

Supplementary Table 2. ICD-9 and 10 codes for definition of chronic liver diseases (HCV, HBV, ALD, NAFLD, and others)

Chronic liver disease	ICD-9 codes	ICD-10 codes	ICD-9 Description	ICD-10 Description
HCV	07041	B1711	Acute hepatitis C with hepatic coma	Acute hepatitis C with hepatic coma
-	07044	B182	Chronic hepatitis C with hepatic coma	Chronic viral hepatitis C
-	07051	B1710	Acute hepatitis C without mention of hepatic coma	Acute hepatitis C without hepatic coma
-	07054	B182	Chronic hepatitis C without mention of hepatic coma	Chronic viral hepatitis C
-	0707	NA	Unspecified viral hepatitis C without hepatic coma	NA
-	07070	B1920	Unspecified viral hepatitis C without hepatic coma	Unspecified viral hepatitis C without hepatic coma
-	07071	B1921	Unspecified viral hepatitis C with hepatic coma	Unspecified viral hepatitis C with hepatic coma
-	V0262	Z2252	Hepatitis C carrier	Carrier of viral hepatitis C
HBV	0702	NA	Viral hepatitis b with hepatic coma	NA
-	07020	B162	Viral hepatitis B with hepatic coma, acute or unspecified, without mention of hepatitis delta	Acute hepatitis B without delta-agent with hepatic coma
-	07021	B160	Viral hepatitis B with hepatic coma, acute or unspecified, with hepatitis delta	Unspecified viral hepatitis B with hepatic coma Acute hepatitis B with delta-agent with hepatic coma
-	07022	B181	Chronic viral hepatitis B with hepatic coma without hepatitis delta	Chronic viral hepatitis B without delta-agent
-	07023	B180	Chronic viral hepatitis B with hepatic coma with hepatitis delta	Chronic viral hepatitis B with delta-agent
-	0703	NA	Viral hepatitis b without mention of hepatic coma	NA
-	07030	B169 B1910	Viral hepatitis B without mention of hepatic coma, acute or unspecified, without mention of hepatitis delta	Acute hepatitis B without delta-agent and without hepatic coma Unspecified viral hepatitis B without hepatic coma
-	07031	B161	Viral hepatitis B without mention of hepatic coma, acute or unspecified, with hepatitis delta	Acute hepatitis B with delta-agent without hepatic coma
-	07032	B181	Chronic viral hepatitis B without mention of hepatic coma without mention of hepatitis delta	Chronic viral hepatitis B without delta-agent
-	07033	B180	Chronic viral hepatitis B without mention of hepatic coma with hepatitis delta	Chronic viral hepatitis B with delta-agent
-	V0261	Z2251	Hepatitis B carrier	Carrier of viral hepatitis B
ALD	291	NA	Alcohol-induced mental disorders	NA
-	2910	F10231	Alcohol withdrawal delirium	Alcohol dependence with withdrawal delirium
-	2911	F1096	Alcohol-induced persisting amnesic disorder	Alcohol use, unspecified with alcohol-induced persisting amnesic disorder

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Chronic liver disease	ICD-9 codes	ICD-10 codes	ICD-9 Description	ICD-10 Description
-	2912	F1027	Alcohol-induced persisting dementia	Alcohol dependence with alcohol-induced persisting dementia
-	2913	F10951	Alcohol-induced psychotic disorder with hallucinations	Alcohol use, unspecified with alcohol-induced psychotic disorder with hallucinations
-	2914	F10929	Idiosyncratic alcohol intoxication	Alcohol use, unspecified with intoxication, unspecified
-	2915	F10950	Alcohol-induced psychotic disorder with delusions	Alcohol use, unspecified with alcohol-induced psychotic disorder with delusions
-	2919	F1099	Unspecified alcohol-induced mental disorders	Alcohol use, unspecified with unspecified alcohol-induced disorder
-	3575	G621	Alcoholic polyneuropathy	Alcoholic polyneuropathy
-	4255	I426	Alcoholic cardiomyopathy	Alcoholic cardiomyopathy
-	5710	K700	Alcoholic fatty liver	Alcoholic fatty liver
-	5711	K7010	Acute alcoholic hepatitis	Alcoholic hepatitis without ascites
-	5712	K7030	Alcoholic cirrhosis of liver	Alcoholic cirrhosis of liver without ascites
-	5713	K709	Alcoholic liver damage, unspecified	Alcoholic liver disease, unspecified
-	7903	R780	Excessive blood level of alcohol	Finding of alcohol in blood
-	9808	T518X1A	Toxic effect of other specified alcohols	Toxic effect of other alcohols, accidental (unintentional), initial encounter
-	9808	T518X2A	Toxic effect of other specified alcohols	Toxic effect of other alcohols, intentional self-harm, initial encounter
-	9808	T518X3A	Toxic effect of other specified alcohols	Toxic effect of other alcohols, assault, initial encounter
-	9808	T518X4A	Toxic effect of other specified alcohols	Toxic effect of other alcohols, undetermined, initial encounter
-	9809	T5191XA	Toxic effect of unspecified alcohol	Toxic effect of unspecified alcohol, accidental (unintentional), initial encounter
-	9809	T5192XA	Toxic effect of other specified alcohols	Toxic effect of unspecified alcohol, intentional self-harm, initial encounter
-	9809	T5193XA	Toxic effect of other specified alcohols	Toxic effect of unspecified alcohol, assault, initial encounter
-	9809	T5194XA	Toxic effect of other specified alcohols	Toxic effect of unspecified alcohol, undetermined, initial encounter
-	29181	F10239	Alcohol withdrawal	Alcohol dependence with withdrawal, unspecified
-	29182	F10182	Alcohol induced sleep disorders	Alcohol abuse with alcohol-induced sleep disorder

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Chronic liver disease	ICD-9 codes	ICD-10 codes	ICD-9 Description	ICD-10 Description
-	29182	F10282	Alcohol induced sleep disorders	Alcohol dependence with alcohol-induced sleep disorder
-	29182	F10982	Alcohol induced sleep disorders	Alcohol use, unspecified with alcohol-induced sleep disorder
-	29189	F10159	Other alcohol-induced mental disorders	Alcohol abuse with alcohol-induced psychotic disorder, unspecified
-	29189	F10180	Other alcohol-induced mental disorders	Alcohol abuse with alcohol-induced anxiety disorder
-	29189	F10181	Other alcohol-induced mental disorders	Alcohol abuse with alcohol-induced sexual dysfunction
-	29189	F10188	Other alcohol-induced mental disorders	Alcohol abuse with other alcohol-induced disorder
-	29189	F10259	Other alcohol-induced mental disorders	Alcohol dependence with alcohol-induced psychotic disorder, unspecified
-	29189	F10280	Other alcohol-induced mental disorders	Alcohol dependence with alcohol-induced anxiety disorder
-	29189	F10281	Other alcohol-induced mental disorders	Alcohol dependence with alcohol-induced sexual dysfunction
-	29189	F10288	Other alcohol-induced mental disorders	Alcohol dependence with other alcohol-induced disorder
-	29189	F10959	Other alcohol-induced mental disorders	Alcohol use, unspecified with alcohol-induced psychotic disorder, unspecified
-	29189	F10980	Other alcohol-induced mental disorders	Alcohol use, unspecified with alcohol-induced anxiety disorder
-	303	NA	Alcohol dependence syndrome	NA
-	30300	F10229	Acute alcoholic intoxication in alcoholism, unspecified	Alcohol dependence with intoxication, unspecified
-	30301	F10229	Acute alcoholic intoxication in alcoholism, continuous	Alcohol dependence with intoxication, unspecified
-	30302	F10229	Acute alcoholic intoxication in alcoholism, episodic	Alcohol dependence with intoxication, unspecified
-	30303	F10229	Acute alcoholic intoxication in alcoholism, in remission	Alcohol dependence with intoxication, unspecified
-	3039	NA	Other and unspecified alcohol dependence	NA
-	30390	F1020	Other and unspecified alcohol dependence, unspecified	Alcohol dependence, uncomplicated
-	30391	F1020	Other and unspecified alcohol dependence, continuous	Alcohol dependence, uncomplicated
-	30392	F1020	Other and unspecified alcohol dependence, episodic	Alcohol dependence, uncomplicated
-	30393	F1021	Other and unspecified alcohol dependence, in remission	Alcohol dependence, in remission
-	30500	F1010	Alcohol abuse, unspecified	Alcohol abuse, uncomplicated
-	30501	F1010	Alcohol abuse, continuous	Alcohol abuse, uncomplicated
-	30502	F1010	Alcohol abuse, episodic	Alcohol abuse, uncomplicated

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Chronic liver disease	ICD-9 codes	ICD-10 codes	ICD-9 Description	ICD-10 Description
-	30503	F1011	Alcohol abuse, in remission	Alcohol abuse, in remission
-	53530	K2920	Alcoholic gastritis, without mention of hemorrhage	Alcoholic gastritis without bleeding
-	53531	K2921	Alcoholic gastritis, with hemorrhage	Alcoholic gastritis with bleeding
-	E8600	NoDx	Accidental poisoning by alcoholic beverages	NA
-	E8608	NoDx	Accidental poisoning by other specified alcohols	NA
-	E8609	NoDx	Accidental poisoning by unspecified alcohol	NA
-	V113	Z658	Personal history of alcoholism	Other specified problems related to psychosocial circumstances
NAFLD*	NA	K760	NA	Fatty (change of) liver, not elsewhere classified
-	NA	K7581	NA	nonalcoholic steatohepatitis
-	2724	E784	Other and unspecified hyperlipidemia	Other hyperlipidemia
-	2724	E785	Other and unspecified hyperlipidemia	Hyperlipidemia, unspecified
-	4010	I10	Malignant essential hypertension	Essential (primary) hypertension
-	4011	I10	Benign essential hypertension	Essential (primary) hypertension
-	4019	I10	Unspecified essential hypertension	Essential (primary) hypertension
-	4019	I169	Unspecified essential hypertension	Hypertensive crisis, unspecified
-	40501	I150	Malignant renovascular hypertension	Renovascular hypertension
-	40511	I150	Benign renovascular hypertension	Renovascular hypertension
-	40519	I158	Other benign secondary hypertension	Other secondary hypertension
-	40591	I150	Unspecified renovascular hypertension	Renovascular hypertension
-	40599	I158	Other unspecified secondary hypertension	Other secondary hypertension
-	278	NA	Overweight, obesity and other hyperalimentation	NA
-	2501	NA	Diabetes with ketoacidosis	NA
-	2502	NA	Diabetes with hyperosmolarity	NA
-	2503	NA	Diabetes with other coma	NA
-	2504	NA	Diabetes with renal manifestations	NA
-	2505	NA	Diabetes with ophthalmic manifestations	NA
-	2506	NA	Diabetes with neurological manifestations	NA
-	2507	NA	Diabetes with peripheral circulatory disorders	NA

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Chronic liver disease	ICD-9 codes	ICD-10 codes	ICD-9 Description	ICD-10 Description
-	2508	NA	Diabetes with other specified manifestations	NA
-	2509	NA	Diabetes with unspecified complication	NA
-	2777	E8881	Dysmetabolic syndrome X	Metabolic syndrome
-	2780	NA	Overweight and obesity	NA
-	25000	E119	Diabetes mellitus without mention of complication, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus without complications
-	25002	E1165	Diabetes mellitus without mention of complication, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with hyperglycemia
-	25010	E1110	Diabetes with ketoacidosis, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with ketoacidosis without coma
-	25010	E1169	Diabetes with ketoacidosis, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with other specified complication
-	25010	E1310	Diabetes with ketoacidosis, type II or unspecified type, not stated as uncontrolled	Other specified diabetes mellitus with ketoacidosis without coma
-	25012	E1110	Diabetes with ketoacidosis, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with ketoacidosis without coma
-	25012	E1165	Diabetes with ketoacidosis, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with hyperglycemia
-	25012	E1169	Diabetes with ketoacidosis, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with other specified complication
-	25012	E1310	Diabetes with ketoacidosis, type II or unspecified type, uncontrolled	Other specified diabetes mellitus with ketoacidosis without coma
-	25020	E1100	Diabetes with hyperosmolarity, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with hyperosmolarity without nonketotic hyperglycemic-hyperosmolar coma (NKHHC)
-	25020	E1101	Diabetes with hyperosmolarity, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with hyperosmolarity with coma
-	25022	E1100	Diabetes with hyperosmolarity, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with hyperosmolarity without nonketotic hyperglycemic-hyperosmolar coma (NKHHC)
-	25022	E1165	Diabetes with hyperosmolarity, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with hyperglycemia
-	25030	E1111	Diabetes with other coma, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with ketoacidosis with coma

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Chronic liver disease	ICD-9 codes	ICD-10 codes	ICD-9 Description	ICD-10 Description
-	25030	E11641	Diabetes with other coma, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with hypoglycemia with coma
-	25032	E1101	Diabetes with other coma, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with hyperosmolarity with coma
-	25032	E1165	Diabetes with other coma, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with hyperglycemia
-	25040	E1129	Diabetes with renal manifestations, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with other diabetic kidney complication
-	25042	E1121	Diabetes with renal manifestations, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with diabetic nephropathy
-	25042	E1165	Diabetes with renal manifestations, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with hyperglycemia
-	25050	E11311	Diabetes with ophthalmic manifestations, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with unspecified diabetic retinopathy with macular edema
-	25050	E11319	Diabetes with ophthalmic manifestations, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with unspecified diabetic retinopathy without macular edema
-	25050	E1136	Diabetes with ophthalmic manifestations, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with diabetic cataract
-	25050	E1139	Diabetes with ophthalmic manifestations, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with other diabetic ophthalmic complication
-	25052	E11311	Diabetes with ophthalmic manifestations, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with unspecified diabetic retinopathy with macular edema
-	25052	E11319	Diabetes with ophthalmic manifestations, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with unspecified diabetic retinopathy without macular edema
-	25052	E1136	Diabetes with ophthalmic manifestations, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with diabetic cataract
-	25052	E1139	Diabetes with ophthalmic manifestations, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with other diabetic ophthalmic complication
-	25052	E1165	Diabetes with ophthalmic manifestations, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with hyperglycemia
-	25060	E1140	Diabetes with neurological manifestations, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with diabetic neuropathy, unspecified

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Chronic liver disease	ICD-9 codes	ICD-10 codes	ICD-9 Description	ICD-10 Description
-	25062	E1140	Diabetes with neurological manifestations, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with diabetic neuropathy, unspecified
-	25062	E1165	Diabetes with neurological manifestations, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with hyperglycemia
-	25070	E1151	Diabetes with peripheral circulatory disorders, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with diabetic peripheral angiopathy without gangrene
-	25072	E1151	Diabetes with peripheral circulatory disorders, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with diabetic peripheral angiopathy without gangrene
-	25072	E1165	Diabetes with peripheral circulatory disorders, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with hyperglycemia
-	25080	E11618	Diabetes with other specified manifestations, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with other diabetic arthropathy
-	25080	E11620	Diabetes with other specified manifestations, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with diabetic dermatitis
-	25080	E11621	Diabetes with other specified manifestations, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with foot ulcer
-	25080	E11622	Diabetes with other specified manifestations, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with other skin ulcer
-	25080	E11628	Diabetes with other specified manifestations, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with other skin complications
-	25080	E11630	Diabetes with other specified manifestations, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with periodontal disease
-	25080	E11638	Diabetes with other specified manifestations, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with other oral complications
-	25080	E11649	Diabetes with other specified manifestations, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with hypoglycemia without coma
-	25080	E1165	Diabetes with other specified manifestations, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with hyperglycemia
-	25080	E1169	Diabetes with other specified manifestations, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with other specified complication
-	25082	E1165	Diabetes with other specified manifestations, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with hyperglycemia

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Chronic liver disease	ICD-9 codes	ICD-10 codes	ICD-9 Description	ICD-10 Description
-	25082	E1169	Diabetes with other specified manifestations, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with other specified complication
-	25090	E118	Diabetes with unspecified complication, type II or unspecified type, not stated as uncontrolled	Type 2 diabetes mellitus with unspecified complications
-	25092	E1165	Diabetes with unspecified complication, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with hyperglycemia
-	25092	E118	Diabetes with unspecified complication, type II or unspecified type, uncontrolled	Type 2 diabetes mellitus with unspecified complications
-	27800	E669	Obesity, unspecified	Obesity, unspecified
-	27801	E6601	Morbid obesity	Morbid (severe) obesity due to excess calories
-	27803	E662	Obesity hypoventilation syndrome	Morbid (severe) obesity with alveolar hypoventilation
-	V4586	Z9884	Bariatric surgery status	Bariatric surgery status
-	V8530	Z6830	Body Mass Index 30.0-30.9, adult	Body mass index (BMI) 30.0-30.9, adult
-	V8531	Z6831	Body Mass Index 31.0-31.9, adult	Body mass index (BMI) 31.0-31.9, adult
-	V8532	Z6832	Body Mass Index 32.0-32.9, adult	Body mass index (BMI) 32.0-32.9, adult
-	V8533	Z6833	Body Mass Index 33.0-33.9, adult	Body mass index (BMI) 33.0-33.9, adult
-	V8534	Z6834	Body Mass Index 34.0-34.9, adult	Body mass index (BMI) 34.0-34.9, adult
-	V8535	Z6835	Body Mass Index 35.0-35.9, adult	Body mass index (BMI) 35.0-35.9, adult
-	V8536	Z6836	Body Mass Index 36.0-36.9, adult	Body mass index (BMI) 36.0-36.9, adult
-	V8537	Z6837	Body Mass Index 37.0-37.9, adult	Body mass index (BMI) 37.0-37.9, adult
-	V8538	Z6838	Body Mass Index 38.0-38.9, adult	Body mass index (BMI) 38.0-38.9, adult
-	V8539	Z6839	Body Mass Index 39.0-39.9, adult	Body mass index (BMI) 39.0-39.9, adult
-	V854	NA	Body mass index 40 and over, adult	NA
-	V8541	Z6841	Body Mass Index 40.0-44.9, adult	Body mass index (BMI) 40.0-44.9, adult
-	V8542	Z6842	Body Mass Index 45.0-49.9, adult	Body mass index (BMI) 45.0-49.9, adult
-	V8543	Z6843	Body Mass Index 50.0-59.9, adult	Body mass index (BMI) 50-59.9, adult
-	V8544	Z6844	Body Mass Index 60.0-69.9, adult	Body mass index (BMI) 60.0-69.9, adult
-	V8545	Z6845	Body Mass Index 70 and over, adult	Body mass index (BMI) 70 or greater, adult
Others	-	-	-	-
Alpha-1-antitrypsin deficiency	2734	E8801	Alpha-1-antitrypsin deficiency	Alpha-1-antitrypsin deficiency

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Chronic liver disease	ICD-9 codes	ICD-10 codes	ICD-9 Description	ICD-10 Description
Disorders of iron metabolism	2750	NA	Disorders of iron metabolism	NA
Disorders of copper metabolism	2751	E8300 E8301 E8309	Disorders of copper metabolism	Disorder of copper metabolism, unspecified Wilson's disease Other disorders of copper metabolism
Disorders of porphyrin metabolism	2771	E800 E8020 E8029	Disorders of porphyrin metabolism	Hereditary erythropoietic porphyria Unspecified porphyria Other porphyria
Hereditary hemochromatosis	27501	E83110	Hereditary hemochromatosis	Hereditary hemochromatosis
Hemochromatosis due to repeated red blood cell transfusions	27502	E83111	Hemochromatosis due to repeated red blood cell transfusions	Hemochromatosis due to repeated red blood cell transfusions
Other hemochromatosis	27503	E83118 E83119	Other hemochromatosis	Other hemochromatosis Hemochromatosis, unspecified
Other specified diseases of liver	NA	K7689	NA	Other specified diseases of liver
Autoimmune hepatitis	571.42	K75.2-4	Autoimmune hepatitis	Autoimmune hepatitis
a1 antitrypsin	273.4	E88	a1 antitrypsin	a1 antitrypsin
Primary sclerosing cholangitis	NA	K83.01	NA	Primary sclerosing cholangitis

ALD, alcoholic liver disease; HBV, hepatitis B virus; HCC, hepatocellular carcinoma; HCV, hepatitis C virus; ICD, International Classification of Diseases; NA, not applicable; NAFLD, nonalcoholic fatty liver disease.

*NAFLD was defined with ICD-10 codes (K760, K7581). As NAFLD is often under-coded, it was also defined with ICD-9 or 10 code for obesity, diabetes, history of bariatric surgery or both dyslipidemia and hypertension in the absence of HBV, HCV, alcohol abuse, and other known liver disease.