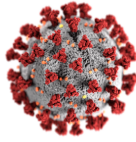


EVENT DEFINITION FORM

Event: Diabetes type (1)
Outcome/covariate: outcome
Version: 1.0
Status: final

Contributing authors

authors	Role	
Miriam Sturkenboom	draft	13-8-2020
Leila Belbachir	Review	20-8-2020
Miriam Sturkenboom	Adding in type 1 algorithm reviews & proposal	21-8-2020
Corinne Willame	Concept sets proposal in algorithm	02-09-2020
Miriam Sturkenboom	restriction type 1 codes	23-3-2021
Carlos Durán	Narrow/broad algorithm check	24-03-2021
Miriam Sturkenboom	Inclusion of final codes	16-07-2021



1. Event definition

Definition

Diabetes mellitus (diabetes) is a group of metabolic diseases characterized by metabolic and hormonal changes in the form of hyperglycemia and defects in insulin secretion. The clinical classification of diabetes includes four classes¹:

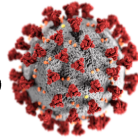
- Type 1 diabetes (results from b-cell destruction, usually leading to absolute insulin deficiency)
- Type 2 diabetes (results from a progressive insulin secretory defect on the background of insulin resistance)
- Other specific types of diabetes due to other causes, e.g., genetic defects in b-cell function, genetic defects in insulin action, diseases of the exocrine pancreas (such as cystic fibrosis), and drug- or chemical-induced (such as in the treatment of HIV/AIDS or after organ transplantation), autoimmune etiology?
- Gestational diabetes mellitus (GDM) (diabetes diagnosed during pregnancy that is not clearly overt diabetes)

Long term effects of chronic diabetic hyperglycemia are associated with long-term damage, dysfunction, and failure of different organs, especially the eyes, kidneys, nerves, heart, and blood vessels.

Clinical Criteria

Diagnosis for diabetes is based on laboratory tests. A test result diagnostic of diabetes should be repeated to rule out laboratory error, unless the diagnosis is clear on clinical grounds, i.e. patients with a hyperglycemic crisis or classic symptoms of hyperglycemia and a random plasma glucose ≥ 200 mg/dL.

- A1C $\geq 6.5\%$. The test should be performed in a laboratory using a method that is NGSP certified and standardized to the DCCT assay. Or
- Fasting plasma glucose (FPG) ≥ 126 mg/dL (7.0 mmol/L). Fasting is defined as no caloric intake for at least 8 h. Or
- Two-hour plasma glucose ≥ 200 mg/dL (11.1 mmol/L) during an oral glucose tolerance test (OGTT). The test should be performed as described by the World Health Organization, using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water. Or
- In a patient with classic symptoms of hyperglycaemia or hyperglycaemic crisis, a random plasma glucose ≥ 200 mg/dL (11.1 mmol/L).
- In the absence of unequivocal hyperglycaemia, result should be confirmed by repeat testing.



2. Synonyms / lay terms used

Diabetes type 1, diabetes type 2, gestational diabetes mellitus (GDM), juvenile-onset diabetes, adult-onset diabetes, insulin-dependent diabetes (IDDM), non-insulin dependent diabetes (NIDDM), brittle diabetes, latent autoimmune diabetes in adults (LADA)

3. Laboratory tests done specific for event

See above. (Plasma glucose measurements.)

4. Diagnostic tests done specific for event

Not relevant

5. Drugs used specific for event treatment

Recommendations for insulin therapy for type 1 diabetes:

- Most people with type 1 diabetes should be treated with MDI (multiple dose injections) therapy (three to four injections per day of basal and prandial insulin) or insulin
- Most people with type 1 diabetes should use insulin analogues to reduce the risk of hypoglycemia.

Recommendations for insulin therapy for type 2 diabetes:

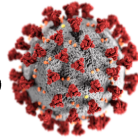
- Metformin is the preferred initial pharmacological agent for type 2 diabetes.
- If noninsulin monotherapy at maximal tolerated dose does not achieve or maintain the A1C target over 3–6 months, a second oral agent (sulfonylureas, alpha-glucosidase inhibitors, glinides, thiazolidinediones, biguanides, dipeptidil peptidase-IV inhibitors), a glucagon-like peptide-1 (GLP-1) receptor agonist, an amylin analogue or insulin should be added.
- In newly diagnosed type 2 diabetic patients with markedly symptomatic and/or elevated blood glucose levels or A1C, insulin therapy should be considered from the outset. Due to the progressive nature of type 2 diabetes, insulin therapy is eventually indicated for many.

5. Procedures used specific for event treatment

No imaging

6. Procedures used specific for event treatment

NA



7. Setting (outpatient specialist, in-hospital, GP, emergency room) where condition will be most frequently /reliably diagnosed

Outpatient: GP or by ambulatory specialist

8. Diagnosis codes or algorithms used in different papers to extract the events in Europe/USA

DIRECT CITATION FROM

Hoi validation Sentinel: Mini-Sentinel Methods - 23 - 16 HOIs for Surveillance Preparedness [2]

Primary Observed or Derived Algorithm

Inpatient or outpatient, any position

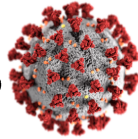
>= 1 ICD-9 code: 250.01, 250.03, 250.11, 250.13, 250.21, 250.23, 250.31, 250.33, 250.41, 250.43, 250.51, 250.53, 250.61, 250.63, 250.71, 250.73, 250.81, 250.83, 250.91, or 250.93

The Sentinel review stated the following

“A literature review produced 14 articles regarding algorithms or codes to identify type I diabetes. Type I diabetes is explicitly intertwined with type II diabetes in the validation literature. Many validation studies exist that examine codes for both type I and type II diabetes, report PPVs and sensitivities ranging from 64%-98% and 73%-97%, respectively. Much less information is available when considering the distinct ICD-9 codes to distinguish between Type I and Type II diabetes, but validation studies do exist.

In a study by Bobo et al., authors validated an algorithm for identifying persons with type I diabetes within Tennessee Medicaid data, finding a PPV of 80%, sensitivity of 65% and specificity being > 99%.¹⁰⁸ Operationally, since this study included codes for both Type I and II diabetes, the algorithm required: 1) a primary discharge diagnosis of 250 [*diabetes mellitus*], 250.0x [*diabetes mellitus without mention of complication*], 250.1x [*diabetes with ketoacidosis*], 250.2x [*diabetes with hyperosmolarity*], 250.3x [*diabetes with other coma*], or 250.9x [*diabetes with unspecified complication*]; 2) an inpatient stay with a secondary discharge diagnosis for one of these same ICD-9 codes + no diagnosis for 256.4 [*polycystic ovaries*] within 120 days of the diabetes diagnosis + a confirmatory antidiabetic prescription or an additional any-setting any-position ICD-9 code for diabetes within 120 days; or 3) an outpatient visit with a primary diagnosis for one of these same ICD-9 codes + a confirmatory antidiabetic prescription or an any-position inpatient ICD-9 code for diabetes within 120 days. In any of these three scenarios, >=1 prescription for insulin was also required within 120 days of the diabetes diagnosis, with no more than a single prescription for an oral antidiabetic drug during that interval. A single prescription for an oral agent did not serve as an exclusion criterion, because such drugs may be occasionally prescribed while awaiting the results of confirmatory testing for type I diabetes. If the aforementioned definition was not met, the individual was classified as a type II diabetic. Of note, the study population consisted solely of a small number of pediatric, adolescent, and young adult atypical antipsychotic users aged 6-24 years.

Rhodes et al. also examined a pediatric, adolescent, and young adult population, yet within the Endocrine/Diabetes or Obesity Programs at Children’s Hospital in Boston, finding a PPV of 97% for Type I diabetes codes.¹⁰⁹ To identify Type I diabetes, the algorithm required an inpatient or outpatient ICD-9 code for 250.x1 or 250.x3 which includes: 250.01 [*diabetes mellitus without mention of complication, type one [juvenile type]*], not stated as uncontrolled], 250.03 [*diabetes*

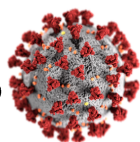


mellitus without mention of complication, type one [juvenile type], uncontrolled], 250.11 [diabetes mellitus with ketoacidosis, type one [juvenile type] not stated as uncontrolled], 250.13 [diabetes mellitus with ketoacidosis, type one [juvenile type], uncontrolled], 250.21 [diabetes mellitus with hyperosmolar coma, type one [juvenile type], not stated as uncontrolled], 250.23 [diabetes mellitus with hyperosmolar coma, type one [juvenile type], uncontrolled], 250.31 [diabetes mellitus with other coma, type one [juvenile], not stated as uncontrolled], 250.33 [diabetes mellitus with other coma, type one [juvenile], uncontrolled], 250.41 [diabetes mellitus with renal manifestations, type one [juvenile type], not stated as uncontrolled], 250.43 [diabetes mellitus with renal manifestations, type one [juvenile type], uncontrolled], 250.51 [diabetes mellitus with ophthalmic manifestations, type one [juvenile type], not stated as uncontrolled], 250.53 [diabetes mellitus with ophthalmic manifestations, type one [juvenile type], uncontrolled], 250.61 [diabetes mellitus with neurological manifestations, type one [juvenile type] not stated as uncontrolled], 250.63 [diabetes mellitus with neurological manifestations, type one [juvenile type] uncontrolled], 250.71 [diabetes mellitus with peripheral circulatory disorders, type one [juvenile type], not stated as uncontrolled], 250.73 [diabetes mellitus with peripheral circulatory disorders, type one [juvenile type], uncontrolled], 250.81 [diabetes mellitus with other specified manifestations, type one [juvenile type], not stated as uncontrolled], 250.83 [diabetes mellitus with other specified manifestations, type one [juvenile type], uncontrolled], 250.91 [diabetes mellitus with unspecified complication, type one [juvenile type], not stated as uncontrolled], or 250.93 [diabetes mellitus with unspecified complication, type one [juvenile type], uncontrolled]. This algorithm is much less complicated than the algorithm proposed by Bobo et al. and has a higher PPV, but authors did not report sensitivity or specificity.

Additionally, Klompas et al. developed algorithms for identifying individuals with type I diabetes, without regard to patient age, within Atrius Health electronic medical record data. The algorithm required ≥ 2 ICD-9 diagnoses for 250.x1 or 250.x3 (as described above), a current prescription for insulin and no prescription for an oral antidiabetic agent at any time (excluding metformin). This yielded a PPV of 81% and sensitivity of 32%. Twenty-one other candidate algorithms were presented by the authors in the manuscript. Of note, among persons meeting screening criteria for potential diabetes, algorithms that maximized sensitivity (often at the cost of PPV) included individual components such as: a prescription for insulin; no record of any oral antidiabetic drug; and no record of any oral antidiabetic drug (excluding metformin). Algorithms that maximized PPV (often at the cost of sensitivity) included individual components such as: a ratio of type I to type II ICD-9 codes >0.5 ; a ratio of type I to type II ICD-9 codes >0.5 + prescription for insulin; a ratio of type I to type II ICD-9 codes >0.5 + prescription for glucagon; C-peptide <0.8 ; and a prescription for urine acetone test strips. An algorithm that maximized PPV (96%) while maintaining an acceptable level of sensitivity (61%) included a requirement for a ratio of type I to type II ICD-9 codes >0.5 and no prescription for an oral antidiabetic drug (excluding metformin). The authors also developed an “optimized” algorithm, achieving a high PPV (96%) and perfect sensitivity (100%), yet this definition requires laboratory components that are not currently supported by the MSCDM (e.g., C-peptide, diabetes autoantibodies results).

In addition to the studies validating ICD-9 codes, a study by Vanderloo et al. conducted in British Columbia, reviewed both ICD-9 and ICD-10 codes. The PPV, sensitivity and specificity reported were 98%, 99% and 78%, respectively for type I diabetes. The workgroup did not recommend this algorithm, based its lumping of ICD-9 and ICD-10 codes.

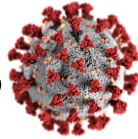
For defining the outcome of type I diabetes, the workgroup favors the algorithm proposed by Rhodes et al., which includes inpatient or outpatient ICD-9 codes 250.x1 or 250.x3, in any position. This algorithm will best identify pediatric, adolescent, and young adults with type I diabetes, and



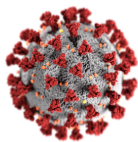
although similar to Bobo et al., the algorithm was evaluated in more persons. As a secondary algorithm, the workgroup proposes the algorithm by Klompas et al. which includes: a ratio of type I to type II ICD-9 codes >0.5 + no prescription for an oral antidiabetic drug (excluding metformin), when researchers are interested in an adult patient population. Should requisite laboratory data be made available within the distributed database, the Klompas et al. “optimized” algorithm should be used”.

9. Codes used in ACCESS

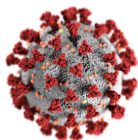
Coding system	Code	Code name	Concept	Algorithm
ICD10/CM	E08	Diabetes mellitus (E08-E13)	C0011849	Possible
ICD10/CM	E09	Diabetes mellitus (E08-E13)	C0011849	Possible
ICD10/CM	E10	Insulin-dependent diabetes mellitus	C0011854	Narrow
ICD10/CM	E10.6	Insulin-dependent diabetes mellitus with other specified complications	C0342261	Narrow
ICD10/CM	E10.6	Insulin-dependent diabetes mellitus with other specified complications	C0342261	Narrow
ICD10/CM	E10.630	Type 1 diabetes mellitus with periodontal disease	C2874066	Narrow
ICD10/CM	E10.69	Type 1 diabetes mellitus with other specified complication	C0342261	Narrow
ICD10/CM	E11	Non-insulin-dependent diabetes mellitus	C0011860	Possible
ICD10/CM	E11.6	Non-insulin-dependent diabetes mellitus with other specified complications	C0342262	Possible
ICD10/CM	E11.69	Type 2 diabetes mellitus with other specified complication	C0342262	Possible
ICD10/CM	E13.6	Other specified diabetes mellitus with other specified complications	C0348931	Possible
ICD10/CM	E13.69	Other specified diabetes mellitus with other specified complication	C0348931	Possible
ICD10/CM	E14	Unspecified diabetes mellitus	C0011849	Possible
ICD10/CM	E14.5	Unspecified diabetes mellitus with peripheral circulatory complications	C0011871	Possible
ICD10/CM	E14.5	Unspecified diabetes mellitus with peripheral circulatory complications	C0011871	Possible
ICD10/CM	E14.8	Unspecified diabetes mellitus with unspecified complications	C0342257	Possible
ICD10/CM	E14.9	Unspecified diabetes mellitus without complications	C0271635	Possible
ICD10/CM	E14.9	Unspecified diabetes mellitus without complications	C0271635	Possible
ICD10/CM	R73.9	Hyperglycaemia, unspecified	C0020456	Possible
ICD9CM	250	Diabetes mellitus	C0011849	Possible
ICD9CM	250.0	Diabetes mellitus without mention of complication	C0271635	Possible
ICD9CM	250.01	Diabetes type 1		narrow
ICD9CM	250.03	Diabetes type 1		narrow
ICD9CM	250.1	Diabetes with ketoacidosis	C0011880	Possible
ICD9CM	250.11	Diabetes type 1		narrow
ICD9CM	250.13	Diabetes type 1		narrow
ICD9CM	250.21	Diabetes type 1		narrow
ICD9CM	250.23	Diabetes type 1		narrow
ICD9CM	250.31	Diabetes type 1		narrow



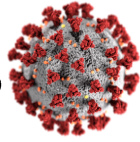
ICD9CM	250.33	Diabetes type 1		narrow
ICD9CM	250.41	Diabetes type 1		narrow
ICD9CM	250.43	Diabetes type 1		narrow
ICD9CM	250.51	Diabetes type 1		narrow
ICD9CM	250.53	Diabetes type 1		narrow
ICD9CM	260.61	Diabetes type 1		narrow
ICD9CM	250.63	Diabetes type 1		narrow
ICD9CM	250.71	Diabetes type 1		narrow
ICD9CM	250.73	Diabetes type 1		narrow
ICD9CM	250.81	Diabetes type 1		narrow
ICD9CM	250.83	Diabetes type 1		narrow
ICD9CM	250.91	Diabetes type 1		narrow
ICD9CM	250.93	Diabetes type 1		narrow
ICPC	T90	Diabetes mellitus	C0011849	Possible
ICPC	T90.01	Diabetes mellitus type 1		Narrow
ICPC2P	N94012	Neuropathy;diabetic	C0011882	Possible
ICPC2P	T89	Diabetes;Type 1		Narrow
ICPC2P	T89001	Diabetes;insulin dependent	C0011854	narrow
ICPC2P	T89002	Diabetes;Type 1	C0011854	narrow
ICPC2P	T89003	Diabetes;juvenile onset	C0011854	narrow
ICPC2P	T89004	Diabetes;complicated	C0342257	narrow
ICPC2P	T90002	Diabetes mellitus	C0011849	Possible
ICPC2P	T90003	Diabetes;complicated	C0342257	Possible
ICPC2P	T90004	Diabetes;insulin dependent	C0011854	Possible
ICPC2P	T90005	Diabetes;non insulin depend	C0011860	Possible
ICPC2P	T90006	Diabetes;juvenile onset	C0011854	narrow
ICPC2P	T90006	Diabetes;juvenile onset	C0011854	Narrow
ICPC2P	T90007	Diabetes;adult onset	C0011860	Possible
ICPC2P	T90008	Diabetes;Type 1	C0011854	narrow
ICPC2P	T90009	Diabetes;Type 2	C0011860	Possible
ICPC2P	T99045	Hyperglycaemia	C0020456	Possible
RCD2	C10..	Diabetes mellitus	C0011849	Possible
RCD2	C100.	Diab.mell. - no complication	C0271635	Possible
RCD2	C100z	Diab.mell.no comp. - onset NOS	C0271635	Possible
RCD2	C101.	Diab.mell.with ketoacidosis	C0011880	Possible
RCD2	C101z	Diab.mell.+ketoacid -onset NOS	C0011880	Possible
RCD2	C105.	Diab.mell.+ eye manifestation	C0342245	Possible
RCD2	C105z	Diab.mell.+eye manif NOS	C0342245	Possible
RCD2	C106.	Diab.mell. with neuropathy	C0011882	Possible
RCD2	C107.	Diab.mell.+periph.circul.dis	C0011871	Possible
RCD2	C1070	Diab.+periph.circ.dis-juvenile	C0154182	Narrow
RCD2	C1073	IDDM periph circulatory disord	C0154182	Narrow



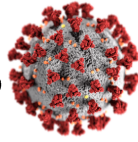
RCD2	C107z	Diab.+periph.circ.disease NOS	C0011871	Possible
RCD2	C108.	Insulin depnd diabetes melitus	C0011854	Narrow
RCD2	C10E.	Type 1 diabetes mellitus	C0011854	Narrow
RCD2	C10F.	Type 2 diabetes mellitus	C0011860	Possible
RCD2	C10y0	Diab.mell.+oth manif.-juvenile	C0342261	Narrow
RCD2	C10y1	Diab.mell.+other manif. -adult	C0342262	Possible
RCD2	C10yy	Oth spec diab mel+oth spec cmp	C0348931	Possible
RCD2	C10z.	Diab.mell. + unspec comp	C0342257	Possible
RCD2	C10zz	Diab.mell. + unspec comp NOS	C0342257	Possible
RCD2	F372.	Polyneuropathy in diabetes	C0011882	Possible
RCD2	G73y0	Diabetic peripheral angiopathy	C0011871	Possible
RCD2	R1057	[D]Glucose,blood level abnorm.	C0020456	Possible
RCD2	R10C.	[D]Drug induced hyperglycaemia	C0020456	Possible
RCD2	Ryu8A	[X]Hyperglycaemia, unspecified	C0020456	Possible
SCTSPA	866003	neuropatía diabética	C0011882	Possible
SCTSPA	982001	angiopatía periférica diabética	C0011871	Possible
SCTSPA	982001	angiopatía periférica diabética	C0011871	Possible
SCTSPA	24927004	acidosis diabética	C0011880	Possible
SCTSPA	25093002	enfermedad ocular debida a diabetes mellitus	C0342245	Possible
SCTSPA	33248009	coma diabético no cetósico no hiperosmolar	C0011870	Possible
SCTSPA	44054006	diabetes mellitus tipo 2	C0011860	Possible
SCTSPA	46635009	diabetes mellitus tipo 1	C0011854	narrow
SCTSPA	73211009	diabetes mellitus insulin dependent	C0011849	narrow
SCTSPA	74627003	complicación de la diabetes	C0342257	Possible
SCTSPA	80394007	hiperglucemia	C0020456	Possible
SCTSPA	111552007	diabetes mellitus sin complicación	C0271635	Possible
SCTSPA	127014009	angiopatía periférica debida a diabetes mellitus	C0011871	Possible
SCTSPA	154674007	diabetes mellitus sin mención de complicación	C0271635	Possible
SCTSPA	190321005	diabetes mellitus sin mención de complicación	C0271635	Possible
SCTSPA	190324002	diabetes mellitus, SAI sin mención de complicación	C0271635	Possible
SCTSPA	190328004	diabetes mellitus, SAI con cetoacidosis	C0011880	Possible
SCTSPA	190343002	diabetes mellitus con manifestaciones oftálmicas	C0342245	Possible
SCTSPA	190348006	diabetes mellitus, SAI con manifestaciones oftalmológicas	C0342245	Possible
SCTSPA	190353001	diabetes mellitus, SAI con manifestaciones neurológicas	C0011882	Possible
SCTSPA	190355008	diabetes mellitus, tipo juvenil, con trastorno circulatorio periférico	C0154182	Narrow
SCTSPA	190358005	diabetes mellitus insulinoddependiente con trastorno circulatorio periférico	C0154182	Narrow
SCTSPA	190361006	diabetes mellitus, SAI con trastorno circulatorio periférico	C0011871	Possible
SCTSPA	190418009	diabetes mellitus, tipo juvenil, con otra manifestación especificada	C0342261	Narrow
SCTSPA	190419001	diabetes mellitus, de inicio en la adultez, con otra manifestación especificada	C0342262	Possible
SCTSPA	190420007	otra diabetes mellitus especificada con otras complicaciones especificadas	C0348931	Possible
SCTSPA	190422004	diabetes mellitus con complicación no especificada	C0342257	Possible



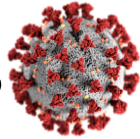
SCTSPA	190426001	diabetes mellitus, SAI con complicación no especificada	C0342257	Possible
SCTSPA	207643008	[X]hiperglucemia, no especificada	C0020456	Possible
SCTSPA	230572002	neuropatía diabética	C0011882	Possible
SCTSPA	237598005	trastorno hiperglucémico	C0020456	Possible
SCTSPA	237618001	síndrome de diarrea secretoria con diabetes mellitus insulino dependiente	C0342288	Narrow
SCTSPA	267383000	diabetes mellitus con trastorno circulatorio periférico	C0011871	Possible
SCTSPA	315299009	[D]hiperglucemia	C0020456	Possible
SCTSPA	372069003	diabetes mellitus con complicaciones	C0342257	Possible
SCTSPA	405096004	conducta relacionada con el automanejo de la diabetes	C1319140	Possible
SCTSPA	420422005	cetoacidosis diabética	C0011880	Possible
SCTSPA	280137006	Diabetic foot (disorder)		narrow
SCTSPA	59276001	Proliferative diabetic retinopathy (disorder)		narrow
SCTSPA	371087003	Diabetic foot ulcer (disorder)		narrow
SCTSPA	390834004	Non proliferative diabetic retinopathy (disorder)		narrow
SCTSPA	424736006	Diabetic peripheral neuropathy (disorder)		narrow
SCTSPA	789542009	Neuropathy due to type 1 diabetes mellitus (disorder)		narrow
SCTSPA	735537007	Hyperosmolar hyperglycemic coma due to diabetes mellitus without ketoacidosis (disorder)		narrow
SCTSPA	368581000119106	Neuropathy due to type 2 diabetes mellitus (disorder)		narrow
SNOMEDCT_US	866003	Diabetic neuropathy	C0011882	Possible
SNOMEDCT_US	982001	Diabetes with peripheral circulatory disorders	C0011871	Possible
SNOMEDCT_US	24927004	Diabetes mellitus with ketoacidosis	C0011880	Possible
SNOMEDCT_US	25093002	Disorder of eye due to diabetes mellitus	C0342245	Possible
SNOMEDCT_US	33248009	Diabetes with non-ketotic non-hyperosmolar coma	C0011870	Possible
SNOMEDCT_US	44054006	Type 2 diabetes mellitus	C0011860	Possible
SNOMEDCT_US	46635009	Type 1 diabetes mellitus	C0011854	narrow
SNOMEDCT_US	73211009	Diabetes mellitus	C0011849	Possible
SNOMEDCT_US	74627003	Complication due to diabetes mellitus	C0342257	Possible
SNOMEDCT_US	80394007	Hyperglycemia	C0020456	Possible
SNOMEDCT_US	111552007	Diabetes mellitus without complication	C0271635	Possible
SNOMEDCT_US	127014009	Peripheral angiopathy due to diabetes mellitus	C0011871	Possible
SNOMEDCT_US	144187006	Hyperglycaemia	C0020456	Possible
SNOMEDCT_US	154671004	Diabetes mellitus	C0011849	Possible
SNOMEDCT_US	154671004	Diabetes mellitus (& [ketoacidosis])	C0011880	Possible
SNOMEDCT_US	154672006	Diabetes mellitus: [adult onset] or [noninsulin dependent]	C0011860	Possible
SNOMEDCT_US	154673001	Diabetes mellitus: [juvenile] or [insulin dependent]	C0011854	Narrow
SNOMEDCT_US	154674007	Diabetes mellitus with no mention of complication	C0271635	Possible



SNOMEDCT_US	154678005	Diabetes + eye manifestation	C0342245	Possible
SNOMEDCT_US	154683002	Diabetes + neuropathy	C0011882	Possible
SNOMEDCT_US	154719004	Hyperglycaemia	C0020456	Possible
SNOMEDCT_US	190321005	Diabetes mellitus with no mention of complication	C0271635	Possible
SNOMEDCT_US	190322003	Insulin dependent diabetes mellitus	C0011854	Narrow
SNOMEDCT_US	190323008	Maturity onset diabetes	C0011860	Possible
SNOMEDCT_US	190324002	Diabetes mellitus NOS with no mention of complication	C0271635	Possible
SNOMEDCT_US	190328004	Diabetes mellitus NOS with ketoacidosis	C0011880	Possible
SNOMEDCT_US	190343002	Diabetes mellitus with ophthalmic manifestation	C0342245	Possible
SNOMEDCT_US	190348006	Diabetes mellitus NOS with ophthalmic manifestation	C0342245	Possible
SNOMEDCT_US	190349003	Diabetes mellitus with neurological manifestation	C0011882	Possible
SNOMEDCT_US	190354007	Diabetes mellitus with peripheral circulatory disorder	C0011871	Possible
SNOMEDCT_US	190355008	Diabetes mellitus, juvenile type, with peripheral circulatory disorder	C0154182	Narrow
SNOMEDCT_US	190358005	IDDM with peripheral circulatory disorder	C0154182	Narrow
SNOMEDCT_US	190361006	Diabetes mellitus NOS with peripheral circulatory disorder	C0011871	Possible
SNOMEDCT_US	190362004	Type I diabetes mellitus	C0011854	Narrow
SNOMEDCT_US	190362004	Type I diabetes mellitus	C0011854	Narrow
SNOMEDCT_US	190384004	Type II diabetes mellitus	C0011860	Possible
SNOMEDCT_US	190418009	Diabetes mellitus, juvenile type, with other specified manifestation	C0342261	Narrow
SNOMEDCT_US	190419001	Diabetes mellitus, adult onset, with other specified manifestation	C0342262	Possible
SNOMEDCT_US	190420007	Other specified diabetes mellitus with other specified complications	C0348931	Possible
SNOMEDCT_US	190422004	Diabetes mellitus with unspecified complication	C0342257	Possible
SNOMEDCT_US	190426001	Diabetes mellitus NOS with unspecified complication	C0342257	Possible
SNOMEDCT_US	191044006	Diabetes mellitus	C0011849	Possible
SNOMEDCT_US	193182005	Diabetic neuropathy	C0011882	Possible
SNOMEDCT_US	207289007	[D]Hyperglycaemia	C0020456	Possible
SNOMEDCT_US	207643008	[X]Hyperglycaemia, unspecified	C0020456	Possible
SNOMEDCT_US	230572002	Neuropathy due to diabetes mellitus	C0011882	Possible
SNOMEDCT_US	237598005	Hyperglycemic disorder	C0020456	Possible
SNOMEDCT_US	237618001	Congenital insulin-dependent diabetes mellitus with fatal secretory diarrhea	C0342288	Narrow
SNOMEDCT_US	267383000	Diabetes mellitus with peripheral circulatory disorder	C0011871	Possible
SNOMEDCT_US	267467004	Diabetes mellitus	C0011849	Possible



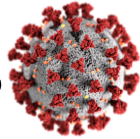
SNOMEDCT_US	267467004	Diabetes mellitus (& [ketoacidosis])	C0011880	Possible
SNOMEDCT_US	267468009	Diabetes mellitus -adult onset	C0011860	Possible
SNOMEDCT_US	267469001	Diabetes mellitus - juvenile	C0011854	Narrow
SNOMEDCT_US	267471001	Diabetes + eye manifestation	C0342245	Possible
SNOMEDCT_US	267472008	Diabetes + neuropathy	C0011882	Possible
SNOMEDCT_US	267473003	Diabetes + periph.circulat.dis	C0011871	Possible
SNOMEDCT_US	270004003	Hyperglycaemia	C0020456	Possible
SNOMEDCT_US	315299009	[D]Hyperglycaemia	C0020456	Possible
SNOMEDCT_US	372069003	Diabetes mellitus with complication	C0342257	Possible
SNOMEDCT_US	390730002	[D]Hyperglycaemia	C0020456	Possible
SNOMEDCT_US	405096004	Diabetes self-management behavior	C1319140	Possible
SNOMEDCT_US	420422005	Diabetic ketoacidosis	C0011880	Possible
SNOMEDCT_US	4855003	Insulin dependent diabetes mellitus		Narrow
SNOMEDCT_US	25093002	Insulin dependent diabetes mellitus		narrow
SNOMEDCT_US	39710007	Insulin dependent diabetes mellitus		narrow
SNOMEDCT_US	43959009	Insulin dependent diabetes mellitus with cataract		narrow
SNOMEDCT_US	190368000	Type 1 with ulcer		narrow
SNOMEDCT_US	190372001	Type 1 maturity onset		narrow
SNOMEDCT_US	201724008	Type 1 with neuropathic atropathy		narrow
SNOMEDCT_US	421920002	Insulin dependent diabetes mellitus with cataract		narrow
SNOMEDCT_US	71771000119100	Type 1 diabetes mellitus		narrow
SNOMEDCT_US	421075007	Type 1 diabetes mellitus		narrow
SNOMEDCT_US	46635009	Type 1 diabetes mellitus		narrow
SNOMEDCT_US	44054006	Type 1 diabetes mellitus		narrow
SNOMEDCT_US	421365002	Diabetes mellitus, juvenile +peripheral circulatory disorder		narrow
SNOMEDCT_US	421365002	Diabetes mellitus, juvenile +peripheral circulatory disorder		narrow
SNOMEDCT_US	739681000	Diabetes mellitus, juvenile type, + ophthalmic manifestation		narrow
SNOMEDCT_US	739681000	Diabetes mellitus, juvenile type, + ophthalmic manifestation		narrow
SNOMEDCT_US	420868002	Diabetes mellitus, juvenile type, + unspecified complication		narrow
SNOMEDCT_US	420868002	Diabetes mellitus, juvenile type, + unspecified complication		narrow
SNOMEDCT_US	313435000	Diabetes mellitus, juvenile type, no mention of complication		narrow
SNOMEDCT_US	313435000	Diabetes mellitus, juvenile type, no mention of complication		narrow



SNOMEDCT_US	190330002	Diabetes mellitus, juvenile type, with hyperosmolar coma	narrow
SNOMEDCT_US	190330002	Diabetes mellitus, juvenile type, with hyperosmolar coma	narrow
SNOMEDCT_US	420270002	Diabetes mellitus, juvenile type, with ketoacidosis	narrow
SNOMEDCT_US	420270002	Diabetes mellitus, juvenile type, with ketoacidosis	narrow
SNOMEDCT_US	421075007	Diabetes mellitus, juvenile type, with ketoacidotic coma	narrow
SNOMEDCT_US	421075007	Diabetes mellitus, juvenile type, with ketoacidotic coma	narrow
SNOMEDCT_US	421893009	Diabetes mellitus, juvenile type, with renal manifestation	narrow
SNOMEDCT_US	421893009	Diabetes mellitus, juvenile type, with renal manifestation	narrow
SNOMEDCT_US	421468001	Diabetes mellitus, juvenile, + neurological manifestation	narrow
SNOMEDCT_US	421468001	Diabetes mellitus, juvenile, + neurological manifestation	narrow
SNOMEDCT_US	73211009	Diabetes mellitus, juvenile, + other specified manifestation	narrow
SNOMEDCT_US	421920002	Diabetes type 1 with cataract	narrow
SNOMEDCT_US	420825003	Diabetes type 1 with gangrene	narrow
SNOMEDCT_US	421468001	Diabetes type 1 with neurological disorder	narrow
SNOMEDCT_US	420789003	Diabetes type 1 with retinopathy	narrow
SNOMEDCT_US	73211009	Insulin dependent diabetes maturity onset	narrow
SNOMEDCT_US	268519009	Insulin dependent diabetes mellitus - poor control	narrow
SNOMEDCT_US	39710007	Insulin dependent diabetes mellitus with arthropathy	narrow
SNOMEDCT_US	43959009	Insulin dependent diabetes mellitus with diabetic cataract	narrow
SNOMEDCT_US	237632004	Insulin dependent diabetes mellitus with hypoglycaemic coma	narrow
SNOMEDCT_US	314771006	Insulin dependent diabetes mellitus with hypoglycaemic coma	narrow
SNOMEDCT_US	230577008	Insulin dependent diabetes mellitus with mononeuropathy	narrow
SNOMEDCT_US	38504100000108	Insulin dependent diabetes mellitus with multiple complicat	narrow
SNOMEDCT_US	127013003	Insulin dependent diabetes mellitus with nephropathy	narrow
SNOMEDCT_US	49455004	Insulin dependent diabetes mellitus with polyneuropathy	narrow
SNOMEDCT_US	49455004	Insulin dependent diabetes mellitus with polyneuropathy	narrow
SNOMEDCT_US	4855003	Insulin dependent diabetes mellitus with retinopathy	narrow
SNOMEDCT_US	422183001	Insulin dependent diabetes mellitus with ulcer	narrow
SNOMEDCT_US	422088007	Insulin-dependent diabetes mellitus with neurological comps	narrow
SNOMEDCT_US	25093002	Insulin-dependent diabetes mellitus with ophthalmic comps	narrow
SNOMEDCT_US	127013003	Insulin-dependent diabetes mellitus with renal complications	narrow
SNOMEDCT_US	111552007	Insulin-dependent diabetes without complication	narrow

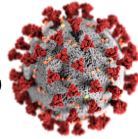
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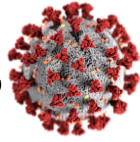


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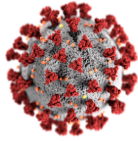
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SNOMEDCT_US	444073006	Type 1 diabetes mellitus - poor control	narrow
SNOMEDCT_US	444073006	Type 1 diabetes mellitus - poor control	narrow
SNOMEDCT_US	703137001	Type 1 diabetes mellitus in remission	narrow
SNOMEDCT_US	190372001	Type 1 diabetes mellitus maturity onset	narrow
SNOMEDCT_US	190372001	Type 1 diabetes mellitus maturity onset	narrow
SNOMEDCT_US	444073006	Type 1 diabetes mellitus uncontrolled	narrow
SNOMEDCT_US	314893005	Type 1 diabetes mellitus with arthropathy	narrow
SNOMEDCT_US	314893005	Type 1 diabetes mellitus with arthropathy	narrow
SNOMEDCT_US	421920002	Type 1 diabetes mellitus with diabetic cataract	narrow
SNOMEDCT_US	421920002	Type 1 diabetes mellitus with diabetic cataract	narrow
SNOMEDCT_US	420486006	Type 1 diabetes mellitus with exudative maculopathy	narrow
SNOMEDCT_US	420486006	Type 1 diabetes mellitus with exudative maculopathy	narrow
SNOMEDCT_US	420825003	Type 1 diabetes mellitus with gangrene	narrow
SNOMEDCT_US	420825003	Type 1 diabetes mellitus with gangrene	narrow
SNOMEDCT_US	420825003	Type 1 diabetes mellitus with gangrene	narrow
SNOMEDCT_US	713702000	Type 1 diabetes mellitus with gastroparesis	narrow
SNOMEDCT_US	713702000	Type 1 diabetes mellitus with gastroparesis	narrow
SNOMEDCT_US	314771006	Type 1 diabetes mellitus with hypoglycaemic coma	narrow
SNOMEDCT_US	314771006	Type 1 diabetes mellitus with hypoglycaemic coma	narrow
SNOMEDCT_US	420270002	Type 1 diabetes mellitus with ketoacidosis	narrow
SNOMEDCT_US	421075007	Type 1 diabetes mellitus with ketoacidotic coma	narrow
SNOMEDCT_US	420918009	Type 1 diabetes mellitus with mononeuropathy	narrow
SNOMEDCT_US	420918009	Type 1 diabetes mellitus with mononeuropathy	narrow
SNOMEDCT_US	422228004	Type 1 diabetes mellitus with multiple complications	narrow
SNOMEDCT_US	422228004	Type 1 diabetes mellitus with multiple complications	narrow
SNOMEDCT_US	421893009	Type 1 diabetes mellitus with nephropathy	narrow
SNOMEDCT_US	421893009	Type 1 diabetes mellitus with nephropathy	narrow
SNOMEDCT_US	421468001	Type 1 diabetes mellitus with neurological complications	narrow
SNOMEDCT_US	421468001	Type 1 diabetes mellitus with neurological complications	narrow
SNOMEDCT_US	7177100011910 0	Type 1 diabetes mellitus with neuropathic arthropathy	narrow
SNOMEDCT_US	7177100011910 0	Type 1 diabetes mellitus with neuropathic arthropathy	narrow



SNOMEDCT_US	739681000	Type 1 diabetes mellitus with ophthalmic complications	narrow
SNOMEDCT_US	739681000	Type 1 diabetes mellitus with ophthalmic complications	narrow
SNOMEDCT_US	31211000119101	Type 1 diabetes mellitus with peripheral angiopathy	narrow
SNOMEDCT_US	401110002	Type 1 diabetes mellitus with persistent microalbuminuria	narrow
SNOMEDCT_US	420514000	Type 1 diabetes mellitus with persistent proteinuria	narrow
SNOMEDCT_US	420514000	Type 1 diabetes mellitus with persistent proteinuria	narrow
SNOMEDCT_US	713705003	Type 1 diabetes mellitus with polyneuropathy	narrow
SNOMEDCT_US	713705003	Type 1 diabetes mellitus with polyneuropathy	narrow
SNOMEDCT_US	421893009	Type 1 diabetes mellitus with renal complications	narrow
SNOMEDCT_US	421893009	Type 1 diabetes mellitus with renal complications	narrow
SNOMEDCT_US	420789003	Type 1 diabetes mellitus with retinopathy	narrow
SNOMEDCT_US	420789003	Type 1 diabetes mellitus with retinopathy	narrow
SNOMEDCT_US	190368000	Type 1 diabetes mellitus with ulcer	narrow
SNOMEDCT_US	190368000	Type 1 diabetes mellitus with ulcer	narrow
SNOMEDCT_US	313435000	Type 1 diabetes mellitus without complication	narrow
SNOMEDCT_US	313435000	Type 1 diabetes mellitus without complication	narrow
SNOMEDCT_US	46635009	Type I diabetes mellitus	narrow
SNOMEDCT_US	46635009	Type I diabetes mellitus	narrow
SNOMEDCT_US	444073006	Type I diabetes mellitus - poor control	narrow
SNOMEDCT_US	444073006	Type I diabetes mellitus - poor control	narrow
SNOMEDCT_US	444073006	Type I diabetes mellitus - poor control	narrow
SNOMEDCT_US	703137001	Type I diabetes mellitus in remission	narrow
SNOMEDCT_US	190372001	Type I diabetes mellitus maturity onset	narrow
SNOMEDCT_US	190372001	Type I diabetes mellitus maturity onset	narrow
SNOMEDCT_US	190372001	Type I diabetes mellitus maturity onset	narrow
SNOMEDCT_US	314893005	Type I diabetes mellitus with arthropathy	narrow
SNOMEDCT_US	314893005	Type I diabetes mellitus with arthropathy	narrow
SNOMEDCT_US	314893005	Type I diabetes mellitus with arthropathy	narrow
SNOMEDCT_US	421920002	Type I diabetes mellitus with diabetic cataract	narrow
SNOMEDCT_US	421920002	Type I diabetes mellitus with diabetic cataract	narrow
SNOMEDCT_US	421920002	Type I diabetes mellitus with diabetic cataract	narrow
SNOMEDCT_US	420486006	Type I diabetes mellitus with exudative maculopathy	narrow



SNOMEDCT_US	420825003	Type I diabetes mellitus with gangrene		narrow
SNOMEDCT_US	420825003	Type I diabetes mellitus with gangrene		narrow
SNOMEDCT_US	713702000	Type I diabetes mellitus with gastroparesis		narrow
SNOMEDCT_US	314771006	Type I diabetes mellitus with hypoglycaemic coma		narrow
SNOMEDCT_US	314771006	Type I diabetes mellitus with hypoglycaemic coma		narrow
SNOMEDCT_US	314771006	Type I diabetes mellitus with hypoglycaemic coma		narrow
SNOMEDCT_US	314771006	Type I diabetes mellitus with hypoglycemic coma		narrow
SNOMEDCT_US	420270002	Type I diabetes mellitus with ketoacidosis		narrow
SNOMEDCT_US	421075007	Type I diabetes mellitus with ketoacidotic coma		narrow
SNOMEDCT_US	420918009	Type I diabetes mellitus with mononeuropathy		narrow
SNOMEDCT_US	420918009	Type I diabetes mellitus with mononeuropathy		narrow
SNOMEDCT_US	420918009	Type I diabetes mellitus with mononeuropathy		narrow
SNOMEDCT_US	422228004	Type I diabetes mellitus with multiple complications		narrow
SNOMEDCT_US	422228004	Type I diabetes mellitus with multiple complications		narrow
SNOMEDCT_US	422228004	Type I diabetes mellitus with multiple complications		narrow
SNOMEDCT_US	421893009	Type I diabetes mellitus with nephropathy		narrow
SNOMEDCT_US	421893009	Type I diabetes mellitus with nephropathy		narrow
SNOMEDCT_US	421468001	Type I diabetes mellitus with neurological complications		narrow
SNOMEDCT_US	421468001	Type I diabetes mellitus with neurological complications		narrow
SNOMEDCT_US	7177100011910 0	Type I diabetes mellitus with neuropathic arthropathy		narrow
SNOMEDCT_US	739681000	Type I diabetes mellitus with ophthalmic complications		narrow
SNOMEDCT_US	739681000	Type I diabetes mellitus with ophthalmic complications		narrow
SNOMEDCT_US	3121100011910 1	Type I diabetes mellitus with peripheral angiopathy		narrow
SNOMEDCT_US	401110002	Type I diabetes mellitus with persistent microalbuminuria		narrow
SNOMEDCT_US	420514000	Type I diabetes mellitus with persistent proteinuria		narrow
SNOMEDCT_US	713705003	Type I diabetes mellitus with polyneuropathy		narrow
SNOMEDCT_US	713705003	Type I diabetes mellitus with polyneuropathy		narrow
SNOMEDCT_US	713705003	Type I diabetes mellitus with polyneuropathy		narrow
SNOMEDCT_US	421893009	Type I diabetes mellitus with renal complications		narrow
SNOMEDCT_US	421893009	Type I diabetes mellitus with renal complications		narrow
SNOMEDCT_US	420789003	Type I diabetes mellitus with retinopathy		narrow
SNOMEDCT_US	420789003	Type I diabetes mellitus with retinopathy		narrow



SNOMEDCT_US	420789003	Type I diabetes mellitus with retinopathy		narrow
SNOMEDCT_US	190368000	Type I diabetes mellitus with ulcer		narrow
SNOMEDCT_US	190368000	Type I diabetes mellitus with ulcer		narrow
SNOMEDCT_US	190368000	Type I diabetes mellitus with ulcer		narrow
SNOMEDCT_US	313435000	Type I diabetes mellitus without complication		narrow
SNOMEDCT_US	313435000	Type I diabetes mellitus without complication		narrow
SNOMEDCT_US	11530004	Unstable insulin dependent diabetes mellitus		narrow
SNOMEDCT_US	11530004	Unstable insulin dependent diabetes mellitus		narrow
SNOMEDCT_US	11530004	Unstable insulin dependent diabetes mellitus		narrow
SNOMEDCT_US	290002008	Unstable type 1 diabetes mellitus		narrow
SNOMEDCT_US	290002008	Unstable type 1 diabetes mellitus		narrow
SNOMEDCT_US	290002008	Unstable type I diabetes mellitus		narrow
SNOMEDCT_US	290002008	Unstable type I diabetes mellitus		narrow
SNOMEDCT_US	290002008	Unstable type I diabetes mellitus		narrow

11. Algorithm proposal

Broad algorithm:

- All concept sets: Concept sets = (Type1diabetes, diabetes_mellitus), any position, any provenance
- Index date: first occurrence of any of these concept sets

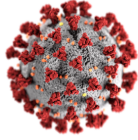
Narrow algorithm:

- Narrow codes excluding oral antidiabetic (ATC=A10B)
- Index date: first occurrence of concept set

12. References

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1. American Diabetes Association. Diagnosis and classification of diabetes mellitus. *Diabetes Care*. 2009 Jan;32 Suppl 1(Suppl 1):S62-7. doi: 10.2337/dc09-S062. PMID: 19118289; PMCID: PMC2613584.
2. **Mini-Sentinel Applied Surveillance Core, Health Outcome Algorithm Inventory.**
<https://www.sentinelinitiative.org/methods-data-tools/health-outcomes-interest/health-outcome-algorithm-inventory>