

Anaphylaxis: A Payor's Perspective on Epinephrine Autoinjectors

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ABSTRACT

The scope of expenditures due to anaphylaxis likely is underestimated by health care payors because anaphylaxis is underdiagnosed and, when reported, most costs of anaphylaxis borne by payors relate to direct medical expenses. Direct costs of anaphylaxis have been estimated at \$1.2 billion per year, with direct expenditures of \$294 million for epinephrine, and indirect costs of \$609 million. More accurate diagnostic coding will allow payors to improve their understanding of the full impact of anaphylaxis on health care plans, employers, patients, and their families. Similarly, more accurate diagnosis and treatment of anaphylaxis should have a direct effect on overall cost savings achieved in this disease state. This includes savings in both direct costs, such as emergency department visits, and indirect costs, such as lost productivity of patients and caregivers. Educating medical personnel on treatment guidelines regarding the specific use of appropriate epinephrine autoinjectors will contribute to cost savings. Even though the cost of autoinjectors has been increasing, evidence indicates that the cost of improper response to, and treatment of, anaphylaxis outweighs that increase. At this time, there are several branded epinephrine autoinjectors and one generic equivalent for one of these branded products available on the US market; the branded autoinjectors are not considered equivalents for substitution. Barriers to coverage and access, such as managed care organization tier classification, medication copay, and socioeconomic status of specific patients, need to be examined more closely and addressed. Education in the proper use of epinephrine autoinjectors, including regular checking of medication expiration dates, is critical for proper management of anaphylaxis and minimizing the costs of anaphylactic events. Managed care organizations can play a role in educational initiatives.

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The level of underdiagnosis of anaphylaxis and the resultant treatment shortcomings in the US are of concern. Underdiagnosis results in incorrect usage of International

Classification of Diseases (ICD) codes and exposes a potential weakness in the ability of ICD codes to distinguish specific allergic reactions, which ultimately affects

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payor understanding of the magnitude of anaphylaxis.¹ Suboptimal ICD code identification and subsequent treatment of anaphylaxis add to both direct and indirect health care costs. Educating medical personnel, particularly in the emergency department (ED), on treatment guidelines, including proper and specific use of epinephrine auto-injectors, will contribute toward more efficient and effective anaphylaxis treatment. Identifying and addressing specific patient barriers to coverage and access to autoinjectors and educating patients in their correct use, including regular examination of medication expiration dates, should contribute to cost savings for anaphylactic events and reduce the overall cost burden of anaphylaxis on the health care system.

ECONOMIC BURDEN OF ANAPHYLAXIS IN THE UNITED STATES

Underuse of ICD codes specific to anaphylaxis reflects the underdiagnosis of this condition, which leads to undertreatment. ICD codes commonly are used to track the epidemiology of anaphylaxis; thus, coding limitations result in underreporting and underestimation of the true impact of anaphylaxis. Proper coding also is used as an educational tool. The total costs to and overall impact on the health care system, particularly in EDs, need to be better understood. By better understanding how ICD codes are being used currently, we can gain better insight into anaphylaxis reporting and begin to remedy ICD code discrepancies.

Food-related anaphylaxis is of particular concern. For example, a national survey of pediatricians showed that those not currently caring for patients with food allergy were more likely to misdiagnose, incorrectly treat, or undertreat anaphylaxis.² Krugman et al² designed a case-based study to assess physician knowledge and attitudes regarding the management of food allergies and anaphylaxis. They mailed 1130 surveys that included a scenario in which a child was experiencing peanut-induced anaphylaxis. There were 468 respondents to the mailing. The final sample size available for evaluation was 419, as 49 respondents reported having specialized allergy training, which excluded them from this study. A total of 235 (56%) respondents correctly agreed with both the diagnosis of anaphylaxis and treatment of the patient with epinephrine, while 184 (44%) respondents disagreed with the diagnosis ($P < .0001$). Also of interest was the finding that residents who completed their residency training within the past 10 years were more likely to disagree with the diagnosis ($P < .0001$) (ie, a direct association between years in practice and correct diagnosis).

There also appears to be notable variation in ED recognition and management of acute allergic reactions and anaphylaxis. Gaeta et al¹ analyzed a total of 12.4 million allergy-related ED visits that occurred between 1993 and 2004, about 1% of all ED visits during that time period. The estimated annual rate for visits to the ED due to severe allergic reactions during that time period was 3.8% (95% confidence interval, 3.4%–4.1%) and remained relatively

constant during the 12-year study interval. ED staff prescribed medication to 87% of patients, the most common being H₁-antihistamines (62%) and corticosteroids (38%). Although these medications may be implemented as second-line agents for severe allergic reactions, their onset of action is much slower than that of epinephrine; in addition, they do not treat life-threatening symptoms of anaphylaxis. Further, this study showed that epinephrine use was infrequent, representing 11% of all cases and declining from 19% at study onset to 7% at study end ($P = .04$). Epinephrine is considered first-line treatment for anaphylaxis,^{3–5} yet it is not always given or prescribed appropriately.^{1,4}

Direct and Indirect Costs of Anaphylactic Events

The direct costs of anaphylactic events, such as ED visits, physician office visits, and pharmacotherapy, are relatively simple to quantify. However, it could be argued that the indirect costs of anaphylaxis may be an even heavier burden. Indirect costs include quality-of-life issues, lost productivity, mortality, and inappropriate or underutilized treatment. These are difficult to “value” for a payor or employer, but a concerted effort needs to be made to quantify these costs.

Patel et al⁶ examined the economic burden of food-induced allergic reactions and anaphylaxis in the US. Using the federal health care databases, they estimated the direct and indirect medical costs associated with food allergy and anaphylaxis (**Table 1**). Total annual direct costs caused by food-related events alone were estimated to be \$225 million per year (in 2007 dollars), with office-based physician visits accounting for 52.5% of total costs. Patel et al⁶ also examined the indirect costs of these illnesses. In 2007 dollars, total indirect costs of food-induced events alone were estimated to be \$115 million per year. These included lost productivity for patients and caregivers, as well as mortality. Morbidity-related costs were the dominant component of indirect costs, with office visits comprising 82% of costs.⁶

An updated and more complete estimate of the societal burden of anaphylaxis in the US was estimated by Sclar et al,⁷ who calculated direct and indirect cost estimates for all anaphylactic reactions to foods, medications, insect stings, and latex, as well as the utility of access to and use of epinephrine autoinjectors. A national burden of illness profile was developed by using a Monte Carlo simulation, a decision-analytical framework parameterized by stochastic and deterministic components. Findings were based on a 2010 US population and calculated in 2010 dollars. The prevalence of at-risk populations, use of health care, and deaths were determined from survey data from the US National Center for Health Statistics and the medical literature. Indirect costs included lost productivity for both patients and caregivers, and mortality.

Specific databases used in the Sclar et al study are specified in **Table 2**.⁷ The Healthcare Cost and Utilization

Table 1 Direct Medical Costs and Indirect Costs of Anaphylaxis Due to Food Allergy Alone (in 2007 US Dollars)

Category	Direct Medical Costs		Indirect Costs	
	Mean Cost per Patient (\$)	Annual Cost (\$ Millions)	Morbidity (\$ Millions)	Mortality (\$ Millions)
Inpatients	4719	26.6	2.0	12.2
Emergency department visits	553	44.8	10.9	4.8
Office visits	193	118.2	80.2	0
Outpatient hospital visits	280	8.7	4.8	0
Ambulance	470	6.9	NA	NA
Epinephrine autoinjector	51	19.7	NA	NA
Total costs		224.9	114.9	

Adapted with permission from *J Allergy Clin Immunol* © 2011 Elsevier.⁶

Project (HCUP)-Nationwide Inpatient Sample dataset lists hospital charges for inpatient stays, procedures, tests, and ED visits, with charges converted to costs using the individual hospital's cost/charge ratio. The HCUP-Nationwide Emergency Department Sample was used for ED visits not resulting in hospitalization, with charges converted to costs using the Medicare average ratio of 0.53. Clinic/office visit costs were calculated by summing reimbursement costs for physician fees (from Medicare coding), diagnostic procedures (from Ambulatory Payment Classification codes), laboratory tests (from the Medicare Lab Schedule Reimbursement file), and medications prescribed (based on average wholesale price from the Red Book). Facility charges were estimated from the literature. Estimates for ambulance use also were obtained from the literature and then multiplied by the mean Medicare reimbursement. US estimates of epinephrine autoinjector use were obtained from the literature.

Indirect costs attributed to morbidity were calculated as discounted earnings foregone and/or absenteeism.⁷ The length of absenteeism was quantified based on the length of stay in the hospital, or, for patients not hospitalized, as 1 day. In children or adolescents experiencing anaphylaxis, an absence of 1 day also was assumed for 1 caregiver. Lost days of employment were multiplied by the mean wage for a day as reported in the 2010 US Census. Indirect costs of mortality were projected using the discounted value of future lifetime earnings, using a discount rate of 3%. This included the value of household services performed by a household member but not compensated.

All analyses were derived using Statistical Analysis System version 9.1.3 (SAS; Cary, NC).⁷ In 2010, the US

population at risk for anaphylaxis was estimated at a median of 14.4 million people (range, 3.7-48.7 million), with a median incidence of anaphylaxis of 211,874 events (range, 50,446-657,330). Annual direct costs were a median of \$1.2 billion (range, \$288 million-\$3.7 billion), with direct expenditures for epinephrine reaching \$294 million. Indirect costs were estimated at a median of \$609 million (range, \$145 million-\$1.9 billion). These results suggest that the cost burden of anaphylaxis in the US is much greater than previously reported and that the costs of illness exceed the investment needed to provide patients with epinephrine autoinjectors.

More accurate diagnosis and more appropriate treatment for anaphylaxis are likely to have a direct impact on overall cost savings, though improved coding of claims is necessary to fully evaluate the impact of treatment changes. Potential savings include direct costs, such as ED visits and inpatient hospitalization, as well as indirect costs, such as lost productivity for both patients and caregivers.

INSURANCE COVERAGE AND ACCESS TO EPINEPHRINE AUTOINJECTORS

Multiple guidelines exist for responding to anaphylaxis, all of which recommend that at-risk patients have epinephrine available to them at all times and that epinephrine be used as treatment for anaphylaxis.^{3,5} Epinephrine autoinjectors play a large role in these guidelines as first-line therapy in the outpatient setting. It is recommended that a prescription for 2 doses of an epinephrine autoinjector be given at discharge and that patients at risk for anaphylaxis carry 2 devices at all times.^{3,4} Access to an appropriate number of autoinjectors

Table 2 US Databases Used in the Sclar et al Study of Costs of All-cause Anaphylaxis⁷

Database	Information Captured
Healthcare Cost and Utilization Project Nationwide Inpatient Sample (HCUP-NIS)	Nationwide hospitalizations
Healthcare Cost and Utilization Project Nationwide Emergency Department Sample (HCUP-NEDS)	Emergency department encounters
National Ambulatory Medical Care Survey (NAMCS)	Physician-patient encounters (office-based visits)
National Hospital Ambulatory Medical Care-Outpatient Department (HAMCS-OD)	Hospital-based outpatient encounters

is essential during anaphylaxis. In the outpatient setting, the National Institute of Allergy and Infectious Diseases recommends repeated doses of epinephrine if a patient responds poorly to an initial dose or has progressive symptoms despite dosing.³ Consistent with this guideline, EpiPen, EpiPen Jr (Mylan Specialty L.P., Basking Ridge, NJ), Adrenaclick (Amedra Pharmaceuticals LLC, Horsham, PA), and the recently approved Auvi-Q device (sanofi-aventis U.S. LLC, Bridgewater, NJ), as well as the generic equivalent product for Adrenaclick, are all available in dual-packs.⁸⁻¹¹

Rising Costs

The wholesale cost of epinephrine autoinjectors in the US has increased substantially in the past several years, from a cost of \$35.59 per single-dose unit in 1986 to \$87.92 in 2011, an increase of 147% in constant 2011 dollars (Figure 1).¹² At present, the branded epinephrine autoinjectors available on the US market are automatically placed in Tier 2 or higher in almost all insurance plans. For example, for United Healthcare and Blue Cross/Blue Shield, branded epinephrine autoinjectors are in Tier 2, with \$35 and \$30 copays, respectively.^{13,14} For Humana, they fall into Tier 2 with a 30% copay or Tier 4 with up to a 100% copay, depending on the type of prescription plan.^{15,16}

It is important to note that, as generic products become available, they will likely be placed in a lower tier and thus be more financially appealing. It is imperative, however, that health care professionals determine to which brand-name product a generic product is rated as equivalent by the Food and Drug Administration, because different administration or dosing may be required. All devices are not the same, and there is concern that inappropriate substitutions may be made.¹⁷ Therefore, once a patient has been instructed on the use of a specific epinephrine autoinjector, the prescriber should write for that specific epinephrine autoinjector, indicating, if appropriate, “do not substitute” or “brand medically necessary” on the prescription (as required

by individual state regulations). Patients, in turn, should be advised to learn how to use their specific epinephrine autoinjector in their physician’s office. Patients also should be instructed to check the epinephrine autoinjector they receive from the pharmacy to verify that they are familiar with and understand the specific device, and that they have received training regarding its use.¹⁷

Increased Demand and Usage in Children

The rate of epinephrine dispensing has increased steadily in the US during the past decade. There was a 69% increase in epinephrine autoinjector prescriptions from 2003 to 2010, with 1.4 million epinephrine autoinjectors prescribed in 2003 and 2.4 million prescribed in 2010.¹⁸ This increase may be due to several factors, such as increased awareness among the public and health care professionals, as well as broader marketing initiatives.¹⁸ Food allergy-related admissions in children also have increased substantially.¹⁸ As a result, food allergy management in schools has evolved in recent years.¹⁹ In January 2011, the Food Allergy and Anaphylaxis Management Act (FAAMA) was signed by President Barack Obama. This Act requires the US Secretary of Health and Human Services to develop voluntary guidelines to manage food-related anaphylaxis in schools.¹⁹ FAAMA may allow schools to stock non-student-specific epinephrine autoinjectors for immediate use in severe allergic reactions while waiting for professional emergency responders to arrive.¹⁹

Expired Product

As epinephrine autoinjectors are moment-of-need products and may remain unused for long periods of time, the likelihood of carrying expired autoinjectors is higher than that of a medication dosed every day. Although it is recommended that patients and family members check epinephrine autoinjector expiration dates,³ both children and adults at risk for anaphylactic reactions often carry expired autoinjectors. A survey of 100 families with food-allergic children found that only 71% of families had an epinephrine autoinjector with them and, of those, 10% of the devices were expired.²⁰ In addition, a study in Germany of patients allergic to insect venom who were instructed always to carry epinephrine with them found that the medication in 54% of patients’ emergency kits had expired.²¹

Impact of Socioeconomics on Access

Children in lower socioeconomic classes also may tend to carry expired product due to the financial burden of replacing unused medication. A substantial health disparity has been observed among socioeconomic classes regarding food-allergic children and access to epinephrine.²² Families with lower incomes were less likely to fill prescriptions for and have regular access to epinephrine autoinjectors, and children from upper-middle or high income groups were 8.35 times more likely to be prescribed autoinjectors.²²

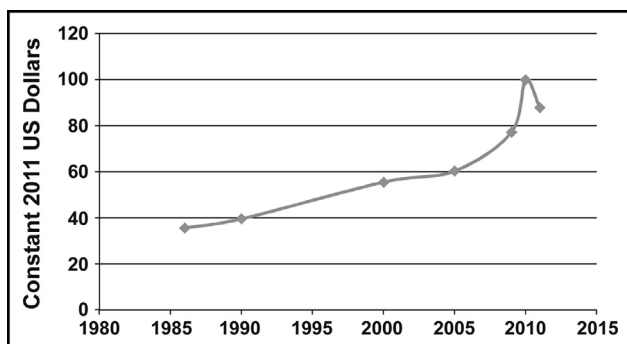


Figure 1 Average wholesale price of epinephrine autoinjectors over time (in 2011 US dollars). Data on the cost of single-use equivalent products were obtained from every available manufacturer in the Micromedex Red Book and converted into constant 2011 US dollars. (Adapted with permission from *J Allergy Clin Immunol* © 2006 Elsevier.¹²)

Among children with food allergy in the public health system in Ontario, Canada, which does not subsidize epinephrine autoinjectors, children attending schools with >20% low-income households were less likely to have medication at school than those in areas with <20% (7.5% vs 16.3%; relative risk 2.2; 95% confidence interval, 1.1-4.4), although rates were low in either category.²³

Addressing Key Issues

Medication cost, appropriate use, tier level, and access to medication are all key issues that need to be considered, along with the establishment of consistent, standardized processes for responding to anaphylaxis. A clear understanding of these issues should lead to improvements in the uniform and suitable management of anaphylaxis, including proper use of epinephrine autoinjectors and ready access to the optimal number of devices for a given event.

In determining cost, the value received from medication expenditures needs to be clear, and the cost savings of successful anaphylaxis interventions should be compared with the higher cost of inappropriate interventions, including both hospital expenditures and indirect costs due to morbidity or mortality. Increased pharmacy costs need to be weighed against cost savings as outcomes improve from better treatment of anaphylaxis at the moment of need. For example, managed care organizations should consider providing multiple dual-packs of epinephrine autoinjectors at price levels that make them easier to obtain. Multiple dual-packs could be particularly helpful for patients whose exposure to allergens is not easily controlled, such as those who suffer from seasonally triggered events and younger children who may have more difficulty avoiding allergy triggers.

Effective use of epinephrine autoinjectors is another key component of successful anaphylaxis treatment. This requires communication with patients, as well as educational programs that teach and reinforce proper use. Prescribers, nurses, pharmacists, and case managers all have important roles to play in educating patients. They need to work together to ensure patients have a solid understanding of correct device usage and allergy triggers. Health care professionals must provide a clear rationale for ready access to epinephrine autoinjectors and should be aware of any patient-specific issues that might impede this access, such as socioeconomic factors and age. In addition, patients need to be taught to regularly check the expiration date of their medication.

Managed care organizations play a critical role in epinephrine autoinjector management by assigning tier levels to different medications. More attractive copays are often provided for generic products, although, in the case of epinephrine autoinjectors, the available generic is not therapeutically equivalent to all branded epinephrine autoinjectors.¹⁷ This should be considered both when a health care professional prescribes medication and also when a tier level is established, because a higher copay may prevent some patients from obtaining the most appropriate

medication for their condition or from obtaining any medication at all. The financial barrier to access needs to be weighed against the resultant cost of ED visits, hospitalization, and other direct costs or indirect costs incurred from untreated or undertreated anaphylactic events.

Managed care organizations also can play an active role in educating health care providers and plan members about specific medications and treatment options, and they can sponsor educational events or newsletters that counsel patients on how to identify allergy triggers and avoid them. Identifying higher-risk patients, such as those who frequently visit the ED, and referring them to specialty care services could benefit the patient and help control managed care costs.

Lastly, pharmaceutical companies that manufacture anaphylaxis medications need to demonstrate to managed care organizations the value, particularly in overall cost savings, that their products can bring. In turn, these groups might allow greater dispensing (quantities) of epinephrine autoinjectors, or place more products on a lower copay tier, if there was shared risk with the pharmaceutical industry.

CONCLUSIONS

More accurate diagnosis, coding, and treatment of anaphylaxis are likely to have a positive impact on understanding and addressing the overall costs associated with anaphylaxis. This includes savings in both direct costs, such as ED and outpatient physician office visits, and indirect costs, such as lost productivity of patients and caregivers. Educating medical personnel on domestic and international treatment guidelines regarding the appropriate use of epinephrine in response to anaphylactic events may contribute to cost savings. The cost of epinephrine autoinjectors has been increasing, but evidence indicates that the cost of improper response to and treatment of anaphylaxis outweighs that increase. Barriers to coverage and access, such as tier classification by managed care organizations and the socioeconomic status of certain patient groups, need to be examined more closely and addressed. For example, providing more favorable copays for multiple dual-pack purchases of epinephrine autoinjectors could ease the burden on patients with limited financial resources and allow for better adherence during moment-of-need anaphylactic events, resulting in a net cost savings to the health care system. In addition, readily available and specific education on the correct use of autoinjectors, including regular checking of medication expiration dates, is critical for proper management of anaphylaxis. All of the stakeholders, including health care professionals, patients, caregivers, and pharmaceutical manufacturers, need to work together to improve education concerning anaphylaxis and its appropriate treatment.

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References

1. Gaeta TJ, Clark S, Pelletier AJ, Camargo CA. National study of US emergency department visits for acute allergic reactions, 1993 to 2004. *Ann Allergy Asthma Immunol*. 2007;98:360-365.
2. Krugman SD, Chiaramonte DR, Matsui EC. Diagnosis and management of food-induced anaphylaxis: a national survey of pediatricians. *Pediatrics*. 2006;118:e554-e560.
3. Boyce JA, Assa'ad A, Burks AW, et al. Guidelines for the diagnosis and management of food allergy in the United States: report of the NIAID-sponsored expert panel. *J Allergy Clin Immunol*. 2010;126(6 Suppl):S1-S58.
4. Simons FE, Arduzzo LR, Bilo MB, et al. 2012 Update: World Allergy Organization Guidelines for the assessment and management of anaphylaxis. *Curr Opin Allergy Clin Immunol*. 2012;12:389-399.
5. Simons FE. World Allergy Organization survey on global availability of essentials for the assessment and management of anaphylaxis by allergy-immunology specialists in health care settings. *Ann Allergy Asthma Immunol*. 2010;104:405-412.
6. Patel DA, Holdford DA, Edwards E, Carroll NV. Estimating the economic burden of food-induced allergic reactions and anaphylaxis in the United States. *J Allergy Clin Immunol*. 2011;128:110-115.
7. Sclar DA, Cohen LJ, Robison LM. Economic burden of anaphylaxis in the United States [abstract]. *Allergy Asthma Proc*. 2012;33:374.
8. *EpiPen® (epinephrine) auto-injector 0.3 mg and EpiPen® Jr (epinephrine) auto-injector 0.15 mg [prescribing information]*. Basking Ridge, NJ: Mylan Specialty L.P.; 2012.
9. *Auvi-Q™ (epinephrine injection, USP) 0.3 mg, 0.15 mg Auto-Injector [prescribing information]*. Bridgewater, NJ: sanofi-aventis U.S. LLC; 2012.
10. *Adrenaclick® (epinephrine injection, USP) auto-injector [prescribing information]*. Horsham, PA: Amedra Pharmaceuticals LLC; 2013.
11. *Epinephrine injection, USP auto-injector [prescribing information]*. Horsham, PA: Lineage Therapeutics; 2013.
12. Westermann-Clark E, Fitzhugh DJ, Lockey RF. Increasing cost of epinephrine autoinjectors. *J Allergy Clin Immunol*. 2012;130:822-823.
13. UnitedHealthOne. Copay SelectSM: plan benefits chart. Available at: <http://www.goldenrule.com/health-insurance/copay-select/>. Accessed October 24, 2012.
14. Anthem BlueCross BlueShield. Individual and family health care plans for Missouri. Available at: <http://docs.anthem.com/wellpoint/docs/viewDocument?mcItemNbr=MOBR80011XPR>. Accessed October 24, 2012.
15. Humana. Humana prescription coverage: EpiPen. Available at: <http://apps.humana.com/UnsecuredDrugListSearch/Search.aspx>. Accessed October 24, 2012.
16. Humana. Plan details for Humana Walmart-Preferred Rx Plan PDP. Available at: <https://www.humana-medicare.com/PlansNew/compare/details.aspx>. Accessed October 24, 2012.
17. Tuck J. Generic epinephrine injector may cause confusion. Available at: <http://www.acaai.org/allergist/Resources/letters/Pages/letterstowebeditor-6.aspx>. Accessed December 12, 2012.
18. Campbell RL, Manivannan V, Hartz MF, Sadosty AT. Epinephrine auto-injector pandemic. *Pediatr Emerg Care*. 2012;28:938-942.
19. Gregory NL. The case for stock epinephrine in schools. *NASN Sch Nurse*. 2012;27:222-225.
20. Sicherer SH, Forman JA, Noone SA. Use assessment of self-administered epinephrine among food-allergic children and pediatricians. *Pediatrics*. 2000;105:359-362.
21. Fischer J, Knaudt B, Caroli UM, Biedermann T. Factory packed and expired - about emergency insect sting kits. *J Dtsch Dermatol Ges*. 2008;6:729-733.
22. Coombs R, Simons E, Foty RG, Stieb DM, Dell SD. Socioeconomic factors and epinephrine prescription in children with peanut allergy. *Paediatr Child Health*. 2011;16:341-344.
23. Frost DW, Chalin CG. The effect of income on anaphylaxis preparation and management plans in Toronto primary schools. *Can J Public Health*. 2005;96:250-253.