Diabetes in Schools: Putting the Pieces Together for Successful Prevention and Management

National Diabetes Education Program Quarterly Webinar Series
Thursday, August 22, 2013
2-3 PM ET
Objectives

• Discuss research findings related to diabetes in children and adolescents and the implications of these findings.

• Explain how the NDEP’s *Helping the Student with Diabetes Succeed: A Guide for School Personnel (School Guide)* can be successfully implemented in a school setting.

• Provide resources to help participants promote diabetes prevention and management messages to children and adolescents.
Presenters

Francine R. Kaufman, M.D.
Chief Medical Officer, Medtronic Diabetes, Emeritus Professor of Pediatrics, Keck School of Medicine, University of Southern California, and Children’s Hospital Los Angeles, CA

Leah Wyckoff, M.S., B.S.N., R.N., N.C.S.N.
School Nurse Consultant
Douglas County School District, Denver, Colorado

Joanne Gallivan, M.S., R.D.
Director, National Diabetes Education Program
National Institutes of Health
Program Overview

• US Department of Health and Human Services program jointly sponsored by:
  – National Institutes of Health
  – Centers for Disease Control and Prevention
  – With over 200 public and private partners

• Seeks to reduce the burden of diabetes in the US by:
  – facilitating adoption of proven approaches to prevent or delay the onset and progression of diabetes and its complications
Webinar Logistics

• All lines are muted

• Two ways to ask questions during Q&A period:
  1. Type your question into the chat section and we will read your question aloud
  2. Click the “raise hand” icon and we will call your name and unmute your line allowing you to ask your question
Type 2 Diabetes in Youth

Francine R. Kaufman, M.D.
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Type 2 Diabetes in Youth

• Marked increase in T2D in youth in late 1990s, following the rise in childhood obesity
• Increasing in all groups, but most prevalent in minority populations
  – Diagnostic criteria (ADA Practice Guidelines)
  – Screening recommendations (ADA/AAP Consensus Statement)
• Research efforts: epidemiology (SEARCH), treatment (TODAY), and prevention (HEALTHY)
**ADA Guidelines for the Diagnosis of Diabetes**

The same criteria for youth and adults

<table>
<thead>
<tr>
<th>A1C $\geq 6.5%$. The test should be performed in a laboratory using a method that is NGSP certified and standardized to the DCCT assay.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR</td>
</tr>
<tr>
<td>FPG $\geq 126$ mg/dl (7.0 mmol/l). Fasting is defined as no caloric intake for at least 8 h.*</td>
</tr>
<tr>
<td>OR</td>
</tr>
<tr>
<td>2-h plasma glucose $\geq 200$ mg/dl (11.1 mmol/l) during an OGTT. The test should be performed as described by the World Health Organization, using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water.*</td>
</tr>
<tr>
<td>OR</td>
</tr>
<tr>
<td>In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose $\geq 200$ mg/dl (11.1 mmol/l).</td>
</tr>
</tbody>
</table>

*In the absence of unequivocal hyperglycemia, criteria 1–3 should be confirmed by repeat testing.
Screening: ADA/AAP Consensus Statement 2000

• Criteria*: Overweight (BMI > 85th %ile for age and sex, weight for height > 85th %ile, or weight > 120% of ideal for height)

• PLUS: any two of the following risk factors:
  – Family history of DM 2 in 1st or 2nd degree relative
  – Race/Ethnicity
  – Signs of insulin resistance

• Age of Initiation: age 10 or at onset of puberty

• Frequency: every two years in the context of health visit

• Test: Fasting plasma glucose preferred

* Clinical judgment should be used
SEARCH for Diabetes in Youth

- Funded in 2000 by CDC and NIDDK to provide population-based statistics
- Six centers (South Carolina, Cincinnati, Colorado, Seattle, So. CA Kaiser, Hawaii) plus CoC (Wake Forest)
- Register youth with diabetes ≤ 19 years old
- Ascertain Prevalence in 2001 and Incidence in 2002 and ongoing
Type 2 Diabetes in Youth

Rate of new cases of type 1 and type 2 diabetes among youth ages younger than 20 years, by race/ethnicity, 2002–2005

- **ALL**
- **NHW**
- **NHB**
- **H**
- **API**
- **AI**

<10 years

10–19 years
Based on 2002 and 2003 SEARCH Data

- Incidence estimated at 24.3 per 100,000/y
  - 15,000 youth diagnosed with type 1
  - 3,700 youth diagnosed with type 2
- Youth aged <10 years, most cases are type 1, regardless of race/ethnicity
  - Highest in non-Hispanic whites (19/100,000 for 0–4 y and 28/100,000 for 5–9 y)
- Youth ages 10–14 and 15–19 years, highest incidence of type 1 in non-Hispanic white youth (33 and 15)*
  - Followed by African American (19.2 and 11.1)* and Hispanic (17.6 and 12.1)* and lowest among American Indian (7.1 and 4.8)* and Asian/Pacific Islanders (8.3 and 6.8)*
- Incidence of type 2 highest among American Indians (25.3 and 49.4)*
  - Followed by African Americans (22.3 and 19.4)*, Asian/Pacific Islanders (11.8 and 22.7)* and Hispanics (8.9 and 17.0)*, and is low (3.0 and 5.6)* among non-Hispanic whites

*Numbers expressed as per 100,000 per year for ages 10-14 years and 15-19 years
Cardiovascular Disease Risk Factors

68% AI, 37% Asian, 32% AA, 35% Hispanics, 16% Whites (p<0.0001)

At least 2 risk factors
92% of type 2
14% of type 1
(p<0.0001)

Rodriguez et al, Diabetes Care, 2006
Diabetes Care 29;1891,2006
Treatment Options for Type 2 Diabetes in Adolescents and Youth

June 2013
Primary Aim and Outcome

• To compare three treatment regimens on time loss of glycemic control
  – Metformin
  – Metformin + rosiglitazone
  – Metformin + intensive lifestyle

• Outcome
  – HbA1c ≥ 8.0% for at least 165 days (5½ months) or ended TODAY ≥ 10%
  – Inability to wean from temporary insulin therapy due to metabolic decompensation (forced wean by algorithm)

CONSORT Diagram

Screening
N = 1211

Run-in
N = 927 (76.5%)

Exclusions, N = 284
- Positive antibodies: 116 (9.6%)
- C-peptide < 6: 14 (1.1%)
- Transaminase > 2.5 ULN: 17 (1.4%)
- Other: 137 (11.3%)

Randomization
N = 699 (57.7%)

Exclusions, N = 228
- Inability to maintain A1c < 8%: 74 (8.0%)
- Transaminase > 2.5 ULN: 3 (0.3%)
- Inability to complete run-in: 89 (9.6%)
- Other: 57 (6.1%)
# Rates of Treatment Failure

319 of 699 = 45.6% experienced PO over a maximum 72 months of follow-up

<table>
<thead>
<tr>
<th>Treatment arm</th>
<th>Failure rate</th>
<th>Median time to failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Met + rosi</td>
<td>90 of 230</td>
<td>10.3 months</td>
</tr>
<tr>
<td>Met + lifestyle</td>
<td>109 of 234</td>
<td>12.0 months</td>
</tr>
<tr>
<td>Met alone</td>
<td>120 of 232</td>
<td>11.8 months</td>
</tr>
</tbody>
</table>

TODAY Study: Time-to-outcome analysis

Failure Rates
- M: 51.7%
- M+R: 38.6%
- M+L: 46.6%

Pairwise Tests
- M+L vs. M+R: p=0.15
- M vs. M+R: p=0.006
- M vs. M+L: p=0.17

Time from randomization in months

Number at Risk
- 699
- 542
- 425
- 297
- 187
- 92

Proportion not experiencing glycemic failure

Predictors of Failure

• Baseline A1c is the primary predictor of likelihood of failure (irrespective of therapy)
  – Patients who do not normalize their A1c on metformin alone within a few months appear to be at higher risk of failure on therapy.

• Over time in treatment, rising A1c – even though in the normal range – is associated with failure
  – Rising A1c suggests the need to intensify treatment, early even while the patient has an A1c below 6.5%.

• These relationships are not affected by treatment group, race-ethnicity, or sex
TODAY: Risk Factor Control and Emerging Microvascular Disease

Worsening Outcomes in TODAY youth

<table>
<thead>
<tr>
<th>Condition</th>
<th>Baseline</th>
<th>End of Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>11.6</td>
<td>33.8</td>
</tr>
<tr>
<td>Microalbuminuria</td>
<td>6.3</td>
<td>16.6</td>
</tr>
<tr>
<td>LDL &gt; 130</td>
<td>4.5</td>
<td>10.7</td>
</tr>
<tr>
<td>Retinopathy</td>
<td>13.7</td>
<td></td>
</tr>
</tbody>
</table>

Summary and Implications

• Metformin monotherapy is inadequate for half of youth with type 2 diabetes
• The role of intensive lifestyle interventions in youth with type 2 diabetes is uncertain
• Youth with type 2 diabetes have high and increasing rates of hypertension, microalbuminuria, and dyslipidemia, as well as evidence for end organ cardiac damage
• Youth with type 2 diabetes have high rates of depression and come from families challenged by poverty, poor education and widespread poor health
• There are important race/ethnicity differences among youth with type 2 diabetes in the US
HEALTHY
A Middle School Program for Diabetes Prevention
HEALTHY Study Design

• Population-based intervention
• School as unit of randomization – n=42
• Follow 6th grade cohort for 3 years
• Intervention
  – Environmental changes to school food service and physical education class activities
  – Behavior change activities
  – Communications and promotional campaign
• Primary outcome: Combined prevalence of overweight plus obesity
HEALTHY School Eligibility

• 42 middle schools
  – 6 @ 7 field centers
  – 21 randomized to Intervention
  – 21 to Control (data collection only)

• Eligible schools were
  ≥ 50% minority and/or
  ≥ 50% eligible for free/reduced lunch

• Eligible 6th graders took PE, had no diabetes, provided consent/assent for data collection
The HEALTHY Intervention

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Intervention themes and targeted behaviors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. THEMES</strong></td>
<td></td>
</tr>
<tr>
<td>Winter/Spring 6th Grade</td>
<td>Water versus added sugar beverages</td>
</tr>
<tr>
<td>Fall 7th Grade</td>
<td>Physical activity versus sedentary behavior</td>
</tr>
<tr>
<td>Winter/Spring 7th Grade</td>
<td>High-quality versus low-quality food</td>
</tr>
<tr>
<td>Fall 8th Grade</td>
<td>Energy balance: energy in/energy out</td>
</tr>
<tr>
<td>Winter/Spring 8th Grade</td>
<td>Strength, balance, and choice for life</td>
</tr>
</tbody>
</table>

| **B. TARGETED BEHAVIORS** | |
| • Increasing water consumption | |
| • Substituting water for added sugar beverages | |
| • Drinking water for health, nutrition, and hydration | |
| • Choosing healthier foods and drinks for meals and snacks | |
| • Substituting nutrient dense, lower caloric foods for low nutrient, higher caloric foods | |
| • Self-monitoring, goal setting, and problem solving to increase intake of water, fruits, and vegetables | |
| • Increasing movement and accumulation of time spent being active | |
| • Decreasing time spent in sedentary behavior | |
| • Substituting physical activity for sedentary behavior | |
| • Self-monitoring, goal setting, and problem solving to increase physical activity and decrease sedentary behavior | |
The HEALTHY Intervention

Nutrition and School Food Environment
- $3000 per year to the food service department to defray costs
- Hands-on monitoring and guidance from a dietician expert on the staff of each field center
- Food service staff training to deliver the intervention
  - Manager received $50 for 4- to 6-h initial training and $25 per semester for 2-h booster training, plus $100 per semester collection procedures related to documenting delivery of intervention
  - Workers received $50 for 4- to 6-h initial training and $25 per semester for 2-h booster training
  - Semester theme-related messaging posted along the cafeteria line
  - 1 or 2 taste tests per semester to introduce new or unfamiliar products
  - 1 cafeteria learning laboratory per semester to provide a fun and engaging educational activity

Physical Education
- PE teacher handbook of lesson plans and classroom management for each of 6th, 7th, and 8th grades
- PE teacher training to deliver the intervention
  - 6-h training at beginning of each school year (reimbursed at hourly rate)
  - 6-h booster training in second half of school year (reimbursed at hourly rate)
  - $100 per semester for time spent in data collection procedures related to documenting delivery of intervention
  - $15,000 over 3 years in PE class equipment required to implement intervention
- Hands-on monitoring and guidance from a physical education expert on staff of each field center
- Physical education teacher aide at each school

Behavior Change
- Theme-based educational program materials for each of 5 semesters
  - Teacher manual
  - Student handbook (English and Spanish versions)
  - Materials to enhance the lessons and engage in a creative project
- Classroom teacher training to deliver the educational program
  - 4-h training at beginning of each school year (reimbursed at hourly rate)
  - 1-h booster training in second half of school year (reimbursed at hourly rate)
  - $100 per semester for time spent in data collection procedures related to documenting delivery of intervention
- 7 issues of a newsletter sent to families with first-person stories, tips, Q&A, etc.
- School break packages of materials to engage the family and maintain lifestyle and behavior change (1) during grades and (2) over 8th grade winter holiday break
- Hands-on monitoring and guidance from a health promotion expert on the staff of each field center
- Health activities aide at each school

Communications, Promotion, and Social Marketing
- Intervention launch event materials
- Exterior banners
- Semester theme-related posters, flyers, and PA announcements
- Semester theme-related school-wide activity
- Recruitment and training of a corps of student peers who assisted with study events
- Distribution of incentive and premium items to students, both branded (e.g., t-shirts, pedometers, water bottles, coupons, health care products, tunes and DVDs)
The HEALTHY Study Cohort

Table 1. Baseline Characteristics of the Students.*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total</th>
<th>Intervention Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total†</td>
<td>BMI &lt;85th Percentile</td>
<td>BMI ≥85th Percentile</td>
</tr>
<tr>
<td>No. of students (% within group)</td>
<td>4603 (100)</td>
<td>2307 (100)</td>
<td>1147 (49.7)</td>
</tr>
<tr>
<td>Age (yr)</td>
<td>11.3±0.6</td>
<td>11.3±0.5</td>
<td>11.3±0.5</td>
</tr>
<tr>
<td>Male sex (%)</td>
<td>47.3</td>
<td>47.4</td>
<td>44.2</td>
</tr>
<tr>
<td>Race or ethnic group (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>54.2</td>
<td>54.8</td>
<td>51.3</td>
</tr>
<tr>
<td>Black</td>
<td>18.0</td>
<td>20.3</td>
<td>22.2</td>
</tr>
<tr>
<td>White</td>
<td>19.3</td>
<td>17.1</td>
<td>18.6</td>
</tr>
<tr>
<td>Other</td>
<td>8.5</td>
<td>7.8</td>
<td>7.9</td>
</tr>
</tbody>
</table>

HEALTHY Results

• The combined prevalence of overweight and obesity fell by 4% in both intervention and control schools.
• The prevalence of obesity declined more in intervention schools.
• BMI z-score, prevalence of large waist circumference and fasting insulin fell significantly in intervention schools (p=0.04).
• In the overweight/obese subgroup (n=2292), intervention schools had significantly greater decreases than control schools in prevalence of:
  – obesity (p=0.04)
  – large waist circumference (p=0.03)
  – insulin (p=0.04)
## Distribution of Glycemic Risk Factors by BMI Percentile in HEALTHY

<table>
<thead>
<tr>
<th>BMI Percentile</th>
<th>&lt; 85 (N=3221)</th>
<th>85 - 94 (N=1255)</th>
<th>≥ 95 (N=1882)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting glucose (mg/dL)†</td>
<td>92.8 (6.7)</td>
<td>93.3 (6.8)</td>
<td>94.5 (6.6)</td>
</tr>
<tr>
<td>Fasting glucose ≥ 100</td>
<td>13.5%</td>
<td>15.5%</td>
<td>20.8%</td>
</tr>
<tr>
<td>Fasting insulin (μU/mL)†</td>
<td>8.4 (5.2)</td>
<td>12.8 (7.5)</td>
<td>22.1 (15.8)</td>
</tr>
<tr>
<td>Fasting insulin ≥ 30</td>
<td>0.8%</td>
<td>3.0%</td>
<td>19.6%</td>
</tr>
</tbody>
</table>

*Diabetes Care 29;212;2006  Diabetes Care 32:953;2009  p < .0001§*
HEALTHY Results: Significant Intervention Effect in Prevalence of Hypertension in Non-Hispanic Black and White Males

<table>
<thead>
<tr>
<th>Table 3 Distribution of blood pressure categories in males, by race/ethnicity and treatment group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood pressure categories</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>&lt;90th percentile (normal)</td>
</tr>
<tr>
<td>Intervention</td>
</tr>
<tr>
<td>Control</td>
</tr>
<tr>
<td>90th–94th percentile (pre-HTN)</td>
</tr>
<tr>
<td>Intervention</td>
</tr>
<tr>
<td>Control</td>
</tr>
<tr>
<td>95th–99th percentile (HTN stage 1)</td>
</tr>
<tr>
<td>Intervention</td>
</tr>
<tr>
<td>Control</td>
</tr>
<tr>
<td>&gt;99th percentile (HTN stage 2)</td>
</tr>
<tr>
<td>Intervention</td>
</tr>
<tr>
<td>Control</td>
</tr>
</tbody>
</table>
## What Did We Learn about Screening from HEALTHY?

### Results of the HEALTHY Study and Pilot

<table>
<thead>
<tr>
<th>Measurement</th>
<th>6\textsuperscript{th} grade</th>
<th>8\textsuperscript{th} grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(N = 6367)</td>
<td>(N = 1740)</td>
</tr>
<tr>
<td><strong>BMI (kg/m(^2))</strong> Mean (SD)</td>
<td>22.4 (5.7)</td>
<td>24.3 (5.9)</td>
</tr>
<tr>
<td><strong>BMI percentile</strong> (adjusted for age and gender)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 85</td>
<td>50.5%</td>
<td>51.0%</td>
</tr>
<tr>
<td>85-94</td>
<td>19.8%</td>
<td>19.8%</td>
</tr>
<tr>
<td>≥ 95</td>
<td>29.7%</td>
<td>29.2%</td>
</tr>
<tr>
<td><strong>Fasting glucose (mg/dL)</strong> Mean (SD)</td>
<td>93.4 (6.7)</td>
<td>98.2 (8.5)</td>
</tr>
<tr>
<td>&lt; 100</td>
<td>84.0%</td>
<td>59.5%</td>
</tr>
<tr>
<td>100-109</td>
<td>14.7%</td>
<td>34.3%</td>
</tr>
<tr>
<td>110-125</td>
<td>1.2%</td>
<td>5.8%</td>
</tr>
<tr>
<td>≥ 126</td>
<td>0.1%*</td>
<td>0.4%**</td>
</tr>
</tbody>
</table>

*\(n=6\) of which only 1 confirmed on follow-up testing; **\(n=7\)

| Fasting insulin (µU/mL) ≥ 30 | 6.2%                          | 36.2%                         |

References:

Diabetes Care 29;212;2006; Diabetes Care 32:953;2009
Conclusions

• Primary outcome was negative, associated with an unexpected decline in overweight/obesity in control schools

• Intervention did decrease obesity, other indicators of adiposity, and insulin among low income, ethnically diverse youth

• Obesity is associated with the greatest health risk in middle school students. At a public health level, even small rates of change can have important implications
Role of the School Nurse (RN) as Provider of Diabetes Care Coordination in the School Setting

Leah Wyckoff, M.S., B.S.N., R.N., N.C.S.N.
Douglas County School District
School Nurse Consultant

leah.wyckoff@dcsdk12.org
Helping the Student with Diabetes Succeed: A Guide for School Personnel

Purpose:

• Educate school personnel about effective diabetes management

• Share a set of practices that enable schools to ensure a safe learning environment for students with diabetes

Provides Key Elements for School Nurses
Role of the School Nurse: Communication

- Establishes channels of communication with student, parent/guardian, school personnel, healthcare providers.
Role of the School Nurse: Collaboration

- Collaborates with the student, parent/guardian, healthcare providers to develop an individualized healthcare plan (IHP), based on the Diabetes Medical Management Plan (DMMP), e.g. provider orders.
- IHP outlines the who, what, where, when for the student’s diabetes care tasks and includes the Hypo-Hyperglycemia Emergency Care Plans and Disaster Plan.
Role of the School Nurse: Training

- Trains school personnel in effective diabetes care in the school setting
- Goals:
  - Safety of the student
  - Maximize long-term health
  - Student ready to learn and participate fully in school activities
  - Minimize disruption of classroom activities
Role of the School Nurse: Supervision

• Daily management and self-management skills
• Supervises unlicensed assistive personnel
Role of School Nurse: Evaluation

- Ongoing evaluation of student’s progress to goals outlined in IHP and modifies plan as needed
- Evaluates school’s disaster preparedness process/plans
Role of School Nurse: Support

• Supports student in transition to diabetes self-management
Building the School Team to Support the Student with Diabetes

• Using the NDEP *School Guide* in identifying appropriate school personnel
• Using the “Actions” for educating school personnel
Training Using the NDEP Guidelines for the Three Tiered Training Model

- Diabetes Primer
- Three levels of Diabetes Management training:
  - Level 1: All school personnel
  - Level 2: Classroom teachers and all school personnel who have responsibility for the student with diabetes during the school day
  - Level 3: Trained diabetes personnel
Role of the School Nurse: Section 504 Process

• Provides a link between the medical and education communities
• A primary resource to the family and school team
Helping the Student with Diabetes Succeed

As the provider of diabetes care coordination in the school setting, the school nurse facilitates student success!
Diabetes Management Resources for Schools and Youth

Joanne Gallivan, M.S., R.D.
Director, National Diabetes Education Program
National Institutes of Health
Diabetes Resources for Schools and Youth

NDEP offers a variety of resources on diabetes in children and teens.

1. Diabetes Resources for Schools
   - Helping the Student with Diabetes Succeed: A Guide for School Personnel
   - Diabetes HealthSense

2. Diabetes Education for Children and Adolescents
   - Tip Sheets Series for Children and Teens

3. Diabetes Education for Parents
   - When Your Child is Diagnosed with Diabetes: Parents’ Questions for the Health Care Team
   - Transitions from Pediatric to Adult Care

4. Teens Quiz and Focus on Research
   - NDEP Quiz for Teens with Diabetes
   - Links to TODAY and HEALTHY research study websites

What is NDEP Promoting this Quarter?

Coming Soon: National Diabetes Month 2013

• November is National Diabetes Month: *Diabetes is a Family Affair*

• Partner Call – September 10, 2PM EDT
  https://www3.gotomeeting.com/register/342847374

• To learn more, visit the National Diabetes Month page at
  www.ndep.nih.gov/DiabetesMonth2013
Webinar Slides and Evaluation

- Webinar Series Webpage
  - http://ndep.nih.gov/resources/webinars
- Presentation Slides
- Webinar Evaluation
- Certificate of Completion for Webinar Attendees
  - ndep@hagersharp.com
Questions and Answers