DIABETES MELLITUS IN CHILDREN

Diagram of Possible mechanism for development of Type I diabetes

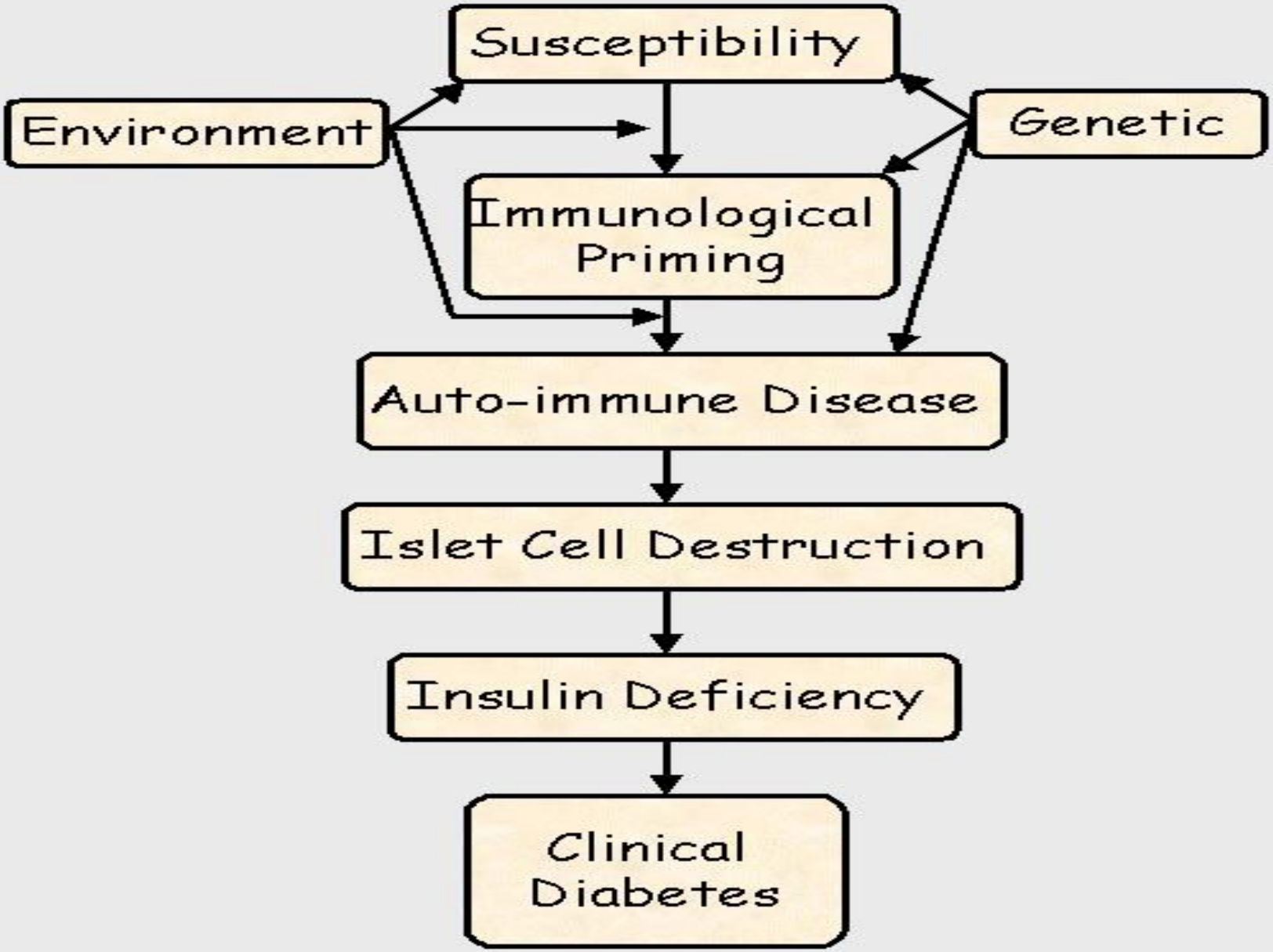
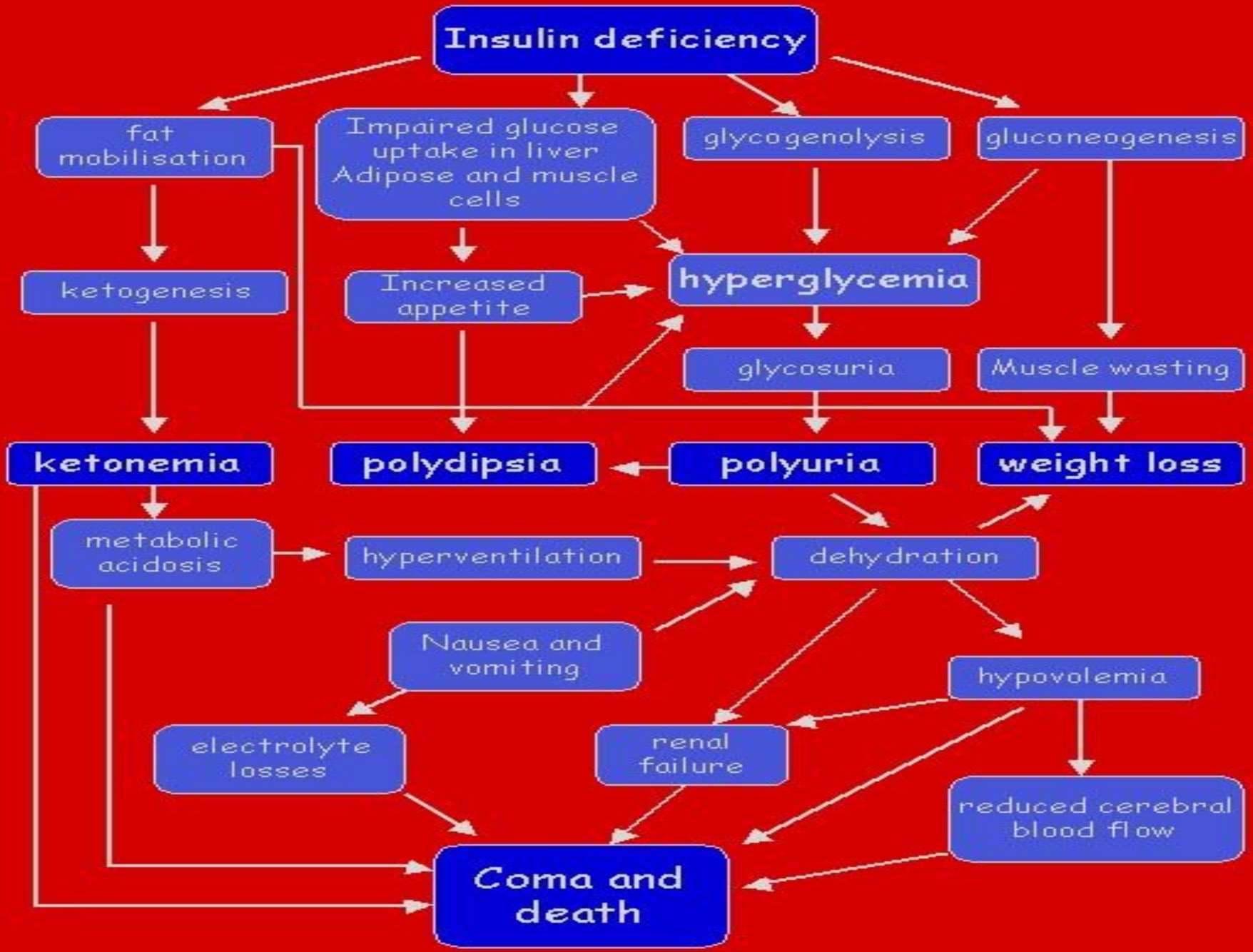
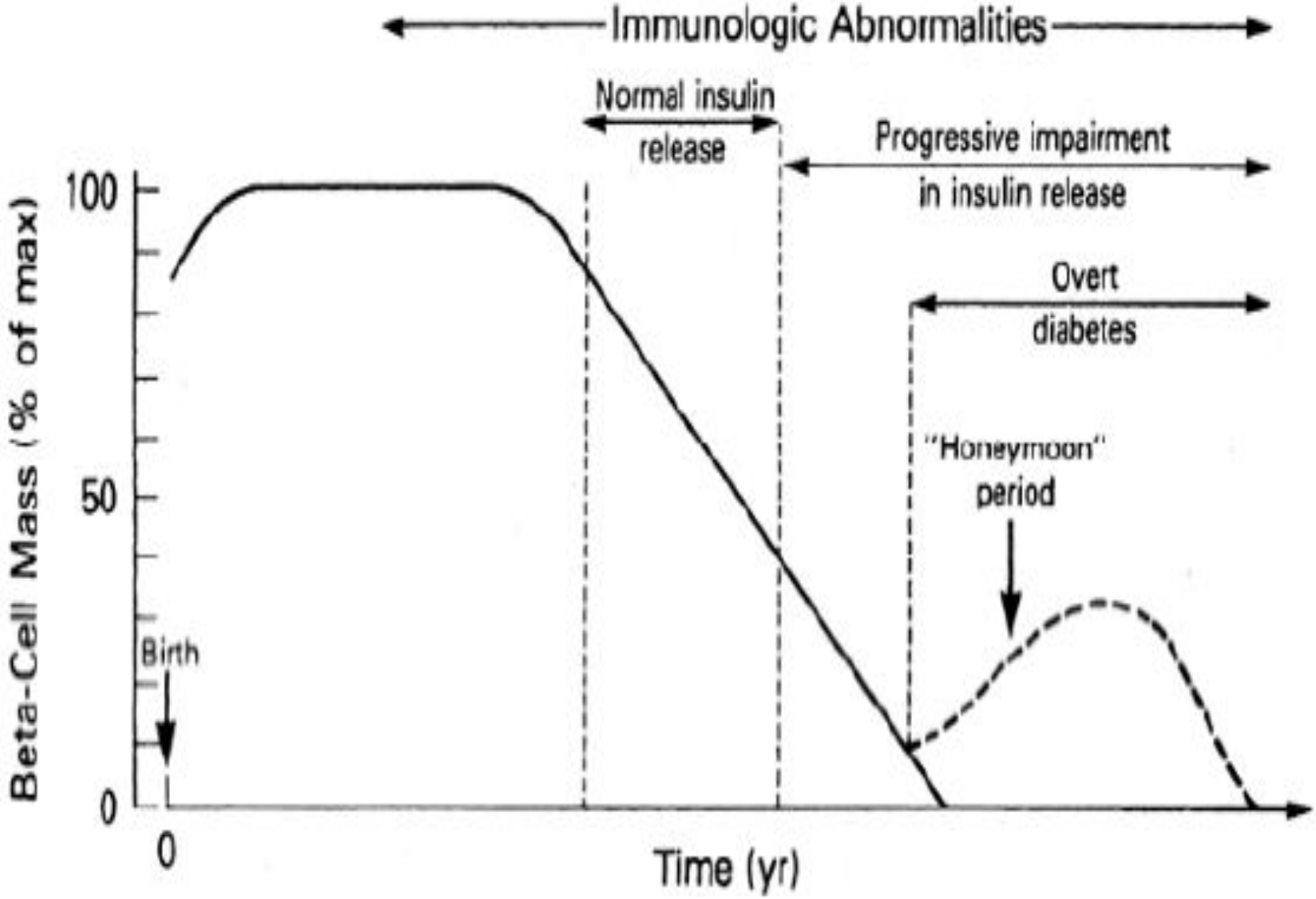


Diagram of the Effects of Insulin Deficiency





The proposed natural history of Î²-cell destruction leading to type 1 diabetes mellitus. Clinical presentation does not occur until 80 to 90% of Î²-cell mass has been destroyed. SOURCE: (***Medical management of Type 1 Diabetes, 3rd ed. Alexandria, VA, American Diabetes Association; 14, 1998.*** **)**

Blood glucose

Apart from transient illness-induced or stress-induced hyperglycemia, a random whole-blood glucose concentration of more than 200 mg/dL (11 mmol/L) is diagnostic for diabetes, as is a fasting whole-blood glucose concentration that exceeds 120 mg/dL (7 mmol/L). In the absence of symptoms, the physician must confirm these results on a different day. Most children with diabetes detected because of symptoms have a blood glucose level of at least 250 mg/dL (14 mmol/L).

Glycated hemoglobin

Glycosylated hemoglobin derivatives (HbA1a, HbA1b, HbA1c) are the result of a nonenzymatic reaction between glucose and hemoglobin. A strong correlation exists between average blood-glucose concentrations over an 8-week to 10-week period and the proportion of glycated hemoglobin. The percentage of HbA1c is more commonly measured. Normal values vary according to the laboratory method used, but nondiabetic children generally have values in the low-normal range. At diagnosis, diabetic children unmistakably have results above the upper limit of the reference range.

Measurement of HbA1c levels is the best method for medium-term to long-term diabetic control monitoring. The Diabetes Control and Complications Trial (DCCT) has demonstrated that patients with HbA1c levels around 7% had the best outcomes relative to long-term complications. Check HbA1c levels every 3 months. Most clinicians aim for HbA1c values of 7-9%. Values less than 7% are associated with an increased risk of severe hypoglycemia; values more than 9% carry an increased risk of long-term complications.

Islet cell antibodies

Islet cell antibodies may be present at diagnosis but are not needed to diagnose insulin-dependent diabetes mellitus (IDDM).

Islet cell antibodies are nonspecific markers of autoimmune disease of the pancreas and have been found in as many as 5% of unaffected children. Other autoantibody markers of type 1 diabetes are known, including insulin antibodies. More antibodies against islet cells are known (eg, those against glutamate decarboxylase [GAD antibodies]), but these are generally unavailable for routine testing.

Oral glucose tolerance test (OGTT)

Although unnecessary in diagnosing type 1 diabetes mellitus, an OGTT can exclude the diagnosis of diabetes when hyperglycemia or glycosuria are recognized in the absence of typical causes (eg, intercurrent illness, steroid therapy) or when the patient's condition includes renal glucosuria.

Obtain a fasting blood sugar level, then administer an oral glucose load (2 g/kg for children aged <3 y, 1.75 g/kg for children aged 3-10 y [max 50 g], or 75 g for children aged >10 y). Check the blood glucose concentration again after 2 hours. A fasting whole-blood glucose level higher than 120 mg/dL (6.7 mmol/L) or a 2-hour value higher than 200 mg/dL (11 mmol/L) indicates diabetes. However, mild elevations may not indicate diabetes when the patient has no symptoms and no diabetes-related antibodies.

Long-term complications include the following:

Retinopathy

Cataracts

Hypertension

Progressive renal failure

Early coronary artery disease

Peripheral vascular disease

Neuropathy, both peripheral and autonomic

Increased risk of infection

Symptoms of ketoacidosis

Severe dehydration

Smell of ketones

Acidotic breathing (ie, Kussmaul respiration), masquerading as respiratory distress

Abdominal pain

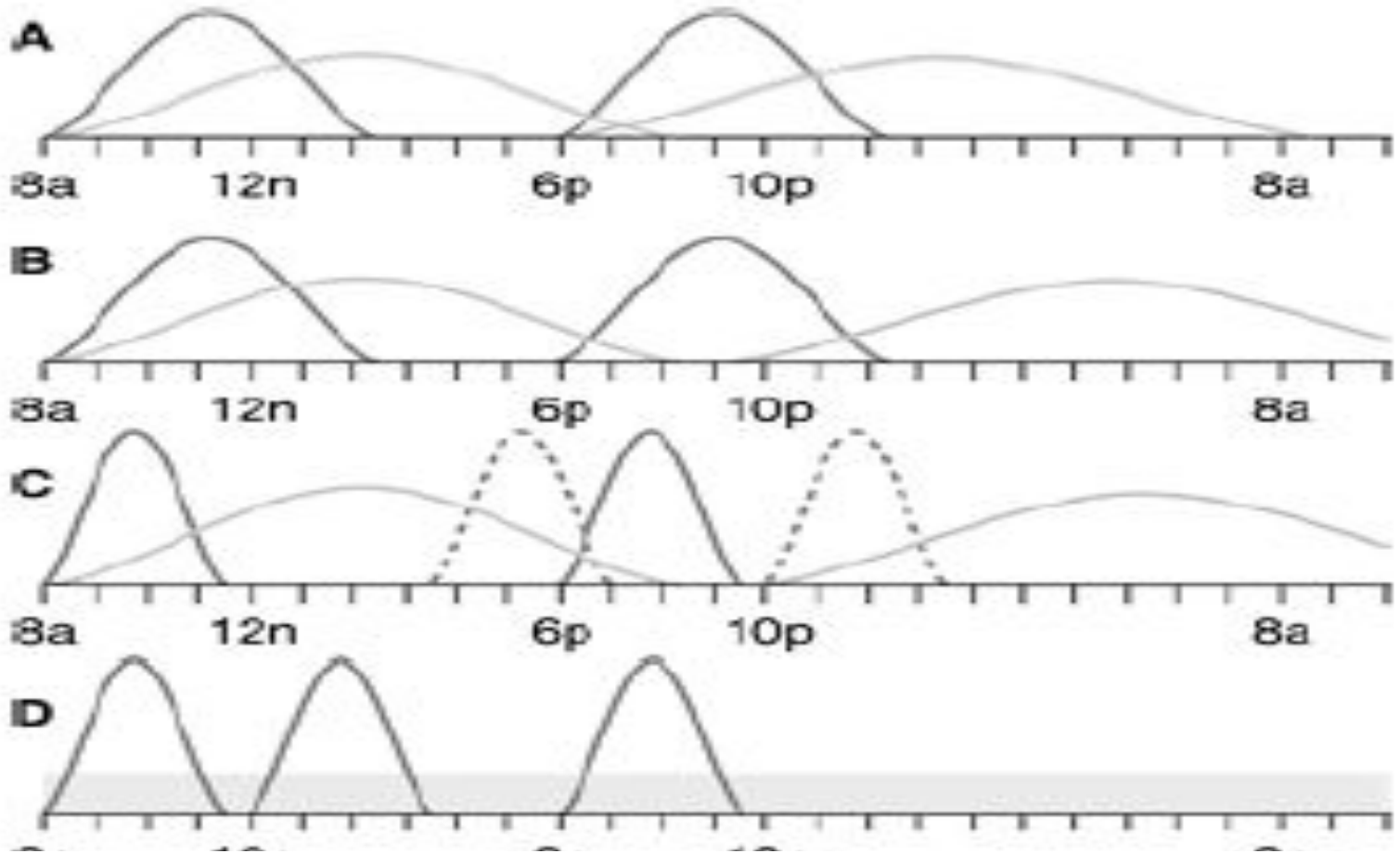
Vomiting

Drowsiness and coma

Other nonspecific findings

Degree of Dehydration

Guidelines	Mild	Moderate	Severe
Volume of deficit (ml/kg)*			
>2 years	30	60	90
2 years	50	100	150
Clinical measures			
Palpation of peripheral pulses (pulse volume)	Normal	Normal to decreased	Decreased to absent
Capillary refill time (s)‡	<2	2 to 3	3
Skin temperature (tactile)	Normal	Normal to cool	Cool to cold
Heart rate	Normal to mildly increased	Moderately increased	Moderately to severely increased
Blood pressure	Normal	Normal to mildly increased	Decreased to moderately increased
Blood urea nitrogen (mg/dL)	Normal to mildly increased, e.g., <20	Mildly increased, e.g., 20 to 25	Moderately to severely increased, e.g., 30
Predicted Na^+ (mEq/L)	Usually normal	Usually normal	Normal to increased



Examples of commonly used insulin regimens for patients with type 1 diabetes mellitus. A. Standard split-mixed regimen with short-acting and intermediate-acting insulins (in this case regular and NPH) given before breakfast and dinner. B. Three-shot regimen with the NPH moved to bedtime to prevent nocturnal hypoglycemia, provide better coverage through to breakfast, and minimize effects from the dawn phenomenon. C. Four-shot regimen commonly used by school-age children with no injections during school. Lispro has been substituted for regular insulin at breakfast