Concordance with Recommended Postdischarge Care Guidelines among Children with Food-Induced Anaphylaxis

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Objective To describe patient characteristics, concordance with recommended postdischarge care, and risk of repeat events within a cohort of children discharged from an emergency department (ED) or hospital for food-induced anaphylaxis in the US.

Study design Children (aged <18 years) with an ED visit/hospitalization for food-induced anaphylaxis were identified from the 2002-2008 Truven Health MarketScan databases using an expanded *International Classification of Diseases, Ninth Revision, Clinical Modification* diagnosis code algorithm. The initial identified ED visit/hospitalization was the index event. Claims data for the children with continuous medical and prescription coverage for ≥1 year before and after the index event were evaluated. Analyses included the rates of 1-year postdischarge epinephrine autoinjector (EAI) prescription fills, allergist/immunologist visits, and repeat events.

Results The study cohort comprised 1009 patients with an average age of 7 years, including 58% males, 27% with a history of asthma, and 90% discharged from an ED. Within 1 year postdischarge, 83% had an EAI prescription fill (69% within 1 week postdischarge), 43% had a specialist visit (51% within 4 weeks postdischarge), and 6.4% had evidence of another anaphylaxis-related ED visit/hospitalization.

Conclusion Among children with food-induced anaphylaxis, within 1 year postdischarge from the ED or hospital, concordance was higher for EAI prescription fills than for allergist/immunologist visits. Subsequent ED visits/hospital stays for anaphylactic events were low. More research is needed to identify barriers between recommendations and physician/patient behaviors, as well as the impact of not following the recommendations on patient outcomes and healthcare costs. *(J Pediatr 2014;164:1444-8)*.

Food-induced anaphylaxis is a potentially life-threatening systemic allergic reaction that frequently results in emergency department (ED) visits and/or hospitalizations. In the US, approximately 3 million children (3.9% of children) had a reported food allergy in 2007.[1] Among both adults and children, there are 203 000 ED visits annually for acute food-related allergic reactions, of which 90 000 are for food-related anaphylaxis.[2] Children (aged <18 years) account for approximately 38% (77 000) of the ED visits for food-related allergic reactions annually.[2]

US national guidelines recommend that after an ED visit/hospitalization for anaphylaxis, patients should be prescribed an epinephrine autoinjector (EAI); receive education about avoiding allergens, recognizing the symptoms of anaphylaxis, and using an EAI; be given an anaphylaxis emergency action plan; and be referred to an allergist/immunologist.[3-9]

Retrospective studies of children with food-induced anaphylaxis have found that concordance with these guidelines varies depending on the severity of the allergic reaction and whether the patient is admitted to the hospital. In children with a food-induced allergic reaction, reported frequencies of EAI prescription receipt and allergist referral after discharge from the ED were 43% and 22%, respectively.[10] Among children considered to have food-induced anaphylaxis, reported frequencies ranged from 51% to 63% for receipt of an EAI prescription and from 24% to 33% for referrals for specialist follow-up.[10,11] Among children discharged from the hospital, 94% were prescribed an EAI and 69% were referred to an allergist.[10] Although the foregoing studies assessed physician compliance with the recommendations, they did not measure patient compliance with these instructions.

The risk of recurrent anaphylaxis is reportedly higher in food-induced anaphylaxis than for other triggers.[12,13] In a study that followed children for a mean of 7 years, the rate of recurrent anaphylaxis was 30% overall and 39% for food-induced anaphylaxis.[13]

In the present retrospective study of healthcare claims for a large population of commercially insured children in the US with food-induced anaphylaxis discharged from an ED or hospital, we examined patient concordance with

EAI	Epinephrine autoinjector
ED	Emergency department
ICD-9-CM	*International Classification of Diseases, Ninth Revision, Clinical Modification*

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recommended postdischarge care and the rate of a repeat event over 1 year of follow-up.

Methods

As part of a larger population study, data were obtained from the 2001-2009 Truven Health MarketScan Commercial and Medicare supplemental databases. These databases provide access to fully adjudicated annual inpatient and outpatient medical claims, as well as outpatient prescription drug claims for >43 million privately insured individuals in the US. Data are derived from >100 health plans, including various fee-for-service and managed-care designs. Detailed cost, use, and outcomes data for healthcare services received in both inpatient and outpatient settings are available. The medical claims, outpatient prescription (retail and mail order) drug claims, and person-level enrollment data are linked by unique enrollee identifiers. The MarketScan databases are fully compliant with the letter and spirit of the Health Insurance Portability and Accountability Act of 1996. Because the study used only deidentified patient records and did not involve the collection, use, or transmittal of individually identifiable data, Institutional Review Board approval was not required.

The children selected for this study were aged <18 years and had an ED visit or hospitalization during the study period (January 1, 2002, to December 31, 2008) for food-induced anaphylaxis based on method I (*International Classification of Diseases, Ninth Revision, Clinical Modification* [ICD-9-CM] codes specifically indicating anaphylaxis) or method II (ICD-9-CM algorithm based on the National Institute of Allergy and Infectious Diseases and Food Allergy and Anaphylaxis Network definitions of anaphylaxis) of the Harduar-Morano algorithm.[14] The selected children had continuous medical and prescription coverage for ≥1 year before (preindex) and after (postindex) the date of the initial ED visit or hospital discharge (index date). Patients admitted to the hospital through the ED were captured in the hospitalized cohort. Immunocompromised patients with a diagnosis of AIDS, cancer, or organ transplantation during the preindex period, as well as those with sepsis at index, were excluded from our analysis.

Data on age, sex, US Census region, and health plan type were extracted from the claim for the index event. Urbanicity or rurality, as defined by Urban Influence Code,[15] was assigned based on the county of residence, and median household income was estimated by matching the ZIP code of the patient's residence with that of the 2000 US Census. Individual comorbid conditions were identified using ICD-9-CM codes from preindex medical claims. Preindex prescription fills for EAIs were identified using the National Drug Code numbers recorded on individual prescription claims (retail and mail order) and preindex allergist/immunologist visits were identified by physician specialty, as coded on the preindex outpatient medical claims.

Variables measured in patients with an index ED visit included cardiorespiratory failure and subsequent interventions identified on the index ED claim or hospital facility/professional claim for an inpatient stay using ICD-9-CM, Current Procedural Terminology, and Healthcare Common Procedure Coding System Level II codes. Inpatient measures, including intensive care unit stay, length of hospital stay, and discharge destination, were identified on the facility and admission summary claims for the index hospital stay. Costs for the ED and hospital index events are represented by the total reimbursed amount for all providers of care associated with the event, including copayment and coinsurance deductibles, any coordination of benefits amount, and the amount paid by the insurer. All costs were inflated to 2008 US dollars using the medical component of the Consumer Price Index.

Prescription EAI fills and allergist/immunologist visits in the postindex period were identified as for the preindex period. These data were recorded on individual prescription and medical claims and thus capture care sought by the patient and covered by the insurer. In addition, time to first EAI prescription fill, number of fills, time to first allergist/immunologist visit, and number of visits in the postindex period were determined. Patients with ≥1 subsequent anaphylaxis events and treatment as an inpatient or in an ED were identified using the same methods (methods I and II) as used to identify index events. A second hospitalization was considered an extension of an index hospital event if the discharge destination on the index claim indicated transfer to another facility and if the admission date on the second hospital claim was the same as the discharge date of the index event.

Statistical Analyses

Medical and prescription drug claim histories were examined as described above. Data are reported as mean ± SD to summarize continuous measures, as median (IQR) for continuous measures with skewed distributions, and as number (%) for categorical measures. Outcomes of index events were stratified by the index place of service, ED or hospital. Analyses were performed with SAS version 9.2 (SAS Institute, Cary, North Carolina).

Results

After the selection criteria were applied, 43% of the children (1009 of 2322) treated for anaphylaxis in the ED or hospital were assigned a code for food-induced anaphylaxis. Among these children, 97% were identified using single diagnosis codes (method I), and 3% were identified using the expanded diagnosis algorithm (method II). The children were enrolled in a variety of health plans, and 58% were male (**Table**). Patients resided across the US, with the majority (92%) living in metropolitan counties. Overall, 27% of the patients had a history of asthma, 18% had a history of allergic rhinitis, 12% had a history of eczema, and 4.2% had a "personal history" of allergy. In addition, in the preindex period, 35% of patients had a claim for ≥1 EAI prescription fill, and 19% had ≥1 visit to an allergist/immunologist.

Index Event Characteristics

Most patients (90%) were treated in and discharged from the ED. Hypotension was listed on 1 ED patient's claim, but the