

Supplementary data

Table S1 Inclusion medical codes for type 2 diabetes

	Medical code	Read term
1.	506	Non-insulin dependent diabetes mellitus
2.	758	Type 2 diabetes mellitus
3.	1407	Insulin treated Type 2 diabetes mellitus
4.	4513	Non-insulin dependent diabetes mellitus
5.	5884	NIDDM - Non-insulin dependent diabetes mellitus
6.	8403	Non-insulin dependent diabetes mellitus - poor control
7.	12640	Type 2 diabetes mellitus with nephropathy
8.	12736	Type 2 diabetes mellitus with gangrene
9.	17262	Non-insulin-dependent diabetes mellitus with retinopathy
10.	17859	Type 2 diabetes mellitus
11.	18143	Type II diabetes mellitus with arthropathy
12.	18209	Type 2 diabetes mellitus with renal complications
13.	18219	Type II diabetes mellitus
14.	18264	Insulin treated Type II diabetes mellitus
15.	18278	Insulin treated Type 2 diabetes mellitus
16.	18390	Type 2 diabetes mellitus with persistent microalbuminuria
17.	18425	Type 2 diabetes mellitus with polyneuropathy
18.	18496	Type 2 diabetes mellitus with retinopathy
19.	18777	Type 2 diabetes mellitus with renal complications
20.	22884	Type II diabetes mellitus
21.	24458	Type II diabetes mellitus - poor control
22.	24693	Non-insulin dependent diabetes mellitus with arthropathy
23.	24836	Type 2 diabetes mellitus with nephropathy
24.	25041	Dietary advice for type II diabetes
25.	25591	Type 2 diabetes mellitus with exudative maculopathy
26.	25627	Type 2 diabetes mellitus - poor control
27.	26054	Type 2 diabetes mellitus with persistent proteinuria
28.	29979	Non-insulin-dependent diabetes mellitus without complication
29.	32627	Type 2 diabetes mellitus with ketoacidosis
30.	34268	Type 2 diabetes mellitus with neurological complications
31.	34450	Hyperosmolar non-ketotic state in type 2 diabetes mellitus
32.	34912	Non-insulin dependent diabetes mellitus with ulcer
33.	35385	Type 2 diabetes mellitus with neuropathic arthropathy
34.	36633	Hyperosmolar non-ketotic state in type 2 diabetes mellitus
35.	36695	Diabetes mellitus autosomal dominant type 2
36.	37648	Insulin treated non-insulin dependent diabetes mellitus
37.	37806	Type 2 diabetes mellitus with peripheral angiopathy
38.	40401	Non-insulin dependent diabetes mellitus with gangrene
39.	42762	Type 2 diabetes mellitus with retinopathy
40.	43227	Type II diabetes mellitus with multiple complications
41.	43785	Non-insulin dependent diabetes mellitus with hypoglyca coma
42.	44779	Type 2 diabetes mellitus with diabetic cataract
43.	44982	Type 2 diabetes mellitus with diabetic cataract
44.	45467	Non-insulin dependent diabetes mellitus with polyneuropathy
45.	45913	Type 2 diabetes mellitus - poor control
46.	45919	Type 2 diabetes mellitus with neurological complications

	Medical code	Read term
47.	46150	Type 2 diabetes mellitus with gangrene
48.	46917	Type 2 diabetes mellitus with hypoglycaemic coma
49.	47315	Type II diabetes mellitus - poor control
50.	47321	Type 2 diabetes mellitus with ophthalmic complications
51.	47409	Type II diabetes mellitus with polyneuropathy
52.	47816	Type II diabetes mellitus with neuropathic arthropathy
53.	47954	Type 2 diabetes mellitus without complication
54.	48192	Type II diabetes mellitus with diabetic cataract
55.	49074	Type 2 diabetes mellitus with ulcer
56.	49655	Type II diabetes mellitus with retinopathy
57.	49869	Type 2 diabetes mellitus with arthropathy
58.	50225	Type II diabetes mellitus with renal complications
59.	50429	Non-insulin-dependent diabetes mellitus with ophthalm comps
60.	50527	Type II diabetes mellitus with polyneuropathy
61.	50609	Pre-existing diabetes mellitus, non-insulin-dependent
62.	50813	Type II diabetes mellitus with mononeuropathy
63.	51756	Type 2 diabetes mellitus with ketoacidotic coma
64.	52303	Non-insulin-dependent diabetes mellitus with renal comps
65.	53392	Type II diabetes mellitus without complication
66.	54899	Type II diabetes mellitus with peripheral angiopathy
67.	55075	Type II diabetes mellitus with ulcer
68.	55842	Non-insulin-dependent diabetes mellitus with neuro comps
69.	56268	Type II diabetes mellitus with hypoglycaemic coma
70.	56803	NIDDM with peripheral circulatory disorder
71.	57278	Type II diabetes mellitus with renal complications
72.	58604	Type II diabetes mellitus with retinopathy
73.	59253	Type 2 diabetes mellitus with arthropathy
74.	59365	Non-insulin dependent diabetes mellitus with nephropathy
75.	59725	Type II diabetes mellitus with ophthalmic complications
76.	60699	Type 2 diabetes mellitus with peripheral angiopathy
77.	60796	Type II diabetes mellitus with persistent proteinuria
78.	61071	Type 2 diabetes mellitus with hypoglycaemic coma
79.	62107	Type II diabetes mellitus with gangrene
80.	62146	Non-insulin-dependent diabetes mellitus with multiple comps
81.	62674	Type 2 diabetes mellitus with mononeuropathy
82.	63690	Type 2 diabetes mellitus with gastroparesis
83.	64571	Type II diabetes mellitus with nephropathy
84.	64668	Insulin treated Type II diabetes mellitus
85.	65267	Type 2 diabetes mellitus with multiple complications
86.	65704	Type 2 diabetes mellitus with ulcer
87.	66965	Type 2 diabetes mellitus with neuropathic arthropathy
88.	67905	Type II diabetes mellitus with neurological complications
89.	69278	Non-insulin depend diabetes mellitus with diabetic cataract
90.	70316	Type 2 diabetes mellitus with ophthalmic complications
91.	72320	Non-insulin dependent diabetes mellitus with mononeuropathy
92.	83532	Diabetes type 2 review
93.	85991	Type II diabetes mellitus with persistent microalbuminuria
94.	91646	Type II diabetes mellitus with ulcer
95.	93727	Type II diabetes mellitus with diabetic cataract
96.	95351	Type II diabetes mellitus with mononeuropathy
97.	98616	Type II diabetes mellitus with neurological complications
98.	98723	Type II diabetes mellitus with hypoglycaemic coma
99.	100964	Type II diabetes mellitus with ophthalmic complications

	Medical code	Read term
100.	101801	Type II diabetic dietary review
101.	102201	Type II diabetes mellitus with nephropathy
102.	102611	Type 2 diabetic dietary review
103.	103902	Type II diabetes mellitus with arthropathy
104.	104323	Type II diabetes mellitus with gangrene
105.	104639	Type II diabetes mellitus with peripheral angiopathy
106.	105784	Type 2 diabetes mellitus without complication
107.	106061	Type II diabetes mellitus with ketoacidotic coma
108.	106528	Type II diabetes mellitus with ketoacidosis
109.	107701	Hyperosmolar non-ketotic state in type II diabetes mellitus
110.	107824	Type II diabetes mellitus in remission
111.	108005	Type 2 diabetes mellitus with multiple complications
112.	109103	Type II diabetes mellitus without complication
113.	109197	Type II diabetes mellitus with neuropathic arthropathy
114.	109865	Type 2 diabetes mellitus with polyneuropathy
115.	111798	Type II diabetes mellitus with exudative maculopathy

Table S2 Exclusion type 1 diabetes codes

	Medical code	Read term
1.	1038	Insulin dependent diabetes mellitus
2.	1549	Type 1 diabetes mellitus
3.	1647	Insulin dependent diabetes mellitus
4.	6509	Insulin dependent diabetes mellitus with retinopathy
5.	6791	Insulin dependent diabetes mellitus - poor control
6.	10418	Type 1 diabetes mellitus with nephropathy
7.	10692	Type 1 diabetes mellitus with ketoacidosis
8.	12455	Type I diabetes mellitus
9.	17545	Type I diabetes mellitus with diabetic cataract
10.	17858	Type 1 diabetes mellitus
11.	18230	Type 1 diabetes mellitus with neuropathic arthropathy
12.	18387	Type 1 diabetes mellitus with retinopathy
13.	18505	IDDM-Insulin dependent diabetes mellitus
14.	18642	Type 1 diabetes mellitus with arthropathy
15.	18683	Type 1 diabetes mellitus with ulcer
16.	21983	Type 1 diabetes mellitus with renal complications
17.	22871	Type 1 diabetes mellitus with exudative maculopathy
18.	24423	Type I diabetes mellitus
19.	24490	Diabetes mellitus, juvenile type, no mention of complication
20.	24694	Insulin dependent diabetes mellitus with mononeuropathy
21.	26855	Unstable insulin dependent diabetes mellitus
22.	30294	Type 1 diabetes mellitus with persistent microalbuminuria
23.	30323	Type 1 diabetes mellitus with persistent proteinuria
24.	31310	Insulin dependent diabetes maturity onset
25.	32359	Perceived control of insulin-dependent diabetes
26.	35288	Type 1 diabetes mellitus - poor control
27.	38161	Type I diabetes mellitus with retinopathy
28.	39070	Type 1 diabetes mellitus with hypoglycaemic coma
29.	39809	Insulin dependent diab mell with neuropathic arthropathy
30.	40023	Diabetes mellitus, juvenile type, with hyperosmolar coma
31.	40682	Type 1 diabetes mellitus maturity onset
32.	40837	Type 1 diabetes mellitus with ketoacidotic coma
33.	41049	Type 1 diabetes mellitus with retinopathy
34.	41716	Insulin dependent diabetes mellitus with polyneuropathy
35.	42567	Diabetes mellitus, juvenile type, with ketoacidotic coma
36.	42729	Type I diabetes mellitus with hypoglycaemic coma
37.	42831	Type 1 diabetes mellitus with neurological complications
38.	43921	Unstable type 1 diabetes mellitus
39.	44260	Insulin dependent diabetes mellitus with diabetic cataract
40.	44440	Insulin dependent diabetes mellitus with hypoglycaemic coma
41.	44443	Insulin dependent diabetes mellitus with ulcer
42.	45276	Insulin dependent diabetes mellitus with multiple complicat
43.	45914	Type 1 diabetes mellitus - poor control
44.	46301	Type 1 diabetes mellitus with polyneuropathy
45.	46850	Type I diabetes mellitus - poor control
46.	46963	Insulin-dependent diabetes mellitus with renal complications
47.	47582	Type 1 diabetes mellitus with renal complications

	Medical code	Read term
48.	47649	Type 1 diabetes mellitus with ophthalmic complications
49.	47650	Type 1 diabetes mellitus with multiple complications
50.	49146	Type I diabetes mellitus with neurological complications
51.	49276	Insulin-dependent diabetes mellitus with ophthalmic comps
52.	49554	Type 1 diabetes mellitus with diabetic cataract
53.	49949	Unstable type I diabetes mellitus
54.	50960	Pre-existing diabetes mellitus, insulin-dependent
55.	51261	Insulin dependent diabetes mellitus
56.	51957	Type I diabetes mellitus with ulcer
57.	52104	Insulin dependent diabetes mellitus with multiple complicatn
58.	52283	Insulin-dependent diabetes mellitus with neurological comps
59.	53200	Diabetes mellitus, juvenile type, with ketoacidosis
60.	54008	Type 1 diabetes mellitus with neuropathic arthropathy
61.	54600	Unstable insulin dependent diabetes mellitus
62.	55239	Type 1 diabetes mellitus with gastroparesis
63.	56448	Insulin-dependent diabetes without complication
64.	57621	Insulin dependent diabetes mellitus with nephropathy
65.	60107	Unstable type I diabetes mellitus
66.	60208	Type I diabetes mellitus with neuropathic arthropathy
67.	60499	Insulin dependent diabetes mellitus with gangrene
68.	61344	Type I diabetes mellitus with renal complications
69.	61829	Type 1 diabetes mellitus with neurological complications
70.	62209	Type I diabetes mellitus with ketoacidosis
71.	62352	Type I diabetes mellitus with arthropathy
72.	62613	Type I diabetes mellitus without complication
73.	63017	Type I diabetes mellitus maturity onset
74.	64446	Insulin dependent diab mell with peripheral angiopathy
75.	65616	Insulin dependent diabetes mellitus with arthropathy
76.	66145	Type I diabetes mellitus with ketoacidotic coma
77.	66872	Type I diabetes mellitus with nephropathy
78.	68105	Type 1 diabetes mellitus with mononeuropathy
79.	68390	Type 1 diabetes mellitus with ulcer
80.	68792	Diabetes mellitus, juvenile type, + unspecified complication
81.	69043	Dietary advice for type I diabetes
82.	69676	Type 1 diabetes mellitus without complication
83.	69748	Diabetes mellitus, juvenile type, + ophthalmic manifestation
84.	69993	Type 1 diabetes mellitus with gangrene
85.	70766	Type 1 diabetes mellitus with hypoglycaemic coma
86.	72702	Insulin dependent diabetes mellitus - poor control
87.	85660	Diabetes type 1 review
88.	91942	Type I diabetes mellitus with multiple complications
89.	91943	Type I diabetes mellitus with polyneuropathy
90.	93468	Type 1 diabetes mellitus with peripheral angiopathy
91.	93875	Insulin dependent diabetes mellitus with retinopathy
92.	93878	Type I diabetes mellitus with ulcer
93.	93922	Diabetes mellitus, juvenile type, with renal manifestation
94.	95343	Type I diabetes mellitus with retinopathy
95.	95992	Type I diabetes mellitus without complication
96.	96235	Type I diabetes mellitus maturity onset
97.	97446	Type 1 diabetes mellitus maturity onset
98.	97474	Unstable type 1 diabetes mellitus
99.	97849	Insulin dependent diabetes maturity onset
100.	97894	Type I diabetes mellitus with exudative maculopathy

	Medical code	Read term
101.	98071	Insulin-dependent diabetes mellitus with ophthalmic comps
102.	98392	Maturity onset diabetes in youth type 1
103.	98704	Insulin dependent diabetes mellitus with ulcer
104.	99231	Type I diabetes mellitus with mononeuropathy
105.	99311	Type I diabetes mellitus with ophthalmic complications
106.	99716	Insulin dependent diabetes mellitus with hypoglycaemic coma
107.	99719	Insulin-dependent diabetes without complication
108.	100770	Insulin dependent diabetes mellitus with diabetic cataract
109.	101311	Insulin dependent diabetes mellitus with polyneuropathy
110.	101735	Insulin-dependent diabetes mellitus with neurological comps
111.	102112	Type I diabetes mellitus with gangrene
112.	102163	Insulin dependent diabetes mellitus with nephropathy
113.	102620	Type I diabetes mellitus with persistent microalbuminuria
114.	102704	Type I diabetic dietary review
115.	102740	Type 1 diabetes mellitus with ophthalmic complications
116.	102946	Insulin-dependent diabetes mellitus with renal complications
117.	104453	Type 1 diabetic dietary review
118.	105337	Type I diabetes mellitus - poor control
119.	108007	Type I diabetes mellitus with multiple complications
120.	108360	Type I diabetes mellitus in remission
121.	108724	Type I diabetes mellitus with gastroparesis
122.	109051	Insulin dependent diabetes mellitus with gangrene
123.	109628	Type 1 diabetes mellitus in remission
124.	109837	Type I diabetes mellitus with renal complications
125.	109878	Diet advice for insulin-dependent diabetes
126.	110400	Type 1 diabetes mellitus with diabetic cataract
127.	111106	Type 1 diabetes mellitus without complication

Figure S1 Severity hierarchy of cardiovascular disease domains (cardiac muscle- myocardium and pericardium).

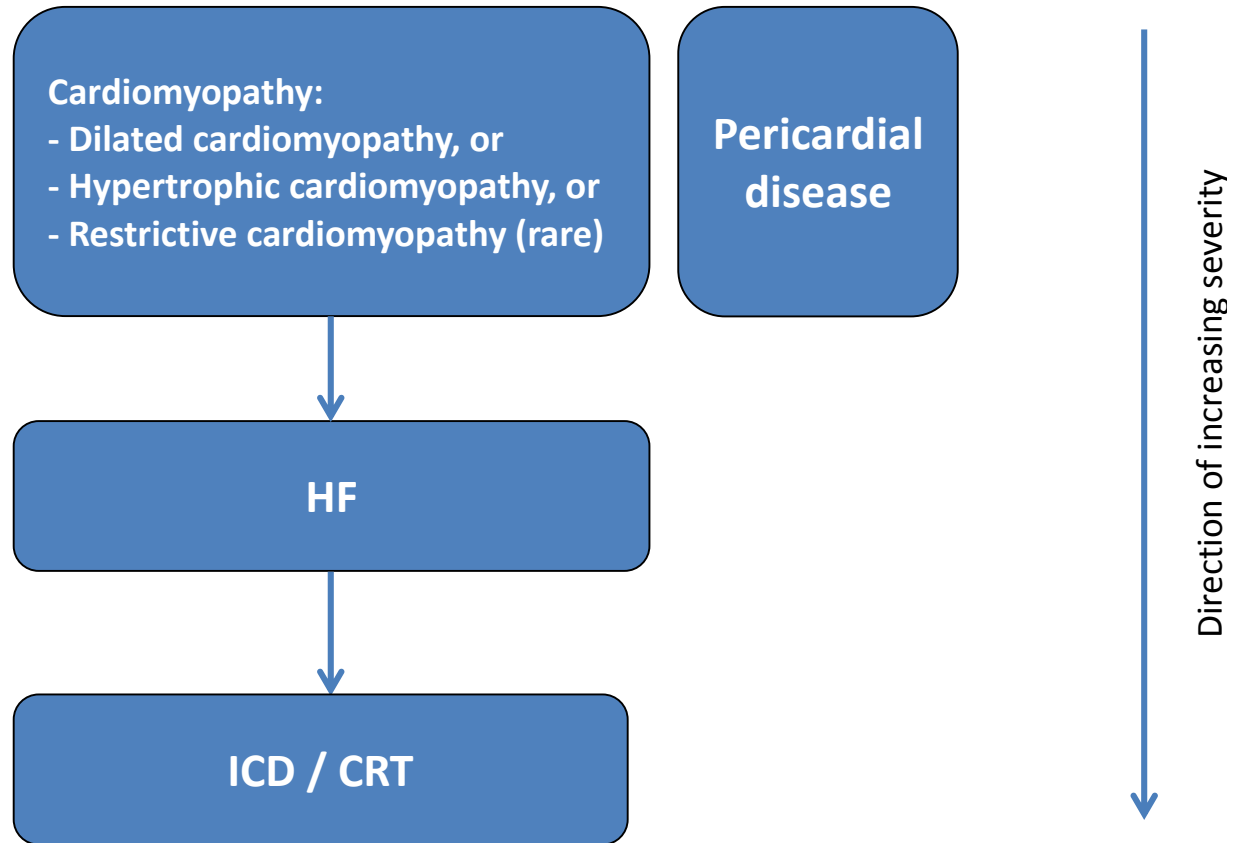


Figure S2 Severity hierarchy of cardiovascular disease domains (Heart valve diseases)

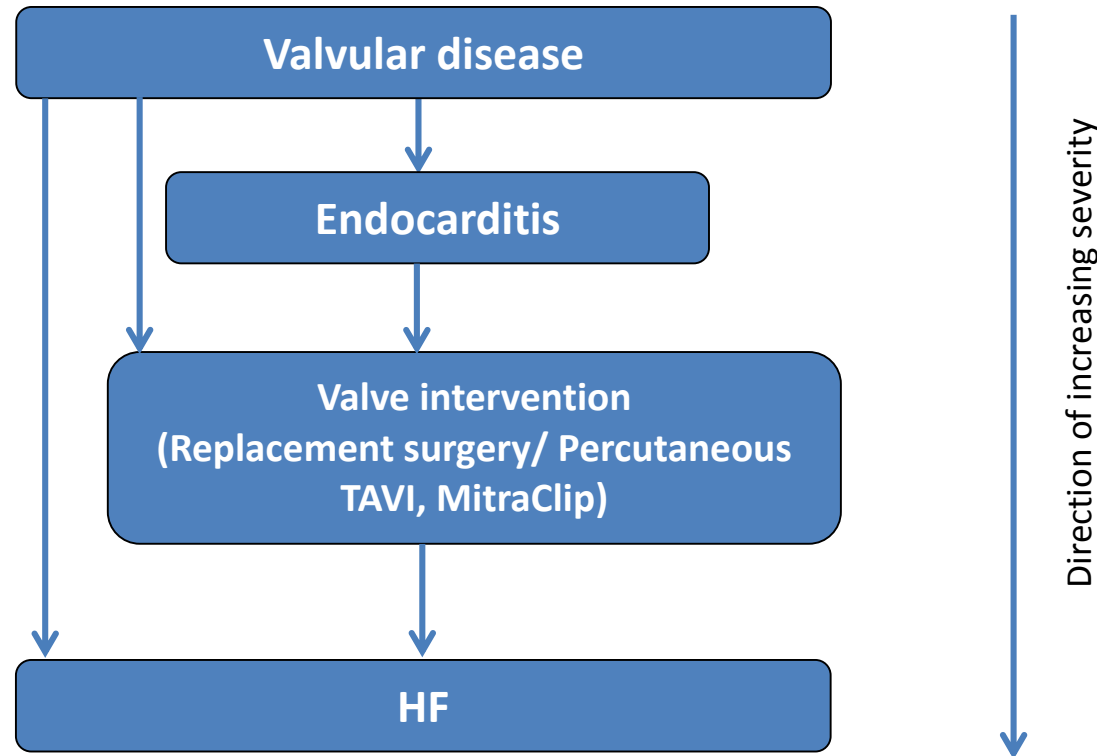


Table S3 Factors used in previous studies to define severity of diabetes

Study ID	Factors used to define diabetes severity / Outcome(s)	Severity scale/ levels	Validation study
Gini et al. (2016) ⁽¹⁾	<ul style="list-style-type: none"> • Indication for insulin therapy • The presence of diabetes-related complications <p>Outcomes: Assessing the positive predictive value (PPV) for the presence/absence of type 2 diabetes against the GP's response to the questionnaire and measure the agreement on the severity level.</p>	<p>Four levels of T2DM severity:</p> <ul style="list-style-type: none"> • Level 1: Clinical definition of the disease, no indication for Insulin therapy and no complications listed in Level 3. • Level 2: as in Level 1 except insulin is indicated. • Level 3: as in Level 1 except with one of the following complications: (1) arterial stenosis, angina, MI, TIA, ischaemic stroke, intermittent claudication, diabetic foot ulcer, lower limb amputation, (2) retinopathy, (3) incipient or overt diabetic nephropathy/ dialysis. • Level 4: As in Level 3 except insulin is indicated 	A random sample of identified cases was validated by interviewing their self-selected general practitioners (GPs).
Grootenhuus et al. (1994) ⁽²⁾	<p>Type 2 diabetes symptom severity items categorised over six clinical dimensions:</p> <ul style="list-style-type: none"> • Hyperglycaemic • Hypoglycaemic • Psychological • Cardiovascular • Neuropathic • Ophthalmological <p>Outcomes: To measure differences in symptom severity between patients and detect changes over time within patients.</p>	A 34-item patient-derived checklist used as a measure for type 2 diabetes symptom severity.	The face and content validity of severity items and dimension structures were based on literature and experiences of diabetologists.
Young et al. (2008) ⁽³⁾	<p>From laboratory data and diabetes-related complications:</p> <ul style="list-style-type: none"> • Retinopathy • Nephropathy • Neuropathy • Cerebrovascular • Cardiovascular • Peripheral vascular disease • Metabolic <p>Outcomes: Risk of mortality, hospitalisation and healthcare utilisation.</p>	Developed the Diabetes Complication Severity Index (DCSI) that is categorised to two or three levels (0=no abnormality; 1=some abnormality, 2=severe abnormality) depending on the severity of the complication. So if no abnormalities were present, the patient received no score, a 1 was added to the DCSI if patient had any complication classified as some abnormality and 2 was added if patient had any complication classified as severe abnormality.	The study design was a validation sample

References

1. Gini R, Schuemie MJ, Mazzaglia G, Lapi F, Francesconi P, Pasqua A, et al. Automatic identification of type 2 diabetes, hypertension, ischaemic heart disease, heart failure and their levels of severity from Italian General Practitioners' electronic medical records: a validation study. *BMJ open*. 2016;6(12):e012413. Epub 2016/12/13.
2. Grootenhuis PA, Snoek FJ, Heine RJ, Bouter LM. Development of a type 2 diabetes symptom checklist: a measure of symptom severity. *Diabetic medicine : a journal of the British Diabetic Association*. 1994;11(3):253-61. Epub 1994/04/01.
3. Young BA, Lin E, Von Korff M, Simon G, Ciechanowski P, Ludman EJ, et al. Diabetes complications severity index and risk of mortality, hospitalization, and healthcare utilization. *Am J Manag Care*. 2008;14(1):15-24.