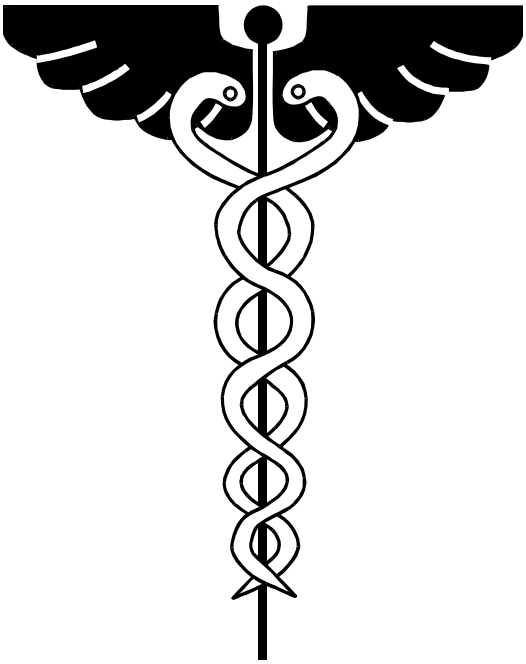
STATE OF CALIFORNIA
DMV
DEPARTMENT OF MOTOR VEHICLES

Diabetes Guidelines
(Chapter 3)



Published by
Kuwatch Law Offices
http://www.dui-law.com
707 456 9000

(Rev. 2/99)

DIABETES MELLITUS

Diabetes mellitus is a chronic life-long metabolic disorder affecting approximately five to ten percent of the population. Diabetes can develop at any age.

Insulin, a pancreatic hormone which maintains normal metabolism of carbohydrates, fats, and protein, regulates how the body uses and stores food for energy. Insulin is the key to diabetes. Lack of insulin affects the body's ability to properly use glucose. In diabetes, the body either stops producing insulin or cannot properly use the insulin it makes.

The three types of diabetes mellitus are:

- Type I diabetes: Insulin Dependent Diabetes Mellitus (IDDM)
  Type I diabetes is diagnosed in ten percent of the people with diabetes mellitus. In Type I diabetes, there is a defect in the person's immune system that triggers the body to destroy its own insulin-producing cells. The onset of Type I diabetes usually occurs before age 40. People with Type I diabetes always require insulin injections to regulate their blood glucose in order to survive.

- Type II diabetes: Non-Insulin Dependent Diabetes Mellitus (NIDDM)
  Type II diabetes affects approximately sixty percent of people diagnosed with diabetes mellitus. Most people who acquire Type II diabetes are overweight and are over age 40. In Type II diabetes, the pancreas may produce an insufficient amount of insulin or the body may become resistant to insulin, causing it to be less effective or not to be used properly in maintaining metabolic control. Most people with Type II diabetes manage their blood glucose by diet and/or oral diabetes medicine. In some cases, insulin injections are also prescribed for Type II diabetes.

- Gestational Diabetes Mellitus (GDM) which develops during some pregnancies.
  Gestational Diabetes develops in approximately five percent of pregnant women during the second or third trimester. Once the pregnancy is over, the gestational diabetes goes away. However, a significant number of these women will eventually develop Type II diabetes later in life. Therapy for managing gestational diabetes is either a prescribed diet or insulin injections as determined by the health care team.

The attached Diabetes Consolidation Matrix and Glossary of Terms defines types of diabetes and provides information on management therapy. The matrix describes ranges of severity and lists possible complications and information on functional driving impairments; provides factors to consider when evaluating a driver; and provides a range of actions for both hypoglycemic and hyperglycemic diabetic reactions including physiological changes which include visual, kidney, nervous system and vascular changes. The matrix provides guidance in determining appropriate actions concerning the driving privilege of individuals diagnosed with diabetes.

EVALUATING DRIVERS WITH DIABETES

The department may receive a report of a driver with diabetes from a variety of sources, including physicians, law enforcement agencies, and relatives of the driver. All drivers who have been referred to the department with a diabetic condition that may impair the ability to drive are scheduled for a driver safety reexamination. Depending upon the severity of physical or mental impairment and its effect on functional driving, further reexamination including written, vision and drive tests may be necessary. The evaluation of a driver with diabetes must include

questioning that is sufficiently thorough to collect the specifics of his/her treatment regimen and its effectiveness.

Factors to Consider:

- Whether the driver understands the need to comply with treatment and is willing and motivated to maintain his/her treatment regimen.
- Whether there are difficulties the driver experiences in work hours, lifestyle, job duties, etc. that could interfere with compliance? For example, it may be easier for a person with sedentary desk job to be able to self-monitor blood glucose levels, make adjustments to insulin dosages, have access to emergency supplies (carbohydrates) and help, and to make appropriate meal choices than a person with odd hours who travels on the road long distances.
- The severity range of any complication that has developed as a result of the diabetes.

Imposing Licensing Actions:

The following matrix provides a range of licensing actions that can be taken for each diabetes complication. Since the driver may be experiencing more than one complication, and each complication may be at a different range of severity, it is important to factor all of these debilitations together. It is appropriate to take the recommended action based on the driver's worst complication, especially if that complication is moderate or severe. Immediate action will be taken against the driving privilege if evidence indicates that the condition renders the person unsafe to drive. The driver may request a hearing after receiving a notice of suspension or revocation.

Types of Diabetes Mellitus	***Definitions for Diabetes Mellitus Types***	***Regimen of Therapy for Management***
Type I diabetes *or* *Insulin Dependent Diabetes Mellitus (IDDM)*	• Type I diabetes is managed by: - diabetes education. - a balanced diet and exercise. - testing blood glucose frequently. - *daily* insulin injections. • Most people with Type I diabetes usually acquire it before age 40. • The mismanagement and/or duration of Type I diabetes increases transitory (acute) and long term (chronic) complications. • Hyperglycemic and/or hypoglycemic reactions may occur in spite of conscientious efforts to manage control by the person and their health care team.	• People with Type I diabetes will *always* require insulin injections for treatment to regulate their blood glucose.
Type II diabetes *or* *Non-Insulin Dependent Diabetes Mellitus (NIDDM)*	• People with Type II diabetes are likely to be older and overweight. • Generally, people with Type II diabetes are not dependent on insulin therapy. • They may even have normal or elevated concentrations of insulin in their blood. • People with Type II diabetes may be undiagnosed or asymptomatic for years, while slowly developing complications.	• Treatment for managing a person's Type II diabetes includes: - diabetes education. - a balanced diet and exercise. - testing blood glucose. - either oral hypoglycemic agent tablets or, on occasion, insulin injections as determined by his or her health care team.
Gestational Diabetes Mellitus *(GDM)*	• Gestational diabetes develops in some pregnant women during the second trimester. • Once the pregnancy is over, the gestational diabetes goes away. • A significant number of these women will eventually develop Type II diabetes later in life.	• Treatment for managing GDM is either a prescribed diet or insulin injections determined by the health care team.

VISUAL CHANGES*

RANGE OF SEVERITY AND POSSIBLE COMPLICATIONS	FUNCTIONAL DRIVING IMPAIRMENTS	OTHER FACTORS CONTRIBUTING TO UNSAFE DRIVING	DRIVER LICENSING OPTIONS FOR VISUAL COMPLICATIONS
MILD • Premature cataracts. • Glaucoma. • Diabetic retinopathy earliest stage (nonproliferative or sometimes referred to as "background"): - diabetic macular edema.	***MILD*** • None.	• Change in daily routine (work or sleep). • Unplanned exercise. • Inadequate health care. • Noncompliance with medical regimen of therapy. • Lack of diabetes education.	***MILD*** *Reference Vision Guidelines.*
MODERATE • Cataracts. • Glaucoma. • Diabetic retinopathy (nonproliferative or proliferative): - diabetic macular edema	***MODERATE*** *Reference Vision Guidelines.*	• Alcohol use or abuse. • Poor diet and nutrition. • Interfering effects of multi-medications. • Driving record.	***MODERATE*** *Reference Vision Guidelines.*
SEVERE • Cataracts. • Glaucoma. • Diabetic retinopathy (proliferative): - diabetic macular edema. • Retinal detachment. • Blindness.	***SEVERE*** *Reference Vision Guidelines.*		***SEVERE*** *Reference Vision Guidelines.*

Advice*:*

** Reference Vision Guidelines when visual acuity is questionable. A Report of Vision Examination (DL-62) is required before rendering any decision.*

Consider the person's entire diabetes condition.

Licensing decisions should be based on the medical condition(s) having the greatest effect on a person's ability to drive safely.

KIDNEY CHANGES

RANGE OF SEVERITY AND POSSIBLE COMPLICATIONS	FUNCTIONAL DRIVING IMPAIRMENTS	OTHER FACTORS CONTRIBUTING TO UNSAFE DRIVING	DRIVER LICENSING OPTIONS FOR KIDNEY COMPLICATIONS
MILD Diabetic Nephropathy Earliest Stage: • Hypertension (blood pressure greater than 160/95 mm Hg) due to increased peripheral resistance. • Persistent presence of protein in the urine (albuminuria) greater than 30mg but less than 300mg/100ml. • Not a candidate for hemodialysis or peritoneal dialysis since kidney function is more than 5%. ***MODERATE*** Diabetic Nephropathy Clinical: • Abnormal kidney function. • Persistent urinary albuminuria greater than 300 mg/100ml. • Persistent hypertension. • Fluid retention causing swelling (edema) in the feet, legs, abdomen, and face. • Potential candidate for hemodialysis or peritoneal dialysis; 95% or less of kidney function has been lost. • History of cardiovascular disease. • History of stroke. • Loss of muscular control.	***MILD*** • None. ***MODERATE*** Cognitive: • Inability to concentrate. Loss of Muscular Control or Coordination: • Fatigue. • Dizziness. Musculoskeletal: • Physical weakness. • Decreased lower extremity functional and muscular coordination deteriorating the range of motion for lower back, torso, legs, and feet. • Numbness in arms and legs decreasing range of motion and endurance with less ability to steer smoothly. • Burning sensation in the feet affecting smooth operation of accelerator, brake, or clutch pedals.	• Change in daily routine (work or sleep). • Unplanned exercise. • Inadequate health care. • Noncompliance with medical regimen of therapy. • Lack of diabetes education. • Alcohol use or abuse. • Poor diet and nutrition. • Interfering effects of multi-medications. • Driving record. • Illness and infections.	***MILD*** *"No Action"* If severity of kidney complication is long standing and a review of the driving record determines continued ability to demonstrate compensation, and no other disqualifying complications. ***MODERATE*** Since the rate of progression is highly variable for a person with renal disease a special driving test is required when ability to drive safely is affected by: • Physical weakness or frailty decreasing stamina to drive. • Muscular incoordination affecting range of motion. • Cognitive deficits causing poor safety awareness. *"No Action"* If severity of kidney complication is long standing and a review of the driving record determines continued ability to demonstrate compensation, and no other disqualifying complications. *"Medical Probation II"* If kidney condition is not stabilized within the previous three months because of: • The severity of complication has recently been determined. • Regimen of therapy has recently changed. • Human error in medication and management. • Other temporary precipitating factors contributing to unsafe driving. *"Restriction"* Application of restrictions is guided by: • A review of the driving record to determine a continued ability to demonstrate compensation. • The results of a vision screening. • Special drive test. • Any other traffic safety risks. *NOTE: for example consider driving restrictions such as neighborhood, time of day, no freeway driving, automatic transmission, sunrise to sunset, to and from designated destinations, additional or special equipment to increase driving proficiency.*

KIDNEY CHANGES (continued)

RANGE OF SEVERITY AND POSSIBLE COMPLICATIONS	FUNCTIONAL DRIVING IMPAIRMENTS	OTHER FACTORS CONTRIBUTING TO UNSAFE DRIVING	DRIVER LICENSING OPTIONS FOR KIDNEY COMPLICATIONS
SEVERE Diabetic Nephropathy Latest Stage: • Serum creatinine greater than 133 µmol/L or above 2.0mg/dl. • Protein levels greater than 0.3g/L • Blood Urea Nitrogen (BUN) greater than 6.5mmol/L. • Physical debilitating kidney failure symptoms. • Persistent hypertension due to increased peripheral resistance. • End stage renal failure requiring dialysis therapy or organ transplantation for survival. • Hemodialysis or Peritoneal dialysis. • Fluid retention causing swelling (edema) in the feet, legs, abdomen, and face. • Kidney failure. • Uremic symptoms due to the build-up of creatinine and BUN toxins causing loss of muscular control and coordination. • History of vascular complications. • Loss of muscular control or coordination. • Cognitive deficits. • Seizure or convulsions.	***SEVERE*** Cognitive:* • Difficulty concentrating. • Memory loss. • Lethargic after dialysis. Loss of Muscular Control or Coordination:* • Dizziness. • Nausea. • Seizures or convulsions if end stage renal failure is untreated. • Temporary muscular weakness and fatigue before and after dialysis. Musculoskeletal: • Physical weakness. • Shortness of breath. • Temporary muscular weakness and fatigue before and after dialysis. • Lower back pain decreasing functional and muscular coordination affecting range of motion. • Pain in chest while sitting. • Numbness in arms and legs decreasing range of motion and endurance with less ability to steer smoothly. • Burning sensation in the feet affecting smooth operation of accelerator, brake, or clutch pedals.	• Change in daily routine (work or sleep). • Unplanned exercise. • Inadequate health care. • Noncompliance with medical regimen of therapy. • Lack of diabetes education. • Alcohol use or abuse. • Poor diet and nutrition. • Interfering effects of multi-medications. • Driving record.	***SEVERE*** Since the rate of progression is highly variable for a person with renal disease, a special driving test (SDT) is required when ability to drive safely is affected by: • Physical weakness or frailty decreasing stamina to drive. • Muscular incoordination affecting range of motion. • Cognitive deficits causing poor safety awareness. *"Restriction"* Application of restrictions is guided by: • A review of the driving record to determine continued ability to demonstrate compensation. • The results of a vision screening. • Special drive test. • Any other traffic safety risks. *NOTE: For example consider driving restrictions such as: neighborhood, time of day, no freeway driving, automatic transmission, sunrise to sunset, to and from designated destinations, additional or special equipment to increase driving proficiency.* *"Calendar Reexamination with Special Driving Test"* A calendar reexamination with a SDT should be scheduled when: • Persons with end stage renal disease are just starting a dialysis regimen of therapy, since symptoms of renal failure can be nonspecific. • Post-operative organ transplant recovery. *"Medical Probation II"* If kidney complication is stabilized for at least for at 3 months on dialysis. Medical reports from driver's physician are needed for recent dialysis regimen of therapy for end stage renal disease. Driver should be closely monitored by medical probation for debilitating kidney failure conditions or other illnesses that may contribute to unsafe driving, since symptoms of diabetic nephropathy complications can be nonspecific. *"Suspension"* Severity of kidney complication affects the driver's ability to safely operate a motor vehicle a suspension may be reasonable if: • Complication is not stabilized due to precipitating factors. • Does not comply with care, medication, or dialysis regimen. • Regimen of therapy has recently changed. • Driver is a candidate for an organ transplantation. *"Revocation"* If kidney complication is not likely to ever be brought under control a revocation may be reasonable if: • Functional impairments affect safe driving due to renal or liver insufficiency causing loss of muscular control or seizures. • Driver fails to demonstrate compensation for the adverse affects of end stage renal failure functional impairments.
Advice: **Reference the Lapse of Consciousness (Metabolic Chart), and Dementia (Multi-infarct or Metabolic/Systemic Chart) Guidelines for additional licensing options.*			

VASCULAR CHANGES

RANGE OF SEVERITY AND POSSIBLE COMPLICATIONS	FUNCTIONAL DRIVING IMPAIRMENTS	OTHER FACTORS CONTRIBUTING TO UNSAFE DRIVING	DRIVER LICENSING OPTIONS FOR VASCULAR COMPLICATIONS
MILD Atherosclerosis: • Hypertension due to increased peripheral resistance. • Cardiovascular disease. • Cerebrovascular disease. • Peripheral artery disease. ***MODERATE*** Atherosclerosis: • Hypertension due to increased peripheral resistance. • Peripheral artery disease. • Cerebral vascular disease. • Coronary vascular disease. • Chronic stable angina or chest pain. • Intermittent claudication (leg cramps) lower leg pain induced with moderate exercise. • Visual changes. • Cognitive deficits.	***MILD*** • None. ***MODERATE*** Cognitive: • Lack of concentration and judgment to react appropriately in different driving situations. Musculoskeletal: • Lack of upper body strength and dexterity to properly maintain physical control over vehicle. • Chest pain while sitting. • Physical frailty. • Erratic operation of accelerator, brake, or clutch pedals affecting ability to control speed or deceleration especially in congested traffic situations or challenging geographical locations. • Lack of lower body strength and dexterity to properly move or adjust foot to/from accelerator, brake, or clutch pedals. • Persistent pain affecting concentration and judgment. Visual Changes: • Visual and depth perception deficits.	• Change in daily routine (work or sleep). • Unplanned exercise. • Inadequate health care. • Noncompliance with medical regimen of therapy. • Lack of diabetes education. • Alcohol use or abuse. • Poor diet and nutrition. • Interfering effects of multi-medications. • Driving record.	***MILD*** *"No Action"* If severity of vascular complication is long standing and a review of the driving record determines continued ability to demonstrate compensation, and no other disqualifying complications. ***MODERATE*** Since the rate of progression is highly variable for a person with vascular disease, a special driving test (SDT) is required when ability to drive safely is affected by: • Physical weakness or frailty decreasing stamina to drive. • Muscular incoordination affecting range of motion. • Cognitive deficits causing poor safety awareness. *"Restriction"* Application of restrictions is guided by: • A review of the driving record to determine continued ability to demonstrate compensation. • The results of a vision screening. • Special drive test. • Any other traffic safety risks. *NOTE: for example consider driving restrictions such as neighborhood, time of day, no freeway driving, automatic transmission, sunrise to sunset, to and from designated destinations, additional or special equipment to increase driving proficiency.* *"Medical Probation II"* If vascular condition is not stabilized within the previous three months because of: • The severity of complication has recently been determined. • Regimen of therapy has recently changed. • Human error in medication and management. • Other temporary precipitating factors contributing to unsafe driving. *"Suspension"* A suspension may be reasonable if: • Complication is not stabilized due to precipitating factors contributing to unsafe driving. • Driver does not demonstrate compensation on a SDT for the adverse affects of functional impairments. • Does not comply with care or medication regimen. • Regimen of therapy has recently changed.

VASCULAR CHANGES (continued)*

RANGE OF SEVERITY AND POSSIBLE COMPLICATIONS	FUNCTIONAL DRIVING IMPAIRMENTS	OTHER FACTORS CONTRIBUTING TO UNSAFE DRIVING	DRIVER LICENSING OPTIONS FOR VASCULAR COMPLICATIONS
SEVERE Atherosclerosis: • Hypertension due to increased peripheral resistance. • Peripheral artery (vascular) disease. • Claudication (leg cramping) lower leg pain with minimal exercise. • Visual changes.* • Significant ischemia. • Cardiovascular disease. • Angina. • Transient Ischemic Attack (TIA). • Carotid bruit. • Cerebrovascular disease possibly causing brain damage.* • Stroke.* • Lower extremity amputation. • Foot lesions (ulcer) infection or gangrene. • Vascular dementia.* • Cognitive deficits.* • Loss of control or loss of muscular control. • Sudden death.	***SEVERE*** Cognitive:* • Lack of concentration and impaired judgment to react appropriately in different driving situations. • Decreased cognitive functions. Loss of Consciousness or Loss of Muscular Control:* • Loss of muscular control and coordination; may be unable to maintain physical control of vehicle. • Loss of awareness of environment. Musculoskeletal: • Lack of upper body strength and dexterity to properly maintain physical control over vehicle. • Chest pain affecting steering action. • Physical frailty or weakness. • Erratic operation of accelerator, brake, or clutch pedals causing inability to control speed or deceleration in different traffic situations and geographical locations. • Unable to properly move or adjust foot from accelerator, brake, or clutch pedals. • Loss of leg or foot resulting in possible use of hand controls. Visual Changes:* • Visual and depth perception deficits. • Loss of complex visual acuity. • Cortical blindness. • Other visuospatial difficulties.	• Change in daily routine (work or sleep). • Unplanned exercise. • Inadequate health care. • Noncompliance with medical regimen of therapy. • Lack of diabetes education. • Alcohol use or abuse. • Illness or infections. • Poor diet and nutrition. • Interfering effects of multi-medications. • Driving record.	***SEVERE*** Since the rate of progression is highly variable for a person with vascular disease, a special driving test (SDT) is required when ability to drive safely is affected by: • Physical weakness or frailty decreasing stamina to drive. • Muscular incoordination affecting range of motion. • Cognitive deficits causing poor safety awareness. "*Restriction*" Application of restrictions is guided by: • A review of the driving record to determine continued ability to demonstrate compensation. • The results of a vision screening. • Special drive test. • Any other traffic safety risks. *NOTE: for example consider driving restrictions such as neighborhood, time of day, speed, no freeway driving, automatic transmission, sunrise to sunset, to and from designated destinations, special equipment such as artificial leg, hand controls, and supportive devices to increase driving proficiency.* "*Calendar Reexamination with Special Drive Test*" A calendar reexamination with a SDT should be scheduled when: • Persons with vascular disease are just starting a regimen of therapy. • Debilitating medical conditions or other illnesses resulting from other factors contributing to unsafe driving, since symptoms of vascular complications can be nonspecific. "*Medical Probation II*" If vascular condition is not stabilized within the previous three months because of: • The severity of complication has recently been determined. • Regimen of therapy has recently changed. • Human error in medication and management. • Other temporary precipitating factors contributing to unsafe driving. "*Suspension*" Severity of complication affects the driver's ability to safely operate a motor vehicle a suspension may be reasonable if: • Complication is not stabilized due to precipitating factors. • Driver fails to demonstrate compensation for the adverse affects of vascular complication functional impairments. • Does not comply with care, medication, or dialysis regimen. • Regimen of therapy has recently changed. "*Revocation*" If vascular complication is not likely to ever be brought under control a revocation may be reasonable if: • Functional impairments affect safe driving due to severity of complication.
Advice: *Reference: Vision, Lapses of Consciousness, or Dementia (Multi-infarct *vascular dementia*, or Metabolic/Systemic Chart) Guidelines.			

PERIPHERAL NERVOUS SYSTEM CHANGES

RANGE OF SEVERITY AND POSSIBLE COMPLICATIONS	FUNCTIONAL DRIVING IMPAIRMENTS	OTHER FACTORS CONTRIBUTING TO UNSAFE DRIVING	DRIVER LICENSING OPTIONS FOR NERVOUS SYSTEM COMPLICATIONS
MILD Diabetic Neuropathy (peripheral nervous system diseases): • motor nerves (muscular weakness). • sensory nerves (loss of feeling). • autonomic nerves (loss of bodily functions that are not normally under consciousness control, such as): -gastrointestinal (digestive tract). -cardiovascular system (abnormal heart beat, blood pressure, sweating). -genitourinary system (genital organs). ***MODERATE*** Diabetic Neuropathy (peripheral nervous system diseases): • motor nerves (muscular weakness): - Diabetic amyotrophy. - Thoracic radiculopathy. - Unilateral foot drop. • sensory nerves (loss of feeling or sensation). - Carpal Tunnel Syndrome. • autonomic nerves (loss of bodily functions that are not normally under consciousness control, such as): -gastrointestinal (digestive tract). -cardiovascular system (abnormal heart beat, blood pressure, sweating). - Tachycardia. - Hypotension. - genitourinary system (genital organs).	***MILD*** • None ***MODERATE*** Motor Nerves: • Insufficient hand grip strength or range of motion to hold steering wheel steady during complex turning movements. • Insufficient leg strength causing inability to operate or smoothly apply accelerator, brakes, or clutch pedals. • Chest or abdominal weakness affecting range of motion while driving. • Inability to lift foot up. Sensory Nerves: • Loss of sensation (decreased sense for pain and numbness) in legs, feet, toes or hands affecting steering capability and smooth operation of gas, brake, or clutch pedals. • Distracting topical burning, or shooting pain feeling like ice picks or needles affecting concentration. • Facial pain leading to transitory paralysis of eye muscles causing double vision. Autonomic Nerves: • Shortness of breath. • Dizziness from hypotension. • Difficulty coordinating insulin with food intake causing blood glucose fluctuations causing hypoglycemic reactions.	• Change in daily routine (work or sleep schedule). • Unplanned exercise. • Inadequate health care. • Noncompliance with medical regimen of therapy. • Lack of diabetes education. • Alcohol use or abuse. • Poor diet and nutrition. • Interfering effects of multi-medications. • Driving record.	***MILD*** *"No Action"* If severity of complication is long standing and a review of the driving record determines continued ability to demonstrate compensation. ***MODERATE*** Since the rate of progression is highly variable for a person with nervous system disease, a special driving test (SDT) is required when ability to drive safely is affected by: • Physical weakness or frailty decreasing stamina to drive. • Muscular incoordination affecting range of motion. *Restriction"* Application of restrictions is guided by: • A review of the driving record to determine continued ability to demonstrate compensation. • The results of a vision screening. • Special drive test. • Traffic safety risks. *NOTE: for example consider driving restrictions such as neighborhood, time of day, speed, no freeway driving, automatic transmission, sunrise to sunset, to and from designated destinations, special equipment such as artificial leg, hand controls, and supportive devices to increase driving proficiency.* *"Calendar Reexamination with Special Drive Test"* A calendar reexamination with a SDT should be scheduled when: • Persons with nervous system complications are just starting a regimen of therapy. • Muscular weakness or loss of feeling is determined. • Debilitating medical conditions or other illnesses resulting from other factors contributing to unsafe driving, since symptoms can be nonspecific. *"Medical Probation II"* If nervous system disease is not stabilized within the previous three months because of: • The severity of complication has recently been determined. • Regimen of therapy has recently changed. • Human error in medication and management. • Other temporary precipitating factors contributing to unsafe driving. *"Suspension"* Severity of complication affects the driver's ability to safely operate a motor vehicle a suspension may be reasonable if: • Complications not stabilized due to precipitating factors. • Driver fails to demonstrate compensation for the adverse affects of nervous system disease complication functional impairments. • Does not comply with care or medication regimen. • Regimen of therapy has recently changed.

PERIPHERAL NERVOUS SYSTEM CHANGES (continued)

RANGE OF SEVERITY AND POSSIBLE COMPLICATIONS	FUNCTIONAL DRIVING IMPAIRMENTS	OTHER FACTORS CONTRIBUTING TO UNSAFE DRIVING	DRIVER LICENSING OPTIONS FOR NERVOUS SYSTEM COMPLICATIONS
SEVERE Diabetic Neuropathy: (peripheral nervous system diseases). • motor nerves (muscular weakness): - Diabetic amyotrophy. - Thoracic radiculopathy. - Unilateral foot drop. • sensory nerves (loss of feeling or sensation). - Carpal Tunnel Syndrome. • autonomic nerves (loss of bodily functions that are not normally under consciousness control, such as): -gastrointestinal (digestive tract). -cardiovascular system (abnormal heart beat, blood pressure, sweating). - Tachycardia. - Hypotension. -genitourinary system (genital organs).	***SEVERE*** Motor Nerves: • Insufficient hand grip strength or range of motion to hold steering wheel steady during complex turning movements. • Insufficient leg strength causing inability to operate or smoothly apply accelerator, brakes, or clutch pedals. • Chest or abdominal weakness affecting range of motion while driving. • Inability to lift foot up. Sensory Nerves: • Loss of sensation (decreased sense for pain and numbness) in legs, feet, toes or hands affecting steering capability and smooth operation of gas, brake, or clutch pedals, also affecting where feet and hands are placed without looking at them (proprioception). • Distracting topical burning, or shooting pain feeling like ice picks or needles affecting concentration. • Facial pain leading to acute paralysis of eye muscles causing double vision. Autonomic Nerves: • Shortness of breath. • Heart failure. • Dizziness from hypotension • Difficulty coordinating insulin with food intake causing blood glucose fluctuations causing hypoglycemic reactions and brittleness. • Possible inability to recognize hypoglycemia warning signs or symptoms.	• Change in daily routine (work or sleep schedule). • Unplanned exercise. • Inadequate health care. • Noncompliance with medical regimen of therapy. • Lack of diabetes education. • Alcohol use or abuse. • Poor diet and nutrition. • Interfering effects of multi-medications. • Driving record. • "Tight control" of blood glucose levels.	***SEVERE*** ***Special Drive Test Is Required For Any Severe Peripheral Nervous System Change.*** *Restriction"* Application of restrictions is guided by: • A review of the driving record to determine continued ability to demonstrate compensation. • The results of a vision screening. • Special drive test. • Traffic safety risks. *NOTE: for example consider driving restrictions such as neighborhood, time of day, speed, no freeway driving, automatic transmission, sunrise to sunset, to and from designated destinations, special equipment such as artificial leg, hand controls, and supportive devices to increase driving proficiency* *"Calendar Reexamination with Special Drive Test"* A calendar reexamination with a SDT should be scheduled when: • Persons with nervous system complications are just starting a regimen of therapy. • Muscular weakness or loss of feeling is determined.. • Debilitating medical conditions or other illnesses resulting from other factors contributing to unsafe driving, since symptoms can be nonspecific. *"Suspension"* Severity of complication affects the driver's ability to safely operate a motor vehicle a suspension may be reasonable if: • Complications not stabilized due to precipitating factors. • Does not comply with care or medication regimen. • New regimen of therapy. *"Revocation"* If complication is not likely to ever be brought under control a revocation may be reasonable if: • Functional impairments affect safe driving due to severity of complication. • Driver fails to demonstrate compensation for the adverse affects of vascular complication functional impairments.

HYPOGLYCEMIA TRANSITORY REACTIONS

RANGE OF SEVERITY AND POSSIBLE COMPLICATIONS	FUNCTIONAL DRIVING IMPAIRMENTS	OTHER FACTORS CONTRIBUTING TO UNSAFE DRIVING	DRIVER LICENSING OPTIONS FOR HYPOGLYCEMIA COMPLICATIONS
MILD *Rapid Onset - Requiring Self Treatment*. Note: The driver may experience any of these transitory symptoms during an episode: • Sweating. • Shakiness or tremors. • Visual changes. • Rapid heartbeat. • Hunger. • Lightheadedness or faintness. • Weakness or fatigue. • Slower reaction times. • Confusion. • Irritability or grouchiness. • Anxiety or nervousness. ***MODERATE*** *Rapid Onset - May Require Assistance In Treatment*. Note: The driver may experience any of these transitory symptoms during an episode: • Hunger. • Rapid heartbeat. • Personality changes. • Sweating. • Pallor. • Clammy skin. • Tremors.* • Cognitive deficits.	***MILD*** • None. ***MODERATE*** Cognitive Changes During An Episode: • Impaired judgment. • Poor judgment and safety awareness. • Reduced problem solving skills while driving in hazardous traffic situations. • Decreased memory and orientation. • Unawareness of disability to recognize warning symptoms of hypoglycemia. • Slower responses. Visual Changes During An Episode: • Blurriness. • Dark spots. • Double vision (Diplopia). • Diminished ability to recognize color. • Decreased depth or foreground perception.	• Change in daily routine (work or sleep). • Too much unplanned exercise. • Inadequate health care. • Noncompliance with medical regimen of therapy. • Lack of diabetes education. • Alcohol use or abuse. • Illness or infections. • Poor diet and nutrition. • Interfering effects of multi-medications. • Too little food or delayed meals. • Too much insulin or oral diabetes medication. • Driving record.	***MILD*** *"No Action"* If hypoglycemia is well managed and: • A review of the driving record determines continued ability to demonstrate compensation. • Able to anticipate and self manage an episode. • Strict adherence with regimen of therapy. • Absence of incapacitation or mental confusion due to insulin reaction. • No loss consciousness, muscular control, or awareness of surroundings. ***MODERATE*** *"Medical Probation II"* If within the previous three months hypoglycemia reactions have recently been determined because: • Regimen of therapy has recently changed. • Human error in medication or management. • Other temporary precipitating factors that may contribute to unsafe driving. **Note:** Loss of muscular control and coordination must be minimal to the point that physical control of a motor vehicle can be maintained. *"Suspension"* Frequency and severity of hypoglycemia reactions affects the driver's ability to safely operate a motor vehicle a suspension may be reasonable if: • Fails to demonstrate control for hypoglycemia reactions and is adversely affected by precipitating factors. • Noncompliance with regimen of therapy. • Medical condition may likely improve. *"Revocation"* If hypoglycemia is not likely to ever be brought under control a revocation is appropriate.

Advice:
*Reference the Lapses of Consciousness (Metabolic Chart) Guidelines.

HYPOGLYCEMIA TRANSITORY REACTIONS (continued)

RANGE OF SEVERITY AND POSSIBLE COMPLICATIONS	FUNCTIONAL DRIVING IMPAIRMENTS	OTHER FACTORS CONTRIBUTING TO UNSAFE DRIVING	DRIVER LICENSING OPTIONS FOR HYPOGLYCEMIA COMPLICATIONS
SEVERE *Rapid Onset - Usually Requiring Emergency Measures By Someone Else*. Note: The driver may experience any of these transitory symptoms during an episode: • Severe hypoglycemia reactions occur unpredictably without warning. • Someone having an insulin reaction may appear: - angry. - combative. - stuporous. - unresponsive. - drunk and may experience difficulty walking correctly. • Visual changes. • Cognitive deficits. • Altered mental state. • Hypoglycemia unawareness. • Syncope.***** • Lapses of consciousness or loss of muscular control.* • Sudden death.	***SEVERE*** • CAN NOT DRIVE SAFELY. Lapses of Consciousness or Loss of Muscular Control During An Episode:* • Reduced problem solving skills and poor judgment while driving. • Slower responses**.** • Loss of muscular control. • Seizure or convulsions. • Unawareness of disability to recognize warning symptoms of hypoglycemia. Visual Changes During An Episode:***** • Blurriness. • Dark spots. • Double vision (Diplopia). • Diminished color distinction. • Decreased depth and foreground perception. Cognitive Changes During An Episode: • Impaired judgment. • Poor judgment and safety awareness. • Reduced problem solving skills while driving in hazardous traffic situations. • Decreased memory and orientation. • Unawareness of disability to recognize warning symptoms of hypoglycemia. • Slower responses.	• Change in daily routine (work or sleep). • Too much unplanned exercise. • Inadequate health care. • Noncompliance with medical regimen of therapy. • Lack of diabetes education. • Alcohol use or abuse. • Illness or infections. • Poor diet and nutrition. • Interfering effects of multi-medications. • Too little food or delayed meals. • Too much insulin or oral diabetes medication. • Driving record.	***SEVERE*** *"Medical Probation II"* If within the previous three months hypoglycemia reactions have recently been determined because: • Regimen of therapy has recently changed. • Human error in medication or management. • Other temporary precipitating factors that may contribute to unsafe driving. **Note:** Loss of muscular control and coordination must be minimal to the point that physical control of a motor vehicle can be maintained. *"Suspension"* Frequency and severity of hypoglycemia reactions affects the driver's ability to safely operate a motor vehicle a suspension may be reasonable if: • Fails to demonstrate control for hypoglycemia reactions and is adversely affected by precipitating factors. • Noncompliance with regimen of therapy. • Medical condition may likely improve. *"Revocation"* If hypoglycemia is not likely to ever be brought under control a revocation is appropriate.

Advice:
*Reference Lapses of Consciousness (Syncope and Metabolic Chart) Guidelines .

NOTE: Persons with diabetes should:
(1) Check their own blood glucose levels for hypoglycemia symptoms before driving, and not drive if blood glucose is too low.
(2) Keep a supply of sugar material (carbohydrate) available in the vehicle to treat hypoglycemia.
(3) Know how to recognize their own hypoglycemia symptoms, and know when and how to treat it, especially when driving a motor vehicle.
(4) Store insulin in an environmentally safe carrying case and location in vehicle, and carry personal medical identification.
(5) Not drink alcoholic beverages since it has a blood glucose-lowering effect that can last for up to thirty-six hours after consumption.

HYPERGLYCEMIC TRANSITORY REACTIONS

RANGE OF SEVERITY AND POSSIBLE COMPLICATIONS	FUNCTIONAL DRIVING IMPAIRMENTS	OTHER FACTORS CONTRIBUTING TO UNSAFE DRIVING	DRIVER LICENSING OPTIONS FOR HYPERGLYCEMIA COMPLICATIONS
MILD *Slow Onset-Requiring Self Treatment*. Note: The driver may experience any of these transitory symptoms during an episode: • Increased thirst and urination. • Weakness or fatigue. • Lethargy. • Dry mouth. • Blurred vision. • Hunger. • Nausea. ***MODERATE*** *Slow Onset - May Require Assistance In Treatment*. Note: The driver may experience any of these transitory symptoms during an episode: • Increased thirst and urination. • Abdominal pains and aches. • Heavy or labored breathing. • Loss of appetite. • Nausea and vomiting. • Fatigue. • Lethargy. • Weakness. • Dry mouth. • Cognitive deficits. • Visual changes. • Diabetic acidosis.	***MILD*** • None. ***MODERATE*** Cognitive Changes During An Episode: • Lethargy. • Slow responses. • Disorientation. • Stupor. • Inability to understand or recognize traffic safety errors. • Reduced problem solving ability. • Decreased memory and orientation, awareness of disability, and sense of movement. • Presence of incapacitation or mental confusion due to transitory diabetic acidosis. Musculoskeletal During An Episode: • Weakness. • Lack of functional muscular coordination and endurance needed to maintain strength to drive safely. • Abdominal pains and aches. Visual Changes During An Episode: • Blurred vision. • Reduced depth or foreground perception.	• Change in daily routine (work or sleep). • Not enough planned exercise. • Inadequate health care. • Noncompliance with medical regimen of therapy. • Lack of diabetes education. • Alcohol use or abuse. • Illness or infections. • Poor diet and nutrition. • Interfering effects of multi-medications. • Too much food. • Too little insulin or oral diabetes medication. • Emotional stress. • Driving record.	***MILD*** *"No Action"* If hyperglycemia is well managed and: • A review of the driving record determines continued ability to demonstrate compensation. • Able to anticipate and self manage an episode. • Strict adherence with regimen of therapy. • Absence of incapacitation or mental confusion due to insulin reaction. • No loss consciousness, muscular control, or awareness of surroundings. • Absence of incapacitation or mental confusion due to transitory diabetic acidosis. ***MODERATE*** *"Medical Probation II"* If within the previous three months: • Hyperglycemia reactions has recently been determined. • Regimen of therapy has recently changed. • Human error in medication and management. • Other temporary precipitating factors that may contribute to unsafe driving. *"Suspension"* Frequency and severity of hyperglycemia reactions affects the driver's ability to safely operate a motor vehicle a suspension may be reasonable if: • Fails to demonstrate control for hyperglycemia reactions and is adversely affected by precipitating factors that contribute to unsafe driving. • Noncompliance with regimen o f therapy. • Medical condition may likely improve. *"Revocation"* If hyperglycemia is not likely to ever be brought under control a revocation is appropriate.
Advice: *Reference Lapses of Consciousness Guidelines.			

HYPERGLYCEMIC TRANSITORY REACTIONS (continued)

RANGE OF SEVERITY AND POSSIBLE COMPLICATIONS	FUNCTIONAL DRIVING IMPAIRMENTS	OTHER FACTORS CONTRIBUTING TO UNSAFE DRIVING	DRIVER LICENSING OPTIONS FOR HYPERGLYCEMIA COMPLICATIONS
SEVERE *Slow Onset - Usually Requiring Emergency Measures By Someone Else*. Note: The driver may experience any of these transitory symptoms during an episode: • Cognitive deficits. • Diabetic ketoacidosis.* • Nonketotic hyperosmolar coma (NKHC) syndrome.* • Cerebral edema • Lapses of Consciousness or Loss of Muscular Control.* ** Diabetic ketoacidosis and NKHC develops over several hours or days. Severe complications requiring hospitalization may cause voluntary driving cessation.*	***SEVERE*** Cognitive Changes During An Episode:* • Lethargy. • Slow or delayed responses. • Disorientation. • Stupor. • Inability to understand or recognize traffic safety errors. • Reduced problem solving ability. • Decreased memory and orientation, awareness of disability, and sense of movement. • Mental confusion. Lapses of Consciousness or Loss of Muscular Control During An Episode:* • Convulsions. • Coma. Musculoskeletal During An Episode: • Weakness. • Lack of functional muscular coordination or endurance that is needed to maintain strength to drive safely. • Abdominal pains and aches affecting range of motion. Visual Changes: • Blurred vision. • Reduced depth or foreground perception.	• Change in daily routine (work or sleep). • Not enough planned exercise. • Inadequate health care. • Noncompliance with medical regimen of therapy. • Lack of diabetes education. • Alcohol use or abuse. • Illness or infections. • Poor diet and nutrition. • Interfering effects of multi-medications. • Too much food. • Too little insulin or oral diabetes medication. • Emotional stress. • Driving record.	***SEVERE*** *"Medical Probation II"* If within the previous three months: • Hyperglycemia reactions has recently been determined. • Regimen of therapy has recently changed. • Human error in medication and management. • Other temporary precipitating factors. *"Suspension"* Frequency and severity of hyperglycemia reactions affects the driver's ability to safely operate a motor vehicle a suspension may be reasonable if: • Fails to demonstrate control for hyperglycemia reactions and is adversely affected by precipitating factors. • Noncompliance with regimen o f therapy. *"Revocation"* If hyperglycemia is not likely to ever be brought under control a revocation may be reasonable if: • Any associated precipitating factor is likely to continue indefinitely, (such as infections, medication side effects, vascular events).
Advice: *Reference Lapses of Consciousness Guidelines.			

DIABETES GLOSSARY

Acidosis: A condition caused by high acidity in the blood.

Acute Complications: Transient complications that are temporary and reversible due to blood glucose fluctuations having a short term impact on driving capability, such as hypoglycemia, hyperglycemia, diabetic ketoacidosis, and nonketotic hyperosmolar coma.

Albumin: A type of simple water soluble protein present in the urine.

Albuminuria: The presence of simple protein in the urine, sometimes indicative of kidney disease.

Alcohol Induced Diabetes: (See Latent Diabetes).

Angina: Chest pain or severe spasmatic and painful suffocation in the chest caused by reduced blood flow to the heart muscle.

Atherosclerosis: A chronic disease in which excessive amounts of fat and cholesterol remaining in the bloodstream collect on the inside walls of arteries, forming plaque that gradually thickens and hardens the arterial walls, slowing down and interfering with blood circulation until a blockage occurs. If blood cannot get through the affected vessel to nourish tissues, complications such as hypertension, stroke, gangrene, peripheral vascular disease, heart disease and other arteriosclerotic forms of disease can occur.

Autonomic Neuropathy: The autonomic nervous system (comprised of the sympathetic and parasympathetic nervous systems) are the nerves which control a whole range of bodily functions, such as the action of the stomach, intestine, esophagus, bladder, genitals, sweat glands, and even the heart and regulating changes in blood pressure levels. These are all nerves which work independently of conscious control. There may also decreased ability of the foot to perspire leading to dry, scaly skin which can crack and become infected and can gradually lead to foot ulceration problems. (Orthostatic Hypotension, Hypoglycemic Unawareness).

Background Diabetic Retinopathy: (Non-proliferative Retinopathy) Is the earliest stage of diabetic retinopathy in the mildest form, fine blood vessels and retinal capillaries within the retina become narrowed, clogged and swollen, or form balloon-like sacs. These altered vessels leak blood and fluid (macular edema) causing the retina to swell or form deposits called exudates from the center of the retina called the macula.

Balanced Diet: (American Diabetes Association Diet) A proper diet is the utmost importance in the therapy for management in treating diabetes. A diet for a person with diabetes should provide sufficient calories to achieve and maintain a desirable body weight.

Beta Cells: Cells that produce insulin within the body(endogenous) and found in the Islets of Langerhans in the pancreas.

Blood Glucose Monitoring: Testing the blood or urine of a person with diabetes to help maintain the amount of glucose in the blood within reasonable limits. Usually, a drop of blood (obtained by pricking the finger) is placed on a small test-strip that is inserted into a blood glucose meter. The meter calculates and displays the blood glucose level in (mg/dl) milligrams per deciliter unit of measurement. Testing the blood for glucose several times a day serves as an effective guide for proper management. Many people with diabetes test before each meal. A blood test taken before

eating (pre-absorptive or fasting) or after eating (postprandial) to determine the level of glucose in the blood. Normal blood glucose is usually from 100mg/dl to 160mg/dl.

Blood Urea Nitrogen: (BUN) A common blood test that can determine the level of a certain waste product , urea, in the blood.

Brittle Diabetes: (Labile or Unstable Diabetes) Marked fluctuations in blood glucose concentrations which are difficult to control causing frequent episodes of insulin reactions or coma despite good therapy for management and medical supervision. It is characterized by rapidly passing into either reaction or coma precipitated by fluctuation between high and low levels of glucose in the blood.

Carbohydrate: One of three major sources of calories in the diet. Carbohydrate is broken down into glucose during digestion and is the main nutrient that raises blood glucose levels. Carbohydrates come primarily from sugar (simple carbohydrate) and starch (complex carbohydrate, found in bread, pasta, beans).

Cardiovascular Disease: Relating to the blood supply to the heart. Diabetes is a major risk factor for developing heart disease. Other risk factors are family history of heart disease, obesity, sedentary lifestyle, stress, cigarette smoking, and high levels of blood fats (cholesterol). Heart and blood vessel disease (coronary artery disease and hypertension) is the leading cause of death among adults in the United States.

Cerebrovascular Disease: Relating to the blood supply to the brain, particularly with reference to pathologic changes such as stroke and other cognitive deficits.

Cerebral Vascular Accident: (CVA, Stroke) Impaired cerebral blood supply.

Chemical Diabetes: (See Latent Diabetes).

Chronic Complications: Associated with the duration of the disease, the lack of metabolic control of blood glucose, and other factors which result in tissue damage and have a long term impact on driving capability. The main chronic complications of diabetes mellitus are: (1) Visual Impairments: blurred vision, cataracts, glaucoma, maculopathy (macular edema), diabetic retinopathy. (2) Diabetic Nephropathy: progressive kidney dysfunction causing muscular weakness and fatigue leading to dialysis. (3) Cardiovascular, Cerebrovascular, and Peripheral Diseases: narrowing of arteries causing decreased blood flow to the heart, brain, and legs. (4) Neuropathy: a disorder of the nervous system (autonomic and peripheral) which impairs sensation or movement in the feet, legs, or hands.

Chronic Hyperglycemia: excessively high blood glucose that is slow progressing and long continuance of that may result in diabetic ketoacidosis or nonketotic hyperosmolar coma.

Claudication: A condition caused by a local and temporary deficiency of blood to the muscles due to narrowing (sclerosis) of the arteries (Peripheral Artery Disease) and characterized by attacks of lameness, odd sensation of tightness or pain in the affected thigh or calf muscles brought on by walking; however the condition may occur in other muscle groups.

Coma: (See Diabetic Coma.)

Coronary Vascular Disease: Relating to the blood supply to the heart, particularly with reference to pathologic changes. Coronary heart disease occurs when arteries that supply the heart muscle become narrowed by fatty deposits (atherosclerosis). Congestive heart failure, enlarged heart, syncope or collapse, angina, dyspnea (shortness of breath), or coronary insufficiency, myocardial infarction,

thrombosis. A condition in which the heart cannot efficiently pump blood. Coronary artery disease is the most common form of heart disease. It occurs when the arteries that nourish the heart muscle narrow or become blocked. People with diabetes have a higher risk than the general population for developing heart disease.

Diabetes: Either diabetes insipidus or diabetes mellitus, diseases having in common the symptom polyuria; when used without qualification, refers to *diabetes mellitus* characterized by high blood glucose levels.

Diabetes Complications: Are either short term (acute) or long term (chronic) impairments which affect the microvascular or macrovascular blood vessels of persons with diabetes, such as: (Acute) hypoglycemia, hyperglycemia, diabetic ketoacidosis, nonketotic hyperosmolar coma; (Chronic) visual impairments, diabetic nephropathy, cardiovascular and cerebrovascular disease, and diabetic neuropathy.

Diabetes Control and Complications Trial: (DCCT) A ten year study ending June 1993, was sponsored by the National Institute of Diabetes and Digestive and Kidney Diseases comparing the effects of the usual two-injection a day insulin treatment or intensive therapy using multiple daily injections or an insulin pump to prevent or slow the development of diabetic complications. The DCCT proved that "tight control" of blood glucose levels would slow or prevent complications from diabetes.

Diabetes Education: Approved American Diabetes Association patient and family education for self-management and treatment of diabetes by: (1) Eating a recommended diet and paying close attention to caloric intake and timing of meals. (2) Exercising sufficiently and regularly to help maintain health. (3) Self-monitoring of blood glucose levels frequently as instructed by health care team. (4) Taking diabetes medicine as prescribed (oral diabetes tablets and/or insulin injections), that is consistent with the National Standards for Diabetes Patient Programs, preferably provided by a certified diabetes educator. By knowing proper diabetes education and treatment many people stay healthy and manage their diabetes well.

Diabetes Insipidus: Chronic excretion of very large amounts of urine causing dehydration and extreme thirst; ordinarily resulting from pituitary dysfunction, damage or injury. The condition is not synonymous with diabetes mellitus.

Diabetes Mellitus: There are five general types of diabetes mellitus that are recognized, but only Type I and Type II diabetes and gestational diabetes mellitus diseases are the most important involving the endocrine pancreas. Diabetes is a disease in caused by an absolute or relative deficiency of insulin which the body cannot produce insulin or cannot use the insulin it makes properly. Diabetes is a metabolic disorder of fat metabolism which changes the way our bodies break down and use starches and glucose and is a disease of the pancreas characterized by excessive thirst, hunger, urination, weakness, acidosis, and without injection of insulin, eventual coma and death.

Diabetic: Relating to or suffering from diabetes. The medical condition term "diabetic" *should not* be used to describe a person who has a diabetes disease.

Diabetic Coma: Develops when insulin and blood glucose are so out of balance that ketones accumulate in the blood. Characterized by acid poisoning (ketoacidosis), or acid intoxication caused by a lack of insulin or an elevation in counterregulatory (stress) hormones usually taking several hours or even days to occur, but can usually be controlled at the first signs of high blood glucose or ketones in the urine. It is marked by high blood glucose levels and ketones in the urine, and occurs almost

exclusively in persons with Type I diabetes. Certain causes directly related to diabetes are: (1) Hypoglycemic coma resulting from excessive doses of insulin or oral hypoglycemic agents. (2) Hyperglycemic coma associated with either severe insulin deficiency (*diabetic ketoacidosis Type I diabetes*) or a mild to moderate insulin deficiency (*nonketotic hyperosmolar coma, Type II diabetes*). (3) Lactic acidosis associated with diabetes, particularly in persons with diabetes stricken with severe infection or with cardiovascular collapse.

Diabetic Ketoacidosis: (DKA, also see Diabetic Coma) The basis for DKA is either absolute deficiency of insulin or acute resistance to insulin developing when absolute insulin deficiency and excess contra-insulin hormones increase liver glucose production, decrease peripheral glucose utilization, and stimulate release of fatty acids from fat cells and production of ketones by the liver. These changes cause hyperglycemia, osmotic diuresis, volume depletion, and acidosis. DKA is a severe condition caused by a lack of insulin or an elevation in stress hormones and marked by high blood glucose levels and ketones in the urine, and occurs almost exclusively in those with Type I diabetes. Its symptoms may include dry mouth, great thirst, loss of appetite, excessive urination, dry and flushed skin, heavy or labored breathing, possible vomiting, abdominal pain, fruity-smelling breath (odor of alcoholic beverage), unconsciousness, and death.

Diabetic Macular Edema: (See Maculopathy).

Diabetic Neuropathy: (Peripheral and Autonomic Neuropathies) Damage to the nervous system which affects the peripheral nervous system causing impairment of motor nerves affecting voluntary movement, and sensory nerves affecting touch and feeling sensations, especially the ability to feel pain impulses. The autonomic nervous system causes impaired bodily functions that are not under consciousness control such as heart beats, breathing, and digestion.

Diabetic Retinitis: Inflammation of the retina of the eye caused or complicated by diabetes.

Diabetic Retinopathy: (Background and Proliferative Retinopathy) A progressive disorder of the retina damaging the receptor cells and small blood vessels in the eye that can lead to vision changes. Early stage background retinopathy, the blood vessels bulge and leak fluids into the retina and may cause blurring. In the advanced stage, proliferative retinopathy is more serious and can cause vision loss because new blood vessels form in the retina and branch out to other areas of the eye causing blood to leak into the clear fluid (vitreous) inside the eye and cause tissue in the macula to swell or cause the retina to detach.

Diabetic Shock: (See Insulin Reaction).

Diabetologist: (Diabetology) A specialist in the field of medicine concerned with diabetes.

Dialysis: A method of cleaning the blood of waste and maintaining the chemical balance of the blood by either hemodialysis or peritoneal dialysis process when the kidneys have failed. Dialysis is a form of diffusion filtration to separate smaller molecular substances from larger molecular substances after end stage renal failure. Dialysis (opposed to transplantation) is the most common form of kidney replacement therapy. There are two forms of dialysis: (1) Hemodialysis, a method in which a person is connected to an artificial kidney blood filtering machine three times a week. (2) Peritoneal dialysis enables people to do dialysis without an artificial kidney filtering machine practically anywhere clean to help reduce chances of germs entering the peritoneum through the tube and catheter causing infection. A special solution of dialysate is run through a tube into the thin tissue that lines the inside of the abdomen (peritoneum) cavity, after several hours the dialysate absorbs the waste from blood

circulating in the peritoneum and drained out. The two preferred processes of peritoneal dialysis are the Continuous Ambulatory Peritoneal Dialysis (CAPD) machine-free and done during normal activities in which the dialysate is in the peritoneum 24 hours a day, seven days a week. The cleansing fluid is drained and replaced 3 to 5 times a day. The Continuous Cycling Peritoneal Dialysis (CCPD) uses a machine called a "cycler" to deliver and drain the cleansing fluid usually while asleep.

Diet Control: (See Balanced Diet).

Diplopia: Objects appear double. Double vision.

Emergency Measures: (Emergency Diabetes Assistance) The regimen of treatment for the rapid onset of hypoglycemia. (1) A mild range of severity generally requires self-treatment. (2) A moderate range of severity may require assistance in treatment. (3) A severe range of severity usually requiring immediate attention and assistance by someone else.

Endocrinologist: Specialist of endocrinology concerned with endocrine glands: Pineal body; Pituitary; Parathyroid; Thyroid; Thymus; Stomach; Pancreas (Islets of the Langerhans); Suprarenal (adrenal); Duodenum; Ovaries (female); Testes (male).

Foot Ulceration: A wound with superficial loss of tissue from trauma and may become ulcerated if infection occurs. A foot ulceration may go unnoticed in persons with diabetes who have diabetic neuropathy because of a loss of sensation, inability to feel pain or numbness.

Functional Impairments: The Department of Motor Vehicles use in its medical guidelines specifically referring to a wide range of physical, mental or emotional impairments affecting a person's ability to operate a motor vehicle safely. Functional impairments help to define the mild, moderate, or severe range of severity for disease complications and its progression.

Gangrene: A form of a wet or dry infection, frequently seen in diabetes causing decay and dying of tissue in a localized part of the body or involve an organ or a limb because of an obstruction or loss of blood supply, injury, or disease resulting from arteriosclerosis.

Gestational Diabetes: (GDM) Diabetes mellitus that develops during pregnancy and usually goes away after pregnancy, but about 60% of those women will eventually develop Type II diabetes. GDM is the appearance of elevation of blood glucose (hyperglycemia) during pregnancy in approximately five percent (5%) of pregnant women during the second trimester. Gestational diabetes develops in pregnant women previously not known to have diabetes. The regimen for therapy for managing GDM is either a prescribed diet or insulin injections determined by her health care team.

Glaucoma: (Open-angle and acute angle-closure glaucoma, Neovascular glaucoma) A disease of the eye characterized by high intraocular pressure within the eyeball, damaged optic disk, atrophy of the optic nerve, hardening of the eyeball, and partial defect in the field of vision or complete loss of vision. Glaucoma is associated with high blood pressure, diabetes, and hardening of the arteries (atherosclerosis), or optic nerve damage.

Glucagon: A hormone produced by the pancreas that raises blood glucose levels. An injectable preparation is available by prescription for use in treating a severe insulin reaction.

Glucopenia: (See Hypoglycemia.)

Glucose: (Sugar) A simple form of sugar that acts as the body's fuel. It is produced when foods are metabolized in the digestive system and carried by the blood to cells for energy. The amount of glucose in the blood is known as blood glucose level.

Glycohemoglobin: (GHb) A glycosylated hemoglobin test administered by the physician to review average blood glucose control for the past three to four months before the test, and can be used as a retrospective index of glucose control over a period of time. (one such test is the hemoglobin test $A1_C$.

Glycosuria: (Glucosuria) The urinary excretion of glucose usually in enhanced quantities.

Growth Onset Diabetes: (See Non-Insulin Dependent Diabetes Mellitus).

Health Care Team: A support group of health-care professionals who helps persons manage diabetes. This team may include an endocrinologist, physician, registered dietitian, and certified diabetes educator (a certified diabetes educator can be a physician, registered nurse, or registered dietitian). Ophthalmologist, podiatrists, nephrologist, neurologist, cardiologist or other specialist can also be part of the team.

Heart Disease: (See Coronary Vascular Disease.)

Hemodialysis: The most common form of treatment for end stage renal failure. Surgery is required to join one artery to a vein to form a larger vein called a fistula or loop (vein carries blood to the heart; an artery carries blood from the heart), or a straight piece of graft material tubing is implanted. An artificial kidney is used to remove waste from the blood at a person's home, outpatient clinic, or hospital. Dialysis is usually done three times a week, for three to five hours each session. All sessions are normally the same at either location.

Human Error: Lack of or reluctance to use proper diabetes education techniques by person with diabetes or other individual assisting in self-management and treatment involving a balanced diet and exercise, adequate blood glucose monitoring, oral diabetes medicine, or insulin injections that result in emergency measures or
violating a precise and detailed therapy for management plan or the study of a biomedical problem.

Hyperglycemia: A condition in which blood glucose levels are too high. Symptoms include frequent urination increased thirst, and weight loss despite increased appetite.

Hyperglycemic Episode or Reaction: Slow onset of severe elevation in blood glucose levels causing acute complications including stupor, lethargy, blurred vision, disorientation, slow responses, weakness, diabetic ketoacidosis (diabetic coma) and nonketotic hyperosmolar coma.

Hyperinsulinism: (Hyperinsulinemia) Increased levels of insulin in the plasma due to increased secretion of insulin by the beta cells (cells that make insulin) of the pancreatic islets and decreased liver removal of insulin is a case in some persons, although hyperinsulinism usually is associated with insulin resistance and is commonly found in obesity in association with varying degrees of hyperglycemia, (Alimentary Hyperinsulinism).

Hyperlipidemia: (Lipemia) The presence of an abnormally large amount of lipids (fats) in the circulating blood.

Hyperparathyroidism: An endocrine condition due to an increase in the secretion of the parathyroid gland that regulates the proper functioning of the skeletal, digestive, renal, and nervous systems. Symptoms and signs may include lethargy, constipation, nausea, vomiting, polyuria. In extreme cases, bone pain (Recklinghausen's disease of the bone), renal stones, renal failure, and coma.

Hypertension: Diabetes and hypertension are powerful risk factors for cardiovascular disease, stroke, peripheral vascular disease, renal failure. Five percent (5%) of high blood pressure cases are caused by glandular or hormonal abnormalities. The other 95 percent (95%) are caused by essential hypertension from diet, body size, stress, and heredity. Hypertension alone is not likely to cause sudden collapse. However, complications from sustained hypertension can cause headaches, dizziness, fatigue, and spontaneous nosebleeds, and if untreated heart attack or stroke. A systolic/diastolic blood pressure of even 140/90 is probably too high in diabetes, because renal damage starts when blood is in the high normal range.

Hypoglycemia: (Insulin Reaction, Glucopenia) A condition in which blood glucose drops too low. An abnormally small concentration of glucose in the circulating blood less than the minimum of the normal range above 70mg/dl. Hypoglycemia may cause cognitive dysfunction and loss of consciousness if untreated.

Hypoglycemia Unawareness: The lack of ability to recognize warning signs (symptoms) of the sympathetic nervous system (adrenergic) involving weakness, nervousness, sweating, cold sweats, increased heart rate, and irritability. Adrenergic symptoms may not occur in some persons with diabetes such as: (1) Who have nerve damage and do not release adrenaline (autonomic neuropathy). (2) Have a long duration of diabetes. (3) Have tightly controlled blood glucose levels. (4) Are taking medications for heart disease or hypertension that block the release of adrenaline and are at risk for having severe hypoglycemic reactions. If adrenergic symptoms do not appear or are ignored, the thought process and motor coordination become noticeably difficult from the lack of glucose to the brain.

Hypoglycemic Coma: Resulting from excessive doses of exogenous (injected) insulin or oral hypoglycemic agents medication.

Hypoglycemic Episode or Reaction: (See Insulin Reaction).

Hyponatremia: Low blood sodium.

Hypoparathyroidism: Increased secretion of parathyroid hormone. Symptoms and signs include neuromuscular excitability, cramps, spasm, and generalized tetany, paresthesias, and seizures and particularly a primary cause in cataracts, chronic fungal infection of the skin, and baldness.

Hypoxia: Low levels of oxygen in the brain.

Impaired Glucose Tolerance: (IGT) A condition, not considered a form of diabetes, diagnosed when oral glucose tolerance test results show that a person's blood glucose level falls between normal and diabetic levels. Persons with IGT have an increased risk for developing diabetes. Impaired glucose tolerance used to be called latent, chemical, or borderline diabetes but is no longer considered a form of diabetes.

Insulin: A hormone that is needed to convert glucose, starches and other food into energy needed for daily life. Insulin allows cells to use glucose for fuel and is secreted by beta cells in the islets of Langerhans. The release of insulin from the pancreas is stimulated by increased blood glucose, vagal

nerve stimulation, and other factors. Insulin is obtained from various animals and available in a variety of preparations. Commercial insulin preparations differ in a number of ways, including differences in the animal species from which they are obtained; their purity, concentration, and solubility; and the time of onset and duration of their biologic action. *An oral hypoglycemic agent is not a form of insulin therapy.*

Insulin Delivery: (Insulin Injections) The method a person with diabetes learns to use for injecting exogenous insulin into the body's bloodstream. Some delivery methods are usually *syringes*; miniature computerized continuous *insulin pumps*; "no needle" *jet injectors* method where insulin is forced through the skin; insulin syringe like *pocket-pens*; *infusers* injection access portal into subcutaneous tissues for 2-3 days; *insertion* is a device to accelerate needle insertion into the skin, *subcutaneous infusion* where a flexible teflon catheter remains beneath the skin for several days.

Insulin Injections: (See Insulin Delivery).

Insulin Reactions: (Diabetic Shock or Hypoglycemic Reaction) Severe hypoglycemia produced by administration of insulin, manifested by sweating, tremor, anxiety, vertigo, and diplopia, followed by delirium, convulsions and collapse. If the blood glucose drops much below 70 mg/dl the person may go into insulin shock very rapidly. After unusual exercise, or after missing a meal, a person may have more insulin available than is needed to metabolize their glucose supply at that moment and the blood glucose drops and the person may suddenly get very jittery, or may lose consciousness. Often there is enough warning so that a person may eat a piece of candy to raise their blood glucose level. Hypoglycemic reactions can occur in some persons with no history of diabetes.

Insulin Resistance: A condition in which the body does not respond to insulin properly. This is most common in Type II diabetes or associated with obesity, ketoacidosis, infection, and certain rare conditions. Diminished effectiveness of insulin in lowering blood glucose levels requiring 200 units or more of insulin per day to prevent hyperglycemia or ketosis.

Insulin Producing Cells: (See Beta Cells).

Insulin Therapy: (See Insulin Delivery.) The two types of insulin therapy (1) conventional or (2) intensive starts when the body stops making insulin or makes only a tiny amount, without insulin a person with diabetes could not survive. Insulin is injected under the skin (in the fat) for it to work. Insulin cannot be taken in a pill or tablet since stomach fluids in the digestive system would destroy the hormone before the body can put it to use. It controls blood glucose levels. There is no cure for diabetes, but can be controlled by insulin injections (exogenous insulin), self monitoring of blood glucose, pancreas and islet cell transplants, oral hypoglycemic agents, or diet and exercise. If untreated can cause heart and kidney disease, blindness, problems in pregnancy or childbirth, nerve and blood vessel damage, and can reduce the ability to fight against infection.

Islet's of Langerhans: Cellular masses varying from a few to hundreds of cells lying in the interstitial tissue of the pancreas; they are composed of different cell types which comprise the endocrine portion of the pancreas and are the source of insulin and glucagon.

Juvenile-Onset Diabetic: (See IDDM.) Diabetes developing during childhood, usually begins before the eighteenth birthday with severe and rapidly developing symptoms of hunger, thirst, and urination and a sudden dramatic loss of weight despite a normal diet.

Ketones: Acids produced when the body breaks down fat or fuel. This occurs when there is not enough insulin to permit glucose to enter the cells and fuel them or when there are too many

counterregulatory (stress) hormones appearing in the urine when the body does not have enough insulin. A moderate or large amount of ketones are a clear warning sign that diabetes is out of control (Ketonuria).

Ketonemia: The presence of recognizable concentrations of ketone bodies in the plasma.

Ketosis: An enhanced production of ketone bodies.

Labored Breathing: (Kussmaul) Spasmatic respiratory attack (paroxysmal) of forced deep breathing characteristic of diabetic ketoacidosis or other causes of acidosis.

Lactic Acidosis: Accumulation of excessive lactic acid in the blood resulting in muscles burning glucose instead of oxygen.

Latent Diabetes: (Chemical Diabetes) A mild form of diabetes mellitus in which the person displays no overt symptoms, but displays certain abnormal responses to diagnostic procedures, such as an elevated fasting blood glucose concentration or reduced glucose tolerance. A diet high in glucose and simple carbohydrate may cause latent diabetes to become visible.

Lethargy: Sluggishness of mind and body. Neurologic mental confusion and stupor.

Maculopathy: (Macular Edema) Retinal capillaries become clogged and swollen, leaking fluid into the retina and cause swelling. The leaking fluid from the capillaries will accumulate and pool in the center of the retina, the macula. The most sensitive part of the retina is the macula, which is responsible both for the fine vision used in reading, and for color vision.

Metabolic Disorder: Common metabolic diseases of the body's *endocrine glands* are: (1) *Pancreas*, Islet cell of the Langerhans, diabetes mellitus. (2) *Thyroid*' hyperthyroidism, hypothyroidism. (3) *Parathyroid*, hyperparathyroidism, hypoparathyroidism. (4) *Pituitary*, diabetes insipidus, hyperpituitarism, hypopituitarism, hypophysitis. (5) *Adrenal* hyperfunction of adrenal cortex (Cushing's disease), hypofunction of adrenal gland (Addison's disease), adrenal medulla hyperfunction. (6) *Gonads*, ovaries, testes.

Metabolic Control: (See Diabetes Education.)

Metabolism: The complex physical breakdown and synthesis of chemical changes occurring in the tissues.

Microvascular Diabetic Complications: (See Diabetes Complications.)

mg/dl: Symbol for milligram per deciliters. This is the unit of measure used when referring to blood glucose levels.

Nephropathy: Kidney damage when they fail to function. If diabetes damages kidney filters, they become leaky, allowing protein to spill from the blood to urine. They also become less able to remove waste products. Nephropathy occurs in five stages leading to end stage kidney failure leading to dialysis or kidney transplantation. A specialist concerned with the science of medical diseases of the kidneys is referred as a nephrologist. As a result of diabetes, the kidneys overwork attempting to filter out through the glomeruli capillaries excess glucose. Waste substances not needed by the body are filtered out through the glomeruli into the urine and passed on to the bladder. Eventually the kidneys becomes damaged with scarring and capillary wall build-up resulting in renal failure. (Nephrogenic

Diabetes Insipidus; Vasopressin-Resistant Diabetes.) Renal failure symptoms and signs are weakness, fatigue, a metallic taste in the mouth, loss of appetite, generalized twitching, and if untreated loss consciousness, seizures, and death.

Nonketotic Hyperosmolar Coma: (NKHC, Hyperglycemic Coma) This is a gradual loss of consciousness, most often in an older person whose diabetes usually does not require insulin injections. NKHC is seen generally in older persons with Type II diabetes who are institutionalized, or mentally impaired due to a prior cerebrovascular accident that may mask the signs and symptoms of NKHC including focal neurologic abnormalities, transient hemiparesis, hemisenory deficits, aphasia, involuntary muscle contractions, hallucinations, delirium and coma.

Non-Insulin Dependent Diabetes Mellitus: (NIDDM.) Type II diabetes; adult or maturity onset diabetes; an often mild form of diabetes mellitus of gradual onset, usually in obese individuals over age 35. A milder form of diabetes, circulating endogenous (contained within the body) insulin is sufficient to prevent diabetic ketoacidosis but is often either subnormal or relatively inadequate because of tissue insensitivity and responds well to dietary regulation and/or oral hypoglycemic agent, but diabetic complications and degenerative changes can develop.

Nonproliferative Diabetic Retinopathy: (See Background Diabetic Retinopathy).

Obesity: Excessively fat or overweight.

Oral Hypoglycemic Agents: (First and Second generation Sulfonylureas; Biguanides) Usage by Type II diabetics to lower blood glucose, but *they are not insulin pills*. Insulin is a protein and can't be taken orally because it would be broken down in the digestive tact, and destroyed before becoming effective. Oral medications treating hyperglycemia in non-insulin dependent diabetics increases the release of endogenous insulin as well as improve its peripheral effectiveness. Biguanides may cause lactic acidosis build up.

Pancreas: A comma-shaped endocrine gland that produces enzymes for digesting food and hormones that regulate the use of fuels in the body, including insulin and glucagon. In a fully functioning pancreas, insulin is released through special cells located in clusters called islets of the Langerhans. The three hormones (insulin, glucagon, somatostatin) produced by the pancreas enable the body to break down (metabolize) food that is eaten.
When the pancreas is fully functioning normally, the glucose concentration in the blood changes in response to a wide variety of events including meals, exercise, stressful situations, and infections, but remaining within therapeutic ranges.

Peripheral Artery Disease: The artery passage is blocked from the heart with a build up of fat and fibrous tissue, called plaque. Atherosclerosis complications of the vessels that supply blood to the arms and legs or hardening of the arteries that supply blood to every part of the body. Peripheral arterial disease can cause intermittent claudication (pain on walking, usually in the calf or thigh, but is relieved by resting), infections, gangrene, and even amputation of apart of the foot or leg. This reduces circulation to the lower legs and feet, so that if the foot is cut or injured in any way, healing may be slowed and the risk of infection increased. Treatment may include angioplasty, atherectomy, arterial bypass surgery.

Peripheral Neuropathy: Affects the peripheral nervous system, which links the legs, arms, and outer trunk with (motor functions) the brain. This system of nerves allows you to feel sensations, telling you, for instance, to move your hand if touch a hot skillet. It allows you to walk, grasp objects, manipulate your fingers. It is further categorized as: (1) Distal Symmetrical Polyneuropathy. (2)

Mononeuropathy. (3) Cranial Mononeuropathy. (4) Truncal Mononeuropathy. (5) Proximal Motor Neuropathy (6) Focal Neuropathy.

Polydipsia: Excessive thirst that is relatively chronic.

Polyphagia: Excessive appetite.

Polyuria: (Hydruria.) Excessive excretion or discharge of urine.

Pregnancy Diabetes: (See Gestational Diabetes).

Prosthesis: The artificial replacement device for a limb, or other part of the body.

Range of Severity: The area or scope of a physical or mental condition or complication of a physical or mental condition occurring during another disease and aggravating it within a mild, moderate or severe degree of impairment limit.

Rebound Hyperglycemia: (Somogyi Effect) In diabetes a rebound phenomenon of reactive hyperglycemia in response to a proceeding period of relative hypoglycemia that has increased secretion of hyperglycemic agents (adrenaline, norepinephrine, glucagon, cortisol, and growth hormone) described in diabetic patients given too much insulin who developed unrecognized nocturnal hypoglycemia that made them hyperglycemic (suggesting insufficient insulin) when tested the next morning. It may be mistaken for inadequate control.

Renal Failure: As a result of excessive glucose in the bloodstream, the capillary walls (referred to as basement membranes) overwork in filtering the waste products and builds up scar-like material that eventually collapse the glomeruli filtering process causing kidney damage. Valuable parts of blood, such as red blood cells and protein are too large to pass through the filter and leak into the urine. The kidneys almost completely stop cleaning wastes out of the blood. Wastes build up to poisonous levels and can cause death. When creatinine and blood urea nitrogen levels in the blood are high, kidney failure will likely progress more rapidly unless treated. The two choices for renal failure are dialysis and kidney transplant.

Renal Threshold: Concentration of plasma substance above which the substance appears in the urine.

Rest Pain: An unpleasant sensation associated with actual or potential tissue damage, occurring usually in the extremities during body inactivity while sitting or lying down.

Secondary Diabetes: Type of diabetes caused by another disease altogether or damage to the pancreas from chemicals, certain medicines, or diseases of the pancreas (such as cancer) or other glands. Secondary diabetes can occur as a consequence of disorders such as acromegaly, Cushing's Syndrome, hyperthyroidism, or surgical removal of the pancreas.

Self-Management Training: (See Diabetes Education).

Seizure Condition: Metabolic seizures resulting from unbalanced chemical and physical processes occurring in the body, such as hypoglycemia (low blood glucose), hyponatremia (low blood sodium), or hypoxia (low level of oxygen in the tissue). Symptomatic seizures resulting from a known structural brain abnormality or other medical condition such as, severe sleep deprivation, stroke, multi-infarct dementia, or pregnancy.

Severe Hypoglycemia: Insulin reaction symptoms consistent with hypoglycemia that could not be treated by the person with diabetes alone, but required the attention and assistance from another person who aided with oral carbohydrate, injected glucagon intramuscularly, or glucose intravenously, for which hospital admission may have followed. Causes include lack of care or alertness and diabetes education, human error, improper combination of insulin, alcohol use, and hypoglycemia unawareness. Severe hypoglycemia includes all episodes in which neurologic impairment was severe enough to prevent self-treatment, and possibly causing seizures, convulsions or coma.

Somogyi Effect: (See Rebound Hyperglycemia).

Stupor: Marked by a cessation of mental activity or feeling, often produced by sleepiness, illness, or the effect of alcohol, or narcotics.

Sugar: (See Glucose).

Syncope: A brief loss of consciousness from a transient deficiency in the oxygen carrying material of the blood to the brain. Fainting or loss of consciousness due to loss cardiac output. Syncope is not a seizure. The three types of syncope are: (1) *Situational*, cough, emotion, or while urinating (micturitional). (2) *Cardiogenic*, decrease of cardiac output secondary to rhythm disturbance or failed pump. (3) *Vasovagal or vaso-depressor*, precipitated by fright or pain. Fainting or loss of consciousness due to loss of cardiac output.

Temporary Precipitating Factor: A transient unforeseen or unknown event that contributes to or results in insulin reaction episodes in spite of consciousness efforts by a person with diabetes and their health care team, such as human error or other contributing factor that may affect safe driving.

Therapy for Management: (Regimen of Therapy) The treatment of disease by various methods. The key to treating and managing diabetes is controlling the blood glucose concentration by monitoring it.

Tight Control: Suggested by the Diabetes Control and Complications Trial ten year study and the American Diabetes Association as an important way to delay the onset and dramatically slow the progression of complications from diabetes. Intensive insulin therapy for management consisting of strict monitoring of blood glucose levels to keep as close to normal by multiple daily insulin injections, a lifestyle change, exercise and healthier eating. Tight control significantly *increases* the danger of serious hypoglycemic reactions, and is not recommended for everyone.

Tissue Damage: Impairment of the usefulness of the four basic tissues in the body: (1) membranous tissue, *epithelium*, (2) the connective tissues; including blood, bone, and cartilage, (3) muscle tissue, (4) nerve tissue.

Topical Burning: An indirect reference of intense heat pertaining to a local part on the body.

Tumefactions: Swelling and edema caused by insulin injections.

Type I Diabetes: (See Insulin Dependent Diabetes Mellitus).

Type II Diabetes: (See Non-Insulin Dependent Diabetes Mellitus).

Urine Tests: (Urinalysis.) Analysis of the fluid and dissolved substances excreted by the kidney. Urine tests for ketones are the only tests measure ketones and are important in preventing ketoacidosis.

Vascular Changes: Complications relating to or containing the thickening of blood vessel linings causing decreased blood flow of nutrients through narrowed arteries (atherosclerosis) to the heart (cardiovascular), brain (cerebrovascular), and extremities primarily in the legs (peripheral vascular) diseases.

Violation of Protocol: Deviation from a precise and detailed therapy for management plan or the study of a biomedical problem.

Visual Changes: Diabetes-induced vision problems are an alteration from a person's normal vision due to changes in the small arteries that provide blood for the retina. Diabetic vision complications are: (1) Cataracts. (2) Background retinopathy. (3) Macular edema. (4) Retinitis. (5) Proliferative retinopathy. (6) Glaucoma.
(7) Retinal detachment. (8) Blindness.

Warning Symptoms: Signs of impending departure from the normal sensations or functions experienced by persons with diabetes.