is not comprehensive and if there is a concern; patients should be referred to a clinical immunology/allergy specialist for assessment. • Limited access to emergency medical care ○ In remote locations, early administration of adrenaline may not be possible unless an adrenaline auto-injector is provided to the patient for self-administration.

†Refer to Table 1 for definitions.



injector or EpiPen or referral or follow-up or allergist.

We considered any (interventional or observational design) study assessing post-discharge care in anaphylaxis, measured by either adrenaline self-injection prescription or allergist referral. Subjects were patients with (suspected) anaphylaxis or severe allergic reaction, with no age limit. Patients with angiotensin-converting-enzyme inhibitor-related angioedema or severe delayed drug reactions were not included as they were considered outside the scope of this review.

One reviewer (FJB) assessed all titles and abstracts for potential relevant articles. We retrieved the full-text article of any reference that appeared to meet the inclusion criteria and was published after 1990. Duplicates were removed.

The bibliographies of relevant articles or reviews were also searched for references to further papers. Articles were selected for inclusion in this review if they included data on one of the performance indicators (prescription of self-injectable adrenaline or referral for follow-up care). Articles were excluded from this review if they did not include numbers of cases or

Figure 1. Search strategy and selection of eligible articles for review.

specific rates of prescription or referral. Selected original research articles were then reviewed to identify rates of prescription of adrenaline auto-injector and referral to an allergist after presentation with an anaphylactic reaction.

The following data were extracted from the studies: title, year of publication, country of study, study design, number of participants, age and sex of participants, adrenaline self-injection prescription or allergist referral. Results of studies were summarised using weighted averages.

The weighted (arithmetic) mean was calculated for rates of prescription of adrenaline auto-injector and referral to an allergist when data regarding numbers of cases were available. Weighted rates were calculated for each study (number of cases $\times$ rate), then the weighted arithmetic mean was calculated by dividing the sum of the weighted rates by the total number of cases. Due to an overrepresentation of studies from the USA in this review, the weighted means for studies from the USA and Australia were also calculated separately.

Results

After abstracts were reviewed and full-text articles assessed where relevant, 16 original research articles were selected for inclusion in this review. Relevant studies are summarised in Table 3.

The eligible papers represent those that reported rates of prescription of adrenaline auto-injector or referral to an allergist after presentation to an ED with an anaphylactic reaction. All included studies used retrospective chart reviews to generate their findings; none was prospective.

One study was excluded from the summary table due to a lack of detailed outcome data.¹⁸ The article demonstrated an increase in the rates of prescription of adrenaline and referrals to allergists in children with no known history of allergies or previous episodes of anaphylaxis, when they were discharged from the ED after an anaphylactic episode, when comparing results from 1986 to 1990 with 2002 to 2006. However, data on the rates of prescription or referrals were

only presented in the form of a figure, so precise data were not available for inclusion in this review. We were unable to obtain raw data from the authors.

Reported prescription rates for self-injected adrenaline at the time of discharge varied from 0%²¹ to 68%.¹² The overall weighted arithmetic mean rate for prescriptions for self-injected adrenaline was 44%, based on $n = 14$ studies and $n = 3558$ patients (USA 46% [$n = 8$ studies and $n = 3277$ patients]; Australia 9% [$n = 2$ studies and $n = 199$ patients]).

Rates for referrals to allergists ranged from 0%²¹ to 84%.²⁹ The weighted arithmetic mean rate for referrals to allergists was 33%, based on $n = 14$ studies and $n = 3891$ patients (USA 32% [$n = 10$ studies and $n = 3610$ patients]; Australia 48% [$n = 2$ studies and $n = 199$ patients]).

Discussion

This review of quality indicators for post-discharge anaphylaxis care shows suboptimal prescription rates of auto-injectors and allergist referral. Both are areas amenable to improvement.

Anaphylaxis is a potentially life-threatening condition, and prescription of self-injectable adrenaline and referral for follow up with an allergist are important components of care for patients with anaphylaxis. Nonetheless, this review shows that only one-third of patients received a referral for follow-up care.

This review also shows that overall, less than half (44%) of patients received a prescription of self-injectable adrenaline after an anaphylactic reaction. When analysed separately, the weighted mean rates from studies from USA (46%) were considerably higher than in two Australian studies, where the rates of prescription were 17.5%²⁹ and 5%²² (weighted mean 9%).

Possible explanations for the low rate of prescriptions for self-injectable adrenaline and referrals for follow-up with an allergist in patients discharged from the ED include lack of documentation and underdiagnosis of anaphylaxis.³⁰ For example, one study found that only four of 17 cases of anaphylaxis (retrospective diagnosis by allergist review) were correctly identified

in the ED as anaphylaxis, whereas 13 of the cases had been identified as allergic reactions without anaphylaxis.²⁰ In another study, a number of referrals were made to the patient's general practitioner (GP) rather than to an allergist, possibly with the expectation that appropriate referrals would then be made to allergists.²⁹ However, direct referral to an allergist is likely to be more effective, especially as some patients with anaphylaxis do not realise that follow-up care is required.²⁰

In other cases, referrals might have been made by the treating doctor, but not documented. In some instances, patients presenting with anaphylaxis might have reported having current prescriptions for self-injected adrenaline and/or ongoing care by an allergist, therefore not requiring further prescriptions or referrals. Although not included in this review, it is possible that in some instances an adrenaline auto-injector prescription or allergist referral was not considered appropriate by the treating team, when an avoidable drug was the trigger for anaphylaxis. Some EDs have designated (nursing) staff that facilitate the discharge process and help with discharge instructions and as such might not be reported in the medical notes.³⁷ Considering these possible explanations for low reported rates of appropriate ED post-discharge care, as well as the high turnover of staff in EDs, it is important to clarify responsibility for arranging and documenting this.

Limitations of this review include exclusion of data from before 1990, exclusion of non-English language publications and the use of a single author to review the literature. Another potential confounder in these findings is that all selected studies used retrospective collection of data. It is possible that emergency physicians are in fact prescribing self-injectable adrenaline and referring patients for follow up at higher rates than reported here. In order to more accurately monitor the rates of appropriate post-discharge care for anaphylaxis, prospective research is required to determine a more precise estimate of actual care provided.

Although many of the studies summarised in this review report poor

TABLE 3. Summary of studies of post-discharge care after presentations with anaphylactic reactions in emergency departments

Author	Country	Cohort	Prescription rate (%) for self-injected adrenaline at time of discharge	Allergist referral rate (%) for follow-up care
Arroabarren <i>et al.</i> ²⁷	Spain	64 cases of anaphylaxis in children aged <14 years old (31 in Group A, 33 in Group B)	27 in group A (before), 58 in group B (after updated anaphylaxis protocol)	10 in group A (before), 38 in group B (after updated anaphylaxis protocol)
Banerji <i>et al.</i> ²⁸	USA	802 adult patients with food-related anaphylactic reactions	44	21
Braganza <i>et al.</i> ²⁹	Australia	57 cases of anaphylaxis in children <16 years of age	17.5	81
Brown <i>et al.</i> ²²	Australia	142 patients with anaphylaxis	5	35
Campbell <i>et al.</i> ³⁰	USA	208 patients with anaphylaxis	36.6	31.3
Clark <i>et al.</i> ⁷	USA	51 patients with anaphylactic reactions related to food	22	13
Clark <i>et al.</i> ³¹	USA	617 patients with systemic insect sting allergic reaction	27	20
Haymore <i>et al.</i> ³²	USA	24 cases of anaphylaxis	29	29
Melville and Beattie ⁹	Scotland	237 children (<13 years of age) with acute allergic reactions	n/a	60 (of severe and life-threatening cases)†
Rudders <i>et al.</i> ¹²	USA	846 presentations of food-related anaphylaxis in children (160 in 2001–2002, 155 in 2003–2004, 531 in 2005–2006)	66 (2001–2002), 65 (2003–2004), 68 (2005–2006)	39 (2001–2002), 32 (2003–2004), 55 (2005–2006)
Rudders <i>et al.</i> ³³	USA	605 cases of children with food-related anaphylaxis	43	22
Russell <i>et al.</i> ³⁴	USA	124 cases of anaphylaxis in patients <21 years of age	63	33
Schwartz ³⁵	USA	326 patients with anaphylaxis	27 (of bee sting allergic patients)†	12.5 (of bee sting allergic patients) and 0 (of other patients)†
Stewart and Ewan ²¹	England	18 patients with severe anaphylaxis (9 patients in Study A in 1993, 9 patients in Study B in 1994)	0	Study A: 0 (in 1993) Study B: 56 (in 1994)
Yocum and Khan ³⁶	USA	179 patients with anaphylaxis	n/a	79
Yocum <i>et al.</i> ²⁴	USA	154 cases of anaphylaxis	n/a	52

†Data not included in weighted arithmetic mean calculations because the exact numbers of patients included in calculations for follow-up rates were not reported.

quality of post-discharge care for patients with allergic disorders, improvement is possible. For instance, one study reported an increase in referrals to an allergist following presentation to an ED for anaphylaxis from 39% in 2001–2002 to 55% in 2005–

2006, possibly reflecting increased awareness among ED clinicians.¹² In another study, implementation of an updated protocol to improve medical performance in a paediatric ED resulted in a significant increase in the rate of prescription of adrenaline auto-

injector (from 27% to 58%), as well as an increase in the proportion of patients referred to the allergy department (from 10% to 38%).²⁷

As suggested by El-Shanawany *et al.*, improvements in rates of allergist referral might also be achieved by

establishing a fast-track allergy clinic, where patients could be seen before they leave the ED.³⁸ It is also likely that involvement of allergy specialists in reviewing and improving physician education regarding post-anaphylaxis care will be of benefit.

One strategy for improving the rates of allergist referral from the ED might lie in physician education regarding the existence of numerous co-contributors to the risk of severe anaphylactic reactions. These potential co-contributors include younger age,^{39–42} asthma,^{41,43–46} exercise^{47–49} and alcohol.^{50,51} Given the complex interactions underlying potentially fatal anaphylactic reactions, the role of the allergy specialist is critical in risk identification, patient and carer education, treatment of comorbidities, and provision of a supportive, empowering and effective management plan.

Conclusion

Allergic disorders are common and with rising rates of ED presentations related to anaphylaxis, it is important that ED clinicians are familiar with diagnosis and management of this potentially life-threatening condition. Proper medical care for patients presenting to the ED with anaphylaxis does not end with discharge from the hospital. Despite clear guidelines, there is obvious room for improvement in post-discharge care for patients with anaphylactic reactions. This review found low rates of prescription of self-injected adrenaline and referral for follow-up diagnostic testing and management. This review also highlights the need for ongoing physician education in relation to the need for specialist allergic review and follow-up care in patients with life-threatening anaphylaxis.

Author contributions

FJB and GK conceived the study. FJB performed the literature search and prepared the first draft. All authors were involved in interpretation of data for the work and critically reviewed and edited all the drafts. All authors contributed to and approved the final manuscript.

Competing interests

GK is a section editor for *Emergency Medicine Australasia*.

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