
Diabetes Mellitus: Current Concepts in Diagnosis, Classification and Coding

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Diabetes mellitus (DM) is a chronic disorder of metabolism, which is commonly found in the Puerto Rican population. In this article the current concepts in diagnosis, classification and correct coding of DM are discussed. Since the cutoff point for diagnosing DM was lowered to 126 mg/dl in a fasting plasma glucose levels, many persons may be undiagnosed unless physicians are aware of this fact. Once diagnosed, strict control of the disease is mandatory to prevent the chronic diabetic

complications. It is very important to classify and code the persons with DM accurately. This practice will help researchers, physicians, health insurance managers and other persons to assess the prevalence of DM and its complications. This will eventually lead to better management of this important disease.

Key words: Diabetes mellitus, Diagnosis criteria, Classification, Coding.

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by the elevation of blood glucose or hyperglycemia. This chronic hyperglycemia is associated with long-term damage and/or dysfunction of organs such as the heart, kidneys, eyes, nerves and blood vessels, conditions known as chronic diabetic complications. The development of this damage can be delayed or prevented by strict control of the hyperglycemia (1-3). Being such a common condition, taking care of persons with diabetes places a heavy burden on the budget of health care delivery. DM is the third leading cause of death among Puerto Ricans and contributes to the first cause of death in the island, cardiovascular disease (4).

Diabetes care is best focused on the prevention of its related complications, since the hospitalizations resulting from the complications consume most of the diabetes-related health care spending. (5-6) The early diagnosis

and treatment of DM is of utmost importance. The care of diabetes has become progressively more complex and demanding, as more knowledge has been gained on the pathophysiology of this disease and more therapeutic options have become available, especially on the treatment of type 2 patients with diabetes. The comprehensive and intensive care of DM has been confirmed to yield important benefits by delaying or preventing complications (1-3).

Adequate and comprehensive care of diabetics will result in best overall health status of Puerto Ricans and a reduction in overall spending of the health care resources. Data from the Behavioral Risk Factor Surveillance Survey shows that the prevalence of DM in Puerto Rico is the highest between the United States and its territories. The prevalence of DM in PR in 1999, according to the BRFSS, is 9.67 percent (7). Physicians would be of great help to researchers by helping them to collect this data by coding with the exact diagnosis code when rendering a medical service to a person with diabetes. The purpose of this article is to review the current criteria for the diagnosis and classification of diabetes mellitus and the codes that apply to diabetes care.

A clinical endocrinologist is most effective as the head of comprehensive diabetes care program. Two reports have concluded that an endocrinologist involvement offers advantages in the care, cost-effectiveness, and outcomes for patients with diabetes (8-9). Optimally, the clinical endocrinologist should be the principal physician in charge of patients with type 1 or type 2 diabetes (10). As of 1999, less than fifteen percent of diabetics in the United

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States were under the direct care of an endocrinologist (11). Due to the large number of diabetics in PR, and a relative small number of endocrinologists, primary care physicians (PCP) are taking care of most diabetic patients. It is very important that PCP's have the knowledge to deal with this important and treacherous disease.

Classification of Diabetes Mellitus

The American Diabetes Association in 1997 adopted the following classification and Criteria for the diagnosis of diabetes mellitus (12); the principal types of DM are types 1 and 2.

Type 1 diabetes mellitus. This form of diabetes results from an autoimmune destruction of the beta cells of the pancreas. It was previously known as insulin-dependent or juvenile-onset diabetes. Type 1 DM is believed to result from an infection or toxic environmental injury to the pancreatic beta cells in an individual that is genetically predisposed. The immune system of the susceptible individual destroys the beta cells while overcoming the invasive agent. Circulating islet cells auto-antibodies (ICA's) have been detected in as many as 85% of the recently diagnosed type 1 diabetics and up to 60% of these diabetics also present measurable titers to insulin, prior to receiving insulin therapy. Type 1 DM may be associated with other conditions thought to be of autoimmune etiology such as polyglandular deficiency, systemic lupus erythematosus and Grave's disease.

Type 2 diabetes mellitus. Approximately 90% of persons with diabetes have Type 2 DM. This type of DM was previously known as non-insulin dependent (NIDDM) or adult-onset DM. It consists of a heterogeneous group of diabetics. The onset of the disease is subtle and occurs predominantly in adults. Recently an epidemic of type 2 DM has been described in children and adolescents (13). Up to 85% of Type 2 diabetics are obese. These patients show an increased deposition of abdominal fat with increased waist-to-hip ratio. Type 2 DM shows a strong genetic susceptibility. The identical twin of a type 2 diabetic will develop the disease within one year of the diagnosis of the sibling. These diabetics present insulin resistance and relative insulin deficiency.

Other types of diabetes. Hyperglycemia may be a manifestation of genetic defects of beta cell function, genetic defects in insulin action and some diseases of the exocrine pancreas. Hyperglycemia may result from some endocrinopathies. It may also be drug or chemically-induced or a result of an infectious process.

Gestational diabetes. This classification of diabetes is reserved for women who develop hyperglycemia while being pregnant. All Puerto Rican pregnant women are

considered to be at risk for developing gestational diabetes, due to the high prevalence of DM in Puerto Rico, and should be screened in the first prenatal visit with the measurement of the fasting plasma glucose (FPG). This woman is considered to be diabetic if the FPG level is over 126 mg/dl or if casual plasma glucose is over 200 mg/dl. If these criteria are not met, a three hours oral glucose tolerance test is performed (3 hr OGTT). A 100 grams glucose load is given and plasma glucose levels are measured hourly for the next three hours. Two or more plasma glucose values over the top normal on the reported values meet the criteria for GD. Diagnostic criteria are derived from the original work of O'Sullivan and Mahan (14) and shown on Table 1.

Table 1. Diagnostic criteria for gestational diabetes with 100 oral glucose tolerance test

Time	mg/dl Upper limit of normal
Fasting	95
1-h	180
2-h	155
3-h	140

Diagnostic Criteria for Diabetes Mellitus in Non-pregnant Adults

To make the diagnosis of DM in a symptomatic person with polydipsia, polyuria and weight loss, a casual plasma glucose level of over 200 mg/dl is the test needed. In an asymptomatic person, either a fasting plasma glucose over 126 mg/dl or a value of over 200 mg/dl two hours after an oral glucose load of 75 grams would meet the criteria. It is important to know that the diagnosis of DM is only established after confirming the hyperglycemia. A confirmatory test of the hyperglycemia is mandatory. Any of the previously mentioned tests may be used for confirmation: the fasting plasma glucose, the two-hour post glucose plasma glucose or a casual plasma glucose.

The preferred tests are the fasting plasma or casual plasma glucose levels. Some individuals present plasma glucose levels above their normal levels but not reaching

Table 2. Criteria for the diagnosis of diabetes mellitus in non-pregnant adults

Diagnostic Test	Criteria	Diagnosis
Casual plasma glucose	over 200 mg/dl or	Symptomatic
Fasting plasma glucose	over 126 mg/dl or	*asymptomatic
2 hr post 75 grams of glucose	over 200 mg/dl	*asymptomatic

*These criteria should be confirmed on different date on asymptomatic persons

the criteria for DM. These individuals may be classified as having impaired fasting glucose (IFG) or impaired glucose tolerance (IGT). It is important to advise these individuals on maintaining healthy weight and on re-evaluating the blood glucose levels annually. Patients with IFG or IGT are at risk of developing DM and atherosclerosis.

There is a direct association between the levels of plasma glucose and the amount of hemoglobin that is glycosilated in plasma. The average plasma glucose levels in the period of approximately three to four months ahead can be known by measuring the fraction of glycosilated hemoglobin called hemoglobin A1c. This test is not considered a diagnostic test for DM at the present time. It is used as the measure of blood glucose control and should be ordered as a routine follow up test in all persons with diabetes at least twice a year.

Persons with diabetes are classified according to the criteria of the American Diabetes Association and not according to age or insulin use. An adolescent may have type 2 DM and a type 2 diabetic may require insulin to control the blood glucose levels.

Diabetes Codes

Diseases are coded with five digits according to the International Coding of Diseases Codification Manual, ICD 9 CM. (15). All persons with diabetes should be coded under the 250 category. The fourth digit indicates the corresponding complication. The fifth digit is the subclassification, according to the type of DM and the degree of control (Table 3).

All diabetics should be coded 250.XX. For example, if a patient with Type 1 DM is found with ketoacidosis, the appropriate code would be 250.13. An uncontrolled Type 2 DM with nephropathy should be coded with a 250.42. An uncomplicated DM patient should be coded as 250.00. A person with diabetes, gangrene, currently controlled

with peripheral neuropathy would be coded 250.60/ 785.4/ 250.70. Codes should be as specific and detailed as possible. Complicated patients may require multiple codes.

There are other commonly associated codes for DM, not necessarily under the 250.XX classification (Table 4).

Table 4. Other commonly associated codes for DM, not necessarily under the 250.XX classification

Condition	Codes
Diabetic peripheral neuropathy	357.2 / 250.6
Gangrene	785.4 / 250.7
Gestational diabetes	648.80
Glomerulosclerosis	583.81 / 250.4
Hyperglycemia	790.2
Hypoglycemia, unspecified	251.2
Hyperinsulinism	251.1
Osteomyelitis	731.8 / 250.8

The correct coding would lead to a better understanding of the status of our persons with diabetes. A 250.00 patient does not need the same level of care than a 250.43, for example. Placing the adequate code on the discharge summary or the health insurance invoice would give the physicians a better bargaining power with the health care administrators. Physician's fees could be negotiated according to degree of difficulty. Researchers could identify more easily the status of DM in Puerto Rico. It would be easier to measure the number of persons with diabetes having complications. Statistical data on DM and its complications could be retrieved faster from the computers. Identifying complicated patients would make easier the decision of referring the patient to the corresponding specialist by the primary physicians. This in turn would lead to better care of our patients and an overall better health of the population.

Resumen

La diabetes mellitus (DM) es un desorden crónico del metabolismo que se encuentra comunmente en la población puertorriqueña. Los conceptos actuales de diagnóstico, clasificación y codificación de la DM se discuten en este artículo. Muchos médicos puede que no estén conscientes de que el nivel de glucosa plasmática en ayunas acordado para diagnosticar la DM se redujo a 126 mg/dL, por lo cual muchas personas pueden no estar diagnosticadas. Una vez se establece el

Table 3. Five digits diabetes codes according to the International Coding of Diseases Codification Manual, ICD 9 CM, 2001

Diabetes mellitus (category)	Complication (fourth digit)	Degree of control (fifth digit)
250.XX	0 without complications	0 not stated as uncontrolled
	1 with ketoacidosis	1 type 1, not stated as uncontrolled
	2 coma, hyperosmolar	2 tupe 2, uncontrolled
	3 with coma	3 type 1, uncontrolled
	4 with renal manifestastions	
	5 with ophthalmic manifestastions	
	6 with neurological manifestastions	
	7 with peripheral circulatory disorders	
8 with other complications		

diagnóstico de DM, es muy importante que se asigne la clasificación y codificación correcta. Esta práctica va a permitirle a los investigadores, médicos, administradores de seguros médicos y otras personas el establecer la verdadera prevalencia de la DM y sus complicaciones. A la larga, ésto redundará en un menor manejo de esta enfermedad tan importante.

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