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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: October 19, 2017

Request Description: The purpose of this report was to compare the frequency of diagnoses for glaucoma 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. 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 Modular Program Tool Used: Cohort Identification and Descriptive Analysis (CIDA) tool, version 5.0.4

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 September 30, 2016 were included in this report. The report includes three separate time periods: 1) October 1, 2010 to September 30, 2016, 2) April 1, 2015 to September 30, 2015, and 3) April 1, 2016 to September 30, 2016. See Appendix A for the dates of available data used in this report.

Study Design: We examined the incidence and prevalence of glaucoma across the ICD-9-CM era (October 2010 to September 2015) and ICD-10-CM era (October 2015 to September 2016) in the US. Incidence was additionally evaluated from April 2015 to September 2015 and April 2016 to September 2016. See Appendix B for specific codes used to define glaucoma in this request.

Cohort Eligibility Criteria: Members included in the cohorts were required to be enrolled in health plans with medical and drug coverage. The following age groups were included in the cohorts: 0-18, 19-24, 25-64, and 65+ years

Incident Cohorts: Members included in the incident cohorts were required to be continuously enrolled in health plans with medical and drug coverage for at least 183 days prior to glaucoma diagnosis, during which gaps in coverage of up to 45 days were allowed. Incident glaucoma was defined as no previous glaucoma diagnosis in the 183 days preceding the index date with respect to ICD-9-CM and ICD-10-CM codes.

Prevalent Cohorts: There was no enrollment time requirement for members in the prevalent cohorts. All qualifying diagnosis codes that occurred between October 1, 2010 and September 30, 2016 were included.

Please see Appendix C 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 Query Fulfillment Team (qf@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. 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). 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: (1): Cohort includes only the first valid treatment episode during the query period; (2): Cohort includes all valid treatment episodes during the query period; (3): 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* Glaucoma 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 (April 1, 2015 - September 30, 2015 and April 1, 2016 - September 30, 2016)

	Members with Diagnosis	Eligible Members	Members with Diagnosis per 1,000 Eligible Members
Glaucoma			
ICD-9-CM: April 1, 2015 - September 30, 2015	272,682	23,747,742	11.48
ICD-10-CM: April 1, 2016 - September 30, 2016	242,977	23,613,398	10.29

* Incidence defined by 183 day washout

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

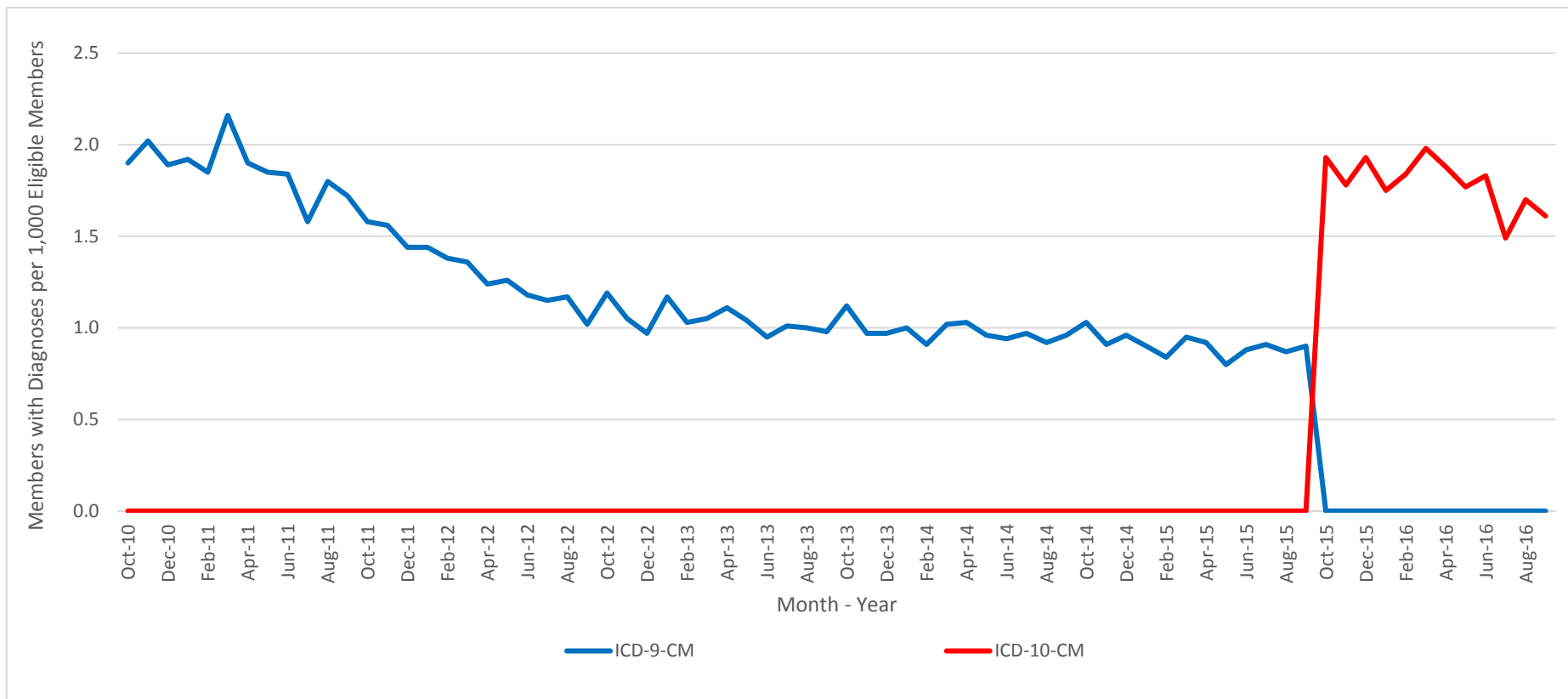
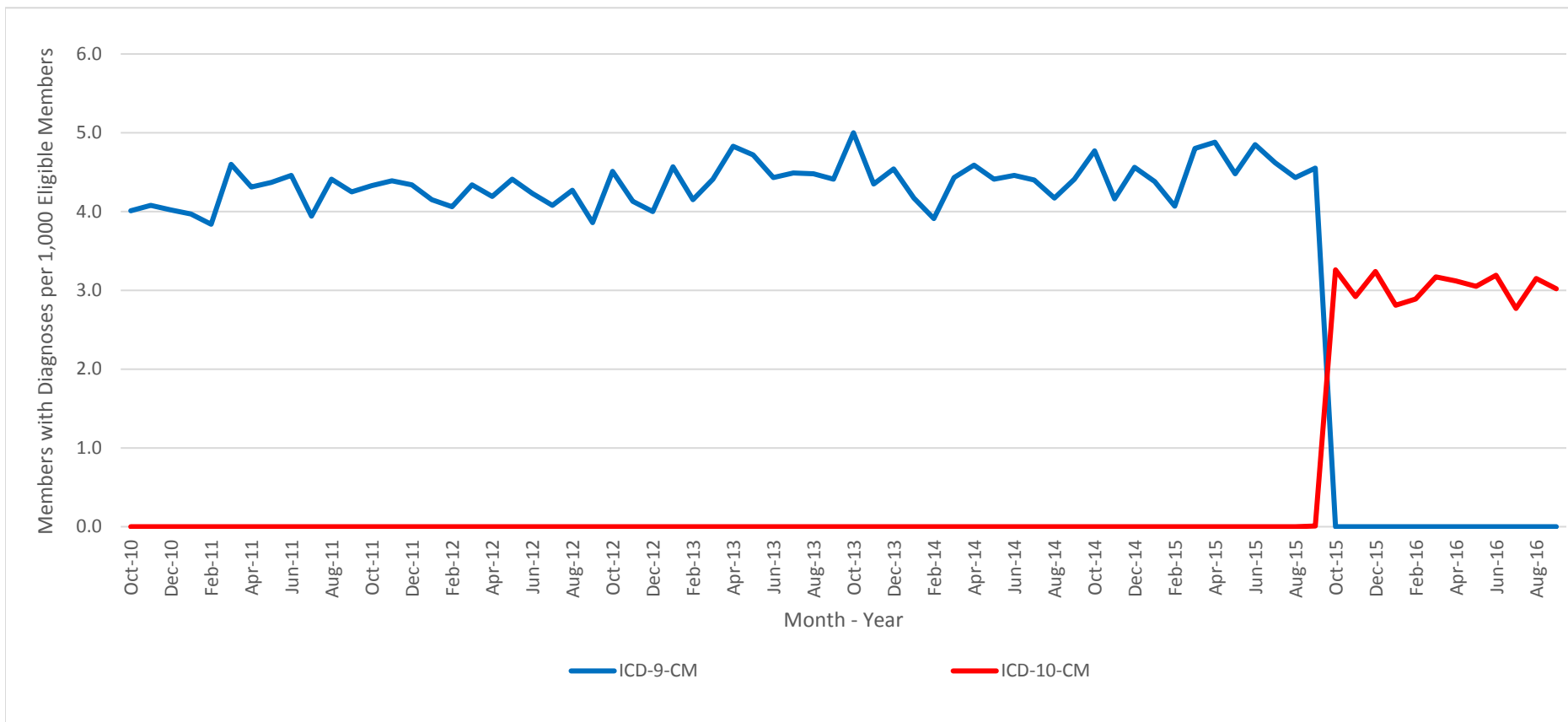


Figure 2. Prevalence of Glaucoma Diagnoses per 1,000 Eligible Members from October 2010 - September 2016 by Code Type, 0-Day Washout





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	9/30/2016

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) and International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) Codes Used to Define Glaucoma

Code	Description	Code Type
ICD-9-CM		
365	Glaucoma	ICD-9-CM Diagnosis
365.0	Borderline glaucoma (glaucoma suspect)	ICD-9-CM Diagnosis
365.00	Unspecified preglaucoma	ICD-9-CM Diagnosis
365.01	Borderline glaucoma, open angle with borderline findings, low risk	ICD-9-CM Diagnosis
365.02	Borderline glaucoma with anatomical narrow angle	ICD-9-CM Diagnosis
365.03	Borderline glaucoma with steroid responders	ICD-9-CM Diagnosis
365.04	Borderline glaucoma with ocular hypertension	ICD-9-CM Diagnosis
365.05	Open angle with borderline findings, high risk	ICD-9-CM Diagnosis
365.06	Primary angle closure without glaucoma damage	ICD-9-CM Diagnosis
365.1	Open-angle glaucoma	ICD-9-CM Diagnosis
365.10	Unspecified open-angle glaucoma	ICD-9-CM Diagnosis
365.11	Primary open-angle glaucoma	ICD-9-CM Diagnosis
365.12	Low tension open-angle glaucoma	ICD-9-CM Diagnosis
365.13	Pigmentary open-angle glaucoma	ICD-9-CM Diagnosis
365.14	Open-angle glaucoma of childhood	ICD-9-CM Diagnosis
365.15	Residual stage of open angle glaucoma	ICD-9-CM Diagnosis
365.2	Primary angle-closure glaucoma	ICD-9-CM Diagnosis
365.20	Unspecified primary angle-closure glaucoma	ICD-9-CM Diagnosis
365.21	Intermittent angle-closure glaucoma	ICD-9-CM Diagnosis
365.22	Acute angle-closure glaucoma	ICD-9-CM Diagnosis
365.23	Chronic angle-closure glaucoma	ICD-9-CM Diagnosis
365.24	Residual stage of angle-closure glaucoma	ICD-9-CM Diagnosis
365.3	Corticosteroid-induced glaucoma	ICD-9-CM Diagnosis
365.31	Corticosteroid-induced glaucoma, glaucomatous stage	ICD-9-CM Diagnosis
365.32	Corticosteroid-induced glaucoma, residual stage	ICD-9-CM Diagnosis
365.4	Glaucoma associated with congenital anomalies, dystrophies, and systemic syndromes	ICD-9-CM Diagnosis
365.41	Glaucoma associated with chamber angle anomalies	ICD-9-CM Diagnosis
365.42	Glaucoma associated with anomalies of iris	ICD-9-CM Diagnosis
365.43	Glaucoma associated with other anterior segment anomalies	ICD-9-CM Diagnosis
365.44	Glaucoma associated with systemic syndromes	ICD-9-CM Diagnosis
365.5	Glaucoma associated with disorders of the lens	ICD-9-CM Diagnosis
365.51	Phacolytic glaucoma	ICD-9-CM Diagnosis
365.52	Pseudoexfoliation glaucoma	ICD-9-CM Diagnosis
365.59	Glaucoma associated with other lens disorders	ICD-9-CM Diagnosis
365.6	Glaucoma associated with other ocular disorders	ICD-9-CM Diagnosis
365.60	Glaucoma associated with unspecified ocular disorder	ICD-9-CM Diagnosis
365.61	Glaucoma associated with pupillary block	ICD-9-CM Diagnosis
365.62	Glaucoma associated with ocular inflammations	ICD-9-CM Diagnosis
365.63	Glaucoma associated with vascular disorders of eye	ICD-9-CM Diagnosis
365.64	Glaucoma associated with tumors or cysts	ICD-9-CM Diagnosis
365.65	Glaucoma associated with ocular trauma	ICD-9-CM Diagnosis
365.7	Glaucoma stage	ICD-9-CM Diagnosis
365.70	Glaucoma stage, unspecified	ICD-9-CM Diagnosis

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Code	Description	Code Type
365.71	Mild stage glaucoma	ICD-9-CM Diagnosis
365.72	Moderate stage glaucoma	ICD-9-CM Diagnosis
365.73	Severe stage glaucoma	ICD-9-CM Diagnosis
365.74	Indeterminate stage glaucoma	ICD-9-CM Diagnosis
365.8	Other specified forms of glaucoma	ICD-9-CM Diagnosis
365.81	Hypersecretion glaucoma	ICD-9-CM Diagnosis
365.82	Glaucoma with increased episcleral venous pressure	ICD-9-CM Diagnosis
365.83	Aqueous misdirection	ICD-9-CM Diagnosis
365.89	Other specified glaucoma	ICD-9-CM Diagnosis
365.9	Unspecified glaucoma	ICD-9-CM Diagnosis
ICD-10-CM		
H40.001	Preglaucoma, unspecified, right eye	ICD-10-CM Diagnosis
H40.002	Preglaucoma, unspecified, left eye	ICD-10-CM Diagnosis
H40.003	Preglaucoma, unspecified, bilateral	ICD-10-CM Diagnosis
H40.009	Preglaucoma, unspecified, unspecified eye	ICD-10-CM Diagnosis
H40.011	Open angle with borderline findings, low risk, right eye	ICD-10-CM Diagnosis
H40.012	Open angle with borderline findings, low risk, left eye	ICD-10-CM Diagnosis
H40.013	Open angle with borderline findings, low risk, bilateral	ICD-10-CM Diagnosis
H40.019	Open angle with borderline findings, low risk, unspecified eye	ICD-10-CM Diagnosis
H40.021	Open angle with borderline findings, high risk, right eye	ICD-10-CM Diagnosis
H40.022	Open angle with borderline findings, high risk, left eye	ICD-10-CM Diagnosis
H40.023	Open angle with borderline findings, high risk, bilateral	ICD-10-CM Diagnosis
H40.029	Open angle with borderline findings, high risk, unspecified eye	ICD-10-CM Diagnosis
H40.031	Anatomical narrow angle, right eye	ICD-10-CM Diagnosis
H40.032	Anatomical narrow angle, left eye	ICD-10-CM Diagnosis
H40.033	Anatomical narrow angle, bilateral	ICD-10-CM Diagnosis
H40.039	Anatomical narrow angle, unspecified eye	ICD-10-CM Diagnosis
H40.041	Steroid responder, right eye	ICD-10-CM Diagnosis
H40.042	Steroid responder, left eye	ICD-10-CM Diagnosis
H40.043	Steroid responder, bilateral	ICD-10-CM Diagnosis
H40.049	Steroid responder, unspecified eye	ICD-10-CM Diagnosis
H40.051	Ocular hypertension, right eye	ICD-10-CM Diagnosis
H40.052	Ocular hypertension, left eye	ICD-10-CM Diagnosis
H40.053	Ocular hypertension, bilateral	ICD-10-CM Diagnosis
H40.059	Ocular hypertension, unspecified eye	ICD-10-CM Diagnosis
H40.061	Primary angle closure without glaucoma damage, right eye	ICD-10-CM Diagnosis
H40.062	Primary angle closure without glaucoma damage, left eye	ICD-10-CM Diagnosis
H40.063	Primary angle closure without glaucoma damage, bilateral	ICD-10-CM Diagnosis
H40.069	Primary angle closure without glaucoma damage, unspecified eye	ICD-10-CM Diagnosis
H40.10X0	Unspecified open-angle glaucoma, stage unspecified	ICD-10-CM Diagnosis
H40.10X1	Unspecified open-angle glaucoma, mild stage	ICD-10-CM Diagnosis
H40.10X2	Unspecified open-angle glaucoma, moderate stage	ICD-10-CM Diagnosis
H40.10X3	Unspecified open-angle glaucoma, severe stage	ICD-10-CM Diagnosis
H40.10X4	Unspecified open-angle glaucoma, indeterminate stage	ICD-10-CM Diagnosis

Appendix B. List of International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) and International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) Codes Used to Define Glaucoma

Code	Description	Code Type
H40.1110	Primary open-angle glaucoma, right eye, stage unspecified	ICD-10-CM Diagnosis
H40.1111	Primary open-angle glaucoma, right eye, mild stage	ICD-10-CM Diagnosis
H40.1112	Primary open-angle glaucoma, right eye, moderate stage	ICD-10-CM Diagnosis
H40.1113	Primary open-angle glaucoma, right eye, severe stage	ICD-10-CM Diagnosis
H40.1114	Primary open-angle glaucoma, right eye, indeterminate stage	ICD-10-CM Diagnosis
H40.1120	Primary open-angle glaucoma, left eye, stage unspecified	ICD-10-CM Diagnosis
H40.1121	Primary open-angle glaucoma, left eye, mild stage	ICD-10-CM Diagnosis
H40.1122	Primary open-angle glaucoma, left eye, moderate stage	ICD-10-CM Diagnosis
H40.1123	Primary open-angle glaucoma, left eye, severe stage	ICD-10-CM Diagnosis
H40.1124	Primary open-angle glaucoma, left eye, indeterminate stage	ICD-10-CM Diagnosis
H40.1130	Primary open-angle glaucoma, bilateral, stage unspecified	ICD-10-CM Diagnosis
H40.1131	Primary open-angle glaucoma, bilateral, mild stage	ICD-10-CM Diagnosis
H40.1132	Primary open-angle glaucoma, bilateral, moderate stage	ICD-10-CM Diagnosis
H40.1133	Primary open-angle glaucoma, bilateral, severe stage	ICD-10-CM Diagnosis
H40.1134	Primary open-angle glaucoma, bilateral, indeterminate stage	ICD-10-CM Diagnosis
H40.1190	Primary open-angle glaucoma, unspecified eye, stage unspecified	ICD-10-CM Diagnosis
H40.1191	Primary open-angle glaucoma, unspecified eye, mild stage	ICD-10-CM Diagnosis
H40.1192	Primary open-angle glaucoma, unspecified eye, moderate stage	ICD-10-CM Diagnosis
H40.1193	Primary open-angle glaucoma, unspecified eye, severe stage	ICD-10-CM Diagnosis
H40.1194	Primary open-angle glaucoma, unspecified eye, indeterminate stage	ICD-10-CM Diagnosis
H40.1210	Low-tension glaucoma, right eye, stage unspecified	ICD-10-CM Diagnosis
H40.1211	Low-tension glaucoma, right eye, mild stage	ICD-10-CM Diagnosis
H40.1212	Low-tension glaucoma, right eye, moderate stage	ICD-10-CM Diagnosis
H40.1213	Low-tension glaucoma, right eye, severe stage	ICD-10-CM Diagnosis
H40.1214	Low-tension glaucoma, right eye, indeterminate stage	ICD-10-CM Diagnosis
H40.1220	Low-tension glaucoma, left eye, stage unspecified	ICD-10-CM Diagnosis
H40.1221	Low-tension glaucoma, left eye, mild stage	ICD-10-CM Diagnosis
H40.1222	Low-tension glaucoma, left eye, moderate stage	ICD-10-CM Diagnosis
H40.1223	Low-tension glaucoma, left eye, severe stage	ICD-10-CM Diagnosis
H40.1224	Low-tension glaucoma, left eye, indeterminate stage	ICD-10-CM Diagnosis
H40.1230	Low-tension glaucoma, bilateral, stage unspecified	ICD-10-CM Diagnosis
H40.1231	Low-tension glaucoma, bilateral, mild stage	ICD-10-CM Diagnosis
H40.1232	Low-tension glaucoma, bilateral, moderate stage	ICD-10-CM Diagnosis
H40.1233	Low-tension glaucoma, bilateral, severe stage	ICD-10-CM Diagnosis
H40.1234	Low-tension glaucoma, bilateral, indeterminate stage	ICD-10-CM Diagnosis
H40.1290	Low-tension glaucoma, unspecified eye, stage unspecified	ICD-10-CM Diagnosis
H40.1291	Low-tension glaucoma, unspecified eye, mild stage	ICD-10-CM Diagnosis
H40.1292	Low-tension glaucoma, unspecified eye, moderate stage	ICD-10-CM Diagnosis
H40.1293	Low-tension glaucoma, unspecified eye, severe stage	ICD-10-CM Diagnosis
H40.1294	Low-tension glaucoma, unspecified eye, indeterminate stage	ICD-10-CM Diagnosis
H40.1310	Pigmentary glaucoma, right eye, stage unspecified	ICD-10-CM Diagnosis
H40.1311	Pigmentary glaucoma, right eye, mild stage	ICD-10-CM Diagnosis
H40.1312	Pigmentary glaucoma, right eye, moderate stage	ICD-10-CM Diagnosis
H40.1313	Pigmentary glaucoma, right eye, severe stage	ICD-10-CM Diagnosis

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Code	Description	Code Type
H40.1314	Pigmentary glaucoma, right eye, indeterminate stage	ICD-10-CM Diagnosis
H40.1320	Pigmentary glaucoma, left eye, stage unspecified	ICD-10-CM Diagnosis
H40.1321	Pigmentary glaucoma, left eye, mild stage	ICD-10-CM Diagnosis
H40.1322	Pigmentary glaucoma, left eye, moderate stage	ICD-10-CM Diagnosis
H40.1323	Pigmentary glaucoma, left eye, severe stage	ICD-10-CM Diagnosis
H40.1324	Pigmentary glaucoma, left eye, indeterminate stage	ICD-10-CM Diagnosis
H40.1330	Pigmentary glaucoma, bilateral, stage unspecified	ICD-10-CM Diagnosis
H40.1331	Pigmentary glaucoma, bilateral, mild stage	ICD-10-CM Diagnosis
H40.1332	Pigmentary glaucoma, bilateral, moderate stage	ICD-10-CM Diagnosis
H40.1333	Pigmentary glaucoma, bilateral, severe stage	ICD-10-CM Diagnosis
H40.1334	Pigmentary glaucoma, bilateral, indeterminate stage	ICD-10-CM Diagnosis
H40.1390	Pigmentary glaucoma, unspecified eye, stage unspecified	ICD-10-CM Diagnosis
H40.1391	Pigmentary glaucoma, unspecified eye, mild stage	ICD-10-CM Diagnosis
H40.1392	Pigmentary glaucoma, unspecified eye, moderate stage	ICD-10-CM Diagnosis
H40.1393	Pigmentary glaucoma, unspecified eye, severe stage	ICD-10-CM Diagnosis
H40.1394	Pigmentary glaucoma, unspecified eye, indeterminate stage	ICD-10-CM Diagnosis
H40.1410	Capsular glaucoma with pseudoexfoliation of lens, right eye, stage unspecified	ICD-10-CM Diagnosis
H40.1411	Capsular glaucoma with pseudoexfoliation of lens, right eye, mild stage	ICD-10-CM Diagnosis
H40.1412	Capsular glaucoma with pseudoexfoliation of lens, right eye, moderate stage	ICD-10-CM Diagnosis
H40.1413	Capsular glaucoma with pseudoexfoliation of lens, right eye, severe stage	ICD-10-CM Diagnosis
H40.1414	Capsular glaucoma with pseudoexfoliation of lens, right eye, indeterminate stage	ICD-10-CM Diagnosis
H40.1420	Capsular glaucoma with pseudoexfoliation of lens, left eye, stage unspecified	ICD-10-CM Diagnosis
H40.1421	Capsular glaucoma with pseudoexfoliation of lens, left eye, mild stage	ICD-10-CM Diagnosis
H40.1422	Capsular glaucoma with pseudoexfoliation of lens, left eye, moderate stage	ICD-10-CM Diagnosis
H40.1423	Capsular glaucoma with pseudoexfoliation of lens, left eye, severe stage	ICD-10-CM Diagnosis
H40.1424	Capsular glaucoma with pseudoexfoliation of lens, left eye, indeterminate stage	ICD-10-CM Diagnosis
H40.1430	Capsular glaucoma with pseudoexfoliation of lens, bilateral, stage unspecified	ICD-10-CM Diagnosis
H40.1431	Capsular glaucoma with pseudoexfoliation of lens, bilateral, mild stage	ICD-10-CM Diagnosis
H40.1432	Capsular glaucoma with pseudoexfoliation of lens, bilateral, moderate stage	ICD-10-CM Diagnosis
H40.1433	Capsular glaucoma with pseudoexfoliation of lens, bilateral, severe stage	ICD-10-CM Diagnosis
H40.1434	Capsular glaucoma with pseudoexfoliation of lens, bilateral, indeterminate stage	ICD-10-CM Diagnosis
H40.1490	Capsular glaucoma with pseudoexfoliation of lens, unspecified eye, stage unspecified	ICD-10-CM Diagnosis
H40.1491	Capsular glaucoma with pseudoexfoliation of lens, unspecified eye, mild stage	ICD-10-CM Diagnosis
H40.1492	Capsular glaucoma with pseudoexfoliation of lens, unspecified eye, moderate stage	ICD-10-CM Diagnosis
H40.1493	Capsular glaucoma with pseudoexfoliation of lens, unspecified eye, severe stage	ICD-10-CM Diagnosis
H40.1494	Capsular glaucoma with pseudoexfoliation of lens, unspecified eye, indeterminate stage	ICD-10-CM Diagnosis
H40.151	Residual stage of open-angle glaucoma, right eye	ICD-10-CM Diagnosis
H40.152	Residual stage of open-angle glaucoma, left eye	ICD-10-CM Diagnosis
H40.153	Residual stage of open-angle glaucoma, bilateral	ICD-10-CM Diagnosis
H40.159	Residual stage of open-angle glaucoma, unspecified eye	ICD-10-CM Diagnosis
H40.20X0	Unspecified primary angle-closure glaucoma, stage unspecified	ICD-10-CM Diagnosis
H40.20X1	Unspecified primary angle-closure glaucoma, mild stage	ICD-10-CM Diagnosis
H40.20X2	Unspecified primary angle-closure glaucoma, moderate stage	ICD-10-CM Diagnosis
H40.20X3	Unspecified primary angle-closure glaucoma, severe stage	ICD-10-CM Diagnosis

Appendix B. List of International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) and International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) Codes Used to Define Glaucoma

Code	Description	Code Type
H40.20X4	Unspecified primary angle-closure glaucoma, indeterminate stage	ICD-10-CM Diagnosis
H40.211	Acute angle-closure glaucoma, right eye	ICD-10-CM Diagnosis
H40.212	Acute angle-closure glaucoma, left eye	ICD-10-CM Diagnosis
H40.213	Acute angle-closure glaucoma, bilateral	ICD-10-CM Diagnosis
H40.219	Acute angle-closure glaucoma, unspecified eye	ICD-10-CM Diagnosis
H40.2210	Chronic angle-closure glaucoma, right eye, stage unspecified	ICD-10-CM Diagnosis
H40.2211	Chronic angle-closure glaucoma, right eye, mild stage	ICD-10-CM Diagnosis
H40.2212	Chronic angle-closure glaucoma, right eye, moderate stage	ICD-10-CM Diagnosis
H40.2213	Chronic angle-closure glaucoma, right eye, severe stage	ICD-10-CM Diagnosis
H40.2214	Chronic angle-closure glaucoma, right eye, indeterminate stage	ICD-10-CM Diagnosis
H40.2220	Chronic angle-closure glaucoma, left eye, stage unspecified	ICD-10-CM Diagnosis
H40.2221	Chronic angle-closure glaucoma, left eye, mild stage	ICD-10-CM Diagnosis
H40.2222	Chronic angle-closure glaucoma, left eye, moderate stage	ICD-10-CM Diagnosis
H40.2223	Chronic angle-closure glaucoma, left eye, severe stage	ICD-10-CM Diagnosis
H40.2224	Chronic angle-closure glaucoma, left eye, indeterminate stage	ICD-10-CM Diagnosis
H40.2230	Chronic angle-closure glaucoma, bilateral, stage unspecified	ICD-10-CM Diagnosis
H40.2231	Chronic angle-closure glaucoma, bilateral, mild stage	ICD-10-CM Diagnosis
H40.2232	Chronic angle-closure glaucoma, bilateral, moderate stage	ICD-10-CM Diagnosis
H40.2233	Chronic angle-closure glaucoma, bilateral, severe stage	ICD-10-CM Diagnosis
H40.2234	Chronic angle-closure glaucoma, bilateral, indeterminate stage	ICD-10-CM Diagnosis
H40.2290	Chronic angle-closure glaucoma, unspecified eye, stage unspecified	ICD-10-CM Diagnosis
H40.2291	Chronic angle-closure glaucoma, unspecified eye, mild stage	ICD-10-CM Diagnosis
H40.2292	Chronic angle-closure glaucoma, unspecified eye, moderate stage	ICD-10-CM Diagnosis
H40.2293	Chronic angle-closure glaucoma, unspecified eye, severe stage	ICD-10-CM Diagnosis
H40.2294	Chronic angle-closure glaucoma, unspecified eye, indeterminate stage	ICD-10-CM Diagnosis
H40.231	Intermittent angle-closure glaucoma, right eye	ICD-10-CM Diagnosis
H40.232	Intermittent angle-closure glaucoma, left eye	ICD-10-CM Diagnosis
H40.233	Intermittent angle-closure glaucoma, bilateral	ICD-10-CM Diagnosis
H40.239	Intermittent angle-closure glaucoma, unspecified eye	ICD-10-CM Diagnosis
H40.241	Residual stage of angle-closure glaucoma, right eye	ICD-10-CM Diagnosis
H40.242	Residual stage of angle-closure glaucoma, left eye	ICD-10-CM Diagnosis
H40.243	Residual stage of angle-closure glaucoma, bilateral	ICD-10-CM Diagnosis
H40.249	Residual stage of angle-closure glaucoma, unspecified eye	ICD-10-CM Diagnosis
H40.30X0	Glaucoma secondary to eye trauma, unspecified eye, stage unspecified	ICD-10-CM Diagnosis
H40.30X1	Glaucoma secondary to eye trauma, unspecified eye, mild stage	ICD-10-CM Diagnosis
H40.30X2	Glaucoma secondary to eye trauma, unspecified eye, moderate stage	ICD-10-CM Diagnosis
H40.30X3	Glaucoma secondary to eye trauma, unspecified eye, severe stage	ICD-10-CM Diagnosis
H40.30X4	Glaucoma secondary to eye trauma, unspecified eye, indeterminate stage	ICD-10-CM Diagnosis
H40.31X0	Glaucoma secondary to eye trauma, right eye, stage unspecified	ICD-10-CM Diagnosis
H40.31X1	Glaucoma secondary to eye trauma, right eye, mild stage	ICD-10-CM Diagnosis
H40.31X2	Glaucoma secondary to eye trauma, right eye, moderate stage	ICD-10-CM Diagnosis
H40.31X3	Glaucoma secondary to eye trauma, right eye, severe stage	ICD-10-CM Diagnosis
H40.31X4	Glaucoma secondary to eye trauma, right eye, indeterminate stage	ICD-10-CM Diagnosis
H40.32X0	Glaucoma secondary to eye trauma, left eye, stage unspecified	ICD-10-CM Diagnosis

Appendix B. List of International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) and International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) Codes Used to Define Glaucoma

Code	Description	Code Type
H40.32X1	Glaucoma secondary to eye trauma, left eye, mild stage	ICD-10-CM Diagnosis
H40.32X2	Glaucoma secondary to eye trauma, left eye, moderate stage	ICD-10-CM Diagnosis
H40.32X3	Glaucoma secondary to eye trauma, left eye, severe stage	ICD-10-CM Diagnosis
H40.32X4	Glaucoma secondary to eye trauma, left eye, indeterminate stage	ICD-10-CM Diagnosis
H40.33X0	Glaucoma secondary to eye trauma, bilateral, stage unspecified	ICD-10-CM Diagnosis
H40.33X1	Glaucoma secondary to eye trauma, bilateral, mild stage	ICD-10-CM Diagnosis
H40.33X2	Glaucoma secondary to eye trauma, bilateral, moderate stage	ICD-10-CM Diagnosis
H40.33X3	Glaucoma secondary to eye trauma, bilateral, severe stage	ICD-10-CM Diagnosis
H40.33X4	Glaucoma secondary to eye trauma, bilateral, indeterminate stage	ICD-10-CM Diagnosis
H40.40X0	Glaucoma secondary to eye inflammation, unspecified eye, stage unspecified	ICD-10-CM Diagnosis
H40.40X1	Glaucoma secondary to eye inflammation, unspecified eye, mild stage	ICD-10-CM Diagnosis
H40.40X2	Glaucoma secondary to eye inflammation, unspecified eye, moderate stage	ICD-10-CM Diagnosis
H40.40X3	Glaucoma secondary to eye inflammation, unspecified eye, severe stage	ICD-10-CM Diagnosis
H40.40X4	Glaucoma secondary to eye inflammation, unspecified eye, indeterminate stage	ICD-10-CM Diagnosis
H40.41X0	Glaucoma secondary to eye inflammation, right eye, stage unspecified	ICD-10-CM Diagnosis
H40.41X1	Glaucoma secondary to eye inflammation, right eye, mild stage	ICD-10-CM Diagnosis
H40.41X2	Glaucoma secondary to eye inflammation, right eye, moderate stage	ICD-10-CM Diagnosis
H40.41X3	Glaucoma secondary to eye inflammation, right eye, severe stage	ICD-10-CM Diagnosis
H40.41X4	Glaucoma secondary to eye inflammation, right eye, indeterminate stage	ICD-10-CM Diagnosis
H40.42X0	Glaucoma secondary to eye inflammation, left eye, stage unspecified	ICD-10-CM Diagnosis
H40.42X1	Glaucoma secondary to eye inflammation, left eye, mild stage	ICD-10-CM Diagnosis
H40.42X2	Glaucoma secondary to eye inflammation, left eye, moderate stage	ICD-10-CM Diagnosis
H40.42X3	Glaucoma secondary to eye inflammation, left eye, severe stage	ICD-10-CM Diagnosis
H40.42X4	Glaucoma secondary to eye inflammation, left eye, indeterminate stage	ICD-10-CM Diagnosis
H40.43X0	Glaucoma secondary to eye inflammation, bilateral, stage unspecified	ICD-10-CM Diagnosis
H40.43X1	Glaucoma secondary to eye inflammation, bilateral, mild stage	ICD-10-CM Diagnosis
H40.43X2	Glaucoma secondary to eye inflammation, bilateral, moderate stage	ICD-10-CM Diagnosis
H40.43X3	Glaucoma secondary to eye inflammation, bilateral, severe stage	ICD-10-CM Diagnosis
H40.43X4	Glaucoma secondary to eye inflammation, bilateral, indeterminate stage	ICD-10-CM Diagnosis
H40.50X0	Glaucoma secondary to other eye disorders, unspecified eye, stage unspecified	ICD-10-CM Diagnosis
H40.50X1	Glaucoma secondary to other eye disorders, unspecified eye, mild stage	ICD-10-CM Diagnosis
H40.50X2	Glaucoma secondary to other eye disorders, unspecified eye, moderate stage	ICD-10-CM Diagnosis
H40.50X3	Glaucoma secondary to other eye disorders, unspecified eye, severe stage	ICD-10-CM Diagnosis
H40.50X4	Glaucoma secondary to other eye disorders, unspecified eye, indeterminate stage	ICD-10-CM Diagnosis
H40.51X0	Glaucoma secondary to other eye disorders, right eye, stage unspecified	ICD-10-CM Diagnosis
H40.51X1	Glaucoma secondary to other eye disorders, right eye, mild stage	ICD-10-CM Diagnosis
H40.51X2	Glaucoma secondary to other eye disorders, right eye, moderate stage	ICD-10-CM Diagnosis
H40.51X3	Glaucoma secondary to other eye disorders, right eye, severe stage	ICD-10-CM Diagnosis
H40.51X4	Glaucoma secondary to other eye disorders, right eye, indeterminate stage	ICD-10-CM Diagnosis
H40.52X0	Glaucoma secondary to other eye disorders, left eye, stage unspecified	ICD-10-CM Diagnosis
H40.52X1	Glaucoma secondary to other eye disorders, left eye, mild stage	ICD-10-CM Diagnosis
H40.52X2	Glaucoma secondary to other eye disorders, left eye, moderate stage	ICD-10-CM Diagnosis
H40.52X3	Glaucoma secondary to other eye disorders, left eye, severe stage	ICD-10-CM Diagnosis
H40.52X4	Glaucoma secondary to other eye disorders, left eye, indeterminate stage	ICD-10-CM Diagnosis

Appendix B. List of International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) and International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) Codes Used to Define Glaucoma

Code	Description	Code Type
H40.53X0	Glaucoma secondary to other eye disorders, bilateral, stage unspecified	ICD-10-CM Diagnosis
H40.53X1	Glaucoma secondary to other eye disorders, bilateral, mild stage	ICD-10-CM Diagnosis
H40.53X2	Glaucoma secondary to other eye disorders, bilateral, moderate stage	ICD-10-CM Diagnosis
H40.53X3	Glaucoma secondary to other eye disorders, bilateral, severe stage	ICD-10-CM Diagnosis
H40.53X4	Glaucoma secondary to other eye disorders, bilateral, indeterminate stage	ICD-10-CM Diagnosis
H40.60X0	Glaucoma secondary to drugs, unspecified eye, stage unspecified	ICD-10-CM Diagnosis
H40.60X1	Glaucoma secondary to drugs, unspecified eye, mild stage	ICD-10-CM Diagnosis
H40.60X2	Glaucoma secondary to drugs, unspecified eye, moderate stage	ICD-10-CM Diagnosis
H40.60X3	Glaucoma secondary to drugs, unspecified eye, severe stage	ICD-10-CM Diagnosis
H40.60X4	Glaucoma secondary to drugs, unspecified eye, indeterminate stage	ICD-10-CM Diagnosis
H40.61X0	Glaucoma secondary to drugs, right eye, stage unspecified	ICD-10-CM Diagnosis
H40.61X1	Glaucoma secondary to drugs, right eye, mild stage	ICD-10-CM Diagnosis
H40.61X2	Glaucoma secondary to drugs, right eye, moderate stage	ICD-10-CM Diagnosis
H40.61X3	Glaucoma secondary to drugs, right eye, severe stage	ICD-10-CM Diagnosis
H40.61X4	Glaucoma secondary to drugs, right eye, indeterminate stage	ICD-10-CM Diagnosis
H40.62X0	Glaucoma secondary to drugs, left eye, stage unspecified	ICD-10-CM Diagnosis
H40.62X1	Glaucoma secondary to drugs, left eye, mild stage	ICD-10-CM Diagnosis
H40.62X2	Glaucoma secondary to drugs, left eye, moderate stage	ICD-10-CM Diagnosis
H40.62X3	Glaucoma secondary to drugs, left eye, severe stage	ICD-10-CM Diagnosis
H40.62X4	Glaucoma secondary to drugs, left eye, indeterminate stage	ICD-10-CM Diagnosis
H40.63X0	Glaucoma secondary to drugs, bilateral, stage unspecified	ICD-10-CM Diagnosis
H40.63X1	Glaucoma secondary to drugs, bilateral, mild stage	ICD-10-CM Diagnosis
H40.63X2	Glaucoma secondary to drugs, bilateral, moderate stage	ICD-10-CM Diagnosis
H40.63X3	Glaucoma secondary to drugs, bilateral, severe stage	ICD-10-CM Diagnosis
H40.63X4	Glaucoma secondary to drugs, bilateral, indeterminate stage	ICD-10-CM Diagnosis
H40.811	Glaucoma with increased episcleral venous pressure, right eye	ICD-10-CM Diagnosis
H40.812	Glaucoma with increased episcleral venous pressure, left eye	ICD-10-CM Diagnosis
H40.813	Glaucoma with increased episcleral venous pressure, bilateral	ICD-10-CM Diagnosis
H40.819	Glaucoma with increased episcleral venous pressure, unspecified eye	ICD-10-CM Diagnosis
H40.821	Hypersecretion glaucoma, right eye	ICD-10-CM Diagnosis
H40.822	Hypersecretion glaucoma, left eye	ICD-10-CM Diagnosis
H40.823	Hypersecretion glaucoma, bilateral	ICD-10-CM Diagnosis
H40.829	Hypersecretion glaucoma, unspecified eye	ICD-10-CM Diagnosis
H40.831	Aqueous misdirection, right eye	ICD-10-CM Diagnosis
H40.832	Aqueous misdirection, left eye	ICD-10-CM Diagnosis
H40.833	Aqueous misdirection, bilateral	ICD-10-CM Diagnosis
H40.839	Aqueous misdirection, unspecified eye	ICD-10-CM Diagnosis
H40.89	Other specified glaucoma	ICD-10-CM Diagnosis
H40.9	Unspecified glaucoma	ICD-10-CM Diagnosis
H42	Glaucoma in diseases classified elsewhere	ICD-10-CM Diagnosis
Q15.0	Congenital glaucoma	ICD-10-CM Diagnosis

Appendix C. Specifications for Parameters for this Request

Sentinel's Cohort Identification and Descriptive Analysis (CIDA) tool, version 5.0.4 was used to compare the frequency of diagnoses for glaucoma 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: 0-18, 19-24, 25-64, 65+ years
Enrollment Requirement: 183 days for incidence scenarios; 0 days for prevalence scenarios
Coverage Requirement: Medical and drug coverage

Scenario	Query Start Date	Query End Date	Event					
			Event	Incidence/Prevalence Code Type	Incident with Respect To	Washout (days)	Cohort Definition	Care Setting
1	4/1/2015	9/30/2015	Glaucoma	ICD-9-CM	ICD-9-CM	183	First valid event only	Any
2	4/1/2016	9/30/2016	Glaucoma	ICD-10-CM	ICD-10-CM	183	First valid event only	Any
3	10/1/2010	9/30/2016	Glaucoma	ICD-9-CM	ICD-9-CM or ICD-10-CM	183	First valid event only	Any
4	10/1/2010	9/30/2016	Glaucoma	ICD-10-CM	ICD-9-CM or ICD-10-CM	183	First valid event only	Any
5	10/1/2010	9/30/2016	Glaucoma	ICD-9-CM	N/A	0	All valid events	Any
6	10/1/2010	9/30/2016	Glaucoma	ICD-10-CM	N/A	0	All valid events	Any

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.