Prepared by MN Dept of Health, MN Diabetes Steering Committee (MDSC) workgroup and University of Minnesota Pediatric Endocrinology

ALGORITHM FOR PREDIABETES & TYPE 2 DIABETES MELLITUS (T2DM) IDENTIFICATION & INTERVENTION FOR YOUTH (AGE 10-17 YEARS or PERIPUBERTAL)

BMI ≥ 85th percentile and/or Waist Circumference > 90th % for age AND

- Evidence for insulin resistance and/or metabolic syndrome*
  - Acanthosis Nigricans
  - Polycystic ovary syndrome
  - Hypertension (>95th % for age, gender and height OR > 130/85)*
  - HDL <40 mg/dL*
  - Triglyceride >150 mg/dL*

OR any two of the following:

- Family history of diabetes in 1st or 2nd degree relative
- Latino, Black, Native American, Asian, Pacific Islander
- Child's birth mother has diabetes or history of Gestational Diabetes Mellitus
- Child born small or large for gestational age

1) Perform Fasting Plasma Glucose (FPG) or
2) Hemoglobin A1c (A1c) (see back for guidelines)

FPG <100 mg/dl and A1c < 5.6 %

Test FPG and/or A1c annually

FPG = 100-125 mg/dl AND/OR A1c 5.7-6.4%

FPG ≥126 mg/dl AND/OR A1c ≥6.5%

Patient has Prediabetes *

- **Consider Performing Oral Glucose Tolerance Test and/or consulting with pediatric endocrinologist**
- Provide counseling on lifestyle changes (outlined on back)
- Maintain weight for child during growth years
- Simple diet changes (outlined on back). Refer to RD for medical nutrition therapy.
- Simple activity changes: Goal to reach 60 minutes/day for child and adult family members 150 minutes/week. (outlined on back)
- Actively refer to structured community programs, if available.

Patient has T2DM*

- *2nd confirmatory test (FPG) on another day is recommended unless unequivocal evidence of hyperglycemia
- Initiate Medical Nutrition Therapy/Lifestyle Changes
- (Metformin ± insulin)
- Consult with pediatric endocrinologist or CDE

Patient achieving lifestyle goals?

NO / YES

YES →

- Give positive feedback.
- Re-test FPG and HbA1c every 4 months

NO ↓

Consider starting Metformin. See dosage recommendations on back

ADDITIONAL INFORMATION

METFORMIN: Starting dosage 500 mg QD with food. Increase dose every 1-2 weeks, to achieve clinically effective dose of 1000-2000 mg/day, based on tolerability. Consider use of Extended Release formulation if patient experiencing significant side effects. Follow-up: Every 1-3 months. Do not use in patients with underlying kidney disease. *Consideration of Metformin use in overweight adolescents not meeting criteria for T2DM is off-label and based on limited published data and consensus of MN diabetes steering committee.*

Prediabetes and Diabetes: Screening and Diagnosis

The current recommended diagnostic test to identify children with pre-diabetes to receive lifestyle interventions is either A1c or FPG. A1C is a measure of long-term blood glucose control and is used to monitor the effectiveness of therapy and risk for complications in persons with diagnosed diabetes. However, an A1c of ≥ 5.7 % may help identify an additional at risk group of children. An A1c ≥ 6.5% performed in a laboratory using standardized methods is now considered a criteria for diagnosis of diabetes. An oral glucose tolerance test may define impaired glucose tolerance or diabetes and should be considered in children with impaired fasting glucose or an A1c in prediabetes range.. To calculate risk factors for BMI and blood pressure calculations refer to:
http://www.cdc.gov/growthcharts/ (BMI)
http://www.nhlbi.nih.gov/guidelines/hypertension/child_tbl.htm (blood pressure)

Prediabetes and Diabetes: Recommended Lifestyle Changes for Entire Family

Simple Diet Changes

- Become a label reader and limit portion sizes; observe serving size and calories per serving
- Limit snacks to 1 serving size; try fresh fruits and vegetables for snacks 2-3 days per week
- Eat less processed and high fat foods; limit fast food and restaurant eating to <1-2 meals per month
- Switch to 1% or skim milk
- Encourage water consumption; eliminate carbohydrate containing beverages (pop, sweetened tea, energy drinks, juice)
- Eat breakfast and try not to skip meals

Simple Activity Changes

- Be active together as a family; Eat meals together as a family whenever possible
- Walk and take the stairs; park in distant spots and walk a bit farther when shopping
- Encourage trying new sports or activities that increase physical activity
- Limit screen time (TV, computer, video games) to 2 hours or less per day
- Consider referral to community programs at YMCA, YWCA, Park & Recreation Centers

Resources

- NDEP: Tips for Teens: Lower Your Risk for Type 2 Diabetes at http://ndep.nih.gov/teens/index.aspx and http://ndep.nih.gov/media/kids-tips-lower-risk.pdf
- DHHS: Small Step Kids: http://www.smallstep.gov/ (also in Spanish)
- American Dietetic Association: http://www.eatright.org (for additional help with label reading)
- Pediatric Obesity Management: http://www.aap.org/obesity/practice_management_resources.html

References

Srinivasan S, et.al. J Clin Endocrinol Metab 2006; 91:2074-2080. Freemark M, et.al. Pediatrics 2001;107(4):e55; Kay JP et al. Metabolism 2001;50:1457-61; Love-Osborne K, et.al. J Pediatr 2008; 152: 817-22; American Diabetes Association. Executive Summary: Standards of Medical Care in Diabetes - 2010 Diabetes Care, 2010.33:S11-69; Fernández JR, et.al. J Pediatr 2004;145:439-44. (waist circumference tables); Nathan DM, et.al. Diabetes Care, 2009; 32: 1327-34

Common ICD-9 codes for Diabetes Screening		Codes Describing Risk Factors	
V77.1	Diabetes Screening	277.7	Dysmetabolic Syndrome
790.21	Impaired Fasting glucose	278.00	Obesity
790.22	Impaired glucose tolerance test (oral)	278.02	Overweight
790.29	Prediabetes NOS/Abnormal Glucose Value	701.2	Acanthosis Nigricans
		V18.0	Family History Diabetes