Comparison of Gestational Diabetes Mellitus Guidelines

Guidelines for screening, testing and diagnosis of gestational diabetes mellitus (GDM) vary among US based advocacy groups as much as they vary among international entities. As several articles reviewed for this overview suggest, efforts to balance efficacy and costs with a rising rate of obesity and glucose intolerance in young women in industrialized countries has been controversial for the last two decades. The major points of contention are the risk factors, the point of initial screening, the types of testing to undertake, the thresholds for diagnosis of GDM, and management strategy.

For instance, even the question of whom to screen and when raises questions within the United States. The **United States Preventive Services Task Force (**USPSTF**)** concluded "the current evidence is insufficient to assess the balance of benefits and harms of screening for gestational diabetes mellitus, either before or after 24 weeks of gestation." Beginning in 2011, the Patient Protection Patient Protection and Affordable Care Act (PPACA) [PL 111-148] mandates that no coinsurance or deductibles will be charged in traditional Medicare for preventive services that are rated A or B by the USPSTF. While few Medicare beneficiaries are likely to be diagnosed with GDM, the provision does increase the visibility and potential impact of the USPSTF and makes the lack of GDM recommendations more significant. However, healthcare reform opponents have targetted this provision for amendment and/or repeal.

Nonetheless, two well-respected organizations, the nation's leading diabetes advocacy group and an important clinician membership organization, do not agree with the USTFPS' lack of recommendation. The **American Diabetes Association** (ADA) suggests initial screening of all pregnant mothers based on risk, with high-risk women undergoing glucose testing immediately and average risk women having the tests between 24-28 weeks of gestation. The **American College of Obstetricians and Gynecologists** (ACOG) concurs with ADA, with a broad approach of screening all pregnant women by patient history, clinical risk factors or laboratory screening test. However, not all practitioner groups take this approach. The **American Academy of Family Practitioners** (AAFP) mirrors the USPSTF, by concluding that the "current evidence is insufficient to assess the balance of benefits and harms of screening for gestational diabetes mellitus (GDM), either before or after 24 weeks gestation."

To address the "insufficient evidence" cited by both the USPSTF and AAFP, **Rep. Eliot Engel** (D-NY) and **Sen. Jeanne Shaheen** (D-NH) introduced the Gestational Diabetes Act (GEDI Act) (HR 5354/S 3966) to develop a multisite, gestational diabetes research project within the Centers of Disease Control and Prevention's (CDC) diabetes program to expand and enhance surveillance data and public health research on gestational diabetes. The bill would also provide demonstration grants to reduce the incidence of gestational diabetes and expand basic, clinical and public health research investigating gestational diabetes, and current treatments. The bill was approved by the House on September 30, 2010 but is still pending in the Senate. As the bill has bipartisan support in the House, it will likely be introduced in the 112th Congress (2011-2012) for reconsideration.

Internationally, there is variety among recommendations for testing, diagnosis and treatment as well. In 2008, the **International Association of Diabetes and Pregnancy Study Groups** (IADPSG) undertook the task of finding international consensus for GDM diagnosis reviewing

the results of the Hypoglycemia and Adverse Pregnancy Outcomes (HAPO) study and other studies. The objective of the HAPO study was to clarify the risk of adverse outcome associated with degrees of maternal glucose intolerance levels by studying a heterogeneous, multinational, multicultural, ethnically diverse cohort, of 25,000 women. This was intended to provide data on the associations that could be used to derive internationally acceptable criteria for diagnosis and classification of GDM.[1]

The IADSPG Consensus Panel reached consensus on a number of items regarding HAPO's findings. In general, IADSPG guidelines recommend that high-risk women should be screened for diabetes on their first prenatal visit and be diagnosed with GDM if they have glucose levels above the new lower thresholds of 5.1mmol/l.

It was hoped that the report would "be considered by diabetes, obstetric and other organizations and serve as the basis of for internationally endorsed criteria for the diagnosis and classification of pregnancy."[2] However, there has been little movement to adopt the consensus guidelines. Perhaps this is due to suggestions that adoption of the lower threshold would increase the number GDM diagnoses from 8% to 18% of pregnancies. As outlined by Professor Robert Moses, director of diabetes services with the South Eastern Sydney and Illawarra Area Health Service, there are problems that will arise related "to the health care costs of these additional diagnoses as well as possible perceptions about the "medicalization" of pregnancy. The inevitable increase in costs may be a disincentive for some national health care systems to adopt a consensus approach."[3]

On December 1, 2010, the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) at the National Institutes of Health (NIH) awarded the Harvard School of Public Health a contract[4] to conduct a study to provide valid and reliable data from a cohort of women with a history of gestational diabetes. The study will:

- Investigate the role of genetic variants important for glucose homeostasis in the progression of gestational diabetes to type 2 diabetes;
- Quantify the role of selected environmental factors (e.g., body weight and weight history characteristics, dietary factors, or physical activity) in the progression of gestational diabetes to type 2 diabetes;
- Assess the interactions of genetic and environmental factors in the progression of gestational diabetes to type 2 diabetes; and
- Identify biochemical markers (in blood, urine, or toenails) for type 2 diabetes and for subsequent use in predicting the development of type 2 diabetes among women with a history of gestational diabetes.

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[1] "The Hyperglycemia and Adverse Pregnancy Outcomes (HAPO) Study, HAPO Study Cooperative Research Group, International Journal Gynecology Obstetrics, July 2002; 78(1): 69-77.

[2] "Recommendations on the Diagnosis and Classification of Hyperglycemia in Pregnancy," International Association of Diabetes and Pregnancy Study Groups Consensus Panel,

[3] "New Consensus Criteria for GDM: Problem solved or a Pandora's box?", Robert G. Moses, MD, Diabetes Care, March 2010, vol. 33 no. 3, 690-69.

[4] Solicitation number: NIH-NICHD-DESPR-10-06, www.fbo.gov

A secondary goal of the study is to obtain baseline data on the children born from a pregnancy complicated by GDM and evaluate the feasibility of studying their long-term health conditions, possibly by establishing a new cohort comprising offspring.

The tables on the following pages outline the major guidelines and recommendations of governmental and advocacy organizations, both in the US, abroad, and in multinational groups.

- Screening recommendations
- Risk Factors
- Time of Screening
- Diagnostic Testing Recommendations
- Diagnosis of Gestational Diabetes
- Definition and Diagnosis of Diabetes
- Testing Regimen and Monitoring
- Glucose Targets During Pregnancy
- Treatment
- Post Natal testing and Follow-up

Groups Issuing Recommendations on Gestational Diabetes

US Government

- The **U.S. Preventive Services Task Force (USPSTF)** is an independent panel of non-Federal experts in prevention and evidence-based medicine and is composed of primary care providers (such as internists, pediatricians, family physicians, gynecologists/obstetricians, nurses, and health behavior specialists). The USPSTF conducts scientific evidence reviews of a broad range of clinical preventive health care services (such as screening, counseling, and preventive medications) and develops recommendations for primary care clinicians and health systems. These recommendations are published in the form of "Recommendation Statements."
    - **Recommendation cite**: U.S. Preventive Services Task Force. Screening for Gestational Diabetes Mellitus: U.S. Preventive Services Task Force Recommendation Statement. AHRQ Publication No. 08-05115-EF-2., May 2008. http://www.uspreventiveservicestaskforce.org/uspstf08/gestdiab/gdrs.htm

US Advocacy Groups

- **American Diabetes Association (ADA)** is leading the fight to stop diabetes and its deadly consequences and fighting for those affected by diabetes. The Association funds research to prevent, cure and manage diabetes; delivers services to hundreds of communities; provides objective and credible information; and gives voice to those denied their rights because of diabetes. www.diabetes.org
    - **Recommendation cite**: Gestational Diabetes Mellitus, Diabetes Care, Volume 26, Supplement 1, January 2003: http://care.diabetesjournals.org/content/26/suppl_1/s103.full.pdf+html
- The **American Congress of Obstetricians and Gynecologists (ACOG)** is a membership organization dedicated to the advancement of women's health care and the professional and socioeconomic interests of its members, through continuing medical education, practice, research and advocacy.
    - **Recommendation cite**: ACOG Practice Bulletin No. 30, Obstetrics and Gynecology, 2001; 98: 525-538.
- **American Academy of Family Physicians (AAFP)** is the national association of family doctors. It is one of the largest national medical organizations, with more than 94,600 members. The Academy was founded to promote and maintain high quality standards for family doctors who are providing continuing comprehensive health care to the public; to provide responsible advocacy for and education of patients and the public in all health-related matters; to preserve and promote quality cost-effective health care; to promote the science and art of Family Medicine and to ensure an optimal supply of well-trained family physicians;
    - **Recommendation cite:** http://www.aafp.org/online/en/home/clinical/exam/diabetes.html
    - **AAFP Peer Reviewed Article:** Diagnosis and Management of Gestational Diabetes Mellitus, *American Family Physician,* 2009 Jul 1; 80(1): pages 57-62, www.aafp.org/afp/2009/0701/p57.html.

Other US Entities

- The **Colorado Clinical Guidelines Collaborative (CCGC)** is a unique non-profit coalition of health plans, physicians, hospitals, employers, government agencies, quality improvement organizations, and other entities working together to reduce fragmentation and implement systems and processes, using evidence-based clinical guidelines, to improve healthcare in Colorado.
    - **Recommendation cite**: Gestational Diabetes, Guidelines, 2006 and Gestational Diabetes Addendum 2009; http://www.coloradoguidelines.org/guidelines/gestationaldiabetes.asp

Other Counties' Governments

- **National Institute for Health and Clinical Excellence (NICE):** A division of the United Kingdom's National Health Service (NHS), NICE provides guidance, sets quality standards and manages a national database to improve people's health and prevent and treat ill health. NICE produces public health recommendations on how to help improve people's health and prevent disease. These are aimed not just at the NHS but at local authorities and all those with a remit for improving people's health in the public, private, community and voluntary sectors.
    - care.diabetesjournals.org/content/early/2009/10/13/dc09-1376
    - **Recommendation cite:** http://www.nice.org.uk/nicemedia/live/11946/41342/41342.pdf
- **The Canadian Task Force on Preventive Health** (formerly the Canadian Task Force On The Periodic Health Examination) is currently conducting guidance development on a variety of topics, including diabetes. Their previous assertion was there was not enough high-level evidence to make a recommendation for or against screening for GDM.
    - **Recommendation cite**: Guidelines currently under review: www.canadiantaskforce.ca/recommendations__current_eng.html

Other Countries' Advocacy Groups

- **The Australasian Diabetes in Pregnancy Society (AIDPS)** is a professional body established to advance clinical and scientific knowledge of diabetes in pregnancy, to encourage dissemination of this knowledge and to foster collaboration with other regional societies interested in diabetes in pregnancy. It is also involved in the development of health policy regarding diabetes in pregnancy at the National and State levels. www.adips.org
    - **Recommendation cite**: Gestational Diabetes, Mellitus – Management Guidelines, Published 1998, Updated December 2002. Endorsed, February 2003. http://www.mja.com.au/public/issues/jul20/hoffman/hoffman.html
- **Canadian Diabetes Association (CDA)** is leading the fight against diabetes by helping people with diabetes live healthy lives while working to find a cure. A community-based network of supporters help provide education and services to people living with diabetes, advocate for the cause of diabetes, break ground towards a cure, and translate research into practical applications. www.diabetes.ca/
    - **Recommendation cite**: Diabetes and Pregnancy, Canadian Diabetes Association Clinical Practice Guidelines Expert Committee, September 2008. http://www.diabetes.ca/files/cpg2008/cpg-2008.pdf

Multinational Organizations

- **World Health Organization (WHO)** is the directing and coordinating authority for health within the United Nations system. It is responsible for providing leadership on global health matters, shaping the health research agenda, setting norms and standards, articulating evidence-based policy options, providing technical support to countries and monitoring and assessing health trends.
    - **Recommendation cite:** http://whqlibdoc.who.int/publications/2006/9241594934_eng.pdf
- The **International Diabetes Federation (IDF)** is an umbrella organization of over 200 national diabetes associations in over 160 countries. It represents the interests of the growing number of people with diabetes and those at risk. The Federation is engaged in action to tackle diabetes from the local to the global level — from programs at community level to worldwide awareness and advocacy initiatives.
    - **Recommendation cite**: Global Guideline on Pregnancy and Diabetes, 2009. www.idf.org/webdata/docs/Pregnancy_EN_RTP.pdf
- The **International Association of Diabetes and Pregnancy Study Groups** (IADPSG) was formed in 1998 as an umbrella organization to facilitate collaboration between the various regional and national groups that have a primary or significant focus on diabetes and pregnancy. The principal objectives of IADPSG are to foster an international approach to enhancing the quality of care, facilitating research, and advancing education in the field of diabetes in pregnancy.
    - During June 2008, the IADPSG sponsored an International Workshop-Conference on Gestational Diabetes Diagnosis and Classification. More than 225 conferees from 40 countries reviewed published results of the Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study, additional unpublished HAPO study findings, and results of other work that examined associations of maternal glycemia with perinatal and long-term outcomes in offspring. Subsequently, the IADPSG Consensus Panel reviewed further HAPO study results. Through this process, a consensus report was reached. "It is expected that this report will be considered by diabetes, obstetric, and other organizations and will serve as the basis for internationally endorsed criteria for the diagnosis and classification of diabetes in pregnancy."
    - **Recommendation cite**: IADPST Recommendations on the Diagnosis and Classification of Hyperglycemia in Pregnancy, Consensus Panel, March 2010: http://care.diabetesjournals.org/content/33/3/676.full

Screening Recommendations

Organization	Recommendation
USPSTF	Current evidence is insufficient to assess the balance of benefits and harms of screening for gestational diabetes mellitus (GDM), either before or after 24 weeks gestation. Harms of screening include short-term anxiety in some women with positive screening results and inconvenience to many women and medical practices because most positive screening tests are likely false-positives.
ADA	Risk assessment for GDM should be undertaken at the first prenatal visit. Women with clinical characteristics consistent with a high risk of GDM should undergo glucose testing as soon as feasible. If they are found not to have GDM at that initial screening, they should be retested between 24 and 28 weeks of gestation. Women of average risk should have testing undertaken at 24–28 weeks of gestation. ADA recently (Feb 2010) included A1c test among the tests for detecting diabetes and pre-diabetes. However, A1C tests may not be appropriate in certain situations e.g. pregnancy and anemias.
ACOG	All pregnant women should be screened for GDM by patient history, clinical risk factors, or a laboratory screening test.
AAFP	The AAFP concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening for gestational diabetes mellitus (GDM), either before or after 24 weeks gestation.
CCGC	Complete risk assessment for gestational diabetes mellitus (GDM) accounting for patient history and clinical risk factors at first prenatal encounter. If woman is high risk, screen immediately with 50-g, 1-hour OCCT. If woman is not high risk, complete universal screening between 24–28 weeks. The option to preclude universal screening at any time during pregnancy, may be considered only when ALL the following criteria are met: (1) Age < 25 years; (2) BMI ≤ 26 kg/m2; (3) Caucasian; (4) No known diabetes in a 1st degree relative; (5) No history of abnormal glucose tolerance; (6) No history of poor obstetric outcome.
NICE	At the booking appointment, risk factor should be determined. Women with any one of these risk factors should be offered testing after being informed that GDM will respond to changes in diet and exercise, some women will need oral hypoglycaemic agents or insulin therapy. Patient should also be informed that if GDM is not detected and controlled, there is a small risk of birth complications such as shoulder dystocia.
ADIPS	All pregnant women should be screened, unless resources are limited. Prospective trials are needed to clarify whether universal screening is justified and to determine the degree of maternal hypoglycemia that causes adverse outcomes.
CDA	All pregnant women should be screened for GDM. For most women, screening should be performed between 24-28 weeks. Women with multiple risk factors should be screened during first trimester, and reassessed during subsequent trimesters. Universal screening is better than a risk factor based approach.
WHO	It may be appropriate to screen pregnant women belonging to high-risk populations during the first trimester of pregnancy in order to detect previously undiagnosed diabetes mellitus. Formal systemic testing for gestational diabetes is usually done between 24 and 28 weeks.
IDF	For women who are at a high risk because of previous GDM, provide healthy lifestyle advice and offer OGTT as soon as practical. If the result is normal, offer again at 26-28 weeks of gestation. One-state definitive procedure is preferred. For all other women (unless a selective process based on risk factors is deemed more appropriate), advise that they will be offered testing for GDM at 26-28 weeks of gestation.
IADPSG	The Consensus Panel recommended a two-phase approach. The first is detection of women with overt diabetes not previously diagnosed or treated outside of pregnancy. Universal early testing in populations with high prevalence of type 2 diabetes is recommended, especially if metabolic testing in this age-group is not commonly performed outside of pregnancy. Well-designed studies should be conducted to determine whether it is beneficial and cost-effective to perform an OGTT in women who do not have overt diabetes at early testing but have indeterminate nondiagnostic results. The second phase is a 75-g OGTT at 24–28 weeks' gestation in all women not previously found to have overt diabetes or GDM.

Risk Factors

USPSTF	Finding: Women who are obese, older than 25 years of age, have a family history of diabetes, have a previous history of GDM, or are of certain ethnic groups (Hispanic, American Indian, Asian or African-American) are at an increased risk of developing GDM.
ADA	• High risk of GDM: marked obesity, personal history of GDM, glycosuria, or a strong family history of diabetes) Pregnant women who fulfill all of these criteria need not be screened for GDM (1) are 25 years of age, (2) are a normal body weight, (3) have no family history (i.e., first-degree relative) of diabetes, (4) have no history of abnormal glucose metabolism, (5) have no history of poor obstetric outcome, and (6) are not members of an ethnic/racial group with a high prevalence of diabetes (e.g., Hispanic American, Native American, Asian American, African American, Pacific Islander)
ACOG	• Low risk is defined as: (1) age younger than 25, (2) no membership in an ethnic group with increased risk for developing type 2 diabetes , (3) body mass index of 25 kg/m2or less, (4) no previous history of abnormal glucose tolerance or adverse obstetrics outcomes usually associated with GDM, and (5) no known history of diabetes in a first-degree relative. • High Risk: GDM is more likely in women who: are older than 25 years, are overweight, have had gestational diabetes before, have had a very large baby, have a close relative with diabetes, had problems in a previous pregnancy (such as stillbirth), are Native American, Asian, Hispanic, African American, or Pacific Islander, have polycystic ovary syndrome.
CCGC	Classify high-risk with one or more of the following risk factors: Advanced maternal age (age ≥ 35 years); Obesity (BMI > 29 kg/m2); High-risk ethnic population (Asian/Pacific Islander, American Indian, Hispanic, Black); Personal history of GDM; Previous macrosomic infant; History of GDM related obstetric complications; First degree relative with diabetes; Polycystic Ovary Syndrome (PCOS); Glycosuria
NICE	Risk factors include: BMI 30+ kg/m^2; previous baby 4.5+kg; previous GDM; first degree relative with diabetes; south Asian (specifically Indian, Pakistani, or Bangladesh), black Caribbean, Middle Eastern (specifically Saudi Arabian, United Arab Emigrates, Iraqi, Jordanian, Syrian, Omani, Quatar, Kuwaiti, Lebanese and Egyptian. Does not include: age, other high risk ethnic groups, past impaired glucose tolerance (IGT), polycystic ovarian syndrome.
ADIPS	Risk factors include: glycosuria, age over 30 years, obesity, family history of diabetes, past history of GDM or glucose intolerance, previous adverse pregnancy outcome and belonging to a high risk ethnic group.
CDA	Risk factors include: previous diagnosis of GDM or delivery of a macrosomic infant, member of a high-risk population (Aboriginal, Hispanic, South Asian, Asian, African), age ≥ 35 years, BMI ≥ 35 kg/m^2, polycystic ovary syndrome, acanthosis nigricans and corticosteroid use.
WHO	Individuals at high risk for gestational diabetes include older women, those with previous history of glucose intolerance, those with a history of babies who are large for their gestational age, women from certain high-risk ethnic groups, and any pregnant women who has elevated fasting, or casual, blood glucose levels.
IDF	Major risk factors for GDM include, but are not limited to, increasing maternal age and weight, previous GDM or macrosomic infant, family history of diabetes among first degree relatives, being from an ethnic background with a high prevalence of diabetes. A randomized control trial found that risk-basked screening compared with universal screening missed about half the women with GDM (1.45% v. 2.7%)
IADPSG	Decision to perform blood testing for evaluation of glycemia on all pregnant women or only on women with characteristics indicating high risk for diabetes is to be made on the basis of the background frequency of abnormal glucose metabolism in the population and local circumstances.

Recommendations for Time of Screening

USPSTF	Findings: Until there is better evidence, clinicians should discuss screening for GDM with their patients and make a case-by-case decision. If a decision is made to screen: most screening is conducted between 24-28 weeks gestation. There is little evidence about value of earlier screening.
ADA	Risk assessment for GDM should be undertaken at the first prenatal visit. High risk women should undergo glucose testing as soon as feasible. If they are found not to have GDM at that initial screening, they should be retested between 24 and 28 weeks of gestation. Women of average risk should have testing undertaken at 24–28 weeks of gestation
ACOG	It has been customary to recommend screening be administered at 24-28 weeks of gestations. 2-step method involving an initial administration of 50 g of glucose one-hour test, followed by a GTT to confirm diagnosis for patients with abnormal initial results.
CCGC	If woman does not meet any of the high-risk criteria, universal screening between 24-28 weeks. Evaluate high risk women as soon as prenatal care is established.
NICE	Offer screening for high risk patients at booking appointment, offer early self-monitoring or a 2-hour 75-g OGTT at 16-18 weeks if woman has had GDM previously, offer OGTT for GDM at 24-28 weeks if the woman has any other risk factors. Do not offer screening for GDM using fasting plasma glucose, random blood glucose, glucose challenge test or urinalysis for glucose.
ADIPS	Universal screening is recommended. Screening test is performed at 26-28 weeks.
CDA	All pregnant women should be screened for GDM between 24-28 weeks' gestation. Women with multiple risk factors should be screened during the first trimester.
WHO	It may be appropriate to screen pregnant women belonging to high-risk populations during the first trimester of pregnancy in order to detect previously undiagnosed diabetes mellitus. Formal systemic testing for gestational diabetes is usually done between 24 and 28 weeks.
IDF	For women at high risk of diabetes because of previous GDM, provided healthy lifestyle advice and offer an OGTT as soon as practical. If normal, offer again at 26-28 weeks. For all other women, unless a selective process based on risk is deemed more appropriate, advise that they will be offered testing for GDM at 26-28 weeks of gestation.
IADPSG	High risk women should have screening at prenatal visit, and retested 24-28 week. Average risk women should have screening at 24-28 weeks.

Diagnostic Testing Recommendations

USPSTF	Finding: Most common test is an initial 50-g 1 hour glucose challenge test (GCT). If the result is abnormal, the patient undergoes a 100-g, 3-hour oral glucose tolerance test (OGTT).
ADA	• Perform a diagnostic oral glucose tolerance test (OGTT) without prior plasma or serum glucose screening. The one-step approach may be cost-effective in high-risk patients or populations (e.g., some Native-American groups). • Perform an initial screening by measuring the plasma or serum glucose concentration 1 h after a 50-g oral glucose load (glucose challenge test [GCT]) and perform a diagnostic OGTT on that subset of women exceeding the glucose threshold value on the GCT. When the two-step approach is employed, a glucose threshold value >140 mg/dl (7.8 mmol/l) identifies approximately 80% of women with GDM, and the yield is further increased to 90% by using a cutoff of >130 mg/dl (7.2 mmol/l). • With either approach, the diagnosis of GDM is based on an OGTT.
ACOG	ACOG has endorsed the use of a 50 g oral glucose load at 24-28 weeks of gestation. "It is customary to recommend the 50-g, 1-hour oral glucose challenge test be administered at 24-28 weeks of gestation. This arbitrary recommendation results from an attempt to balance two competing interests." Testing later will result in higher yield of abnormal results, but the later the abnormality is diagnosed, the less time will be available for intervention.
CCGC	Perform laboratory screening with a 50-g, 1-hour OGCT at 24-28 weeks and immediately for high-risk at first prenatal encounter. If high risk patient has levels ≥135 mg/dl, follow with 100-g, 3 hour OGTT. If preexisting diabetes is suspected, order HbA1c.
NICE	A 2-hour 75 g oral glucose tolerance test (OGTT) should be used to test for gestational diabetes and diagnosis made using the criteria defined by WHO (fasting plasma ≥7.0 mmol/l or 2-hour plasma venous glucose concentration ≥7.8 mmol/l.
AIDPS	The recommended screening test for GDM is performed at 26-28 weeks' gestation and positive results are: 1 hour venous plasma glucose level 7.8 mmol/L after a 50 g glucose load (morning, non-fasting); or 1 hour venous plasma glucose level 8.0 mmol/L after a 75 g glucose load (morning, non-fasting).
CDA	The suggested screening for GDM is the Gestational Diabetes Screen – a 50-g glucose load followed by a plasma glucose test measured 1 hour later. Those with positive screening test (a 1hPG of 7.8-10.2 mmol/L should under go OGTT. A value of >10.3 is considered diagnostic of GDM, and OGTT does not need to be performed.
WHO	Standard OGTT is done after overnight fast, two hours after a 75 g oral glucose load equal to or more than 7.8 mmol/L (or 140 mg/dl).
IDF	A one-stage definitive procedure is preferred, but a two-stage procedure will continue to suit many healthcare arrangements. Potential adoption of a lower glucose load (75g) and shorter duration of testing procedure may lead to reconsideration about the need for a two-stage procedure.
IADPSG	At the first prenatal visit, all* or only high-risk women should be screened for fasting plasma glucose, A1C or random plasma glucose. Between 24-28 weeks, test all women not previously found to have overt diabetes or GDM earlier in pregnancy. (*all women without known diabetes antedating pregnancy.) The Consensus Panel does not recommend routinely performing OGTTs before 24-28 weeks gestation. Although many IADPSG Consensus Panel members favored using A1C for detection of overt diabetes in pregnancy, it was not feasible to recommend a single test to use exclusively. Cost and standardization of A1C testing are issues for consideration, and hemoglobin variants are prevalent in some populations.

Diagnosis of Gestational Diabetes

Domestic Diagnosis of Gestational Diabetes

	ADA	ADA	CCGC	ACOG	ACOG
Load (g)	100g	75g	100g	100g	100g
Method	C&C[5]	C&C	C&C	C&C	NDDG[6]
Fasting	95 mg/dl[7] 5.3 mmol/l	≥95 mg/dl	≥95 mg/dl	95 mg/dl 5.3mmol/L	105 mg/dl 5.8 mmol/L
1 hour	180 mg/dl 10 mmol/L	≥180 mg/dl	180 mg/dl	180 mg/dl >10 mmol/L	190 mg/dl 10.6 mmol/L
2 hour	155 mg/dl 8.6 mmol/L	≥155 mg/dl	≥155 mg/dl	155 mg/dl 8.6 mmol/L	165 mg/dl 9.2 mmol/L
3 hour	140 mg/dl 7.8 mmol/L (100 g only)		≥140 mg/dl	140 mg/dl >7.8 mmol/l	145 mg/dl 8.0 mmol/L

International Diagnosis of Gestational Diabetes

	WHO	NICE (follows WHO)	CDA	IADPSG	IDF	ADIPS
Load (g)	75g	75g	50g	75g		75g
Fasting	7 mmol/L (126 mg/dl)	7 mmol/L (126 mg/dl)	5.3 mmol/L 95 mg/dl	5.1 mmol/L (92 mg/dl)	≥ 5.5 mmol/l (100 mg/dl)	5.5 mmol/l
1 hour			10.6 mmol/L 190 mg/dl	10.0 mmol/L (180 mg/dl)		
2 hour	140 mg/dl	7.8 mmol/L (140 mg/dl)	8.9 mmol/L 160 mg/dl	8.5 mmol/L (153 mg/dl)	8.6 mmol/l	8.0 mmol/l
3 hour						

IADPSG Threshold values for diagnosis of overt diabetes in pregnancy

FPG‡	≥7.0 mmol/l (126 mg/dl)
A1C‡	≥6.5% (DCCT/UKPDS standardized)
Random plasma glucose	≥11.1 mmol/l (200 mg/dl) + confirmation

‡One of these must be met to identify the patient as having overt diabetes in pregnancy.

[5] Carpenter and Coustan criteria

[6] National Diabetes Data Group Conversion --The diagnostic criteria from the National Diabetes Data Group (NDDG) have been used most often, but some centers rely on the Carpenter and Coustan criteria, which set the cutoff for normal at lower values.

[7] To convert mmol/l of glucose to mg/dl, multiply by 18. To convert mg/dl of glucose to mmol/l, divide by 18 or multiply by 0.055.

Definition and Diagnosis

USPSTF	Two or more abnormal values on the OGTT are considered a diagnosis of GDM.
ADA	Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy (1). The definition applies whether insulin or only diet modification is used for treatment and whether or not the condition persists after pregnancy. It does not exclude the possibility that unrecognized glucose intolerance may have antedated or begun concomitantly with the pregnancy. A fasting glucose level >126 mg/dl or casual plasma glucose >200 mg/dl meets the threshold for the diagnosis of diabetes, if confirmed on a subsequent day, and precludes the need for any glucose challenge.
ACOG	Either the plasma or serum glucose level established by Carpenter and Coustan or the plasma level designated by the National Diabetes Data Group conversions are appropriate to use in the diagnosis of GDM.
CCGC	If two or more, values meet or exceed thresholds, diagnose GDM. .
NICE	75 g glucose plasma glucose level: fasting –7.0 mmol/L, 2 hour—7.8mmol/L. One or more time points need to be elevated
ADIPS	Confirmation of diagnosis after a positive screening test: a 75 g oral glucose tolerance test (fasting) with a venous plasma glucose level at 0 hours of 5.5 mmol/L and/or at 2 hours of 8.0 mmol/L
CDA	Recommends diagnosing GDM if the glucose level 1 hour after the GDS is ≥ 10.3 mmol/L
WHO	A 2 hour level ≥ 7.8mmol/L (or 140 mg/dL) is diagnostic of gestational diabetes. If fasting and postprandial blood sugars are elevated in the first trimester, this may indicate existing diabetes mellitus, which is considered a different condition with different implications
IDF	A definitive diagnosis of GDM is currently made on the result of an OGTT.
IADPSG	One or more of the values from a 75-g OGTT must be equaled or exceeded for the diagnosis of GDM. It is recommended that an FPG value early in pregnancy >5.1 mmol/l (92 mg/dl) also be classified as GDM.

Testing Regimen and Monitoring Recommendations

USPSTF	No Findings
ADA	Maternal metabolic surveillance should be directed at detecting hyperglycemia severe enough to increase risks to the fetus. Daily self-monitoring of blood glucose (SMBG) appears to be superior to intermittent office monitoring of plasma glucose. Urine glucose monitoring is not useful in GDM.
ACOG	The guidelines do not specifically recommend daily self-monitoring. There is insufficient evidence to determine the optimal ante partum testing regimen for women with GDM with relatively normal glucose levels on diet and therapy and no other risks. However, if this is instituted, postprandial glucose values appear to be more informative than fasting levels in determining the likelihood of adverse pregnancy outcomes.
AAFP	In patients diagnosed with GDM, glucose monitoring should be undertaken using fasting and two-hour postprandial glucose levels to guide treatment. (Recommendation from AAFP peer reviewed article.)
CCGC	Blood glucose monitoring: check and record levels 4 times a day, fasting and 1 or 2 hours postprandial for a minimum of two weeks.
NICE	Test fasting blood glucose levels and blood glucose levels 1 hour after every meal; women with insulin treated diabetes should be advised to test levels prior to going to bed at night;
AIDPS	Self monitoring is optimal method and well tolerated by most women. At least one fasting and one or two hour postprandial glucose level should be obtained daily. Frequency may be decreased or increased depending on blood glucose monitoring and the progress of the pregnancy.
CDA	Both preprandial and postprandial testing are recommended to guide therapy in order to achieve glycemic targets. Due to the increased risk of nocturnal hypoglycemia during pregnancy, testing during the night is often necessary in patients receiving insulin.
WHO	Glucometers to self monitor blood glucose.
IDF	Recommends self-monitoring four times a day to be used four times daily, fasting and 1 hour after each meal.
IADPSG	Not specified

Glucose Targets During Pregnancy

Domestic monitoring of Gestational Diabetes

	ADA Whole Blood	ADA plasma	CCGC	AAFP	ACOG
Fasting	≤5.3 mmol/L	≤5.8 mmol/L	<95mg/dl	<5.35 mmol/L	Insufficient evidence to determine
1 hour	≤7.8 mmol/L	≤8.6 mmol/L	<130-140 mg/dl	<7.75 mmol/L	
2 hour	≤6.7 mmol/L	≤7.2 mmol/L	<120 mg/dl	6.65-7.05 mmol/L	

International Monitoring of Gestational Diabetes

	WHO	NICE	CDA	ADIPS	IDF (Concur with ADA)
Fasting and preprandial	Not specified for GDM	3.5-5.9 mmol/L	3.8-5.5 mmol/L	<5.5 mmol/L	≤5.8 mmol/L
1 hour postprandial		<7.8 mmol/L	5.5-7.7 mmol/L	<8.0 mmol/L	≤8.6 mmol/L
2 hour			5.0-6.6mmol/L	<7.0 mmol/L	≤7.2 mmol/L
3 hour					
A1C		No Hb/a1c 2nd and 3rd trimester	<6.0% (normal)		

Treatment Recommendations

USPSTF	Treatment usually includes recommendations for physical activity and dietary modifications. In addition treatment sometimes includes medication (either insulin or hypoglycemic agents), support from diabetes educators and nutritionists, and increased surveillance in prenatal care. The extent to which these interventions improve health outcomes is uncertain.
ADA	ADA recommends nutritional counseling, if possible, with a registered dietitian, with individualized nutrition plan based on height and weight. ADA also recommends an average of 30kcal/kg/d based on pre-pregnant body weight for non-obese individuals. Insulin is the pharmacologic therapy that has most consistently been shown to reduce fetal morbidities when added to medical nutrition therapy. Oral glucose-lowering agents have generally not been recommended during pregnancy. Glyburide is not FDA approved for the treatment of GDM and further studies are needed in a larger patient population to establish its safety.
ACOG	Available evidence does not support a recommendation for or against moderate caloric restriction in obese women with GDM. However, if caloric restriction is used, the diet should be restricted by no more than 33% of calories. When medical nutritional therapy have not resulted in lower glucose levels fasting 95 mg/dl, one-hour postprandial exceeds130-140 mg/DL, insulin should be considered.
AAFP	Treatment with diet control or pharmacotherapy should be directed based on blood glucose levels. (Recommendation from AAFP peer reviewed article.)
CCGC	Medical nutrition therapy, physical activity, blood glucose monitoring (Train on self-monitoring of blood glucose (SMBG). Supply with a glucose meter and testing strips, as possible, to ensure SMBG throughout pregnancy. A glucose meter with memory is ideal.). Medical management including insulin, but not oral hypoglycemic agents. Data on Metformin was not conclusive enough to recommend the standard use of metformin during pregnancy beyond the first trimester.
NICE	Low glycemic index diet, caloric restrictions if BMI 27+ kg/m^2, moderate exercise, hypoglycemic therapy including insulin analogues and/or oral agents (including metformin) after 1-2 weeks if lifestyle insufficient or abdominal circumference $>70^{th}$ centile at diagnosis. Rapid acting insulin analogues have advantages over soluble human insulin during pregnancy.
ADIPS	Dietary therapy is the primary therapeutic strategy, with insulin added as required to achieve minimum goals for glycemic control.
CDA	Self-monitoring for blood glucose 4 times a day, nutritional counseling, avoid ketosis; if do not achieve glycemic targets within 2 weeks, insulin therapy should be initiated. Glyburide or metformin may be considered second line agent for women who are nonadherent or refuse insulin. However, the use of metformin or glyburide during pregnancy is not an approved indication in Canada and such use would be considered off-label. Glyburide may be preferred as metformin use is more likely to need supplemental insulin and metformin crosses the placenta with unknown long-term effects.
WHO	Strict metabolic control of blood glucose to lower obstetrical risks; patients treated with diet and exercise, with addition of oral medications, or with addition of insulin; glucometers to self-monitor blood glucose; patient education about diet and exercise; patient education after delivery regarding weight loss and exercise to prevent future diabetes; lifelong screening for type-2 diabetes as patient with will be in high risk category.
IDF	Instruct in self-monitoring of blood glucose (to be used four times daily, fasting and 1 hour after each meal), and advise on lifestyle modification. If targets are not met within 1 to 2 weeks, offer glucose-lowering medication. Insulin has been the treatment of choice, but there is not adequate evidence to consider the use of metformin and glyburide as treatment options for women who have been informed of the possible risks.
IADPSG	No recommendation

Post Natal Testing and Follow Up Recommendations

USPSTF	Not specified
ADA	Reclassification of maternal glycemic status should be performed at least 6 weeks after delivery. If glucose levels are normal, reassessment of glycemia should be undertake at a minimum of 3-year intervals. Women with IFG or IFT in the post partum period should be tested for diabetes annually. These patients should receive intensive MNT and should be place on individualized exercise program. All patients with prior GDM should be educated on lifestyle modifications. Medications that worsen insulin resistance should be avoided.
ACOG	Recommendations are based on ADA. Testing for diabetes may be performed after the immediate effects of pregnancy on glucose metabolism have dissipated and its most convenient at around the time of the postpartum checkup. However, there have been no long-term follow-up studies that verify the benefit of postpartum testing. Test post-partum for diabetes, ideally by OGCT.
AAFP	Regular screening for type-2 diabetes should be strongly encouraged. An oral glucose tolerance test at three-year intervals has been shown to be a cost-effective strategy. Lifestyle recommendations to address postpartum weight loss include: breastfeeding, exercising moderately, modifying diet. (Recommendation from AAFP peer reviewed article.)
CCGC	75g, 2-hour OGTT with fasting and 2-hour results at 6-12 weeks postpartum. Encourage lifestyle modifications, recommend breastfeeding, educate on preconception counseling before future pregnancies. Emphasize healthy lifestyle in children born to women with GDM.
NICE	Offer women with gestational diabetes a blood glucose test before transfer into community care and a fasting plasma glucose test at 6-week postnatal appointment, then annually. Advise women on weight control, diet, exercise, risk of GDM in subsequent pregnancies, and symptoms of hyperglycemia.
ADIPS	Maternal follow-up, with an oral glucose tolerance test, should be performed 6-8 weeks postpartum, then at least every 2 years, because of the increased risk of developing permanent diabetes.
CDA	As women who have had GDM are defined as high-risk of developing subsequent type-2 diabetes, they should be re-evaluated postpartum. A 75-g OGTT should be performed between 6 weeks and 6 months postpartum. Women who are suspected of having pre-existing diabetes should be monitored more closely postpartum. All women with GDM should be counseled on healthy lifestyle.
WHO	The woman should be reclassified as having either diabetes mellitus, or IGT, or normal glucose tolerance based on the results of a 75 g OGTT six weeks or more after delivery. It should be emphasized that such women, regardless of the 6-week post-pregnancy results, are at increased risk of subsequently developing diabetes.
IDF	From 0-6 weeks after pregnancy, ideally together with other postpartum assessments, check for diabetes in women who developed GDM. If then non-diabetic, advise on high risk of future diabetes and on preventive lifestyle measures. Advise them to check for diabetes every 1-3 years.
IADSPG	No recommendation. Suggested a randomized controlled trial may be needed to determine appropriate follow-up of mothers to determine risks for later development of diabetes and follow-up of children to assess potential associations with obesity or altered glucose metabolism.