

I. DIABETES: ITS PRESENCE IN OUR COMMUNITIES

According to the Centers for Disease Control and Prevention (2002)¹ :

- 6.2% of the nation's population has diabetes
- 11.1 million of the 17 million people with diabetes have been diagnosed and 5.9 million people are undiagnosed
- Diabetes was the sixth leading cause of death listed on U.S. death certificates in 1999.

Among the individuals diagnosed with diabetes, 90-95% have Type 2 (formerly referred to as adult-onset diabetes or non-insulin diabetes mellitus). The incidence of Type 2 diabetes in the pediatric population is not known, owing in part to the issues of definition. For example, there are still many people who adhere to the concept that all diabetes mellitus in childhood is Type 1. However, there is evidence that Type 2 is on the rise among children and adolescents, particularly in Hispanic and African American populations. For example, a children's hospital diabetes clinic serving South Texas has documented a steady increase since 1990 in the number of children with Type 2 diabetes seen in the clinic.²

Although there are no comprehensive data on prevalence or incidence of Type 2 diabetes in the pediatric population, there is information that key risk factors for developing Type 2 diabetes are high and increasing.^{3,4,5} In the U.S., an estimated:

- 25-30% of prepubertal children are obese
- 18-25% of adolescents are obese
- 22% of children and adolescents are overweight with increases in prevalence among all sex and age groups
- The prevalence of seriously overweight youths has more than doubled since the late 1970s
- Higher rates of obesity occur among Hispanic and African American children and adolescents

African Americans, Hispanic/Latino Americans, American Indians, and some Asian Americans and Pacific Islanders are at particularly high risk for Type 2 diabetes. The risk for Type 2 diabetes in non-Hispanic whites and others is lower. However, these populations do get Type 2 diabetes. In the U.S., the prevalence of diagnosed diabetes by race/ethnicity in people 20 years or older is¹:

- 10.2% of Hispanics
- 13% of non-Hispanic blacks
- 7.8% of non-Hispanic whites
- 15.1% of American Indians and Alaskan Natives receiving care from the IHS

- Prevalence data for diabetes among Asian Americans and Pacific Islanders are limited but some groups within these populations are at increased risk. Native Hawaiians are 2.5 times as likely to have diagnosed diabetes as white residents of Hawaii.

II. DIABETES DEFINED

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia (elevated blood sugar) resulting from defects in insulin secretion, insulin action or both. The degree of hyperglycemia may change over time depending on the extent of underlying disease process and its treatment. Chronic hyperglycemia is associated with long term damage, dysfunction and failure of various organs, especially the eyes, kidneys, nerves, heart and blood vessels. Diabetes can also be associated with premature death.⁶

To better understand this disease, it is important to review the processes of normal glucose metabolism. After food is ingested, carbohydrates are broken down to simple sugars and, ultimately, the simplest sugar, glucose, in the gastrointestinal tract. Glucose is absorbed directly into the bloodstream. Glucose circulating in the bloodstream passes through cell walls. It is used by cells for energy, may be stored for future use as glycogen in the liver and muscle tissue and stored in fat cells as triglycerides. Glucose is essential to body function. Without it, body cells cannot function and cell death occurs. For this reason,

The body maintains blood glucose levels within a fairly narrow range: 70 to 110 mg/dl before meals and no more than 140 mg/dl after meals.⁷

The after-meal elevated level of blood glucose signals the pancreas to secrete insulin directly into the bloodstream. Insulin is a hormone that enables glucose to pass through cell walls and thus lower the level of blood glucose circulating in the bloodstream. Insulin ensures that glucose levels are regulated so that there is an adequate amount to satisfy the body's requirements under all conditions, including fasting, after eating and during strenuous exercise. The amount of insulin secreted from the pancreas under these different conditions varies, controlled primarily by the glucose level itself. Without insulin, cells are deprived of glucose and body functions are disrupted.

When blood glucose levels fall too low, the brain signals release of other hormones: glucagon (from the pancreas), adrenalin and cortisone (from the adrenal gland) and growth hormone (from the brain). These hormones act on the glucose stored in liver and muscle tissue to raise blood glucose levels back to within the narrow normal range. When glucose is low in the bloodstream, glycogen stored in liver and muscle tissue and triglycerides stored in fat cells are converted for energy. Insulin is not required for this conversion.

A. Four Types of Diabetes

There are four types of diabetes with different causes and different dysfunctions in glucose metabolism.⁸ While each type is defined here, the emphasis of this reference manual is on Type 2 diabetes. For information on other forms of diabetes and their management, see sections on resources and references. Simple analogies are provided to aid in discussing diabetes with families.

1 **Type 1 diabetes** was previously called insulin-dependent diabetes mellitus (IDDM) or juvenile-onset diabetes. It is most commonly diagnosed in childhood and occurs more often in those of European extraction. In Type 1 diabetes, the cause is absolute deficiency in insulin secretion due to pancreatic islet B-cell destruction secondary to an autoimmune process. In short, the body simply is not making any insulin. Most Type 1 cases are detected soon after onset because of acute symptoms. Type 1 diabetes may account for 5-10% of all diagnosed cases of diabetes. Risk factors are less well defined for Type 1 diabetes than for Type 2 diabetes, but autoimmune, genetic, and environmental factors are involved in the development of this type of diabetes.

ANALOGY: You've lost the car key and can't start the car. Insulin is like a key that unlocks body cells so sugar can get inside and make things run. In Type 1, insulin is missing.

2 **Type 2 diabetes** was previously called non-insulin dependent diabetes mellitus (NIDDM) or adult-onset diabetes. Type 2 diabetes is a term used for individuals who have cellular resistance to insulin action and inadequate compensatory insulin secretory response. In other words, the pancreas produces insulin but cells do not use it effectively or the pancreas does not secrete adequate insulin to meet the body's needs.

The many different causes of Type 2 diabetes are undergoing intensive study. It is likely that there will be more definitive subclassifications as genetic defects and disease processes are identified. Autoimmune destruction of B-cells does not occur. *Type 2 diabetes is now being increasingly reported among children and adolescents.*

Type 2 diabetes may account for about 90-95% of all diagnosed cases of diabetes. Risk factors for Type 2 diabetes include obesity, family history of diabetes, prior history of gestational diabetes, impaired glucose tolerance, race/ethnicity, physical inactivity, high dietary fat, and low dietary fiber intake. Although all populations have risk factors, some seem to be more common among certain populations. For example, a family history of diabetes, gestational diabetes, impaired glucose tolerance, hyperinsulinemia and insulin resistance, obesity and physical

inactivity are risk factors that occur more frequently in Mexican Americans and other Hispanics than in non-Hispanic whites.

ANALOGY: You have the key (insulin) to start the car but the ignition switch is jammed. In Type 2, the body is producing some insulin but cells resist its effects. The insulin can't do its job.

The terms IDDM and NIDDM have been eliminated in favor of just using the terms Type 1 and Type 2. This change was made by the American Diabetes Association's Expert Committee on the Diagnosis and Classification of Diabetes Mellitus to reflect the cause of the disease rather than treatment. Patients with any form of diabetes may require insulin treatment at some stage of their disease, so using dependence on insulin as a means of classification is de-emphasized.

3 Gestational diabetes mellitus (GDM), any degree of glucose intolerance with onset or first recognition during pregnancy, develops in 2-5% of all pregnancies but disappears when a pregnancy is over. Gestational diabetes occurs more frequently in African Americans, Hispanic/Latino Americans, American Indians, and persons with a family history of diabetes. Obesity is also associated with higher risk. Women who have had gestational diabetes are at increased risk later for developing Type 2 diabetes. In some studies, nearly 40% of women with a history of gestational diabetes go on to develop diabetes in the future. It is important to note that **gestational diabetes can occur in adolescents**. Students who are pregnant and have not sought medical attention should be referred for high-risk obstetrical care.

4 "Other specific types" of diabetes may account for 1-2% of all diagnosed cases of diabetes. These cases result from a wide variety of causes including infection, specific genetic defects or associated with genetic syndromes, diseases of the pancreas, endocrinopathies, and induced by drugs (e.g. prednisone) or chemicals. One of these specific genetic defects is maturity onset diabetes in youth (MODY), an autosomal dominant inherited condition caused by an abnormality in insulin production. It is not to be confused with Type 2 diabetes mellitus.

B. Steps Leading to Type 2 Diabetes

In addition to four types of diabetes, there are several conditions that may precede diabetes.

1) Impaired glucose tolerance (IGT) and **impaired fasting glucose (IFG)** refer to a metabolic state between normal glucose control and diabetes. In the absence of pregnancy, IGT and IFG are not clinical entities but risk factors for future diabetes and cardiovascular disease. They are identified by use of an oral glucose tolerance test that is conducted for the purposes of diagnosing Type 2 or gestational diabetes.

Impaired glucose tolerance (IGT) can occur before diabetes (usually Type 2) develops. Blood glucose levels are higher than normal but not high enough to be classified as diabetes. A two-hour plasma glucose during oral glucose tolerance testing that is >140 mg/dl but <200 mg/dl is defined as IGT. Although some of the people with IGT never develop diabetes, they may experience some of the same health problems as those people who are diagnosed. People with

IGT are advised to seek medical help to reduce risk of heart disease, maintain weight within a healthy range, and exercise to reduce chances of developing diabetes.⁹

Impaired fasting glucose is a new diagnostic category in which persons have fasting plasma glucose values of 110-125mg/dL. These glucose values are greater than the level considered normal but less than the level that is diagnostic of diabetes. It is estimated that in the U.S., 7% of the population has impaired fasting glucose. Researchers are trying to determine how to predict which of these persons will go on to develop diabetes and how to prevent such progression.¹⁰

2) Insulin resistance is a condition in which the body's cells resist the action of insulin that permits glucose to enter through cell walls. As a result, the pancreas produces more insulin than needed resulting in **hyperinsulinemia**. Over time, the pancreas becomes exhausted and stops producing sufficient quantities of insulin. Insulin resistance and the compensatory hyperinsulinemia have been linked to obesity, hypertension, hyperlipidemia, stroke, and cardiovascular disease. In females, high insulin levels may increase the risk of polycystic ovarian syndrome which is characterized by infertility, irregular menstrual cycles, extreme facial hair, severe acne, obesity and insulin resistance.¹¹

Insulin resistance is a **risk factor for Type 2 diabetes** and a distinguishing feature of Type 2 diabetes. Persons with insulin resistance may require 3-5 times the normal amount of insulin to do the same job of regulating blood glucose levels in the body.

Obesity is the most prevalent cause of insulin resistance. When people eat more calories in a single day than they can burn up, they gain weight. Excess calories are stored as fat. The size and number of fat cells increases with increased body weight. Having too much fat, especially on the upper body (above the pubic symphysis), decreases the body's ability to use insulin. People with excess upper body fat have been described as apple-shaped in contrast to those with excess lower body fat or pear-shaped. An obese person's pancreas has to produce heroic amounts of insulin to overcome insulin resistance and keep blood glucose levels within the normal range. Being overweight and overfat also strains the pancreas, making insulin production more difficult. When the pancreas cannot keep pace with the demands for insulin, diabetes occurs.

With weight loss, insulin output by the pancreas may very well be sufficient to prevent Type 2 diabetes. Getting rid of excess body fat improves sensitivity to insulin.¹²

Acanthosis nigricans is a cutaneous marker for the presence of insulin resistance and hyperinsulinemia and may serve as an **indicator for Type 2 diabetes**. Acanthosis nigricans is a skin lesion characterized by light brown-black, rough or thickened areas on the surface of the skin. It is most prominent and more frequently seen on the back and sides of the neck, but can also be found on the axillae, elbows, knuckles, knees and groin area. Hispanics, Native Americans and African Americans have a higher prevalence of these lesions. This could be due to genetic predisposition and skin which is more sensitive to higher insulin levels.¹³

Acanthosis nigricans is seen in children and adolescents, as well as adults. Obesity is a factor in most cases.

Recent studies indicate that visible signs of acanthosis nigricans, as well as high insulin levels, tend to decrease with proper nutrition, exercise, and weight reduction. Management of the underlying causes may reduce the development of Type 2 diabetes in youth.¹⁴

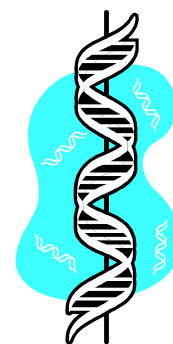
Evaluation methods for obesity and acanthosis nigricans are discussed in Section IV.

III. BIOLOGY, CULTURE, AND ENVIRONMENT¹⁵

A. GENES AND THE ENVIRONMENT

The problems of obesity, insulin resistance and diabetes do not operate in a vacuum. There are significant inputs from genes and the environment. The genetics of obesity and diabetes are undergoing intensive study.

With Type 2 diabetes, multifactorial inheritance is likely and single gene inheritance not proven. Obesity, exercise levels and diet are highly likely to play environmental roles which interact with susceptibility genes. Type 2 diabetes rates are higher among Hispanic, African American, Native American and some Asian American and Pacific Islander populations.



There are a number of candidate genes with possible roles in Type 2 diabetes such as insulin gene mutations, insulin receptor gene mutations, apolipoprotein lipid metabolism genes, and a possible role of obesity genes.¹⁶

In addition, there may be complex factors that affect these health problems. For example, resting energy expenditure in some racial and ethnic groups is lower than in others. The resting energy expenditure (amount of calories burned at rest) in adolescent African American females is about 15% less than that of the adolescent Anglo American female. This translates to a difference of about 200 unexpended calories per day.

While there is currently little to be done to affect individual genetic heritage and risk for Type 2 diabetes, the “environment” can be changed. The environment for humans consists of a host of biologic, cultural, social and politico-economic entities.

Food has always been required to sustain activity and activity required to obtain food. In modern times, this relative balance between food intake and energy output has been tilted toward intake in every domain of human existence.

B. BIOLOGIC ENVIRONMENT FOR FOOD AND PHYSICAL ACTIVITY

There is a strong biologic drive to obtain food. A certain number of calories are required for survival. Hunger is a normal biologic sensation that drives most organisms to seek food to sustain their existence. The normal reproductive cycle cannot be established until a certain body weight and fat content are attained. Lastly, certain genetic traits make one more susceptible to the “nutrient environment”.



The biologic drive for physical activity per se is low, if it even exists. The primary drive for activity is involved in seeking food. While there may be some genetic propensity to be skilled athletically, there is no evidence of a gene that promotes physical activity.

C. SOCIOCULTURAL ENVIRONMENT FOR FOOD AND PHYSICAL ACTIVITY

There are potent cultural forces related to food. Most animals eat and drink whenever the urge arises. Humans, however, do most of their eating and drinking at certain culturally prescribed times and feel hungry as those times approach. Eating times vary from culture to culture.¹⁷

Within a particular culture or in society at large, there are common ideals, values and standards of behavior related to food and physical activity. In many cultures, a fat baby is viewed as a happy baby. Most babies are contented and perceived as happy after being fed. An irritable infant is offered food simultaneously with being comforted. Perceptions may be that it was the food, not the cuddle that soothed the infant. In many cultures, an overweight child is viewed as a healthy child. Weight reflects a happy and prosperous home where children are well-tended. This may reflect cultural memory in which parents helplessly watched children starve to death or lose enormous amounts of weight in response to illness or infection prior to death. In many nonwestern societies, an overweight woman is viewed as sensual and fertile, again reflecting an association between times of plenty and increased fertility. School nurses need to be aware of and sensitive to the cultural values and beliefs of their students and their families.

Food is a central bond that lasts through a lifetime. Almost all holidays and family celebrations center around food. As a general rule, the more important the occasion, the more elaborate and calorically rich the food. Food is a powerful reinforcement for desired behaviors. We reward these behaviors with food - a meal at a restaurant or a piece of candy. Food is widely accessible, relatively inexpensive, reliably appreciated, a good source of entertainment and relief from boredom.

In sharp distinction, there is often little sociocultural support for physical activity. Active babies are viewed as fussy. An active child is viewed as irritating. Rare are complaints about hypoactive children.

Many parents are completely unaware of any physical activities in which their children participate at school or if there is even a



physical education class. In addition, some cultures have negative perceptions of athletic girls and women. In dominant U.S. culture, women's sports activities are increasingly encouraged and promoted at school. In more affluent environments, exercise is culturally desirable and feasible. There are safe places to play and transportation to get there. This is worlds away from the 12 year old girl living in the barrio who is told to go into the house quickly and lock the door as soon as she gets out of school because of personal safety concerns. Efforts with PTA, PTO, and other community-based organizations are needed to identify and/or create safe places in neighborhoods for children and their families to be physically active.

School nurses need to be aware of the cultural attributes of the families and students they serve to ensure they are providing culturally competent services. **See Section VII. Diabetes Resources** for a listing of organizations (e.g. National Center for Cultural Competence) that can provide further information.

D. POLITICAL AND ECONOMIC ENVIRONMENT FOR FOOD AND PHYSICAL ACTIVITY

The political and economic environment for food is enormous. The food industry in the U.S. affects the jobs of millions of people in every region of the country. One is hard pressed to name a single congressional district in which the food industry is not a major political force. The food industry drives every level of commerce. At the local level, fundraising for schools and churches is often food-based. Many schools get a percentage of sale proceeds from vending machines. The trend toward privatization in the U.S. has led food franchises to take over food services in some schools.

In marked contrast, there are fewer economic or political incentives for physical activity. The emphasis in sports is on competition and not on developing lifelong habits of physical activity. Businesses promoting fitness target affluent populations who have the resources and time for participation in fitness clubs. Such resources are rarely located in neighborhoods where obesity is the greatest problem.

To summarize, the environment is decidedly slanted toward intake of food and away from physical activity. A recent study by the Centers for Disease Control and Prevention¹⁸ indicated that in the U.S., the rate of obesity among adults aged 18 years or older climbed 49.2% between 1991 and 1998. Most alarmingly, the greatest magnitude of increase was among 18-29 year olds (7.1% to 12.1%) and those of Hispanic ethnicity (11.6% to 20.8%).

In Texas, the rate of obesity increased 56%. The CDC study's co-authors blamed the modern suburban lifestyle that traps people in their cars for hours, encourages them to eat greasy fast food, and prevents them from having time to exercise. The director of the CDC cited a need for a national strategy to combat obesity. "In general, **restoring physical activity to our daily routines is critical.**"¹⁹

IV. IDENTIFICATION AND INTERVENTION

A. Assessment

At initial presentation, it can be difficult to discern the presence of diabetes, especially in children and adolescents.



SYMPTOMS SUGGESTIVE OF DIABETES

Obvious symptoms suggestive of diabetes and sample questions to ask are:

- **Polyuria** - "Do you have to go to the bathroom a lot?" "When you pee, do you go a little bit or a lot?"
- **Polydipsia** - "Are you having to ask the teachers permission to go get a drink of water?" "How often do you have to get a hall pass?"
- **Polyphagia** - "Tell me what you are eating." (Listen for descriptions of large portions and/or frequent snacking out of line for a child's age).
- **Nocturia** - "Are you getting up in the night to go to the bathroom a lot?"

Less obvious symptoms and sample questions to ask include:

- **Fatigue** - "When you get home are you tired? Do you nap? How long do you rest?"
- **Sudden change in weight** - "Have you suddenly lost or gained some weight?"
- **Recurrent vaginal yeast infections** - "Are you having any discharge in your underwear? Does it have an odor? Does it burn when you pee? Does your bottom itch?"
- **Urinary tract infections** - "When you pee, does it feel like you can't finish? Does it burn when you pee?"
- **Skin infections** - "Do you have any sores on your skin that won't heal?"
- **Dizziness** - "Have you been feeling dizzy?"
- **Blurred or double vision** - "Is your vision blurry?"

While it is imperative that a physician diagnose diabetes mellitus, the following tables are provided in **Appendix A** as tools to aid in identifying students at risk and making an appropriate referral:

- 1) Criteria for Testing for Type 2 Diabetes in Children
- 2) Types of Diabetes in Children and Adolescents
- 3) Pediatric Diabetes Risk Factor Questionnaire
- 4) Protocol for Evaluation of Diabetes Mellitus in Individuals < 18 Years of Age
- 5) Body Mass Index Chart
- 6) Blood Pressure Tables
- 7) Step-by-Step Management Tool for School Nurses

Physical characteristics such as obesity, hypertension and acanthosis nigricans on examination of youth are strong indicators of insulin resistance and risk for Type 2 diabetes.

These three physical characteristics are discussed at length in this section. Methods for assessment and making a medical referral are described. Other physical characteristics that may also signal Type 2 diabetes include early sexual development, female hirsutism, irregular menses, male gynecomastia, excessive height and body odor, all related to hyperandrogenism. ***A positive family history of diabetes is a strong risk factor for developing Type 2 diabetes.***

B. Major Physical Indicators of Type 2 Diabetes in Children and Adolescents

1. Obesity and Overweight

Obesity is an increase in body weight due to excess accumulation of body fat relative to lean body mass. Overweight is a state of weighing more than average for height and body build which may or may not include an increase in amount of fat.²⁰ Obesity in childhood is a risk factor for obesity in adulthood. It is estimated that one third of preschoolers, one half of school age children and 70-80% of adolescents who are obese remain obese into adulthood.²¹

Obesity in young people is related to insulin resistance, elevated blood cholesterol levels, high blood pressure and diabetes.²² Three-fourths of all people with Type 2 diabetes are or have been obese. Overweight does not seem to be a risk factor in Type 1 diabetes.²³

a. Causes of Obesity

Obesity is the cumulative effect of ingesting more calories than the body burns. Poor nutrition and lack of physical activity are the primary causes of obesity among children and adolescents in this country. Obesity can result from an intake of only a small excess of calories each day. For example, drinking one 140-calorie soda per day translates into 14 extra pounds of body weight per year, unless there is additional physical activity to compensate.

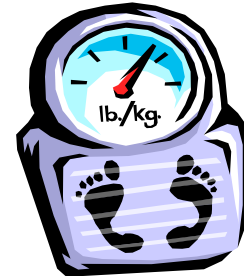


While there is a genetic predisposition to obesity, even people with an inborn tendency to be overweight still have to ingest more calories than they burn to gain the weight. Regardless of genetic composition, there is much a person can do to control body weight by controlling behavior.

b. Assessing Obesity

The standard measure of obesity across age groups is body mass index (BMI). BMI is calculated using weight and height of an individual. BMI is expressed as body weight in kilograms divided by the square of height in meters or:

$$\text{BMI} = \frac{\text{Weight in Kilograms}}{(\text{Height in Meters})^2}$$



Metric conversion: Multiply pounds by .45
 Multiply inches by 2.54

Ex: **Weight** **125 pounds x .45 = 56.25 kg**
 Height **5'2" = 62 inches; 62 x 2.54 = 157.48cm/100 = (1.57 meters)² = 2.46**

 BMI **56.25 /2.46 = 22**

Once BMI is determined, the BMI must be plotted on a growth chart to determine the degree of the child's overweight. Standard growth charts are available from the National Center for Health Statistics at <http://www.cdc.gov/nchs/data/nhanes/databriefs/growthch.pdf>. (See also **Appendix A** for a Body Mass Index Chart).^{24,25}

BMI greater or equal to 95th percentile: Overweight
BMI between 85th and 95th percentile: At Risk of Overweight

A child with a BMI greater or equal to the 95th percentile should undergo an in-depth medical assessment. Use of the 95th percentile identifies children who have a significant likelihood of maintaining obesity into adulthood. In addition, studies have shown that BMI above the 95th percentile is associated with elevated blood pressure, hyperlipidemia, and obesity-related disease and mortality.²⁶

A child whose BMI falls between the 85th and 95th percentile should be evaluated carefully with particular attention to secondary complications associated with obesity, such as hypertension and dyslipidemias.²⁷

It is important to note that the definitions of weight and obesity are based on statistics. The parameters for determining severity of overweight are used for statistical purposes and for establishing definitions. However, **even a child at the 50th percentile who has obese parents, poor eating habits and low activity level is at risk for becoming obese.** You could make the

analogy of an “A” student who begins making poor grades and does not finish homework assignments for two weeks. These are signs of problems. You don’t have to wait for the report card to find out what the problem is or do something to intervene. **There’s no need to wait until a child reaches the 95th percentile for weight to do something about it.**

c. Addressing Obesity

Recent studies indicate that proper nutrition, physical activity and weight reduction can decrease high insulin levels in the blood. As a result, risks associated with insulin resistance tend to also decrease. For example, visible signs of acanthosis nigricans fade.²⁸ Ultimately, weight management may reduce the risk of developing Type 2 diabetes in youth.²⁹

Obesity can cause a variety of complications affecting physical, physiological and psychological health. One such complication is obstructive sleep apnea, the temporary cessation of regular breathing during sleep. One way to assess students is to ask about any snoring, irregular breathing and gasping while sleeping.

Some research indicates that sleep apnea may be common in overweight children and adolescents. Studies suggest that obstructive sleep apnea can have a profound effect on learning potential and may be a major cause of school failure and learning disabilities in the United States. A large sleep study in a well-randomized population of obese youth is needed to confirm preliminary findings.³⁰

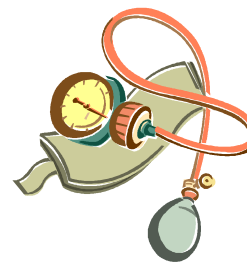
Recommendations for Weight Goals

In 1997, the Maternal and Child Health Bureau, Health Resources and Services Administration, U.S. Department of Health and Human Services convened a committee of experts in the field of pediatric obesity to develop recommendations on evaluation and treatment of obesity in children and adolescents. The Expert Committee reported that prolonged weight maintenance allows for a gradual decline in body mass index as a child grows in height and may be a sufficient goal for children. However, in the event of secondary complications, weight loss may be recommended. Complications may include mild hypertension, dyslipidemias, and insulin resistance. Children with acute complications, such as pseudotumor cerebri, sleep apnea, obesity hypoventilation syndrome, and orthopedic problems should be referred to a pediatric obesity center. The Weight-control Information Network (NIH/National Institute for Diabetes & Digestive & Kidney Diseases, <http://www.niddk.nih.gov/health/nutrit/win.htm>) can assist clinicians in identification of pediatric weight-control services. While only a few pediatric obesity centers exist, they may be useful resources for clinicians who care for patients with severe complications of obesity.²⁷ Registered dietitians and nutritionists are additional resources for information on obesity and weight management.

See **Section VI. Prevention** in this manual for information on individual and school-based interventions concerning overweight and obesity.

2. Hypertension

Hypertension is associated with insulin resistance and hyperinsulinemia. It is a complication of obesity and a condition that increases the risk of cardiovascular disease. Elevated blood pressure in childhood correlates with hypertension in early adulthood.²⁴



To Measure Blood Pressure:

Use a cuff that is appropriate to the size of the child's upper arm. In the case of an obese child, use an adult cuff. It is essential that the rubber balloon inside the cuff surrounds 80-100% of the arm. The right arm is preferred for consistency and comparison of standard tables. Blood pressure should be measured in a controlled environment after 3 to 5 minutes of rest in the seated position and with the antecubital fossa supported at heart level. Blood pressure should be recorded at least twice on each occasion, and the average of each of the systolic and diastolic blood pressure measurements should be used to estimate the blood pressure level. If on repetition, blood pressure measurements are consistently high, a medical referral for further evaluation is needed.

After measuring a child's blood pressure, plot it against the appropriate blood pressure tables adjusting for height and age in boys and girls. See **Appendix A** for blood pressure tables.

Height percentile is determined from the standard growth charts. A child's systolic and diastolic pressures are compared with the numbers provided in the tables for age and height percentiles (boys or girls). A child is normotensive if blood pressure is below the 90th percentile. If a child's blood pressure, systolic or diastolic, is at or above the 95th percentile, the child may be hypertensive. Repeated measurements are recommended and referral made based on outcomes. Blood pressure measurements between the 90th and 95th percentiles are high-normal and warrant further observation and consideration of risk factors.³¹

3. Acanthosis Nigricans

In some states, there are efforts underway to implement screening for acanthosis nigricans in the school setting. For example, the 1999 Texas Legislature authorized collection of data on acanthosis nigricans and other obesity-related complications in a pilot study. In 2001, this pilot was extended to a full screening program in public and private schools along the Texas-Mexico border. This activity is being conducted through the University of Texas System Texas-Mexico Border Health Coordination Office.³²

It is essential that school nurses be aware of acanthosis nigricans as a marker for insulin resistance and make an appropriate referral. School nurses may also need to consider ways to help prepare the infrastructure for care of students identified through screening projects.

Evaluation for acanthosis nigricans can be performed by visually examining and palpating the neck. The physical examination (appearance and texture) of the lesions will show the typical increase in skin thickness with a furrowed appearance and the affected area will be darker than the surrounding skin. No biopsy is needed.



There is a quantitative scale for evaluating severity of acanthosis nigricans that has been developed and validated.³³ This scale permits longitudinal and cross-sectional evaluation that clearly delineates the condition and accounts for differences in severity across sites. However,

ANY acanthosis nigricans is abnormal and is reason for discussion with a student's family. The photographs on the following page are provided to aid in identification of this condition. It is important to note that while it may be less obvious, acanthosis is identifiable on darker skin.

See **Appendix B** for educational materials you can give to families explaining acanthosis nigricans and Type 2 diabetes in children and adolescents.

C. Making a Medical Referral

School districts vary in their policies for making medical referrals. In many cases, if the school nurse suspects a health problem that warrants referral, she/he contacts the parent(s) or guardian to advise that a referral is being recommended. The referral form is sent home with the student.

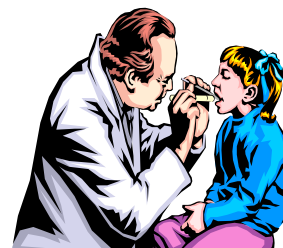


Medical referrals may be made for obesity, hypertension or other indicators of insulin resistance and hyperinsulinemia. Referral for obesity alone may present a particular challenge to the school nurse. One approach is to discuss insulin resistance with parent(s) or guardian and make a referral for possible insulin resistance or other complications of obesity.

Medical referrals are made to a primary care provider for clinical evaluation. A sample generic medical referral form is provided in **Appendix B** and information recommended for clinicians is in **Appendix C**.

D. Evaluation in the Clinician's Office

Clinicians may perform a complete history and physical examination, expanded history of diabetes symptoms, fasting plasma glucose (FPG) or an oral glucose tolerance test (OGTT), fasting plasma insulin testing (a valid measure of insulin resistance), and fasting cholesterol to evaluate children suspected of or at-risk for Type 2 diabetes.



In FPG testing, fasting is defined as no consumption of food or drink other than water for at least 8 hours prior to testing. OGTT involves obtaining a baseline FPG and then giving a patient a glucose drink. Blood samples are taken every 30 minutes to 1 hour for 2 to 3 hours. Retesting is indicated if results for FPG > 126 mg/dl or OGTT > 200 mg/dl (2-hour postload value). Either FPG or OGTT must be repeated on another day to confirm diagnosis.³⁴

In nondiabetic persons:

- FPG >110 mg/dl but <126 mg/dl is defined as impaired fasting glucose (IFG)
 - OGTT >140 mg/dl but <200 mg/dl is defined as impaired glucose tolerance (IGT)
- IFG and IGT are steps on the way to developing Type 2 diabetes.**

It is strongly recommended that pediatric patients, identified as potentially diabetic, be referred to their primary care physician for further evaluation.

Normal plasma glucose levels for FPG are <110 mg/dl and <140 mg/dl in 2-hour OGTT.³⁵

Normal range for fasting plasma insulin is 2 to 12uU/mL.³⁶

For children and adolescents, ages 2-19, acceptable levels for fasting cholesterol are total cholesterol <170 mg/dl; LDL <110 mg/dl.³⁷

V. GUIDELINES FOR MANAGING THE STUDENT WITH TYPE 2 DIABETES

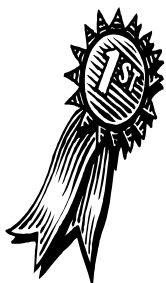
A. General Information

Children and adolescents with Type 2 diabetes may be able to manage their disease through healthy eating habits and physical activity. They may also take oral hypoglycemic agents to control their diabetes.

Youth with Type 2 diabetes should be encouraged to participate in all usual student activities, including PE class, as well as other activities where they can be physically active. They need to monitor their blood glucose at home at least once or twice a day, preferably in the morning and/or before the evening meal.

See **Appendix C** for information tailored specifically for teachers, administrators, and other health care providers on issues of Type 2 diabetes management.

B. Goals for the Student with Type 2 Diabetes



To promote normal growth and development in a student with Type 2 diabetes, there are four primary goals for managing the disease. These include helping the student:

1. Achieve normal body mass index (See **Section IV. on Assessing Obesity**);
2. Maintain blood glucose in the normal target range of 70-110 mg/dl before meals and no more than 140 mg/dl two hours after meals and before bedtime;
3. Engage in physical activity; and
4. Take medication as prescribed.

The student, family, school nurse, physician, dietitian, and other health professionals all work to support these goals.

C. Dietary Management

Children and adolescents with Type 2 diabetes are assessed by a registered dietitian and, along with their families, receive nutritional counseling to modify eating habits. They may follow a prescribed meal plan, selecting foods from a school menu or bringing their own lunch from home. They are given the same dietary guidelines recommended for all people to promote healthy lifestyles³⁸:

- Eat a variety of foods
- Balance the food you eat with physical activity to maintain or improve your weight



- Increase dietary fiber by choosing a diet with plenty of whole grains, vegetables, and fruits
- Decrease dietary fat and cholesterol intake - Less than 30% of calories should come from fat and of this, less than 10% of calories should be from saturated fat
- Decrease sodium - Less than 2,400 mg. per day
- Choose a diet low in sugars (recommendation for non-diabetics is a diet moderate in sugars)

As part of a nutrition prescription, youth and their families are counseled to cut out high calorie beverages such as soft drinks, sport drinks, packaged drink mixes and avoid overconsumption of fruit juice. They are advised to switch from whole milk to 1% milk, ideally working toward skim milk, and to eliminate sugar-coated breakfast cereals. Youth are also counseled to avoid the a la carte cafeteria items and vending machines at school that typically feature high fat foods.

Practical suggestions for families to make such changes include choosing diet drinks and bottled water, mixing 1% with whole milk, then 1% with skim to gradually adjust to the change in taste. In the same way, sugar frosted cereals can be mixed with bran or whole grain cereals to adjust gradually to the change. Families are encouraged to incorporate more fruits and vegetables into their diet and to keep fruit on the table within easy reach of kids. Keep high fat, empty calorie snack foods stored out of sight or better yet, only purchase for special occasions. Physical activity levels are also discussed as part of counseling and recommendations provided.



In the school setting, drink machines should offer bottled water and diet drinks. **Vending machines should have healthy options.** Students will need your help in advocating for change if healthy options are not in place. The CATCH program (Section VI.D. Family, Community and School-based Interventions) provides guidance on impacting the school food service program.

Clients come into nutritional counseling at different stages of readiness for change (See Stages of Change, Section VI. Prevention). Counseling is provided accordingly.

D. Physical Activity and Sports

Young people with Type 2 diabetes should be encouraged to participate in PE, school sports and other programs that provide opportunities for physical activity.

With Type 2 diabetes managed by diet or with oral hypoglycemics, it is likely that moderate exercise will have the effect of lowering blood sugar. However, the response may be variable. When students start to exercise, they may need to make changes in other parts of their diabetes regimen (e.g. lower dosage of oral hypoglycemic medication).



Exercise should be encouraged to be a regular occurrence, preferably at a fixed time, since food and medications must be balanced with exercise. Vigorous exercise should begin slowly over a

period of time (hours, weeks and months) and gradually increase in level of intensity. The goal is 30-45 minutes of vigorous physical activity each day. PE and aftercare teachers should be familiar with symptoms and treatment of blood glucose problems and be given a copy of the "Dear Teacher" letter in **Appendix C**. Students who exercise during the heat of the day need to drink more water, not sports drinks. Specific exercise/sport guidelines may need to be tailored for a particular student.

E. Blood Glucose Monitoring

Blood glucose levels should be tested *at home* once or twice a day, in the morning and/or before the evening meal. Home glucose monitoring is emphasized over monitoring by the school nurse. Children with Type 2 diabetes and their families are learning lifelong skills for preventing complications and to take responsibility for their care. Monitoring involves pricking a finger, placing a drop of blood on a test strip, inserting it into a glucose meter and evaluating the results. Glucose monitoring in the school setting requires a physician's order and parent permission. If using a student's own meter to monitor his/her glucose, obtain a copy of the user's instructions since every brand of meter has its own glucose measurement range. It is important to run a glucose test control on the student's meter and also follow instructions for cleaning the equipment. If additional monitoring equipment is needed, contact the pharmaceutical company using the phone number listed on that student's particular meter or in the user's instructions. Companies are usually quite willing to provide additional meters at no cost.

F. Medications

Children and adolescents with Type 2 diabetes may require medication in addition to managing their condition through healthy eating habits and physical activity. In general, the medications most frequently prescribed are:



1. Metformin (trade name Glucophage) is an "insulin sensitizing" medication. That is, it works by making the tissues more responsive to the youth's own insulin. It is very unlikely to cause hypoglycemia; therefore, the timing of meals and activity is not particularly important for youth on this medication. Most individuals are on metformin twice each day, although an occasional youth will be on it three times a day. The major side effects of metformin are gastrointestinal discomfort, such as nausea, increased gas or loose stool. Nausea can be minimized by taking the medication with food (instead of on an empty stomach). The other problems tend to improve over the course of 1-2 weeks after initiation of medication. If problems persist, they should be discussed with the prescribing physician.

2. Glipizide (Glucotrol and Glucotrol XL) increases insulin production by the pancreas. That is, it increases the amount of insulin in the circulation. Therefore, it has the potential to cause hypoglycemia. Individuals on glipizide need to eat and exercise on a regular schedule. There are two forms of glipizide, one short-acting (Glucotrol) and one long-acting (Glucotrol XL). Individuals taking the short-acting form may take it one time or multiple times each day (e.g. before every major meal). The long-acting form is generally given once each day with breakfast.

The major side effects of metformin are gastrointestinal discomfort, such as nausea, increased gas or loose stool. Nausea can be minimized by taking the medication with food (instead of on an empty stomach). The other problems tend to improve over the course of 1-2 weeks after initiation of medication. If problems persist, they should be discussed with the prescribing physician.

3. Insulin administered subcutaneously is sometimes used to supplement pancreatic insulin production. Several different insulins are in use for this purpose. Most commonly, both a short acting (regular) and a intermediate acting (Lente, NPH) are used together. These may be mixed at the time of administration or one of the standard mixtures (e.g. Humulin 70/30) may be used. Insulin is usually administered before breakfast and before supper. Some youth take insulin before bedtime, often an intermediate acting form. Insulin has the potential to cause hypoglycemia. Typically, the time that the individual is most prone to developing hypoglycemia is mid-morning (2-3 hours after the insulin injection, at the time of the maximum effect of the short acting insulin) and mid-afternoon (6-8 hours after the insulin injection, at the time of the maximum effect of the intermediate acting insulin). Individuals on insulin need to eat and exercise on a regular schedule.

G. Other Monitoring Issues

Below are two other medical management issues of which the school nurse should be aware.

In knowing a little about these issues, nurses can determine how students are doing in terms of diabetes control and emphasize the importance of diabetes care by the questions asked. Nurses are also better prepared to answer students' questions.

1. Hemoglobin A1c

Another method for evaluating blood sugar levels in the clinical setting is to test levels of hemoglobin A1c (abbreviated HgbA1c). This test is a measure of the overall control of diabetes over an extended period of two to four months in contrast to the "snapshot" view from blood glucose monitoring.

In most labs, the "normal value" for hemoglobin A1c is less than 6.4%. This means that blood glucose levels are being maintained close to normal (under control). A value of 7.5% might still be considered good but not normal and a level greater than 9% is considered poor. These values can vary according to the laboratory and are used accordingly. Measuring hemoglobin A1c does not indicate whether blood glucose is stable (varying between 70-140 mg/dl, with an average of 110 mg/dl) at a particular level or whether highs average with lows (varying between 20 and 400 with an average of 110). Only blood glucose monitoring can provide this detail.³⁹

From a nursing perspective, a youth who knows his/her most recent "grade" (hemoglobin A1c) is likely to be a youth who is getting regular medical care. The youth who has a HgbA1c <6.4% is likely to be doing those things that he/she needs to do to take care of the diabetes most of the

time. The youth who does not "know" his HgbA1c is either not getting regular medical care or is not doing what needs to be done to manage diabetes. Youth deemed by their physicians to be in "good control" often do not have to take medications or monitor blood glucose during school hours (although some of these youth may need to take medications to maintain good control). If a student has chronic elevations in glucose levels and other symptoms of poor control, these problems should be discussed with the family and health care provider.

2. Blood Lipids

Children and adolescents with Type 2 diabetes are monitored for dyslipidemias, particularly hyperlipidemia. Cholesterol levels and triglycerides are the blood lipids most commonly evaluated. Diabetes mellitus is a risk factor for atherosclerosis and coronary heart disease. Weight loss, increased activity and improvement of glycemic control often result in improvement of lipid levels. Changes in food choices and their preparation may also be helpful. If these actions fail, it is recommended that medication be used.⁴⁰ As school nurse, you might ask if a student's blood fats have been tested and encourage such testing. Test results might also factor into a student's special dietary requirements.

The National Cholesterol Education Program's (NCEP) Expert Panel on Blood Cholesterol in Children and Adolescents has established guidelines for cholesterol levels in children and adolescents.⁴¹

NCEP Cholesterol Levels in Children and Adolescents 2-19 Years Old

| Category | Total Cholesterol (mg/dl) | LDL cholesterol (mg/dl) |
|------------|---------------------------|-------------------------|
| Acceptable | Less than 170 | Less than 110 |
| Borderline | 170-199 | 110-129 |
| High | 200 or greater | 130 or greater |

3. Dental Care

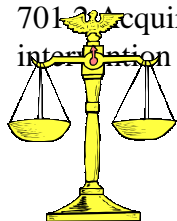


It is especially important that children and adolescents with Type 2 diabetes who develop dental caries or gum problems receive dental care. Gum infections can elevate blood glucose levels, leading to more progressive infection and slower healing. Good dental hygiene and regular dental exams are strongly encouraged.

H. Paying for Diabetes Care

Type 2 diabetes is a well-recognized chronic condition. Medical care, pharmaceuticals, equipment and supplies are available to uninsured families of children with diabetes through Medicaid, special state-run Title V programs for children (e.g. Chronically Ill and Disabled Children Program), and special state insurance programs designed for children.

Nutritional counseling may also be a billable service. For example, in Texas, under CPT code 701.30 Acquired Acanthosis Nigricans, dietitians can conduct two evaluations and four intervention sessions with a pediatric patient.



I. Legal Issues

Students with Type 2 diabetes are generally healthy and should not be excused from the normal workload and activities required of other students.

This includes full participation in physical education (gym class) and other extracurricular activities. However, children requesting special care related to their diabetes must be accommodated. The rights of children with diabetes to care for their diabetes in the school setting are based on the Individuals With Disability Education Act (IDEA) and Section 504 of the Rehabilitation Act of 1973. These laws provide protection against discrimination for children with disabilities, including diabetes. Any school that receives federal funding must comply with IDEA and Section 504 laws. A child need not require special education to be protected.⁴²

Children with diabetes require medical care to remain healthy. The need for medical care does not end while the child is at school. Thus, while at school, each child with diabetes must be allowed to take diabetes medications when necessary and have unrestricted access to water and the bathroom.⁴³ It should be noted, however, that a student's chronic need to get water or go to the bathroom indicates poor control of Type 2 diabetes. This should be discussed with the student's family and health care providers.

Students who frequently miss school because of health problems related to their diabetes may be considered for special education placement under Section 504. Such placement requires that students go through the Admission, Review and Dismissal (ARD) process.⁴⁴

School districts participating in child nutrition programs are required to make substitutions or modifications to meal requirements for those participants with disabilities who are unable to consume the meals offered to participants who are not disabled. Determination of dietary restrictions is to be made on an individual basis by a licensed physician. The physician's medical statement must be based on the regulatory criteria for "handicapped person" and contain a finding that the handicap restricts the participant's diet.

A school district may, at its discretion, make substitutions for individual participants who are not 'handicapped persons' but are unable to consume a food item because of medical or other special dietary needs. Such substitutions may only be made on a case-by-case basis when supported by a statement signed by a recognized medical authority. In these cases, recognized medical authorities may include physicians, physician assistants or nurse practitioners.

School districts are not required to make substitutions for participants whose conditions do not meet the definition of 'handicapped person.' For example, individuals who are overweight or have elevated blood cholesterol generally do not meet the definition of handicapped person, and thus school districts are not required to make meal substitutions for them. In fact, in most cases, the special dietary needs of non handicapped participants may be managed within the normal

program meal service when a well-planned variety of nutritious foods is available to children..."⁴⁵

For children who have special dietary needs, a sample Eating/Feeding Evaluation form is provided in **Appendix C**.

VI. PREVENTION

"Be joyful, although you have considered the facts"...Oliver Wendell Holmes

So often we are bombarded by negative messages that make it seem as if there is nothing we can do to make positive changes and no point in even trying.

But there are success stories in all kinds of places about people doing things to improve our world. The message is that you don't have to change the world to make an incredible difference.

When it comes to getting children and their families to be physically active and eat healthy foods, school nurses have an opportunity not only to improve the health of individuals but to positively affect the public's health. Promoting healthy behaviors among students is an important part of the fundamental mission of schools: to provide young people the knowledge and skills to become healthy and productive adults. **Improving student health can increase students' capacity to learn, reduce absenteeism, and improve physical fitness and mental alertness.**⁴⁶ This is applicable to the entire school community, not only those at risk for or who have Type 2 diabetes.

Poor nutrition and physical inactivity together account for at least 300,000 deaths annually among U.S. adults; only tobacco use contributes more to deaths.⁴⁷ The behaviors that lead to poor nutrition and physical inactivity begin in childhood. Education and early intervention to teach healthy lifestyles is essential. It must also be acknowledged that for some people, prevention is not a priority in a day-to-day survival existence.

Health professionals who feel discouraged about advising people on healthy lifestyles need to know that their advice does make a difference. A recent study describes the results of a survey of 12,835 obese adults, ages 18 and older, who had visited their physician for routine care in the past 12 months. **Persons receiving advice from their clinicians to lose weight were significantly more likely to report trying to lose weight than those who did not.**⁴⁸

The following section provides theory and practical interventions to assist school nurses in promoting healthy lifestyles among students and their families. This information only touches the surface of what is available to help prevent Type 2 diabetes, cardiovascular disease and other health problems associated with poor eating habits and sedentary lifestyles. ***What you choose to do can have far-reaching consequences for the health and well-being of your school, the students, their families, and the community. The worst thing is to do nothing at all because of the perception that the "problem is too big."***

A. How People Change Health Behaviors

The Stages of Change Model, developed by Prochaska and DiClemente⁴⁹, is one way to better understand an individual's readiness to change or attempt to change toward healthy behaviors. It is based on the premise that behavior change is a process, not an event, and that individuals are at varying levels of motivation, or readiness, to change. People at different points in the process of change can benefit from different interventions that are matched to their stage at that time. The stages of change are affected by processes of change such as reinforcement management, the rewarding of oneself or by others for making changes, and the use of helping relationships such as self-help groups to support change. The following table provides a simplified view of the stages and how they are applied.^{50,51}

STAGES OF CHANGE

| Concept | Definition | Application |
|-------------------|---|---|
| Pre-contemplation | Unaware of problem; has no intention of changing in the near future (next 6 months) and may deny need for change. "Everyone in our family is big." | Increase awareness of need for change, personalize information on risks, benefits |
| Contemplation | Thinking about change, in the near future; knows there is an issue but is not ready to change; there may be intent to change in the next 6 months. "I've heard that some overweight kids are getting diabetes. But I don't think I can handle going on a diet." | Motivate, encourage to make specific plans |
| Preparation | Making a plan to change; knows what s/he wants to do; is seeking more information, planning, even starting to change; may tell family and friends; there is an intent to change in the near future. "I found out that if I lose some weight, this smudge on my neck will fade. I've talked to my mom about it..." | Assist in developing concrete action plans, setting gradual goals |
| Action | Implementation of specific action plans; making changes in the environment to support the change. Relapse is normal. This stage may last as long as six months. "I'm walking three times a week for half an hour. I've quit drinking sodas.." | Assist with feedback, problem solving, social support, reinforcement |
| Maintenance | Continuation of desirable actions; or repeating periodic recommended step(s); may last six months to five years; some add a sixth stage, termination;"I lost 10 pounds. The smudge on my neck went away. I am going to keep on walking and eating | Assist in coping, reminders, finding alternatives, avoiding relapses (as apply) |

| |
|----------|
| better.” |
|----------|

While the ideal path involves progression from pre-contemplation to maintenance, most people with serious problems related to chronic diseases, such as Type 2 diabetes or obesity, will have relapses which represent failed action or maintenance. The good news is that relapse and going through the cycle of change are often needed to learn how to maintain change successfully.

Precontemplation

Characteristics of pre-contemplators include lack of intention to change risk behavior, low motivation, rejection of action-oriented suggestions, belief that disadvantages and barriers to practicing a new behavior far outweigh advantages, and difficulty listing benefits of the new behavior. The main goal here is to encourage people to consider the new behavior. In this stage, people respond to positive messages that encourage self-examination (rather than behavior change itself). Reevaluation messages include the risk behavior itself, likelihood of personal risk, personalization of the risk message, consequences of the risk behavior to family and friends, and the likelihood of consequences to others. Positive attributes of the new behavior should be emphasized. People should be encouraged to think about the outcomes of changing to the new behavior in light of this positive information.

Contemplation

Characteristics of contemplators are that they like to talk about the problem, seek information, and are in a state of distress as a result of acknowledging their problem. However, they have inadequate knowledge, skills, and/or emotional abilities to effectively change. The main goals to facilitate change are to encourage people to think about changing something about themselves and gain behavioral experience with the change. People in this stage respond to examination of their risk behaviors and weighing costs versus benefits. Here new positive outcome expectations should be promoted and existing positive outcomes reinforced. Messages should dispute commonly believed but untrue negative consequences, suggest ways to minimize negative consequences, encourage individuals to see themselves as capable of behavior change, and identify how to effectively overcome perceived barriers to change.

Preparation

Characteristics of preparers show they have some experience with the new behavior and are attempting to modify behavior. New behavior is inconsistent. Preparers are forming goals regarding complete adoption of the new behavior. To facilitate change here, people need help to maintain their motivation to eliminate risk behavior and to build a repertoire of safer new behaviors. Preparers respond to skill-building and confidence-increasing activities, planning for barriers and how to overcome them. Messages should instruct and encourage people to restructure their environment so that cues for practicing new behaviors are obvious and socially supported. People should be encouraged to identify and plan solutions to barriers they are most likely to face and to make specific behavior change goals with set incremental steps. Messages

should also enhance preparer's self-efficacy to cope with specific situations and model social reinforcement of appropriate behaviors.

Action

People in the action stage have been practicing the new behavior for several months. They respond to a supportive environment, advocacy for their new behavior, and help in identifying ways to get back on track if they slip. The main goals are to facilitate maintenance of action by continuing to maintain motivation, maintain positive social support, and assist with coping. Messages should emphasize positive self-statements, reward oneself or being rewarded by others, and emphasize healthy alternatives over old behaviors. People at this stage should set a rule for action so that they don't have to make a decision, e.g. I will walk 3 times per week. Entering the action stage normally takes 3 to 6 months.

Maintenance

The most common threats to remaining in the maintenance stage are social pressure, internal challenges, and special situations. Being in a supportive environment, acknowledging the dangers of overconfidence and self-blame are crucial to maintenance. Relapses occur at times of emotional distress (stress, boredom, loneliness, depression). A plan is needed to cope with the inevitable distress without relapsing (e.g. seek social support; deep relaxation such as prayer, massage).

Methods of self-assessment for Stages of Change as well as other instruments and information based on this model can be downloaded from the Internet at <http://www.uri.edu/research/cprc>. There are other models for understanding and promoting behavior change. Self-efficacy theory says that a person's belief that s/he can make desired behavior change is a good predictor of motivation and behavior. Social marketing theory uses commercial marketing principles to influence social ideas, attitudes and behaviors. It looks at the social "cost" of behavior change. Will it take time to learn the behavior? Does it go against the practices of family and friends?

While no single theory or model can explain the complexities of human behavior, they can be useful in appreciating the process for making positive health changes and helping your students and their families.

B. Nutrition

As previously referenced in **Section V.C. Dietary Management**, there are six major dietary guidelines for children and adolescents, established jointly by the U.S. Department of Health and Human Services and U.S. Department of Agriculture. A seventh guideline, directed toward adults, recommends that if there is alcohol consumption, it should be in moderation (alcohol is contraindicated in individuals on medication).

Compliance with the following guidelines have been evaluated in youth:

- Increase dietary fiber by choosing a diet with plenty of whole grain products, vegetables and fruits



- Decrease dietary fat and cholesterol intake - Less than 30% of calories should come from fat and of this, less than 10% of calories should be from saturated fat
- Decrease sodium - Less than 2,400 mg. per day

As reported by the Center for Health Promotion Research and Development, University of Texas Health Science Center School of Public Health, only about 1/3 of children are meeting these recommendations.

| Percentage of Children Who Meet Specific Dietary Recommendations | |
|---|---|
| <u>Recommendation</u> | <u>% Meeting Recommendations</u> |
| FAT (<30% of calories) | 33% |
| SATURATED FAT (<10% of calories) | 27% |
| SODIUM (<2,400 mg or less/day) | 35% |
| FRUITS & VEGETABLES (>5 servings per day) | 29% |
| CALCIUM (>1,300 mg/day) | 35% |

The USDA School Meals Initiative for Healthy Children has established nutrient standards for schools and identified four alternative menu planning systems from which each school district can choose to meet the standards. Standards are set for various grade levels and for breakfast and lunch. Standards address calories, fat (total less than 30% of calories and saturated less than 10% of calories), protein, calcium, iron, Vitamin A and Vitamin C. School nutrition service personnel are now working with schools to meet these standards. Visit the U.S. Department of Agriculture's "Team Nutrition" website at <http://www.fns.usda.gov/tn>, the USDA/National Agricultural Library's Healthy School Meals Resource System training and technical assistance site at <http://schoolmeals.nal.usda.gov>. For a rating guide to nutrition websites for health professionals, educators, and the public, visit the Tufts University Nutrition Navigator site at <http://navigator.tufts.edu>.

C. Physical Activity

Students enjoy physical activity and should be encouraged to be as active as possible both in school and at home. There is substantial, expanding evidence that moderate physical activity can:



- Reduce the risk of dying from coronary artery disease and of developing diabetes, hypertension and colon cancer.
- Help reduce blood pressure in some people who have hypertension.
- Help maintain healthy bones, muscles and joints.
- Reduce symptoms of anxiety and depression and foster improvements in mood and feelings of well-being.
- Help control weight, develop lean muscle, and reduce body fat.

The 1996 U.S. Surgeon General's Report on Physical Activity and Health serves to reinforce the concept that physical education is part of the total education program of a child. The report brings together what has been learned about physical activity and health from decades of research. Among its major findings:

- People who are usually inactive can improve their health and well-being by becoming even moderately active on a regular basis.
- Physical activity need not be strenuous to achieve health benefits.
- Greater health benefits can be achieved by increasing the amount (duration, frequency or intensity) of physical activity

Major findings about physical activity levels of adolescents and young adults, as reported by the U.S. Centers for Disease Control and Prevention (CDC) Youth Risk Behavior Surveillance System Survey,⁵² include:

- Nearly half of young people, ages 12-21, are not vigorously active on a regular basis.
- Physical activity declines dramatically with age during adolescence.
- Female adolescents are much less physically active than male adolescents.
- In high schools across the U.S., enrollment in daily physical education classes dropped from 42% in 1991 to 27% in 1997.
- Only 19% of all high school students are physically active for 20 minutes or more in physical education classes every day during the school week.

Promising ways have been identified to help people include more physical activity in their daily lives. One clear recommendation is for the development and implementation of well-designed programs in schools to increase physical activity in physical education classes.

A well-designed physical education program will:

- Emphasize motor skill development
- Provide sustained vigorous activity
- Focus on conceptual knowledge for movement fundamentals and fitness

Children with Type 2 diabetes should take every opportunity to become physically active in and away from the school setting. Sport leagues are available in many communities and include a wide range of ability levels. Physical activity plans designed for and by all family members can be very helpful in developing healthy lifestyle habits.

D. Family/Community/School-Based Interventions

Exciting work is going on now in school-based programs to promote healthy dietary habits and physical activity in children and adolescents. These programs directly impact children's risk for developing diabetes.



Wilson, et al (1997) cite eight separate studies highlighting school-based approaches with successful outcomes.⁵³ In their research, they report that successful school-based programs include several key components:

- Incorporating directly observable behavioral objectives;
- Obtaining support from school staff and cafeteria workers; and
- Incorporating culturally relevant information into the program.

School-based programs address the problem of obesity and its underlying causes by promoting lifelong healthy eating habits and physical activity. The goal is to have school-based programs that expand and institutionalize a school's capacity to help children adopt positive risk reduction behaviors. This goal can be accomplished through effective curricula, teacher training, family and community involvement, systems change within the school (e.g. school cafeteria menus) and on-going evaluation of programs.⁵⁴

1) CATCH - Coordinated Approach to Child Health

(also called Child and Adolescent Trial for Cardiovascular Health), was developed under the auspices of the National Institutes of Health.

CATCH was originally designed as a cardiovascular prevention education program for elementary students. Because risk factors, primarily poor eating habits and sedentary lifestyle, are the same for Type 2 diabetes, CATCH functions for prevention of diabetes as well as heart disease.



CATCH is a coordinated effort involving health education in the classroom, physical education, child nutrition services, family and community. The curriculum is based on social learning theory, which suggests that most health behaviors are social behaviors that are learned in a social context. The curriculum targets changes in specific environmental, personal, and behavioral factors that influence children's health behavior. Specifically, it encourages changes in the environment that would support healthy eating and physical activity patterns in children by providing opportunities to eat more healthy snacks and engage in physical activity. This is achieved by promoting role models for healthy eating and physical activity, and by creating peer support for selecting healthy foods and doing regular physical activity.

CATCH was designed to be an inclusive program at all levels and has been evaluated in various regions of the country among multiethnic populations.

CATCH components:

(a) Classroom Curricula - Each component is interrelated and complementary to other components. Lessons require minimal preparation time, presentation sequence is flexible and teacher resources are provided (e.g. student materials, transparency masters, videos, resource lists and content information). Units include:

Hearty Heart & Friends, Hearty Heart Home Team - 3rd Grade

Go for Health-4: Taking Off, Stowaway to Planet Strongheart - 4th Grade

Go for Health-5: Breaking Through Barriers, Health Trek - 5th Grade

F.A.C.T.S. for 5: Facts and Activities about Chewing Tobacco and Smoking - 5th Grade

(b) Physical Education - Uses a contemporary approach to PE that provides moderate to vigorous physical activity for a minimum of 50% of class time for each student. The emphasis is on cooperation, life-long skill development, maximizing participation and enjoyment by all. Children are not used as physical or psychological targets (as in games like crazy dodge ball). The program has been extended to include K-2. It is low cost, does not require expensive equipment and is a useful tool for classroom teachers responsible for teaching physical activity. Materials include guidebooks, videos and activity boxes.

(c) "Eat Smart" Food Service - The goal of the Eat Smart program is to meet national guidelines for school meals while maintaining recommended levels of essential nutrients and child participation in the school meals program:

Meals should contain less than 30% of calories from fat, 10% or less of calories from saturated fat and sodium levels of less than 1,000 mg. per meal. The food service component reinforces and complements classroom, physical education and family components. Implementation strategies target menu planning (substitution of low fat/sodium products for high fat/sodium foods, food preparation (baking rather than frying, rinsing meat, etc.), food purchasing (working with vendors to determine lower fat/sodium alternatives), and program marketing (appealing to students, teachers and parents).

(d) Tobacco - This unit is skill-based and was designed to emphasize the dangerous, costly and aversive aspects of both smoking and chewing tobacco; the benefits of not using tobacco; and the fact that to be tobacco-free is now the acceptable way of life.

(e) Family Involvement Component - Has take-home activities involving the family. Parent education can also be provided through family fun nights. Children transfer learning to parents through these activities.

Implementation of CATCH varies between states. In Texas, CATCH:

- Is Texas Education Agency approved for diabetes education in the health curriculum.
- Meets Texas Essential Knowledge and Skills (TEKS) guidelines.
- Is working in Texas schools.

How to Get Catch in Your School:

- Call your state education agency to see if they are disseminating the CATCH Program and find how it is being implemented in neighboring school districts. Ask for a list of contacts.

- In Texas, the CATCH office at The University of Texas Center for Health Promotion Research and Development/Austin can provide materials for you and other faculty to review such as a 9-minute video, "CATCH: A Coordinated Approach to Child Health" and the curriculum, guidebooks and PE boxes. They also provide training for all four components: classroom, school food service, physical education and family/community involvement. They have field-tested strategies that work to get CATCH into schools and lists of people in your region and elsewhere who are using the program and/or have endorsed it. Visit the web site at <http://www.sph.uth.tmc.edu/catch> for more information about the curriculum and to download sample lesson plans. Outside of Texas, CATCH materials can be purchased as a set or by individual component through Flaghouse, Inc. at <http://www.flaghouse.com>.
- Cost: CATCH program materials covering all of these components cost approximately \$185 per school. There may be CATCH grants available through state education agencies. The CATCH office has sample letters and other materials to solicit financial support from a local business, hospital, sports equipment store, grocery, etc.

2) Assessing School Health Status - A Project for School Health Advisory Councils

Some states, such as Texas, mandate that school districts establish local health advisory councils. With or without a mandate, schools interested in evaluating school health status should be aware of the School Health Index for Physical Activity and Healthy Eating, created by the U.S. Centers for Disease Control and Prevention (CDC). This self-assessment and planning tool is available at no cost for use in assessing physical activity and nutrition programs to:

- Identify strengths and weaknesses of your school's health promotion policies and programs;
- Develop an action plan for improving school health; and
- Involve teachers, parents, students and the community in improving school services.

The Index assesses eight core areas that impact the health of students and school environment: family/community involvement; health education; physical education; health services; nutrition services; counseling, psychological and social services; healthy school environment and health promotion for school staff. Assessment involves working with a team, using questionnaires for each core area and arriving at consensus on results and recommendations.

The School Health Index was developed by the CDC Division of Nutrition and Physical Activity in partnership with school health experts, school administrators, staff, parents and education and health organizations. The tool can be completed in as little as four hours. It could be implemented under the auspices of a school health advisory group that may already be in existence in your school. Copies of the School Health Index can be downloaded from the CDC website <http://www.cdc.gov/nccdphp/dash/SHI/index.htm>.

3) Gardening Programs

Gardening is an outlet for physical activity, teaches a variety of skills and nurtures children in ways that support healthy lifestyles. Check in your community for classroom gardening programs such as those offered through local botanical gardens or an agency such as the Texas Agricultural Extension Service's Master Gardeners Program. The program provides basic training for teachers, a packet of curriculum materials for each gardening teacher, pre-cut landscape timbers and nails for two 4' x 8' raised bed gardens, garden soil delivered to the school site, fertilizer, seeds and transplants each spring and fall. Master gardeners are on call for assistance and continuing education is offered for teachers who have completed the basic training. In Texas, visit the web site <http://aggie-horticulture.tamu.edu/mastergd/mg.html>

4) **Bienestar Health Program: A Model for Elementary Schools**

The Bienestar is a school-based diabetes prevention, screening, and treatment project that targets elementary schools with high-risk, low-income students. The prevention component has been implemented for five years and the screening and treatment components for one year in San Antonio elementary schools. The Bienestar uses a comprehensive approach (prevention, screening, and treatment) and is founded on Ecological Theory. Using Ecological Theory, prevention programs were developed for the four social systems that conceptually should have the most influence on children's health behaviors. The Bienestar, therefore, consists of a parent program, a school health class curriculum, a school cafeteria program, and an after-school health club. Students participating in the Bienestar prevention program, when compared with a control group, have significantly decreased their dietary fat intake, increased their dietary fiber intake, and increased their physical fitness levels.^{55,56,57}

Bienestar Components

(a) **Bienestar Parent Diabetes Education** curriculum is designed to provide parents with knowledge of diabetes, exercise, and nutrition. They are taught healthy cooking skills so that they can provide a supportive social environment, as well as role model for their children at home. In addition to the 9-lesson curriculum, the Bienestar Parent Diabetes Education program includes a health fair with students performing a theatrical play based on health topics and bimonthly Bienestar newsletters written by the children informing parents of ongoing activities. Parental attendance at students after-school health clubs is also encouraged. The curriculum includes an instructor's manual and a parent's manual.

(b) **Bienestar Health Class** curriculum was developed around three main units: nutrition, wellness, and non-communicable disease. The nutrition section teaches healthy eating and the positive and negative consequences associated with particular eating habits. The wellness section includes lessons on self-esteem, weight management, and exercise and relates each to current and future cognitive, physical and social success. The non-communicable disease unit includes instruction on diabetes, hypertension, heart disease, and cancer etiology and prevention. The curriculum is made up of 18 ready-to-use lessons, including review lessons and tests. The curriculum includes a teacher's manual, a student workbook, test instruments with respective keys, transparencies, extensions for thematic instruction, and support materials. Bienestar

provides for the inclusion of important diabetes prevention content without eliminating or reducing other important health content of existing curricula. All Bienestar instructional materials are written at the 3rd grade reading level or below and are supplemented with color visuals.

(c) **Bienestar School Cafeteria Program** curriculum is designed to improve the nutrition knowledge of food service staff and to persuade children to choose and eat more fruits and vegetables and less fatty foods. The curriculum consist of 6 lesson plans: orientation and pre-knowledge testing; food guide pyramid; carbohydrates and diabetes; fats and diabetes; methods to persuade students to eat more fruits and vegetables; and review and post-testing. In addition, Bienestar personnel and school cafeteria staff actively promote healthy eating in the school cafeteria through use of poster displays and encouraging children to make healthy choices as they pass through the cafeteria line.

(d) **Bienestar Health Club** curriculum involves after-school learning activities aimed at rehearsing and reinforcing classroom learning and promoting leisure time with moderate to vigorous physical activity. The club provides students with opportunities to develop efficacy beliefs and self-regulatory skills through club learning activities. The health club will teach health topics by playing games and reinforce classroom learning by engaging in problem-solving activities. A section of the club time will be used to play games that involve moderate physical activity levels. Parents are welcomed in this after-school activity. The Bienestar Health Club promotes exercise and the concept that learning can be fun and recreational. This curriculum includes an instructor's manual and student workbook.

All materials are published and available to other schools with at-risk, low-income students. More information can be obtained from the Bienestar office at the Social & Health Research Center in San Antonio, Texas, by calling (210)533-8886 or via E-mail at Shrct@msn.com.

5) Wellness Promotion Programs

A myriad of programs have been developed to foster individual and community wellness. Many of these programs, available through governmental agencies and national voluntary health organizations (See Section VII. Diabetes Resources) have resources to implement health promotion campaigns and other activities within communities. These resources can often be directly downloaded from the Internet. For example:

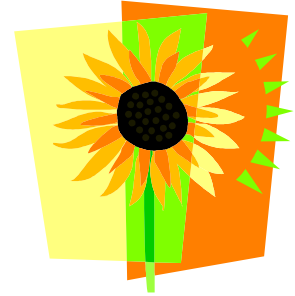
Centers for Disease Control and Prevention/ National Center for Chronic Disease Prevention and Health Promotion at <http://www.cdc.gov/nccdphp/dnpa/npa-proj.htm> - Lists and links to programs such as the 5-A-Day for Better Health, Kids Walk-to-School, ACEs: Active Community Environments, and Obesity and Overweight: State Programs.

American Heart Association's HeartPower! Online is a curriculum-based program including lessons on nutrition and physical activity targeted to teachers, grades preK-8. All resources are downloadable from <http://www.americanheart.org> (click on Free Teacher Resources).

E. Challenges to School Nurses

Be Proactive and Positive

Keep an outlook that is positive and proactive, not blaming and shaming. People who are overweight and at risk for or who have Type 2 diabetes are not bad people. There may well be barriers to making changes.



Reduce Barriers

Look for ways to help students and their families reduce barriers to healthy lifestyles. If a student wants to make healthy food choices, does the school environment have healthy choice options?

Does the student have an opportunity to be physically active? You may be the only one who even considers these things.

Communicate Opportunities

You may be aware of opportunities for fitness and good nutrition that students, families and the doctor do not know exist. Is there a low-cost after-school swimming program in the school's community? Is there an after-school program with physical activity you can tell parents and/or the student's doctor about?

Start Small

Instead of being overwhelmed by the challenges, start small. You don't have to change the whole world to make it better. Can you take a 30-minute lunch break 2-3 times a week and lead a walking program for a small group of overweight girls who want to make a change?

Be a Model

Whether or not you are overweight, you can share your goals and the challenges to maintaining a healthy lifestyle with other faculty, students and families. Show them what you are doing to improve your own health.

Keep A Sense of Humor

Having a sense of humor about yourself and life situations will keep things in perspective. Acknowledging the strengths and weaknesses of our common humanity will endear you to all those you serve. You can move mountains.

F. Strategies School Nurses Can Use Today to Make a Difference

1) **If you do nothing else, counsel students to drink water or diet drinks, not regular soda.** Consider that an extra 140 calories per day in a 12-ounce can of regular soda, above and beyond what is spent through physical activity, adds up to 14 pounds per year. For the average 8 year old child, this 14 pounds translates into an increase of 25% of the child's body weight.

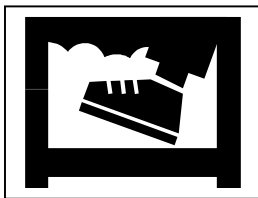
2) Use educational materials on physical activity and nutrition to educate students, teachers, parents and families. **Visit the U.S. Department of Agriculture's "Team Nutrition" website at <http://fns.usda.gov/tn> or Tufts University Nutrition Navigator site at <http://navigator.tufts.edu/educator/children.html>** (See Section VI.D. Family/Community/School-Based Interventions for other resources).

3) Find out if the school cafeteria is offering healthy options for students to choose and what can be done to help make healthy options available.



4) Find out what is going on in the PE and aftercare programs at your school. Are students who are overweight given equal opportunity to be physically active? Are there other programs in the community that the physical education teacher knows about that you can tell students, parents and the clinician caring for students with Type 2 diabetes about?

5) Suggest to parents and their children who ride the bus to consider walking to school if they can or to get off the bus one or two stops sooner and walk the rest of the way home.



6) Implement a walking program. It can be as basic as walking with two or three overweight students during lunch time.

7) Share information on the CATCH program or other school-based nutrition and physical fitness programs with school personnel.

8) Share information on community wellness programs with PE instructors, teachers, administrators, and others.



VII. DIABETES RESOURCES

Families of children with Type 2 diabetes should be strongly encouraged to discuss resources for diabetes information and services with their health care providers.

The following list is provided to augment information available to families. It covers only some of the many organizations that may provide education, information, referral, and health services related to diabetes.

National Organizations

American Association of Diabetes Educators
1-800-832-6874 for a list of diabetes educators in your area
<http://www.diabetesnet.com/aade.html>

American Cancer Society
<http://www.cancer.org>
Search the Prevention and Early Detection section under Staying Active and Nutrition for Risk Reduction for a calories-needed calculator, target heart rate calculator, tips on maintaining your exercise program, nutrition and activity quiz and more. Try also searching http://www.cancer.org/eprise/main/docroot/PED/ped_0

American Diabetes Association
<http://www.diabetes.org>
Provides educational materials and information about support programs for diabetes prevention, community service, and research.

American Dietetic Association
Consumer Nutrition Hotline: 1-800-366-1655; has a list of registered dietitians in your area
<http://www.eatright.org>

American Heart Association
<http://www.americanheart.org>
Provides educational materials and information about health promotion. Example: HeartPower! Online is a curriculum-based program including lessons on nutrition and physical activity targeted to teachers, grades preK-8. All resources are downloadable from the AHA website listed above (click on Free Teacher Resources).

Centers for Disease Control and Prevention
National Center for Chronic Disease Prevention and Health Promotion
<http://www.cdc.gov/nccdphp/dnpa>.
CDC Division of Diabetes Translation <http://www.cdc.gov/diabetes>;
Provides educational materials and information about diabetes statistics, diabetes prevention, community service, research, resources and more.

Children with Diabetes

<http://www.childrenwithdiabetes.com>

A non-profit educational "on-line community for children, families and adults with diabetes."

Diabetes Self Care

1-800-928-8220

Mail order diabetes supplies and equipment. Free home delivery and training on glucose meter.

Juvenile Diabetes Research Foundation International

<http://www.jdf.org>

Medic Alert Foundation

P.O. Box 819008

Turlock, California 95381-1009

1-800-ID-ALERT (432-5378)

For medical information jewelry and national registry service.

National Center for Cultural Competence

<http://www.georgetown.edu/research/gucdc/nccc>

A federally funded agency whose mission is to increase cultural competence of health systems and programs. Primary health programs include a Healthy Schools component.

National Council of La Raza

<http://www.nclr.org>

Hispanic advocacy organization that offers diabetes publications through their web site.

National Diabetes Information Clearinghouse

National Institute for Diabetes & Digestive

& Kidney Diseases

<http://www.niddk.nih.gov/health/diabetes/ndic.htm>

United States Department of Agriculture - Food and Nutrition Information Center

Food Guide Pyramid - Copyright free materials that can be downloaded from Internet

<http://www.nal.usda.gov/fnic>

1-800-687-2258

Weight-control Information Network

National Institute for Diabetes & Digestive & Kidney Diseases (NIDDK)

NIH/NIDDK Publications No.97-4096, "Helping Your Overweight Child"

Can also be downloaded from the Internet at

<http://www.niddk.nih.gov/health/nutrit/pubs/helpchld.htm>

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