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Data obtained through Sentinel are intended to complement other types of evidence such as preclinical studies, clinical trials, postmarket studies, and adverse event reports, all of which are used by FDA to inform regulatory decisions regarding medical product safety. The information contained in this report is provided as part of FDA's commitment to place knowledge acquired from Sentinel in the public domain as soon as possible. Any public health actions taken by FDA regarding products involved in Sentinel queries will continue to be communicated through existing channels.

FDA wants to emphasize that the fact that FDA has initiated a query involving a medical product and is reporting findings related to that query does not mean that FDA is suggesting health care practitioners should change their prescribing practices for the medical product or that patients taking the medical product should stop using it. Patients who have questions about the use of an identified medical product should contact their health care practitioners.

The following report contains a description of the request, request specifications, and results from the modular program run(s).

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Overview

Date Run: June 5, 2017

Request Description: The purpose of this report was to compare the frequency of diagnoses for anaphylaxis using International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) versus International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) diagnosis codes. Anaphylaxis was defined using a complex algorithm that included combinations of ICD diagnosis codes with Healthcare Common Procedure Coding System (HCPCS) and Current Procedural Terminology, Fourth Edition (CPT-4) procedure codes. ICD-10-CM code definitions were determined by mapping from ICD-9-CM code definitions using the Centers for Medicare and Medicaid Services (CMS) General Equivalence Mappings (GEMs). Forward-backward mapping (FBM) was used to map ICD-9-CM to ICD-10-CM codes.¹

Sentinel Routine Querying Module: Cohort Identification and Descriptive Analysis (CIDA) module, version 3.3.6

Data Source: This request was run against the IBM® MarketScan® Commercial Claims and Encounters Database and Medicare Supplemental Database, which included 121 million members. Data from October 1, 2010 to March 31, 2016 were included in this report. The report includes three separate time periods: 1) October 1, 2010 to March 31, 2016; 2) January 1, 2015 to March 31, 2015; and 3) January 1, 2016 to March 31, 2016. See Appendix A for the dates of available data used in this report.

Study Design: We examined the incidence of anaphylaxis across the ICD-9-CM era (October 2010 - September 2015) and ICD-10-CM era (October 2015 - June 2016), and additionally from January 2015 to March 2015, and from January 2016 to March 2016 in the United States. See Appendices B and C for specific codes used to define anaphylaxis in this request.

Cohort Eligibility Criteria: Members included in the cohort were required to be continuously enrolled in health plans with medical coverage for at least six months (183 days) before their diagnosis date, during which gaps in coverage of up to 45 days were allowed. Incident anaphylactic events were defined as no previous anaphylaxis diagnosis in the 183 days preceding the index date with respect to ICD-9-CM and ICD-10-CM codes. The following age groups were included in the cohort: 2-17, 18-44, 45-64, and 65+ years.

Please see Appendix D for detailed specifications of parameters used in the analyses for this request.

Limitations: Algorithms used to define outcomes are imperfect; thus, it is possible that there may be misclassification. Therefore, data should be interpreted with this limitation in mind. The MarketScan claims databases are based on a large convenience sample. Because the sample is not random, it may contain biases or fail to generalize well to other populations. Data come mostly from large employers; medium and small firms may be underrepresented.²

Notes: Please contact the Sentinel Operations Center (info@sentinelssystem.org) for questions and to provide comments/suggestions for future enhancements to this document.

¹Fung, K. W., et al. (2016). "Preparing for the ICD-10-CM Transition: Automated Methods for Translating ICD Codes in Clinical Phenotype Definitions." EGEMS (Wash DC) 4(1): 1211.

²IBM Watson Health (2018). [online] [ibm.com](https://www.ibm.com/downloads/cas/OWZWJ0QO). Available at: <https://www.ibm.com/downloads/cas/OWZWJ0QO> [Accessed 01 Mar. 2019].

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**Glossary of Terms for Analyses Using
Cohort Identification and Descriptive Analysis (CIDA) Tool***

Amount Supplied - number of units (pills, tablets, vials) dispensed. Net amount per NDC per dispensing.

Blackout Period - number of days at the beginning of a treatment episode that events are to be ignored. If an event occurs during the blackout period, the episode is excluded.

Care Setting - type of medical encounter or facility where the exposure, event, or condition code was recorded. Possible care settings include: Inpatient Hospital Stay (IP), Non-Acute Institutional Stay (IS), Emergency Department (ED), Ambulatory Visit (AV), and Other Ambulatory Visit (OA). For laboratory results, possible care settings include: Emergency Department (E), Home (H), Inpatient (I), Outpatient (O), or Unknown or Missing (U). The Care Setting, along with the Principal Diagnosis Indicator, forms the Care Setting/PDX parameter.

Ambulatory Visit (AV) - includes visits at outpatient clinics, same-day surgeries, urgent care visits, and other same-day ambulatory hospital encounters, but excludes emergency department encounters.

Emergency Department (ED) - includes ED encounters that become inpatient stays (in which case inpatient stays would be a separate encounter). Excludes urgent care visits.

Inpatient Hospital Stay (IP) - includes all inpatient stays, same-day hospital discharges, hospital transfers, and acute hospital care where the discharge is after the admission date.

Non-Acute Institutional Stay (IS) - includes hospice, skilled nursing facility (SNF), rehab center, nursing home, residential, overnight non-hospital dialysis and other non-hospital stays.

Other Ambulatory Visit (OA) - includes other non overnight AV encounters such as hospice visits, home health visits, skilled nursing facility visits, other non-hospital visits, as well as telemedicine, telephone and email consultations.

Cohort Definition (drug/exposure) - indicates how the cohort will be defined: 01: Cohort includes only the first valid treatment episode during the query period; 02: Cohort includes all valid treatment episodes during the query period; 03: Cohort includes all valid treatment episodes during the query period until an event occurs.

Days Supplied - number of days supplied for all dispensings in qualifying treatment episodes.

Eligible Members - number of members eligible for an incident treatment episode (defined by the drug/exposure and event washout periods) with drug and medical coverage during the query period.

Enrollment Gap - number of days allowed between two consecutive enrollment periods without breaking a "continuously enrolled" sequence.

Episodes - treatment episodes; length of episode is determined by days supplied in one dispensing or consecutive dispensings bridged by the episode gap.

Episode Gap - number of days allowed between two (or more) consecutive exposures (dispensings/procedures) to be considered the same treatment episode.

Event Deduplication - specifies how events are counted by the MP algorithm: 0: Counts all occurrences of an HOI during an exposure episode; 1: de-duplicates occurrences of the same HOI code and code type on the same day; 2: de-duplicates occurrences of the same HOI group on the same day (e.g., de-duplicates at the group level).

Exposure Episode Length - number of days after exposure initiation that is considered "exposed time."

Exposure Extension Period - number of days post treatment period in which the outcomes/events are counted for a treatment episode. Extensions days are added after any episode gaps have been bridged

Lookback Period - number of days wherein a member is required to have evidence of pre-existing condition (diagnosis/procedure/drug dispensing).

Maximum Episode Duration - truncates exposure episodes after a requester-specified number of exposed days. Applied after any gaps are bridged and extension days added to the length of the exposure episode.

Member-Years - sum of all days of enrollment with medical and drug coverage in the query period preceded by an exposure washout period all divided by 365.25.

Minimum Days Supplied - specifies a minimum number of days in length of the days supplied for the episode to be considered.

Minimum Episode Duration - specifies a minimum number of days in length of the episode for it to be considered. Applied after any gaps are bridged and extension days added to the length of the exposure episode.

Monitoring Period - used to define time periods of interest for both sequential analysis and simple cohort characterization requests.

Principal Diagnosis (PDX) - diagnosis or condition established to be chiefly responsible for admission of the patient to the hospital. 'P' = principal diagnosis, 'S' = secondary diagnosis, 'X' = unspecified diagnosis, '.' = blank. Along with the Care Setting values, forms the Caresetting/PDX parameter.

Query Period - period in which the modular program looks for exposures and outcomes of interest.

Treatment Episode Truncation Indicator - indicates whether the exposure episode will be truncated at the occurrence of a requester-specified code.

Washout Period (drug/exposure) - number of days a user is required to have no evidence of prior exposure (drug dispensing/procedure) and continuous drug and medical coverage prior to an incident treatment episode.

Washout Period (event/outcome) - number of days a user is required to have no evidence of a prior event (procedure/diagnosis) and continuous drug and medical coverage prior to an incident treatment episode.

Years at Risk - number of days supplied plus any episode gaps and exposure extension periods all divided by 365.25.

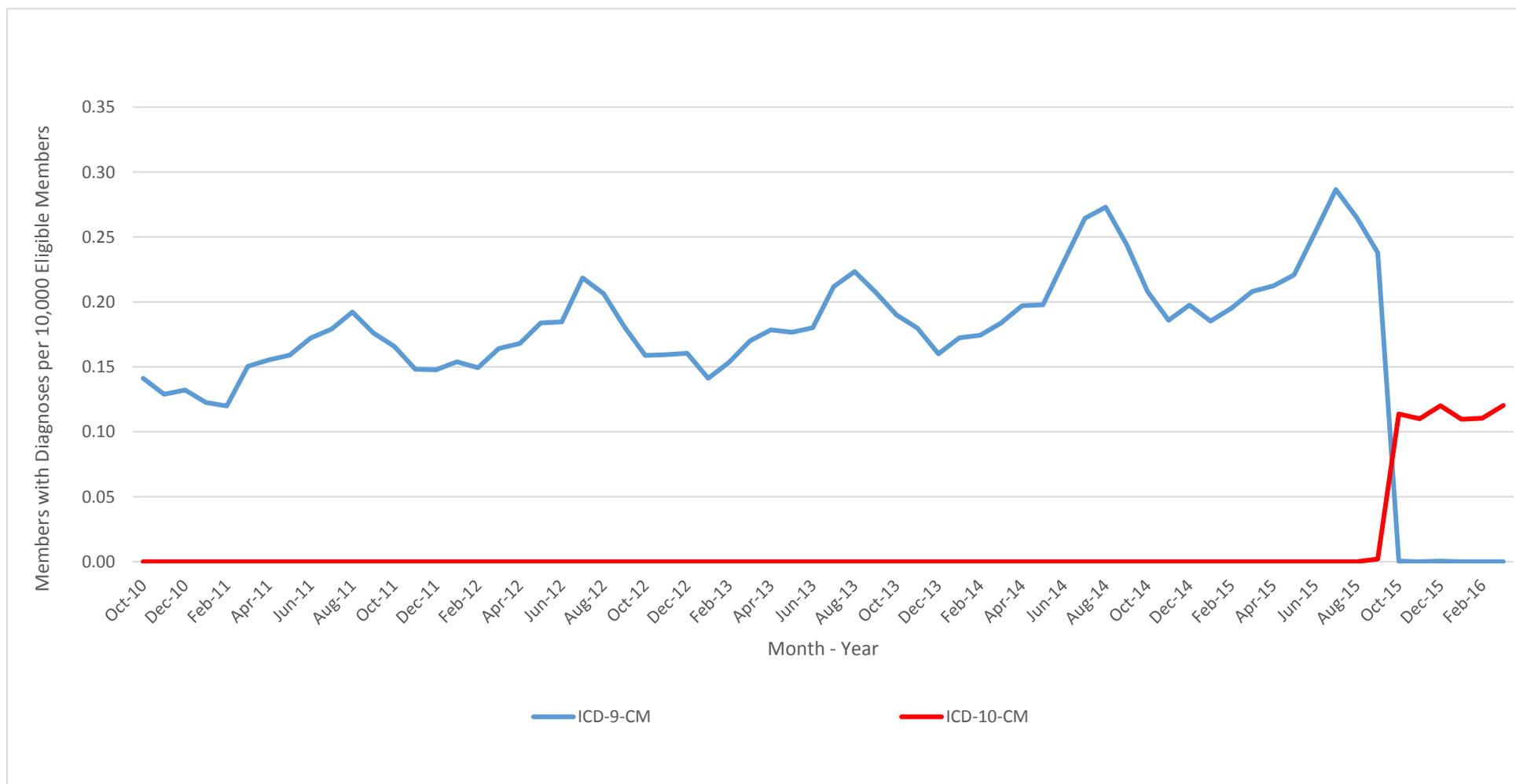
*all terms may not be used in this report

Table 1. Comparison of Incident* Anaphylaxis Diagnoses in the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) and International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) Eras (January 1, 2015 - March 31, 2015 and January 1, 2016 - March 31, 2016)

	Members with Diagnosis	Eligible Members	Members with Diagnosis per 10,000 Eligible Members
Anaphylaxis			
ICD-9-CM: January 1, 2015 - March 31, 2015			
	1,322	22,223,604	0.59
ICD-10-CM: January 1, 2016 - March 31, 2016			
	770	22,698,430	0.34

*Incidence defined by a 90 day washout

Figure 1. Incidence of Anaphylaxis Diagnoses per 10,000 Eligible Members from October 2010 - March 2016 by Code Type, 183-Day Washout



Appendix A. Dates Available for IBM® MarketScan® Commercial and Medicare Supplemental Databases

Databases	Start Date	End Date
IBM MarketScan Commercial and Medicare Supplemental Databases ¹	1/1/2010	3/31/2016

¹ The IBM MarketScan Databases includes a sample of 121 million employees, dependents, and retirees in the United States with primary or Medicare supplemental coverage through privately insured fee-for-service, point-of-service, or capitated health plans. The IBM MarketScan claims databases are based on a large convenience sample. Because the sample is not random, it may contain biases or fail to generalize well to other populations. Data come mostly from large employers; medium and small firms may be underrepresented. For more information on the IBM MarketScan Databases, please review the White Paper here: <https://www.ibm.com/downloads/cas/OWZWJ0QO>

Appendix B. List of International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM), International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM), Healthcare Common Procedure Coding System (HCPCS), and Current Procedural Terminology, Fourth Edition (CPT-4) Codes Used to Define Anaphylaxis

Code	Description	Code Type	Code Category
ICD-9-CM			
995.0	Other anaphylactic reaction	ICD-9-CM	Diagnosis
999.4	Anaphylactic reaction due to serum	ICD-9-CM	Diagnosis
519.11	Acute bronchospasm	ICD-9-CM	Diagnosis
786.1	Stridor	ICD-9-CM	Diagnosis
458.9	Unspecified hypotension	ICD-9-CM	Diagnosis
99.60	Cardiopulmonary resuscitation, not otherwise specified	ICD-9-CM	Procedure
995.3	Allergy, unspecified not elsewhere classified	ICD-9-CM	Diagnosis
995.2	Other and unspecified adverse effect of drug, medicinal and biological substance	ICD-9-CM	Diagnosis
E930	Antibiotics causing adverse effects in therapeutic use	ICD-9-CM	Diagnosis
E930.0	Penicillins causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E930.1	Antifungal antibiotics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E930.2	Chloramphenicol group causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E930.3	Erythromycin and other macrolides causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E930.4	Tetracycline group causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E930.5	Cephalosporin group causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E930.6	Antimycobacterial antibiotics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E930.7	Antineoplastic antibiotics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E930.8	Other specified antibiotics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E930.9	Unspecified antibiotic causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E931	Other anti-infectives causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E931.0	Sulfonamides causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E931.1	Arsenical anti-infectives causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E931.2	Heavy metal anti-infectives causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E931.3	Quinoline and hydroxyquinoline derivatives causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E931.4	Antimalarials and drugs acting on other blood protozoa causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E931.5	Other antiprotozoal drugs causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E931.6	Anthelmintics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E931.7	Antiviral drugs causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E931.8	Other antimycobacterial drugs causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E931.9	Other and unspecified anti-infectives causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E932	Hormones and synthetic substitutes causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E932.0	Adrenal cortical steroids causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E932.1	Androgens and anabolic congeners causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E932.2	Ovarian hormones and synthetic substitutes causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E932.3	Insulins and antidiabetic agents causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E932.4	Anterior pituitary hormones causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E932.5	Posterior pituitary hormones causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E932.6	Parathyroid and parathyroid derivatives causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E932.7	Thyroid and thyroid derivatives causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E932.8	Antithyroid agents causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis

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Code	Description	Code Type	Code Category
E932.9	Other and unspecified hormones and synthetic substitutes causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E933	Primarily systemic agents causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E933.0	Antiallergic and antiemetic drugs causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E933.1	Antineoplastic and immunosuppressive drugs causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E933.2	Acidifying agents causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E933.3	Alkalizing agents causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E933.4	Enzymes, not elsewhere classified, causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E933.5	Vitamins, not elsewhere classified, causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E933.6	Drugs, Medicinal & Biological Substances Causing Adverse Effects in Therapeutic Use, Oral bisphosphonates	ICD-9-CM	Diagnosis
E933.7	Drugs, Medicinal & Biological Substances Causing Adverse Effects in Therapeutic Use, Intravenous bisphosphonates	ICD-9-CM	Diagnosis
E933.8	Other systemic agents, not elsewhere classified, causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E933.9	Unspecified systemic agent causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E934	Agents primarily affecting blood constituents causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E934.0	Iron and its compounds causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E934.1	Liver preparations and other antianemic agents causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E934.2	Anticoagulants causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E934.3	Vitamin K (phytonadione) causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E934.4	Fibrinolysis-affecting drugs causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E934.5	Anticoagulant antagonists and other coagulants causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E934.6	Gamma globulin causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E934.7	Natural blood and blood products causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E934.8	Other agents affecting blood constituents causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E934.9	Unspecified agent affecting blood constituents causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E935	Analgesics, antipyretics, and antirheumatics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E935.0	Heroin causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E935.1	Methadone causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E935.2	Other opiates and related narcotics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E935.3	Salicylates causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E935.4	Aromatic analgesics, not elsewhere classified, causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E935.5	Pyrazole derivatives causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E935.6	Antirheumatics (antiphlogistics) causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E935.7	Other non-narcotic analgesics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E935.8	Other specified analgesics and antipyretics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis

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Code	Description	Code Type	Code Category
E935.9	Unspecified analgesic and antipyretic causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E936	Anticonvulsants and anti-Parkinsonism drugs causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E936.0	Oxazolidine derivatives causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E936.1	Hydantoin derivatives causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E936.2	Succinimides causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E936.3	Other and unspecified anticonvulsants causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E936.4	Anti-parkinsonism drugs causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E937	Sedatives and hypnotics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E937.0	Barbiturates causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E937.1	Chloral hydrate group causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E937.2	Paraldehyde causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E937.3	Bromine compounds causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E937.4	Methaqualone compounds causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E937.5	Glutethimide group causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E937.6	Mixed sedatives, not elsewhere classified, causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E937.8	Other sedatives and hypnotics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E937.9	Unspecified sedatives and hypnotics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E938	Other central nervous system depressants and anesthetics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E938.0	Central nervous system muscle-tone depressants causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E938.1	Halothane causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E938.2	Other gaseous anesthetics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E938.3	Intravenous anesthetics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E938.4	Other and unspecified general anesthetics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E938.5	Surface and infiltration anesthetics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E938.6	Peripheral nerve- and plexus-blocking anesthetics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E938.7	Spinal anesthetics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E938.9	Other and unspecified local anesthetics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E939	Psychotropic agents causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E939.0	Antidepressants causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E939.1	Phenothiazine-based tranquilizers causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E939.2	Butyrophenone-based tranquilizers causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E939.3	Other antipsychotics, neuroleptics, and major tranquilizers causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E939.4	Benzodiazepine-based tranquilizers causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E939.5	Other tranquilizers causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E939.6	Psychodysleptics (hallucinogens) causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E939.7	Psychostimulants causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E939.8	Other psychotropic agents causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E939.9	Unspecified psychotropic agent causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E940	Central nervous system stimulants causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis

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Code	Description	Code Type	Code Category
E940.0	Analeptics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E940.1	Opiate antagonists causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E940.8	Other specified central nervous system stimulants causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E940.9	Unspecified central nervous system stimulant causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E941	Drugs primarily affecting the autonomic nervous system causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E941.0	Parasympathomimetics (cholinergics) causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E941.1	Parasympatholytics (anticholinergics and antimuscarinics) and spasmolytics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E941.2	Sympathomimetics (adrenergics) causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E941.3	Sympatholytics (antiadrenergics) causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E941.9	Unspecified drug primarily affecting the autonomic nervous system causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E942	Agents primarily affecting the cardiovascular system causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E942.0	Cardiac rhythm regulators causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E942.1	Cardiotonic glycosides and drugs of similar action causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E942.2	Antilipemic and antiarteriosclerotic drugs causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E942.3	Ganglion-blocking agents causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E942.4	Coronary vasodilators causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E942.5	Other vasodilators causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E942.6	Other antihypertensive agents causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E942.7	Antivaricose drugs, including sclerosing agents, causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E942.8	Capillary-active drugs causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E942.9	Other and unspecified agents primarily affecting the cardiovascular system causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E943	Agents primarily affecting gastrointestinal system causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E943.0	Antacids and antigastric secretion drugs causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E943.1	Irritant cathartics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E943.2	Emollient cathartics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E943.3	Other cathartics, including intestinal atonia drugs, causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E943.4	Digestants causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E943.5	Antidiarrheal drugs causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E943.6	Emetics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E943.8	Other specified agents primarily affecting the gastrointestinal system causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E943.9	Unspecified agent primarily affecting the gastrointestinal system causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E944	Water, mineral, and uric acid metabolism drugs causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis

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Code	Description	Code Type	Code Category
E944.0	Mercurial diuretics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E944.1	Purine derivative diuretics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E944.2	Carbonic acid anhydrase inhibitors causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E944.3	Saluretics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E944.4	Other diuretics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E944.5	Electrolytic, caloric, and water-balance agents causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E944.6	Other mineral salts, not elsewhere classified, causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E944.7	Uric acid metabolism drugs causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E945	Agents primarily acting on the smooth and skeletal muscles and respiratory system causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E945.0	Oxytocic agents causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E945.1	Smooth muscle relaxants causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E945.2	Skeletal muscle relaxants causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E945.3	Other and unspecified drugs acting on muscles causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E945.4	Antitussives causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E945.5	Expectorants causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E945.6	Anti-common cold drugs causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E945.7	Antiasthmatics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E945.8	Other and unspecified respiratory drugs causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E946	Agents primarily affecting skin and mucous membrane, ophthalmological, otorhinolaryngological, and dental drugs causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E946.0	Local anti-infectives and anti-inflammatory drugs causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E946.1	Antipruritics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E946.2	Local astringents and local detergents causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E946.3	Emollients, demulcents, and protectants causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E946.4	Keratolytics, keratoplastics, other hair treatment drugs and preparations causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E946.5	Eye anti-infectives and other eye drugs causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E946.6	Anti-infectives and other drugs and preparations for ear, nose, and throat causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E946.7	Dental drugs topically applied causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E946.8	Other agents primarily affecting skin and mucous membrane causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E946.9	Unspecified agent primarily affecting skin and mucous membrane causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E947	Other and unspecified drugs and medicinal substances causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E947.0	Dietetics causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E947.1	Lipotropic drugs causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E947.2	Antidotes and chelating agents, not elsewhere classified, causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis

Appendix B. List of International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM), International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM), Healthcare Common Procedure Coding System (HCPCS), and Current Procedural Terminology, Fourth Edition (CPT-4) Codes Used to Define Anaphylaxis

Code	Description	Code Type	Code Category
E947.3	Alcohol deterrents causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E947.4	Pharmaceutical excipients causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E947.8	Other drugs and medicinal substances causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E947.9	Unspecified drug or medicinal substance causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E948	Bacterial vaccines causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E948.0	BCG vaccine causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E948.1	Typhoid and paratyphoid vaccines causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E948.2	Cholera vaccine causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E948.3	Plague vaccine causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E948.4	Tetanus vaccine causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E948.5	Diphtheria vaccine causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E948.6	Pertussis vaccine, including combinations with pertussis component, causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E948.8	Other and unspecified bacterial vaccines causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E948.9	Mixed bacterial vaccines, except combinations with pertussis component, causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E949	Other vaccines and biological substances causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E949.0	Smallpox vaccine causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E949.1	Rabies vaccine causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E949.2	Typhus vaccine causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E949.3	Yellow fever vaccine causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E949.4	Measles vaccine causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E949.5	Poliomyelitis vaccine causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E949.6	Other and unspecified viral and rickettsial vaccines causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E949.7	Mixed viral-rickettsial and bacterial vaccines, except combinations with pertussis component, causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
E949.9	Other and unspecified vaccines and biological substances causing adverse effect in therapeutic use	ICD-9-CM	Diagnosis
ICD-10-CM			
T78.2XXA	Anaphylactic shock, unspecified, initial encounter	ICD-10-CM	Diagnosis
T80.51XA	Anaphylactic reaction due to administration of blood and blood products, initial encounter	ICD-10-CM	Diagnosis
T80.52XA	Anaphylactic reaction due to vaccination, initial encounter	ICD-10-CM	Diagnosis
T80.59XA	Anaphylactic reaction due to other serum, initial encounter	ICD-10-CM	Diagnosis
T88.6XXA	Anaphylactic reaction due to adverse effect of correct drug or medicament properly administered, initial encounter	ICD-10-CM	Diagnosis
HCPCS			
J0170	Injection, adrenalin, epinephrine, up to 1 ml ampule	HCPCS	Procedure
J0171	Injection, Adrenalin, epinephrine, 0.1 mg	HCPCS	Procedure
J1200	Injection, diphenhydramine HCl, up to 50 mg	HCPCS	Procedure
CPT-4			
92950	Cardiopulmonary resuscitation (eg, in cardiac arrest)	CPT-4	Procedure

Appendix C. Algorithm Used to Define Anaphylaxis

Criterion A: (995.0 [other anaphylactic shock] or 999.4 [anaphylactic shock due to serum])
inpatient or emergency department encounter

OR

Criterion B: (995.0 [other anaphylactic shock] or 999.4 [anaphylactic shock due to serum])
outpatient encounter **PLUS** a code for one of the following symptoms/procedures/treatments:

- i. bronchospasm (519.11) or
- ii. stridor (786.1) or
- iii. hypotension (458.9) or
- iv. epinephrine (J0170 or J0171) OR
- v. injection of diphenhydramine (J1200) or
- vi. CPR (92950 or 99.60)

OR

Criterion C: (995.3 [allergy unspecified] or 995.2 [other unspecified adverse effect of drug] or E930-E949 [drugs, medicinal and biological substances causing adverse effects in therapeutic use]) inpatient or emergency department encounter

- i. **PLUS** a code for one of the following symptoms/procedures/treatments:
 1. bronchospasm (519.11) or
 2. stridor (786.1) or
 3. injection of diphenhydramine (J1200)
- ii. **and ALSO** a code for one of the following symptoms/procedures/treatments:
 1. hypotension (458.9) or
 2. epinephrine (J0170 or J0171) or
 3. CPR (92950 or 99.60)

For inpatient and ED codes: All patients who met inclusion criteria were sampled.

For outpatient encounters: All patients who met inclusion criteria, excluding patients with an encounter in the prior 30 days that documented an anaphylaxis code (995.0 or 999.4) were sampled.

Appendix D. Specifications for Parameters for this Request

Sentinel's Cohort Identification and Descriptive Analysis (CIDA) module version 3.3.6 was used to compare the frequency of diagnoses for anaphylaxis using International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) and International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) codes.

Enrollment Gap: 45 days
Age Groups: 2-17, 18-44, 45-64, 65+ years
Enrollment Requirement: 183 days
Coverage Requirement: Medical coverage

Event

Scenario	Query Start Date	Query End Date	Event	Event Code Type	Incident with Respect To:	Washout (days)	Cohort Definition	Care Setting
1	1/1/2015	3/31/2015	Anaphylaxis	ICD-9-CM	ICD-9-CM algorithm	90	First valid event only	See Appendix C
2	1/1/2016	3/31/2016	Anaphylaxis	ICD-10-CM	ICD-10-CM algorithm	90	First valid event only	Emergency Department or Inpatient Hospital Stay Principal Diagnosis
3	10/1/2010	3/31/2016	Anaphylaxis	ICD-9-CM	ICD-9-CM algorithm or ICD-10-CM algorithm	183	First valid event only	See Appendix C
4	10/1/2010	3/31/2016	Anaphylaxis	ICD-10-CM	ICD-9-CM algorithm or ICD-10-CM algorithm	183	First valid event only	Emergency Department or Inpatient Hospital Stay Principal Diagnosis

ICD-9-CM and ICD-10-CM are provided by Optum360. ICD-10-CM codes were mapped from ICD-9-CM codes using the Centers for Medicare and Medicaid Services General Equivalence Mappings.