DM1: Medical Standards for Safety Critical Workers with

Diabetes Mellitus: Definitions and Diagnostic Tests

DEFINITIONS AND DISEASE MECHANISMS

1. **Diabetes mellitus** – a metabolic disease with abnormally high blood glucose levels for prolonged periods of time, resulting in acute (short-term) and chronic (long-term) adverse health effects when untreated. Persons with diabetes mellitus have defective mechanisms for maintaining blood glucose in a normal range (known as euglycemia). In this medical standard, diabetes mellitus is referred to as diabetes.
2. **There are two types of diabetes mellitus**, with different causal mechanisms. These are:
   a. **Type 1 diabetes** – is a condition where the pancreas fails to produce enough insulin resulting in abnormal regulation of blood glucose and decreased uptake of glucose by body organs. Type I diabetes typically is first diagnosed in childhood and is a life-long condition. Type 1 diabetes is considered an auto-immune disease, but the specific cause is unknown. Treatment of type 1 diabetes requires use of insulin; other medications may also be used.
   b. **Type 2 diabetes** – is a condition where the cells of the body do not adequately take up and metabolize glucose from the blood, even though insulin is present (this is known as insulin resistance). Type 2 diabetes typically begins in adulthood; the cause is not known, although risk factors include being overweight and lack of exercise. Initial treatment for type 2 diabetes typically includes diet, exercise, weight loss, and oral medication, but insulin is sometimes needed.

ADVERSE HEALTH EFFECTS

1. **Adverse health effects for both type 1 and type 2 diabetes mellitus are similar.** Short and long-term adverse health effects of diabetes may be minimized if the person: (a) maintains good glycemic control (i.e., keeps blood glucose in the normal range) using diet, exercise and medication; and (b) gets regular medical care.
2. **Short-term (acute) health effects of diabetes mellitus** occur when a person's blood glucose is abnormally low (severe hypoglycemia) or abnormally high (diabetic ketoacidosis or hyperglycemic hyperosmolar state). Persons who have chronic complications of diabetes may also have acute health effects from those conditions.
3. **Long-term health effects (chronic complications) of diabetes mellitus** are primarily caused by abnormally high blood glucose levels over prolonged periods of time, which result in microvascular "end-organ" damage to multiple organ systems.
   a. Chronic complications of diabetes mellitus may include permanent damage to the cardiovascular system (heart and peripheral blood vessels), eyes, kidneys, nervous system (brain and peripheral nerves), skin, and impaired ability to fight infections. Chronic complications of diabetes may be minimized by maintaining good glycemic control, regular medical care, and appropriate diet and exercise.
   b. The occurrence and severity of chronic complications of diabetes increases with the length of time since onset of diabetes, adequacy of glycemic control, and other risk factors. However, chronic complications of diabetes may also occur and progress even if the person maintains good glycemic control and minimizes other risk factors.

DIAGNOSTIC TESTS FOR DIABETES MELLITUS

1. Tests used to diagnose diabetes
   a. **Fasting blood glucose** – is typically the main screening test that suggests a person has diabetes. A pre-diabetes state can also be detected.
   b. **Glucose tolerance test** – person is given a dose of glucose and the rise in blood glucose is assessed over time; the test confirms a diagnosis of diabetes.
   c. **Hemoglobin A1c (A1c)** – blood test that reflects average blood glucose over prior 2-3 months. A1c is used to diagnose diabetes and assess adequacy of treatment (i.e., glycemic control).
2. Tests to assess effectiveness of treatment and adjust insulin dose
   a. **Self-monitoring of blood glucose** – is done several times a day by persons using insulin both to guide treatment (i.e., to adjust insulin dose) and help prevent hypoglycemia episodes. Self-monitoring is done using a glucose meter to analyze finger-tip blood or glucose monitor with a probe inserted under the skin.
   b. **Periodic testing of A1c** – from blood tests obtained by a healthcare provider.
   c. **Tests to screen for and assess complications of diabetes** – is part of recommended regular medical care for all persons with diabetes.

THOROUGH EVALUATION BY AN ENDOCRINOLOGIST

1. **Endocrinologist** – for these medical standards is a physician (MD or DO) who is board-certified in endocrinology.
2. **Thorough evaluation by an endocrinologist** – in these medical standards includes:
   a. **In-clinic evaluation with focused review of medical history and physical exam** – to assess adequacy of control of diabetes, history of any severe hypoglycemia or severe hyperglycemic episodes, symptoms or findings of possible complications of diabetes, and presence of other relevant health conditions.
   b. **Review blood glucose self-monitoring data** (i.e., daily blood glucose logs) – with download of data from glucose meter or monitor with a memory feature; and
   c. **Appropriate laboratory tests** – A1c; kidney function tests (serum creatinine, BUN and glomerular flow rate); and other tests to assess possible complications; and
   d. **Assessment of possible or known complications of diabetes** – either done by the endocrinologist or another appropriate specialist (e.g., ophthalmologist).

MEDICAL RECORDS REQUIRED BY HMS – FOR EMPLOYEES WITH DIABETES MELLITUS

1. Employees having fitness-for-duty evaluations or in medical monitoring for diabetes mellitus should send UPRR Health and Medical Services (HMS) the following medical records:
   a. All clinical notes and test results of evaluations by endocrinologists; and
   b. Copies of downloaded daily glucose logs (the endocrinologist should also provide an interpretation of these glucose logs with the clinical notes).

DM2: Medical Standards for Safety Critical Workers with Hypoglycemia Episodes

CLASSIFICATION AND DEFINITIONS

1. **Hypoglycemia** – is formally defined as blood glucose <70 mg/dl. Hypoglycemia occurs when a person with diabetes uses insulin and/or certain other drugs that cause blood glucose to drop too low; this may occur because the person has not eaten recently or is ill, or if the dose of insulin and/or other drug was too high.
2. **Mild hypoglycemia** – symptoms may include sweating, tremor, hunger, palpitations (rapid heartbeat), fatigue, lethargy, or irritability. Symptoms typically resolve when the person ingests glucose and blood glucose rises to a normal range (i.e., over 80 to 100 mg/dl).
3. **Severe hypoglycemia** – causes confusion and impaired physical function, which may progress to loss of consciousness, seizure, coma, myocardial infarction, stroke, or death. Severe hypoglycemia is also be defined in this medical standard as hypoglycemia requiring assistance of another person or blood glucose <55 mg/dl.
4. **Hypoglycemia unawareness** – is a condition where a person has hypoglycemia but experiences no symptoms, and blood glucose may drop to very low levels and severe hypoglycemia may develop with no warning symptoms. This condition may develop if a person has repeated episodes of mild or severe hypoglycemia.
5. **Return-to-Work (RTW) criteria after a severe hypoglycemia episode**
   a. Person must complete the minimum waiting period, and during this time must: (1) be under the care of an endocrinologist, (2) keep daily blood glucose logs (with print-outs sent to HMS as requested), and (3) have no new severe hypoglycemia episode or other adverse health event that poses a safety risk for work;
   b. In the 6 months prior to RTW, blood glucose logs should show: (1) no reading <70 mg/dl, (2) <5% of readings of 71-80 mg/dl, and (3) no reading >400 mg/dl (unless explained and unlikely to recur); and
   c. Just prior to RTW, have a thorough evaluation by an endocrinologist that shows: (1) adequate glycemic control (with A1c of 7% to 10%), and (2) adequate evaluation and control of any complications of diabetes.

WORK RESTRICTIONS FOR SUDDEN INCAPACITATION (SI) RISK

MEDICAL CONDITION / DIAGNOSIS	DURATION
Episodes of mild hypoglycemia Diagnosed based on: (1) readings on daily glucose logs, or (2) symptoms of mild hypoglycemia that resolve after ingesting glucose.	**Individually evaluated** – assess risk based on frequency and any related incidents/accidents
Hypoglycemia unawareness If suspected or confirmed based on diagnosis of treating clinician or based on history	**Ongoing work restrictions** – pending individual assessment of risk
Episode(s) of possible or probable severe hypoglycemia With no related loss of consciousness, seizure, stroke or myocardial infarction	**Individually evaluated** – may require work restrictions during assessment
Single episode of probable severe hypoglycemia With a related loss of consciousness, seizure, stroke or myocardial infarction and no similar severe hypoglycemia episode in the prior five years	**Minimum 1-year waiting period** – then must meet RTW criteria above
Multiple episodes of probable severe hypoglycemia With a related loss of consciousness, seizure, stroke or myocardial infarction (i.e., two or more such severe hypoglycemia episodes in prior five years)	**Minimum 5-year waiting period** – then must meet RTW criteria above

WORK RESTRICTIONS AND CRITERIA FOR RETURN TO WORK

UPRR work restrictions for sudden incapacitation risk:

1. UPRR considers health conditions with a risk for sudden incapacitation greater than a 1% per year occurrence rate to pose an unacceptable risk for safety critical work, requiring work restrictions. Sudden incapacitation includes loss of consciousness, or sudden impairment in mental or physical functioning that poses a safety risk for work.
2. Work restrictions for sudden incapacitation restrict functional work activities that may affect the health and safety of the worker or others (e.g., operating vehicles or equipment).
3. Work restrictions for sudden incapacitation may include a "minimum waiting period" (after the health event of concern) before the person can be considered for return to safety critical work.

To remove work restrictions for sudden incapacitation risk, the following conditions must be met:

1. Employee must complete the minimum waiting period and have had no new health events that pose safety concerns.
2. Employee must have recent evaluation by an endocrinologist with appropriate diagnostic assessment (as defined in these medical standards and clinical best practices).
3. If after reviewing available information, and HMS determines the employee currently has an acceptable level of risk for sudden incapacitation, HMS may remove the employee's work restrictions for sudden incapacitation risk. However, HMS may apply other work restrictions due to safety concerns.
4. If all the conditions above are not met, then HMS will continue the employee's existing work restrictions and will initiate a new medical fitness-for-duty evaluation.

If the employee returns to safety critical work:

1. Medical monitoring by HMS is required after return to work. Employee must be evaluated by an endocrinologist at least annually, with records sent to HMS. The employee is responsible for this evaluation. HMS may also require more frequent monitoring and/or specific evaluations or tests.
2. The employee must also inform HMS of any Reportable Health Event (i.e., a change in health status that may affect safety at work) as stated in the UPRR Medical Rules.

DM3: Medical Standards for Safety Critical Workers with
Severe Hyperglycemic States

CLASSIFICATION AND DEFINITIONS

1. **Severe hyperglycemia state** –classified as either: (a) diabetic ketoacidosis or (b) a hyperosmolar hyperglycemic state. These conditions result from untreated or poorly controlled diabetes mellitus and may develop rapidly over a period of days if not treated vigorously. Onset of symptoms may also be gradual and insidious, and involve mental confusion, so the person may not recognize the severity of the condition and seek medical care. These conditions require emergency medical care. These two types of severe hyperglycemic state are:
   a. **Diabetic ketoacidosis** – a serious condition that mainly occurs in type I diabetes when a person has very high blood glucose levels and a lack of insulin, so that the body metabolizes fatty acids producing ketones and metabolic acidosis (which cause some of the adverse effects). Symptoms may come on rapidly and include vomiting, diarrhea, labored breathing and confusion. This condition can lead to coma and death, and is a medical emergency that requires rapid treatment.
   b. **Hyperosmolar hyperglycemic state** – a serious complication of type 2 diabetes where prolonged high blood glucose levels cause severe dehydration and increased osmolarity. This condition may cause neurological impairments and delirium, and lead to coma and death. Plasma glucose levels are typically over 600 mg/dl, but the condition does not produce ketones or result in metabolic acidosis.
2. **Return-to-Work (RTW) criteria after a severe hyperglycemic state episode**
   a. Person must complete the minimum waiting period, and during this time must: (1) be under the care of an endocrinologist, (2) keep daily blood glucose logs (with print-outs sent to HMS as requested), and (3) have no new severe hyperglycemic episode or other adverse health event that poses a safety risk for work.
   b. In the 6 months prior to RTW, blood glucose logs should show: (1) no reading <70 mg/dl, (2) <5% of readings of 71-80 mg/dl, and (3) no reading >400 mg/dl (unless explained and unlikely to recur); and
   c. Just prior to RTW, have a thorough evaluation by an endocrinologist that shows: (1) adequate glycemic control (with A1c of 7% to 10%), and (2) adequate evaluation and control of any complications of diabetes.

WORK RESTRICTIONS FOR SUDDEN INCAPACITATION (SI) RISK

MEDICAL CONDITION / DIAGNOSIS	DURATION
Suspected severe hyperglycemic state episode Either diabetic ketoacidosis or hyperosmolar hyperglycemic state	**Ongoing work restrictions** – pending medical evaluation; then based on individual assessment of risk
First lifetime episode of severe hyperglycemic state First lifetime episode of diabetic ketoacidosis or hyperosmolar hyperglycemic state	**Minimum waiting period of 6 months** – then must meet RTW criteria above
Second lifetime episode of severe hyperglycemic state Second lifetime episode (first recurrent episode) of diabetic ketoacidosis or hyperosmolar hyperglycemic state	**Minimum waiting period of 1 year** – then must meet RTW criteria above
More than two lifetime episodes of severe hyperglycemic state More than two life-time episodes of diabetic ketoacidosis or hyperosmolar hyperglycemic state (i.e., multiple recurrent episodes)	**Minimum waiting period of 5 years** – then must meet RTW criteria above

WORK RESTRICTIONS AND CRITERIA FOR RETURN TO WORK

UPRR work restrictions for sudden incapacitation risk:

1. UPRR considers health conditions with a risk for sudden incapacitation greater than a 1% per year occurrence rate to pose an unacceptable risk for safety critical work, requiring work restrictions. Sudden incapacitation includes loss of consciousness, or sudden impairment in mental or physical functioning that poses a safety risk for work.
2. Work restrictions for sudden incapacitation restrict functional work activities that may affect the health and safety of the worker or others (e.g., operating vehicles or equipment).
3. Work restrictions for sudden incapacitation may include a "minimum waiting period" (after the health event of concern) before the person can be considered for return to safety critical work.

To remove work restrictions for sudden incapacitation risk, the following conditions must be met:

1. Employee must complete the minimum waiting period and have had no new health events that pose safety concerns.
2. Employee must have recent evaluation by an endocrinologist with appropriate diagnostic assessment (as defined in these medical standards and clinical best practices).
3. If after reviewing available information, and HMS determines the employee currently has an acceptable level of risk for sudden incapacitation, HMS may remove the employee's work restrictions for sudden incapacitation risk. However, HMS may apply other work restrictions due to safety concerns.
4. If all the conditions above are not met, then HMS will continue the employee's existing work restrictions and will initiate a new medical fitness-for-duty evaluation.

If the employee returns to safety critical work:

1. Medical monitoring by HMS is required after return to work. Employee must be evaluated by an endocrinologist at least annually, with records sent to HMS. The employee is responsible for this evaluation. HMS may also require more frequent monitoring and/or specific evaluations or tests.
2. The employee must also inform HMS of any Reportable Health Event (i.e., a change in health status that may affect safety at work) as stated in the UPRR Medical Rules.