

TIME PERIOD	DISCUSSION TOPICS	CHECKLIST
<b>PRECONCEPTION</b>	<input type="checkbox"/> Nutrition, weight-gain, exercise <sup>1</sup> <input type="checkbox"/> Smoking/EtOH/drugs/caffeine <sup>3</sup> <input type="checkbox"/> Prescription medications <sup>5</sup> <input type="checkbox"/> Work exposure (i.e. radiation, toxins) <input type="checkbox"/> Preconception questionnaire <input type="checkbox"/> Family history of congenital anomalies or hereditary disorders (thyroid dz etc)	<input type="checkbox"/> Check rubella immunity <sup>2</sup> <input type="checkbox"/> Recommend folate supplementation <sup>4</sup> : - 1.0 mg/day if low risk, 5 mg/day if high risk <input type="checkbox"/> Varicella Ab (if no chicken pox Hx or if did not grow up in North America) <sup>6</sup> <input type="checkbox"/> HIV (recommended, needs consent) <sup>7</sup> <input type="checkbox"/> Maternal age ≥40? Discuss risks <sup>8</sup>
<b>FIRST PRENATAL(S) (8-9 weeks)</b>	<input type="checkbox"/> Above topics if Pt not seen preconception <input type="checkbox"/> CVS/amnio <sup>9</sup> (if indicated) <input type="checkbox"/> Pros/cons of IPS/FTS/MSS/NIPT <sup>10</sup> <input type="checkbox"/> Other genetic tests (if indicated) <sup>12</sup> <input type="checkbox"/> Risks of viral infections <sup>13</sup> <input type="checkbox"/> Common discomforts of pregnancy <sup>14</sup> <input type="checkbox"/> Ob Hx: SVD or C/S, GDM, PIH/Preclampsia, PROM, PREM, analgesia, PPH, etc. <sup>15 16</sup>	<input type="checkbox"/> 'OB prenatal package' handout <input type="checkbox"/> Give IPS/FTS requisition <input type="checkbox"/> Book NT or dating ultrasound <sup>11</sup> <input type="checkbox"/> Flu vaccine (seasonal)
<b>PRENATAL PHYSICAL (12 weeks)</b>	<input type="checkbox"/> Vaccines in pregnancy <sup>17</sup> <input type="checkbox"/> VBAC if applicable <sup>19</sup> <input type="checkbox"/> Risks for IUGR <sup>20</sup> <input type="checkbox"/> Confirm EDB based on U/S	<input type="checkbox"/> Pap, GC, Chlamydia, ± BV <sup>18</sup> <input type="checkbox"/> CBC, ABO/Rh, Ab screen, ferritin, TSH ± sickle screen, electro <sup>21</sup> <input type="checkbox"/> Urinalysis, urine C&S <input type="checkbox"/> VDRL <sup>22</sup> , HBsAg <sup>23</sup> , rubella Ab, varicella Ab <input type="checkbox"/> Book anatomy U/S (ok 18-22) <input type="checkbox"/> IPS #1/FTS <input type="checkbox"/> GTT if high risk <sup>24</sup>
<b>SUBSEQUENT VISITS</b>		
⇒ <b>16 weeks</b>	<input type="checkbox"/> Lab results from first prenatal <input type="checkbox"/> Cord Blood <sup>25</sup> <input type="checkbox"/> Prenatal classes	<input type="checkbox"/> IPS #2/AFP/MSS (16-18 wks, ok 15-20 wks) <input type="checkbox"/> AN1, ABO, Rh to SB 'triage'
⇒ <b>18 weeks</b>	<input type="checkbox"/> Quickening <input type="checkbox"/> U/S results <sup>27</sup> , screening results (call)	<input type="checkbox"/> When to contact MD <sup>26</sup>
⇒ <b>28 weeks</b>	<input type="checkbox"/> Expectations, fears, family adjustment, violence, kick counts <sup>28</sup> <input type="checkbox"/> Cord Blood <input type="checkbox"/> C/S prep info for booked C/S <sup>31</sup>	<input type="checkbox"/> CBC, urine C&S, Ab screen, ferritin <input type="checkbox"/> Rhlg if Rh -ve, do consent <sup>29</sup> <input type="checkbox"/> GCT (ok 24-28 wks) <sup>30</sup> <input type="checkbox"/> Tdap vaccine (27-36 weeks)
⇒ <b>32 weeks</b>	<input type="checkbox"/> Lab results from 28 weeks	<input type="checkbox"/> Repeat U/S if previa <sup>32</sup> , etc.
⇒ <b>36 weeks</b>	<input type="checkbox"/> Signs of labour, pain management <sup>33</sup> <input type="checkbox"/> Breastfeeding <input type="checkbox"/> Circumcision <sup>35</sup> <input type="checkbox"/> Start BPPs at 38 wks if ≥40	<input type="checkbox"/> GBS swab (ok 35-37 weeks) <sup>34</sup> <input type="checkbox"/> Antenatals to SB 'triage' <input type="checkbox"/> 'OB Reservation' package <input type="checkbox"/> Start antivirals if history of HSV <sup>36</sup>
> <b>40 weeks</b>	<input type="checkbox"/> Discuss possibility of induction	<input type="checkbox"/> BPP by 41 weeks q 3-4 days <input type="checkbox"/> Book induction (see indications) <sup>37</sup>

# ROUTINE PRENATAL CHECKLIST RESOURCE

## <sup>1</sup> **Nutrition**

During the 1<sup>st</sup> trimester no extra calories are required; nonetheless healthy food choices are paramount. During the 2<sup>nd</sup> and 3<sup>rd</sup> trimesters caloric needs increase slightly. Fluid needs increase in pregnancy to 10 cups/day due to rise in volume requirements.

According to Canada's Food Guide, a diet during pregnancy should contain **2200-2400 kcal/day**, comprised of:

Milk and milk products	3-4 servings/day
Breads and cereals	≥ 5 servings/day
Fruits and vegetables	≥ 5 servings/day
Meat, fish, poultry and alternatives	2 servings/day

### Safe Foods in Pregnancy - previously thought to be unsafe

- Soft-ripened cheeses, deli meats and refrigerated ready to eat foods (including cheese from unpasteurized milk): associated pathogen is *listeria monocytogenes*, risk is low if food is handled and stored properly and may therefore be consumed in moderation if obtained from reputable sources
- Raw or soft-cooked eggs: associated pathogen is *salmonella* infection. Raw or undercooked eggs should be avoided unless pasteurized eggs have been used in place of eggs with shells. Commercial products (as opposed to home-made) containing raw eggs i.e. mayonnaise, salad dressing, custards and ice cream are all made with pasteurized eggs
- Raw fish and shellfish: associated pathogens are *noroviruses*, *vibrionaceae*, *salmonella* as well as some *helminthic* and *protozoan* species. Shellfish account for more infections vs. finfish. Seafood marked for human consumption is inspected for microbial contamination. While cooking is the most effective way of inactivating parasites, flash freezing is also effective and used most often on sushi grade fish. Raw fish from a reputable place, consumed soon after purchase is safe
- Fish Consumption in pregnancy
  - 75 g per month (1 serving per Canadian Food Guide or approximately 1/2 cup) of high mercury fish, which include: fresh/frozen tuna, shark, swordfish, marlin, orange roughy, and escolar
  - Canned Tuna
    - Canned Albacore (white) Tuna should be limited to 2.5 cans per month
    - Canned Light Tuna should be limited to 2.5 cans per week
  - Fish with low mercury and high fatty acids include: anchovy, capelin, char, hake, herring, Atlantic mackerel, mullet, Pollock, salmon, smelt, rainbow trout, lake whitefish, blue crab, shrimp, clam, mussel and oyster
- Weight gain in pregnancy based on pre-pregnancy maternal weight

Underweight	Average	Overweight
28-40 lbs	25-35 lbs	15-25 lbs
12-18 kg	11-16 kg	7-12 kg

## **Exercise**

Exercise (aerobic and strength-conditioning) in pregnancy is strongly encouraged in women with uncomplicated pregnancies as part of a healthy lifestyle. Most women find it easiest to begin in the 2<sup>nd</sup> trimester when symptoms such as nausea, vomiting and fatigue diminish and prior to the physical limitations of the 3<sup>rd</sup> trimester.

TABLE I CONTRAINDICATIONS TO EXERCISE IN PREGNANCY	
Absolute Contraindications	Relative Contraindications
<ul style="list-style-type: none"> <li>• Ruptured membranes</li> <li>• Preterm labour</li> <li>• Hypertensive disorders of pregnancy</li> <li>• Incompetent cervix</li> <li>• Growth restricted fetus</li> <li>• High order multiple gestation (<math>\geq</math> triplets)</li> <li>• Placenta previa after 28th week</li> <li>• Persistent 2nd or 3rd trimester bleeding</li> <li>• Uncontrolled type I diabetes, thyroid disease, or other serious cardiovascular, respiratory, or systemic disorder</li> </ul>	<ul style="list-style-type: none"> <li>• Previous spontaneous abortion</li> <li>• Previous preterm birth</li> <li>• Mild/moderate cardiovascular disorder</li> <li>• Mild/moderate respiratory disorder</li> <li>• Anemia (Hb &lt;100 g/L)</li> <li>• Malnutrition or eating disorder</li> <li>• Twin pregnancy after 28th week</li> <li>• Other significant medical conditions</li> </ul>
Reprinted and modified with permission from the Canadian Society for Exercise Physiology. <sup>23</sup>	

- Previously athletic/exercising females can maintain their current regimen based on the guidelines below.
- Sedentary females should:
  - Start with 15 minutes 3 times per week
  - Gradually increase to 30 minutes 4 times per week

<b>F</b>	<b>I</b>	<b>T</b>	<b>T</b>
FREQUENCY	INTENSITY	TIME	TYPE
Begin at 3 times per week and progress to four times per week	Exercise within an appropriate RPE range and/or target heart rate zone	Attempt 15 minutes, even if it means reducing the intensity. Rest intervals may be helpful	Non weight-bearing or low-impact endurance exercise using large muscle groups (e.g., walking, stationary cycling, swimming, aquatic exercises, low impact aerobics)

**“TALK TEST”** - A final check to avoid overexertion is to use the “talk test”. The exercise intensity is excessive if you cannot carry on a verbal conversation while exercising.

HEART RATE RANGES FOR PREGNANT WOMEN		
MATERNAL AGE	FITNESS LEVEL or BMI	HEART RATE RANGE (beats/minute)
Less than 20	-	140-155
20–29	Low	129-144
	Active	135-150
	Fit BMI > 25 kg m <sup>-2</sup>	145-160 102-124
30–39	Low	128-144
	Active	130-145
	Fit BMI > 25 kg m <sup>-2</sup>	140-156 101-120

Target HR ranges were derived from peak exercise tests in medically prescreened low-risk women who were pregnant. (Mottola et al., 2006; Davenport et al., 2008).

Women should avoid those exercises that can cause loss of balance (i.e. horseback riding, bike riding, ice hockey, etc) as well as SCUBA diving (fetus is not protected from decompression sickness/air embolism). Refer to PARMED-X questionnaire for exercise prescription/planning: <http://www.csep.ca/cmfiles/publications/parq/parmed-xpreg.pdf>

---

Encourage women to stop exercising and seek medical advice if:

- Excessive SOB
- Chest pain
- Painful contractions
- Uterine bleeding
- Dizziness
- AF leakage

<sup>2</sup> Maternal infection with **rubella** in the first trimester can cause *congenital rubella syndrome* (cataracts, deafness, hepatosplenomegaly, congenital heart disease, mental retardation, hematologic changes, IUGR and death). All women of childbearing age should have their rubella immunity determined. The majority will be immune as a result of childhood immunization. If a non-pregnant woman lacks antibodies, she should be immunized with the live attenuated vaccine and advised to defer pregnancy for 1 month afterwards (note that the risk to the fetus is small, and accidental conception is not an indication for termination). If a pregnant woman lacks antibodies, she should be advised of the risks, to avoid exposure, and immunized postpartum.

<sup>3</sup> **Smoking** is associated with spontaneous abortion, low birth weight, placental abruption and perinatal death.

**Fetal alcohol syndrome** (IUGR, mental retardation, behavioral disturbances, atypical facial appearance, congenital heart defects, brain anomalies) occurs in 30-40% of newborns born to mothers who drink >3 ounces of alcohol daily in pregnancy. Lesser effects may be seen in offspring of women who drink less, but no safe level for maternal drinking during pregnancy has been established.

**Cocaine** use is associated with congenital anomalies and placental abruption. There is no evidence that use of **marijuana** or **hashish** results in increased fetal anomalies, but use of all illicit drugs should be strongly discouraged.

There is no evidence at present to support an association between **caffeine** consumption and birth defects; however, Health Canada recommends a maximum of 400-450 mg of caffeine (2 cups/500ml of coffee or 3 cups/750 ml of strong tea). Increased caffeine consumption has been associated with increased miscarriage rates. Herbal teas may be safe in pregnancy depending on ingredients and amount, (ginger balm, orange peel, rose hip, citrus peel and linden flower are considered safe).

Artificial sweeteners safe in pregnancy include: aspartame, sucralose and acesulfame-potassium, those not safe include cyclamates and saccharin.

<sup>4</sup> **Folic Acid Supplementation:** supplementation prior to conception and in early pregnancy has been associated with prevention of neural tube defects, and other congenital anomalies (incl: heart defects, uterine tract anomalies, oral facial clefts, limb defects and pyloric stenosis). Supplementation should begin 2-3 months prior to conception and continue throughout pregnancy and post partum period. Women recommended to have increased dose should begin on it 2-3 months prior to conception and continue until 10-12 weeks post conception, wherein they may return to lower dose of 1 mg

**Neural tube defects** (NTD) occur in Canada at a rate of approximately 1-2 per 1,000 births. Recurrence risk with 1 previously affected child is 2-5%; however, 4 mg/day of folic acid has been shown to prevent 72% of recurrences. In low risk pregnancies, 1.0 mg/day has been shown to prevent 50-70% of NTDs. Food sources of folic acid include green leafy vegetables, fruit and liver. Prenatal supplements contain 0.8 - 1 mg/tablet. Folic acid is available separately in 1 mg tabs without R<sub>x</sub> or 5 mg tabs with R<sub>x</sub>.

**Patients recommended to have 5mg supplementation** include:

1. Women with epilepsy and ingestion of valproic acid or carbamazepine
2. Women with IDDM
3. Women with obesity (BMI>35)
4. Family hx of NTD (First, second or third degree relative with NTD)
5. Women belonging to high risk ethnic groups incl: Sikh, Celtic, and women from Northern China
6. Women on folic acid antagonists (aminopterin, methotrexate)
7. Women with a hx of poor compliance with medications and additional lifestyle issues (variable diet, no consistent birth control and possible teratogenic substance use)

---

**Folic acid is safe**, with very rare allergic reactions (erythema, rash, itching, general malaise, bronchospasm). Be cautious if:

1. **Undiagnosed anemia** - Folic acid 5mg supplementation will not mask vitamin B12 deficiency/pernicious anemia- no investigations are required prior to initiating supplementation
2. **Seizure disorders** - convulsions may occur in previously controlled patients
3. **Neoplasia**- there are some concerns of association with neoplasia or possible exacerbation of pre-existing colorectal cancer

<sup>5</sup> Almost any drug that exerts a systemic effect in the mother will cross the placenta to reach the fetus. For any drug used in pregnancy, the advantages must clearly outweigh the risk to the fetus. Advise expectant mothers to speak to MD before taking any OTC meds. For information on safety of specific medications in pregnancy see Drugs in Pregnancy and Lactation or call **Motherisk at (416) 813-6780 ([www.motherisk.org](http://www.motherisk.org))**.

SSRI use in Pregnancy: In pregnant women small risk of exposing fetus or neonate to antidepressant must be balanced against the benefits in treating MDD. During pregnancy, fluoxetine and other SSRI's are first-line antidepressants, but paroxetine may have a higher risk for cardiac malformations. Women with a history of depression should continue their anti-depressant medication during pregnancy. It is not advisable to recommend abrupt discontinuation as it can have serious ramifications. If following a discussion with an MD, patient decides to stop antidepressant in pregnancy, the medication should be slowly tapered over a couple of weeks

<sup>6</sup> **Varicella** infection in pregnancy, especially during the first half, can lead to congenital varicella syndrome (low birth weight, skin scarring, ophthalmic abnormalities, limb hypoplasia, cortical atrophy, etc.). All women without a definite history of prior chickenpox should be tested for varicella immunity (approximately 85-90% of women in North America are immune to varicella). If not immune, they should be advised of the risks of congenital varicella syndrome and offered immunization with Varivax (2 doses, 4-8 weeks apart, advise to wait 3 months after second vaccination before attempting conception). If nonimmune women have significant exposure to varicella during pregnancy, administration of varicella-zoster immunoglobulin (VZIG) will usually prevent infection if given within 96 hours of exposure.

<sup>7</sup> **HIV** is transmitted from an infected mother to her fetus in 20-30% of cases. The transmission rate can be reduced to 1-2% with maternal use of anti-retrovirals during pregnancy. Therefore, HIV testing should be offered to all pregnant women, and encouraged when risk factors are present. May offer preconception.

<sup>8</sup> **Maternal age 40 or over**

- Increased risk of complications
  - Spontaneous abortion
  - Congenital anomalies
    - Any aneuploidy, but especially: trisomy 13, 18, 21
  - Placenta previa
  - GDM
  - Pre-eclampsia
  - C-section
  - Preterm delivery/low birth weight
  - IUGR
  - Stillbirth
- Management
  - Consider NIPT Covered by OHIP. Alternatively may offer prenatal diagnostic testing (i.e. amniocentesis/CVS) in addition to screening options (IPS/FTS/NIPT) and detailed 2<sup>nd</sup> trimester ultrasound examination.
  - Induce by 40 weeks
    - Considered biologically "post-term" at 39 weeks

<sup>9</sup> **Diagnostic testing for chromosomal disorders** (CVS or amnio) may be offered to those at increased risk, however if age >40 or positive IPS/FTS. Strongly consider NIPT prior to invasive testing, as it may decrease risk and potentially eliminate the need for diagnostic testing:

1. Mother 40 or older at delivery

- 
2. Positive IPS/FTS/MSS
  3. Family history
    - Previous stillbirth or livebirth with chromosomal abnormality
    - Parent with a potentially transmissible chromosomal rearrangement
    - Relatives (other than offspring) with Down syndrome or other trisomy
    - Genetic disorders with an identifiable chromosomal marker or abnormality
    - Familial X-linked disorders with no biochemical or molecular markers
    - History of maternal or paternal therapeutic irradiation
  4. Fetal abnormalities on U/S

### **Amniocentesis**

SB: SB High Risk Obstetrics Program Phone: (416) 480-5367

NYGH: NYGH Prenatal Diagnosis Program Phone: (416) 756-6345

- Done at 15-17 wks, counseling and U/S at  $\leq 14$  wks (available up to 22 wks) requiring all antenatal blood work and forms including IPS/FTS/ MSS results be faxed
- Total pregnancy loss rate: which includes background pregnancy loss for that gestational age and procedure related loss- background SA rate at that gestation is 3%
- Procedure related loss is an added 0.01-0.5% (anywhere from 1/100-1/600)(JOGC 2007;29(7) 586-590) (SOGC clinical practice guideline No 168, 2005)

### **Chorionic Villus Sampling (CVS)**

MSH Prenatal Diagnosis Program Phone: (416) 586-4523

SB: SB High Risk Obstetrics Program Phone: (416) 480-5367

- Done at 10-12 wks, counseling and U/S at 9-10 wks (at MSH)
- 2-3% risk of natural SA after 10 wks, CVS adds 1%

Both CVS and Amniocentesis are now being processed by microarray rather than karyotyping. Chromosome microarray analysis provides higher resolution of detection, and it is able to detect duplications and deletions at 1.5 to 3.5 mb range, rather than larger scale changes. Additionally turn around time is usually <2 weeks in comparison to 2-3 weeks with karyotyping. Can still do FISH analysis for positive IPS/FTS results to look for trisomy (available in about 48h). Note that microarray testing can potentially lead to diagnosis of additions and deletions of unknown significance, which presents a challenging ethical issue, and may cause anxiety for parents.

<sup>10</sup> Prenatal genetic screening should be offered to all pregnant women, regardless of age. Maternal age is considered inferior to the multiple biochemical markers. The guidelines state that women >40 may be offered amniocentesis, without prior screening (NIPT or FTS/IPS); however, should strongly consider screening test first (NIPT in Ontario) because with a negative result, the risk of a clinically significant chromosomal abnormality falls below 1/200.

**Integrated prenatal screening (IPS)** It is a two-part test used to determine if a woman has an increased probability of carrying a fetus with Down syndrome (DS), trisomy 18 or an open neural tube defect (ONTD) It can detect 85-90% of Down syndrome cases (i.e. it does not pick up all cases) with a false positive rate of 3%. The two parts consist of: 1) U/S for nuchal translucency and blood for PAPP-A and free  $\beta$ hCG at 11-13+6 weeks and 2) blood for AFP, unconjugated, estriol,  $\beta$ hCG and dimeric inhibin A (DIA) at 15-18 weeks. Approximately 3% of women will have an initial screen positive; however, very few (1/10 of screen positives) will be true positive results. Women with a positive screen should be offered further testing (see protocol). A result is only given AFTER the second part of the test. Note that U/S for nuchal translucency can only be done at certain designated labs.

**First trimester screening (FTS)** can be offered as an alternative to IPS particularly for women who would like an earlier result (at 14 weeks) and hence an earlier amniocentesis or CVS. It is a combined blood test and NT scan between 11-13+6 weeks that can detect ~80-85% of Trisomy 21 and a false positive rate of 3-5%. It is available through NYGH and Mount Sinai Hospital. It does not screen for ONTDs, an anatomic U/S at a quality establishment (18-20 weeks) should be ordered, AFP does not need to be done.

**Maternal serum screening (MSS)** should be offered to all pregnant women, regardless of age, if they present too late for IPS or FTS (i.e. AFTER 14 weeks). Available between 15-20+6 weeks, involving maternal serum testing of AFP, hCG, uE3 and DIA it detects 75-85% of trisomy 21 with a false positive rate of 5-10%.

**NIPT** (Non-Invasive Prenatal Testing): Considered a second-tier screening test, at present. NIPT offers a 99% detection rate with a 0.1% false positive rate for Down Syndrome. For trisomy 18 it has a >98% detection rate, the rate is much lower for trisomy 13, approximately 80%. Lastly XY analysis has been being validated. Positive results are reported as either positive, negative or suspected. The recommendation is that all positive results should be confirmed using invasive testing. Processing of samples is now done in Canada and therefore results should take less than previous 2 weeks.

Uses cell free DNA, produced by both mother and fetus. The source of the fetal cell free DNA comes from the placenta. Fetal DNA circulates only when placenta is intact, clearing 2-3 hours after placental separation. Previous positive tests do not affect further pregnancies. An average of 10% of DNA harvested from maternal circulation is fetal in origin. The minimum percentage of cell free DNA required for processing of test is 4%. Increased weight (>300 lbs) can negatively affect, amount of fetal DNA in maternal circulation causing a poor sampling to occur.

NIPT has now been validated in both high risk and low risk populations. As well, OHIP now covers the high risk population, which is defined as those with a previously affected fetus for Trisomy 21, Positive IPS/FTS in current pregnancy and advanced maternal age (in Canada >=40y at EDC). Women who do not meet the high risk criteria are able to have NIPT if they pay for it (currently \$500), and it should be offered to ALL pregnant women. Patients may go directly to NIPT either through genetic counseling or by ordering directly through Lifelabs (Panorama). Note that Lifelabs also offers patients the option (at additional cost) to screen for a number of microdeletions, including DiGeorge syndrome, Angelman syndrome, Cri-du-chat syndrome, Prader-Willi syndrome, and 1p36 deletion syndrome. As of October 1, 2015, NIPT testing is available in Canada, and MOHLTC permission for those at high risk is no longer required as long as patients meet the high risk criteria and the appropriate form is completed along with the NIPT requisition. **IF patients are choosing to go to NIPT directly, FTS/IPS testing does not need to be done; however, consideration should be given to still doing an NT U/S, as it may find an abnormality that NIPT does not screen for (e.g. cardiac anomaly)**

Multiple companies available at present, in the general community, Harmony (Ariosa) and Panorama (Natera) \$495.00 and available through SB High Risk OB, Verinata is available solely through MedCan at present. Harmony/Panorama testing has a failure rate of 4%. (Verinata 2%).

**Comparing the performance of different methods of screening for Trisomy 21**

**Table 2. Current available screening options and their screening performance\***

Screening option	Markers	Trimester	Term risk cut-off	DR, %	FPR, %	OAPR
Options that meet the minimum standard						
FTS <sup>5,10</sup>	NT, free β-hCG, PAPP-A, MA	1st	1 in 325	83	5.0	1:27
Quad screening <sup>11</sup>	AFP, uE3, free β-hCG, inhibin A, MA	2nd	1 in 385	77	5.2	1:50
IPS <sup>5,10</sup>	NT, PAPP-A, AFP, uE3, free β-hCG/total hCG, inhibin A, MA	1st & 2nd	1 in 200	87	1.9	1:10
IPS without inhibin A <sup>5</sup>	NT, PAPP-A, AFP, uE3, total hCG, MA	1st & 2nd	1 in 200	88	3.0	1:20
Serum IPS <sup>5,10</sup>	PAPP-A, AFP, uE3, free β-hCG/total hCG, inhibin A	1st & 2nd	1 in 200	85	4.4	1:26
Options that do not meet the minimum standard:						
Maternal age <sup>12</sup>	MA	1st & 2nd	1 in 385	44	16	1:218
Triple screening <sup>12</sup>	AFP, uE3, total hCG, MA	2nd	1 in 385	71	7.2	1:59

MA: Maternal age; OAPR: Odds of being affected given a positive result.  
 \* Some centres in Canada may offer variation on IPS (sequential screening or contingent screening) with cut-offs set that achieve at least the minimum standard.

**Testing for Open Neural Tube Defects and Trisomy 18**

	Open Neural Tube Defects	Trisomy 18
Maternal Serum	AFP	NT, PAPP, <i>fbh</i> CG, AFP, hCG, uE3, DIA
Detection Rate	80% for each test except FTS which does not screen for ONTD	Slightly lower than the detection rate for trisomy 21 for each test

False Positive Rate	Usually 5% or less for all tests except FTS	Lower than the false positive rate for trisomy 21 for each test, usually 1% or less
---------------------	---	---

**Screening for Aneuploidy in Multiple Gestation**

In a multiple gestation pregnancy, fetal nuchal translucency in combination with maternal age is an acceptable first trimester screen for aneuploidy. However, NIPT, can be offered if it provides improvement over NT and age alone, but is only covered by OHIP if it meets criteria.

**Serum markers from IPS/FTS and MSS can also be associated with obstetrical complications**

Patients with IPS/FTS/MSS-positive screen, with subsequent negative or declined amniocentesis, have an increased risk of pregnancy complications. Consider that normal amnio or U/S does not decrease patient’s risk in pregnancy to baseline. Common cause of false-positive testing is abnormal placenta function. Multiple-abnormal test results are strongly associated with stillbirth or extremely preterm birth (<32 weeks gestation) due to pregnancy complications from placental insufficiency.

In patients with IPS/FTS/MSS- negative screen, however noticeably abnormal analytes present (PAPP-A <0.35 MoM, AFP >2.0 MoM, Inhibin >3.0 MoM, total hCG >4.0 MoM). Take a closer look at specific hormone levels. Abnormally elevated levels of serum markers may be associated with adverse obstetrical outcomes. Multiple abnormal markers have stronger associations.

Indications for referral to Placenta Clinic (MSH) - Refer to Special Pregnancy Program (See referral form fax to 416-586-3216)

**Problems in current pregnancy:**

1. Abnormal FTS/MSS/IPS testing results (only if meet thresholds)
  - PAPP-A <0.35
  - AFP >2.0 MoM (positive risk for ONTD)
  - DIA/Inhibin >3.0 MoM
  - hCG >5.0 MoM

Consults for patients with multiple abnormalities that do not meet above criteria also possible. Referral should include anatomy scan and genetic counseling/amnio results. Pt can also be referred for placental U/S (after fetal U/S)

2. Background medical risk factors for placental damage. These include:
  - Insulin dependent diabetes
  - Significant obesity (BMI>35)
  - Advanced maternal age (>40)
  - Chronic hypertension
  - Previous venous thrombo-embolism
  - Renal disease
  - Autoimmune disease
3. Previous complex obstetrical history suggesting placental damage. These include:
  - Prior unexplained/placental loss >16 weeks
  - Stillbirth >20 weeks
  - Delivery <34 weeks due to hypertension/pre-eclampsia/HELLP syndrome
  - Intrauterine growth restriction (IUGR) due to placental disease or abnormal uterine and/or umbilical artery doppler
4. Suspected invasive placenta (placenta accreta/percreta)
  - Anterior low or placenta 18-20 week fetal anatomical ultrasound (or at a later BPP/growth U/S) in a patient with previous Caesarean deliveries, myomectomy, multiple D+C’s, other uterine surgeries
5. Current pregnancy complicated by hypertension or IUGR
6. Sonographic abnormalities of the placenta and/or membranes
7. Placental/chorionicity/growth problems in multi-fetal pregnancies

**Pre-Pregnancy Consultation**

1. Multiple risk factors for placental insufficiency
2. Previous pregnancy complicated by stillbirth/severe pre-eclampsia, HELLP syndrome, IUGR due to placental insufficiency

---

3. High risk for invasive placenta (3+ prior c-sections or multiple other RF)

- Referrals may be diverted to pre-pregnancy counseling clinic as wait time is up to 4 months

CHECKLIST OF USEFUL INFORMATION TO SEND WITH REFERRAL

- FTS/MSS/IPS test results from current or prior pregnancies
- U/S reports from the current or index pregnancies
- Placental pathology report from prior pregnancies
- Thrombophilia screening results (if already done)
- Operative reports from previous pregnancies (if relevant)

<sup>11</sup> **Dating ultrasound**

- SOGC Guideline on Determination of Gestational Age (2014) recommends dating ultrasounds in first trimester even with “certain” LMP dates; however, if a patient is having an NT scan for IPS/FTS, it is acceptable to have this scan used for dating as well. As NT scan can pick up abnormalities related to anomalies not screened for on NIPT, it should be ordered even for women having NIPT instead of IPS/FTS.

<sup>12</sup> **Screening for the heterozygous or carrier state** is recommended for individuals belonging to populations known to have an increased carrier frequency for genetic disorders. If there are concerns for specific genetic disorders, contact the Genetics Clinic at NYGH at **(416) 756-6345**.

1. **Tay-Sachs** (1 in 29 Ashkenazi Jews, some French Canadians are carriers, test ANY partial such background including if one parent is Ashkenazi Jewish)
  - Autosomal recessive, progressive neurodegenerative disorder, starts at 3-6 months of age
  - Caused by deficiency of enzyme hexosaminidase-A, which breaks down a fatty waste substance found in brain cells, thereby causing toxic accumulation in the brain
  - Testing detects approximately 95% of Ashkenazi Jewish carriers and 30% of other carriers
  - Measure serum hexosaminidase A activity
    - SB: Done in our clinic (need 2 purple top tubes, HSC requisition)
    - Blood must be received at HSC by 3:00 pm
    - “Ashkenazi screen” (includes Tay-Sachs, Canavan, familial dysautonomia, Bloom syndrome, Fanconi Anemia type C, Mucopolysaccharidosis type IV, Niemann Pick disease type A & B) can also be done through HSC (patients can call (416) 813-5799 to make appointment).
    - See HSC website at [www.sickkids.ca/molecular](http://www.sickkids.ca/molecular)
2. **Familial Dysautonomia** (1 in 30 Ashkenazi Jews are carriers)
  - Autosomal recessive, progressive neurodegenerative disorder
  - Caused by mutation in the IKBKAP gene on chromosome 9
  - Testing detects approximately 99% of Ashkenazi Jewish carriers
3. **Canavan Disease** (1 in 57 Ashkenazi Jews are carriers)
  - Autosomal recessive, progressive neurodegenerative disorder, starts at 3-6 months of age
  - Caused by deficiency of enzyme aspartoacylase, which breaks down N-acetylaspartic acid in brain tissue, thereby causing toxic accumulation in the brain
  - Testing detects approximately 99% of Ashkenazi Jewish carriers and 50-55% of other carriers
4. **Other “Ashkenazi panel” diseases** (in addition to above 3)
  - Bloom Syndrome (1 in 102), Fanconi Anemia Group C (1 in 89), Mucopolysaccharidosis IV (1 in 100), Niemann Pick Disease type A & B (1 in 90)
  - SOGC (April 2006) recommends only screening in Ashkenazi Jews if there is a positive family history of one of these diseases
5. **Thalassemia  $\alpha$  and  $\beta$**  (high in Asian, Black, Hispanic, Mediterranean, Middle East people)
  - Hb electrophoresis if MCV < 80
    - $\uparrow$  Hb A<sub>2</sub> or Hb F levels indicative of  $\beta$ -thalassemia carrier state
    - Presence of Hb H inclusion bodies in RBCs indicates  $\alpha$ -thalassemia carrier state (may have normal electrophoresis)
    - **Consider ordering Hb electrophoresis with initial blood work if suspicious**
6. **Sickle Cell Disease** (1 in 12 Blacks, also found in Indian, Mediterranean, Asian, Middle Eastern)
  - Check for MCV and sickle cell trait in both parents

---

## 7. Cystic Fibrosis (1 in 20 Caucasians)

- Refer to Genetics if any family history

<sup>13</sup> **Toxoplasmosis** is a protozoal infection transmitted by eating raw meat, through contact with cat feces or congenitally. Approx. 30% of women acquire protective anti-toxoplasma IgG antibody (this can be tested for) before pregnancy, thereby preventing transmission to the fetus. Less than 10% of newborns with congenital toxo have signs at birth (↓ BW, hepatosplenomegaly, icterus, anemia, CNS problems, chorioretinitis). Pregnant women should be advised to avoid contact with cat feces or eating raw meat.

**Human parvovirus B19** is commonly associated with “fifth disease” or erythema infectiosum in childhood. Infection any time during pregnancy may result in spontaneous abortion, fetal anemia, cardiac failure, non-immune hydrops or fetal death (9%). Approximately 60% of adults are immune. Day care workers and teachers are particularly at risk of exposure. Pregnant women exposed to parvovirus (regardless of gestation) need to have their immunity established.

**Cytomegalovirus (CMV)** is the most common congenital viral infection, affecting 0.3 - 14 per 1,000 live births. Day care centres are a common source of infection, and maternal immunity (50-80%) does NOT prevent recurrence or congenital infection. Most maternal infections are asymptomatic, but 15% have a mono-like syndrome. Affected infants may have ↓ BW, hepatosplenomegaly, hemolytic anemia and a variety of neurologic complications.

### **Herpes Simplex Virus (HSV)**

- Counsel
  - Neonatal manifestations
    - Skin, eye, mouth
    - CNS (encephalitis)
    - Disseminated infection (90% fatal)
  - HSV-type serology should be done in all HSV –ve females with +ve males
    - Repeat at 32-34 weeks GA
  - Congenital (via placenta)
    - Manifestations
      - Microcephaly
      - Hepatosplenomegaly
      - IUGR
      - Intra-uterine fetal demise
    - Largest risk if primary infection in 3<sup>rd</sup> TM because unable to produce protective IgG in time → fetus does not have protection
    - Can occur in 1<sup>st</sup> or 2<sup>nd</sup> TM with HSV crossing placenta (less likely)
  - Increased risk of spontaneous abortion
  - Increased risk of premature labour
  - Risk of transferring virus is 2-5% if clinically-apparent lesion at time of delivery
  - Asymptomatic shedding is unpredictable
    - Risk of transfer: 0.02-0.05%
- Management -> see 36 week notes

<sup>14</sup> For significant **nausea and vomiting**, should be offered Diclectin (10 mg doxylamine succinate and 10 mg pyridoxine HCl combined) 2 tabs qhs. If no relief, may add 1 qam, 1 midafternoon adjust according to sx. May add dimenhydrinate 50-100 mg every 4-6h PO or PR up to 200 mg/d when taking 4 tabs diclectin (if vomiting frequently suggest 30-45 min prior to taking diclectin) OR promethazine 12.5-25 mg q4-6h PO or PR. If dehydration present pt will need IV rehydration. If none and nausea still uncontrolled (other causes of nausea other than pregnancy have been ruled out) may add any of the following:

- Chlorpromazine 10-25 mg every 4-6h PO or IM or 50-100 mg every 6-8h PR
- Metoclopramide 5-10mg every 8hr IM or PO
- Ondansetron 4-8 mg every 6-8hr PO
- Prochlorperazine 5-10 mg every 6-8h IM or PO
- Promethazine 12.5-25mg every 4-6h IM, PO or PR

Motherisk runs a nausea and vomiting in pregnancy clinic: (416) 813-6780.

---

<sup>15</sup> **Preeclampsia risk** : Patients may be defined as low or high risk. Those who are high risk as defined below are advised to continue with multivitamins containing folic acid and maintain fitness level. As well, those with low calcium intake should supplement with 1g/d. **Low dose ASA (81mg) QHS** should be started prior to 16 weeks and stopped at term.

**Low Dose ASA in pregnancy**- Treatment of patients at risk of for preeclampsia with low dose ASA started prior to 16 weeks of pregnancy has been shown to reduce the risk of preeclampsia and IUGR by 50%.

Women at risk for preeclampsia include:

- Women with a history of preeclampsia in a previous pregnancy (risk in subsequent pregnancy 15-30%)
  - Family hx of preeclampsia (1st degree relative)
- No previous history of preeclampsia, however high risk of due to underlying chronic disease:
  - Pre-existing hypertension
  - Diabetes
  - Thrombophilia
  - Renal disease (elevated proteinuria at 1st prenatal)
  - Auto-immune disease (antiphospholipid syndrome)
  - Obesity (BMI >40)
- No previous hx of preeclampsia, however, pregnancy at elevated risk
  - Multiples
  - Assisted reproductive technologies

### <sup>17</sup> **Vaccines in Pregnancy**

Tdap – should be offered if patients are not otherwise up to date. (ie not vaccinated in adulthood)

- To protect the infant after birth, as most deaths due to pertussis have been in unvaccinated infants under 3 months of age
- Vaccines should be given between 27-36 weeks GA, to increase maternal antibody transfer. This provides immediate protection to infants who are at the greatest risk of morbidity and mortality, prior to the completion of their primary series.
- Making sure pregnant women are up to date in their vaccination also prevents them from acquiring infection that they may pass onto their newborn baby.

Flu – should be offered to all pregnant women pregnant during influenza season

Live vaccines (MMR, varicella)

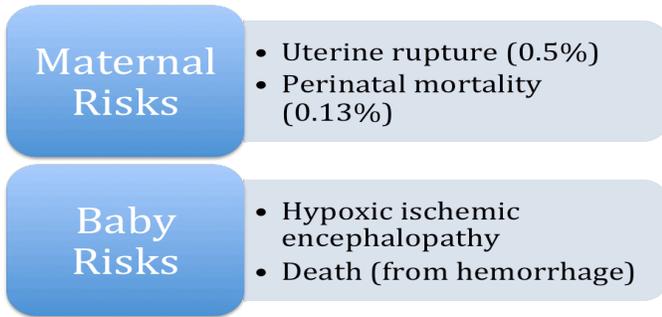
- Should not be administered during pregnancy due to theoretical risk to fetus
- If inadvertently given during pregnancy, women should not be counseled to terminate the pregnancy because of teratogenic risk
- Non-pregnant women immunized with a live vaccine should be counseled to delay pregnancy for at least 4 weeks
- May be safely given to breastfeeding women

Inactivated viral and bacterial vaccines, and toxoids

- Can be used safely in pregnancy and while breastfeeding

<sup>18</sup> **Gonorrhea** has been associated with ↑ PROM, chorioamnionitis and perinatal mortality. **Chlamydia** can cause pneumonia in newborn infants. Both GC and Chlamydia can cause conjunctivitis in newborns. **Bacterial vaginosis** has been linked with PROM and premature labour; therefore screen If patient is high risk for pre-term labour at 13-20 weeks, If patient is high risk for BV at 12-16 weeks, if they are symptomatic or if they have been treated in the last month for BV. Always treat, even if asymptomatic in pregnancy: Flagyl 500 mg po BID x 7 days or Clindamycin 300 mg po BID x 7 days (especially in a patient with premature labour, although there is not good evidence that treatment changes the outcome). If positive for any of the above during pregnancy, need to do test of cure. For Chlamydia, need culture, not usual test. **Pap** only needed if due according to usual guidelines.

<sup>19</sup> **VBAC Risks**



Good Candidate	Inappropriate Candidate
<ul style="list-style-type: none"> <li>• 1 prior low transverse uterine incision</li> </ul>	<ul style="list-style-type: none"> <li>• <b>low vertical incision</b></li> <li>• <b>&gt; 1 C/S</b></li> <li>• <b>High-risk uterine scars</b></li> <li>• <b>Prior uterine rupture</b></li> <li>• <b>Placenta previa, breech, etc</b></li> <li>• <b>Lack of appropriate facility</b></li> </ul>

<sup>20</sup> **Increased risk of IUGR?**

- According to SOGC IUGR Guideline (2013), low dosed ASA should be recommended to women from 12-16 through to 36 weeks who:
  - Have a previous history of IUGR, preeclampsia, placental abruption or placental infarction
  - Have  $\geq 2$  risk factors in current pregnancy: pre-gestational hypertension, obesity, maternal age  $>40$ , assisted reproduction, pre-gestational diabetes, multiple gestation

<sup>21</sup> **Blood work**

Thyroid: TSH should be measured at first blood work in pregnancy.

- Hyperthyroidism, if TSH is low, FT4 should be measured to ensure that suppression of TSH is due to Bhcg. If FT4 is elevated, then T3 and antibodies should be done to investigate for thyroiditis and Graves.
- Hypothyroidism may be divided into overt and subclinical hypothyroidism.
  - Overt hypothyroidism- TSH  $>2.5$  mIU/L and symptomatic or TSH  $>10.0$  mIU/L. Overt hypothyroidism is associated with adverse obstetrical outcomes, including neonatal neurocognitive deficits. Patients should be corrected to target of TSH  $<3.0$  in first trimester and TSH  $<2.5$  in second and third trimester. TSH should be measured q4weeks after dosing changes, and at minimum once per trimester.
  - Subclinical hypothyroidism- TSH  $>2.5-10.0$  and normal FT4. May occur with positive or negative antibodies. Although evidence is unclear, there may be an association with pregnancy complications including loss and neonatal neurocognitive deficits. Evidence is stronger with patients who are antibody positive. However, due to the unclear evidence, patients are treated similarly to those with overt hypothyroidism.

Ferritin: Ferritin should be measured in the first trimester of pregnancy and again at 28 weeks. A substantial proportion of women in pregnancy are iron deficient without having microcytic anemia. Replacing iron decreases risk of transfusion peripartum. Risk of transfusion includes remote risk of blood born diseases, and 8.0% risk of alloimmunization with each unit transfused.

Iron supplementation (Note: If using Proferrin need 2 tabs daily; best qhs on empty stomach with OJ or Vitamin C)  
 Ferritin  $<15$ : Ferrous sulphate 300 mg od

---

Ferritin 15-70: Ferrous gluconate 300 mg od  
Ferritin 71-400: Prenatal multivitamins only  
Ferritin >400: Prenatal multivitamins only -Can be elevated due to inflammation or iron overload  
Measure transferrin saturation. If >45% test for hemochromatosis

IV Venofer if patient can't tolerate po iron: ferritin < 50 AND Hb < 105

Based on information from Dr. Jeannie Callum at OB Grand Rounds October 18, 2013

Hb electrophoresis: Should be ordered on patients with MCV <80

Sickle cell trait: Should be ordered if Black, Indian, Mediterranean, Asian, Middle Eastern

<sup>22</sup> After 18 weeks gestation, *Treponema pallidum* can cross the placenta and cause congenital syphilis (hepatosplenomegaly, osteochondritis, CNS problems), stillbirth or neonatal death. Early treatment may prevent this.

<sup>23</sup> Infants of mothers who are HBsAg +ve should be immunized within 12 hours of birth with both hepatitis B vaccine and hepatitis B immune globulin (HBIG). Repeat doses of vaccine are given at both 1 and 6 months of age. The vaccine is supplied free in these circumstances by the MOH.

<sup>24</sup> **OGTT early if high risk**- If there is a high risk of GDM based on multiple clinical factors, screening should be offered at an earlier stage in the pregnancy. If patient is normoglycemic prior to 24 weeks, testing should be repeated between 24-28 weeks. (D Thompson et al. (2013) Can. J. Diabetes 37: S168-S183)

Risk Factors include:

- Previous diagnosis of GDM
- Pre-diabetes
- Member of a high-risk population (Aboriginal, Hispanic, South Asian, Asian, African)
- Age >35
- BMI>30kg/m<sup>2</sup>
- PCOS, acanthosis nigricans
- Corticosteroid use
- History of macrosomic infant
- Current fetal macrosomia or polyhydramnios
- Acanthosis Nigricans

Testing in a high risk situation should be done using a single 75g OGTT. Women sent for a single 75g OGTT should use the following thresholds for screening and diagnosis of GDM. A diagnosis is made if greater than 1 value is above the threshold.

- Fasting >5.1mmol/L
- 1hr> 10.0 mmol/L
- 2hr>8.5 mmol/L

All women diagnosed with GDM should be referred for educational counseling to SUNDEC (Women's and Babies). All women with GDM should be screened for T2DM with a 75g OGTT between 6 weeks and 6 months post partum.

<sup>25</sup> Several **Cord Blood Programs** offer processing and cryopreservation of stem cells after collection of umbilical cord blood at the time of delivery. Frozen stem cells may be used in the future to treat some childhood cancers and other potentially fatal diseases i.e. lymphoma and leukemia. This program is optional, and does not have any significant risks to mother or baby. Options include:

1. Private storage for family banking
  - Service costs money, but cells are kept for donor /family use only. The patient will be given the cord blood kit to take to the hospital with them when they deliver. The approximate cost is \$975-\$1175 for the first year, and \$125 per year thereafter. Private banking is not currently recommended by the SOGC or the American Academy of Pediatrics (AAP).
  - Inception Biosciences (905) 206-2790 [www.inception.com](http://www.inception.com)
  - Progenics (416) 221-1666 [www.progenicscryobank.com](http://www.progenicscryobank.com)
  - Cells for Life (877) 235-1997 [www.cellsforlife.com](http://www.cellsforlife.com)
  - CReATe (416) 813-4700 [www.createcordbank.com](http://www.createcordbank.com)
  - Cord Blood Bank of Canada (905) 943-4933 [www.cordbloodbankofcanada.com](http://www.cordbloodbankofcanada.com)

- Healthcord (877) 714-6361 [www.healthcord.com](http://www.healthcord.com)
- 2. Public cord blood bank
  - No charge, but parents have no rights to banked sample
  - Victoria Angel (905) 471-1113 [www.cellsforlife.com/victoriaangel/](http://www.cellsforlife.com/victoriaangel/)
- 3. Directed donation for high risk families
  - Specific situation where physician consultation and approval are required (i.e. when potentially needed for a sibling) - there are usually no fees
  - Recommended by SOGC and AAP

<sup>26</sup> **Danger signals that should be reported immediately to MD:** (this list is in prenatal pack given to patients)

- Any vaginal bleeding
- Swelling of face or fingers
- Severe or continuous headache
- Dimness or blurring of vision
- Abdominal pain
- Persistent vomiting
- Chills or fever
- Dysuria
- Leaking of fluid from vagina
- Marked change in fetal movements

<sup>27</sup> **Soft Markers on Ultrasound**

Soft Marker	Associations	Follow-up required
<i>Echogenic Intracardiac Focus</i>	<ul style="list-style-type: none"> <li>• 0.5-12% association with fetal anuploidy</li> </ul>	<ul style="list-style-type: none"> <li>• If in isolation, no further US/echo required</li> <li>• Refer for counseling for karyotype               <ul style="list-style-type: none"> <li>○ If the risk of fetal aneuploidy is greater than 1/600 (maternal age 31 years or by prenatal testing)</li> <li>○ Right-sided</li> <li>○ Biventricular</li> <li>○ Particularly conspicuous ECIF</li> <li>○ Non-isolated ECIF</li> </ul> </li> <li>• If the background risk for fetal aneuploidy is equivalent or less than 1/600 and the EICF is isolated, no further investigations are necessary.</li> </ul>
<i>Mild Pyelectasis</i>	<ul style="list-style-type: none"> <li>• In isolation, no significant increased risk of aneuploidy in low-risk women</li> <li>• Congenital hydronephrosis</li> </ul>	<ul style="list-style-type: none"> <li>• Anterior-posterior measurement of renal pelvis               <ul style="list-style-type: none"> <li>○ If <math>\geq 5</math> mm, require neonatal U/S</li> <li>○ If <math>&gt; 10</math> mm, consider 3<sup>rd</sup> TM U/S and refer to OB</li> </ul> </li> <li>• Karyotyping when:               <ul style="list-style-type: none"> <li>○ Other U/S markers OR</li> <li>○ Females <math>&gt; 35</math>/ screening results suggestive of increased risk of aneuploidy</li> </ul> </li> </ul>
<i>Single Umbilical Artery</i>	<ul style="list-style-type: none"> <li>• Cardiac/renal abnormalities</li> <li>• Low birth weight</li> </ul>	<ul style="list-style-type: none"> <li>• Detailed anatomy ultrasound: inclusive of kidneys and fetal echo</li> </ul>

<i>Echogenic Bowel (grade 2 and 3)</i>	<ul style="list-style-type: none"> <li>• Trisomy 13, 18, 21</li> <li>• X-Y aneuploidies</li> <li>• Cystic Fibrosis (2%)</li> <li>• Congenital infection</li> <li>• Intra-amniotic bleeding</li> <li>• IUGR</li> <li>• Congenital malformations of the bowel</li> </ul>	<ul style="list-style-type: none"> <li>• None for grade 1</li> <li>• Refer to OB <ul style="list-style-type: none"> <li>○ U/S for other soft markers/detailed anatomy</li> <li>○ U/S dedicated to abdomen –bowel obstruction/perforation</li> <li>○ Detailed assessment of placenta</li> <li>○ Amniocentesis</li> </ul> </li> <li>• Refer to genetics</li> <li>• Prenatal screening (if applicable), congenital infection screen</li> </ul>
<i>Thickened Nuchal Fold (≥6mm @18-24 weeks; ≥5mm @16-18 weeks)</i>	<ul style="list-style-type: none"> <li>• Trisomy 21 (Down Syndrome) - 17 fold</li> <li>• Single-Gene abnormalities</li> <li>• Cardiac abnormalities</li> </ul>	<ul style="list-style-type: none"> <li>• Ref to OB –amniocentesis</li> <li>• Fetal echo -4 chamber view, outflow tracts</li> </ul>
<i>Mild Ventriculomegaly</i>	<ul style="list-style-type: none"> <li>• Neurodevelopmental abnormalities</li> <li>• Due to: agenesis of corpus callosum, cerebral maldevelopment/destruction, vascular anomalies, obstruction within ventricular system</li> <li>• Unilateral more favourable than bilateral; resolving also has favourable outcome</li> </ul>	<ul style="list-style-type: none"> <li>• Refer to OB <ul style="list-style-type: none"> <li>○ Detailed ultrasound –looking for other soft markers/maldevelopment</li> <li>○ Amniocentesis</li> <li>○ ± MRI</li> </ul> </li> <li>• Evaluation for congenital infection</li> </ul>
<i>Choroid Plexus Cysts (small cysts in the choroid plexus of lateral ventricle–size not clinically relevant)</i>	<ul style="list-style-type: none"> <li>• Trisomy 18</li> <li>• ? Trisomy 21</li> </ul>	<ul style="list-style-type: none"> <li>• Isolated: <ul style="list-style-type: none"> <li>○ None if maternal age/prenatal screening brings risk to &lt;35 yr old female</li> <li>○ Age/Screening &gt;risk for 35yr old female for trisomy 18/21- Amniocentesis</li> </ul> </li> <li>• Additional soft markers <ul style="list-style-type: none"> <li>○ Amniocentesis</li> <li>○ Refer to OB</li> <li>○ Detailed ultrasound of cranium incl. ventricles and choroid plexus</li> </ul> </li> </ul>
<i>Enlarged Cisterna Magna</i>	<ul style="list-style-type: none"> <li>• Trisomy 18</li> <li>• Multiple anatomic and syndromic anomalies</li> </ul>	<ul style="list-style-type: none"> <li>• Refer to OB</li> <li>• Detailed Ultrasound for: anomalies, IUGR, AFV</li> <li>• Amniocentesis if there are other abnormalities seen</li> </ul>

<sup>28</sup> **Kick counts**

- Low risk women should be made aware of kick counts, and should perform a kick count if they perceive a decrease in fetal movement. They should perceive 6 movements in 2 hours, and can stop as soon as they count 6. If they have reduced fetal movement on kick count, they should be assessed in triage with an NST, and should have a BPP within 24 hours
- High risk women should start monitoring kick counts at 26 weeks

---

<sup>29</sup> **Rhlg** should be given to all Rh -ve women (who have not developed Ab) at 28 weeks, unless father is known to be Rh -ve. Second dose of Rhlg will be needed **within 72 hours of delivery** if infant Rh +ve. The standard dose of Rhlg is 300 µg, which covers up to 30 mL of fetal-maternal hemorrhage. A woman who experiences a larger hemorrhage (i.e. abruption, placenta previa, C/S, intrauterine manipulation or manual removal of placenta) will need a Betke-Kleihauer acid elution test to determine the exact amount of hemorrhage, and the amount of Rhlg needed. Note that the BK test is used to determine if ADDITIONAL Rhlg is required, but doesn't eliminate the need for an initial 300 ug dose if negative. This test is generally followed by a flow cytometry test (available M-F only, done at SB), which has better sensitivity and specificity.

**Other indications for Rhlg in Rh -ve Pregnant Women:**

- Spontaneous or therapeutic abortion, ectopic pregnancy
- CVS or amnio
- Antepartum bleeding
- Significant abdominal trauma during pregnancy
- External cephalic version

<sup>30</sup> All pregnant women should be screened between 24-28weeks gestation. The preferred method of screening is with a 50g Glucose Challenge Test (GCT). It is administered in a non-fasting patient, serum glucose is measured 1 hour later.

<7.8 mmol/L = normal

7.8-11.1 mmol/L a11.1mmol/L = positive screen, requires confirmatory testing with a fasting 75g OGTT

>11.1mmol/L = diagnostic for GDM

Step 2: If a 75g OGTT is performed, diagnosis of GDM may be made with 1 value above the threshold. It is administered in a fasting patient, and serum glucose is measured fasting, at 1 hour and 2 hours. (HAPO Study OR 2.0 cutoff)

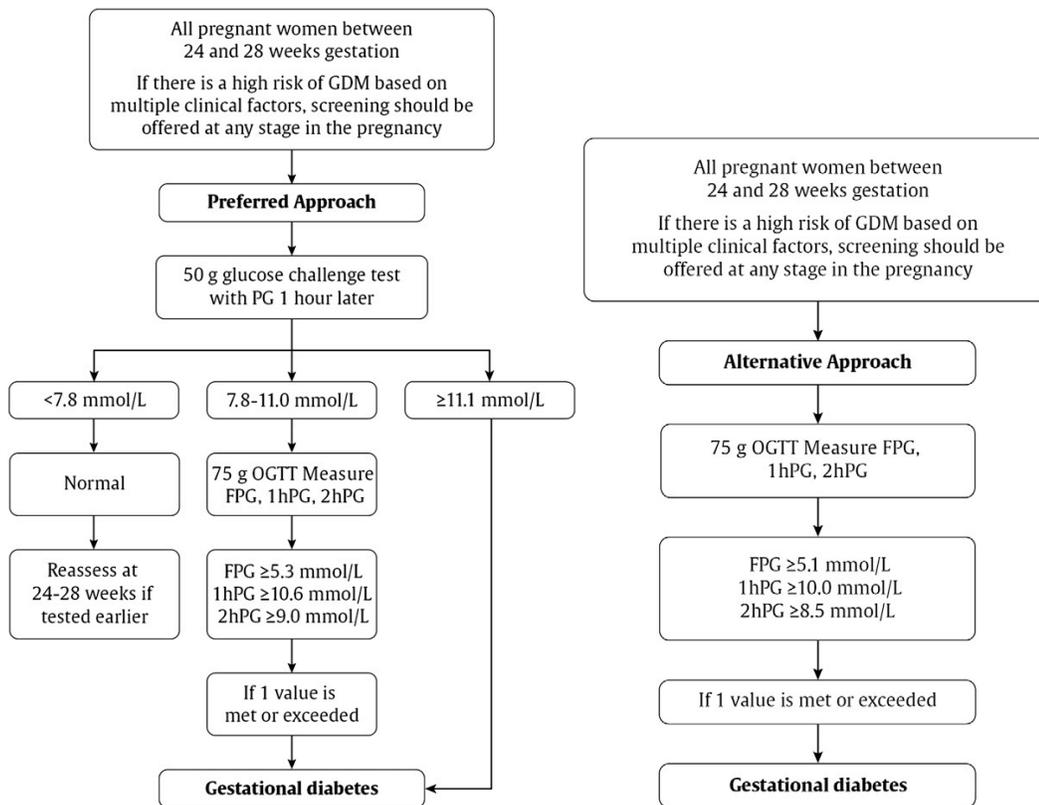
- Fasting >5.3mmol/L
- 1hr> 10.6 mmol/L
- 2hr>8.5 mmol/L

**Alternatively**

Women may be sent for a 1 step 75 OGTT for screening and diagnosis of GDM. A diagnosis is made if greater than 1 value is above the threshold. (HAPO Study OR 1.75 cutoff)

- Fasting >5.1mmol/L
- 1hr> 10.0 mmol/L
- 2hr>8.5 mmol/L

All women diagnosed with GDM should be referred for educational counseling to SUNDEC (Women's and Babies). All women with GDM should be screened for T2DM with a 75g OGTT between 6 weeks and 6 months post partum.



### Management

- Targets
  - FBS < 5.3 mmol/L
  - 1 hr PP < 7.8 mmol/L
  - 2 hr PP < 6.7
  - Intrapartum: 4-7 mmol/L
- Sugar checks
  - Pregnancy
    - Pre- and post-prandial
  - Intrapartum
    - Q2h
  - Postpartum
    - Fasting + with meals x24h post SVD; x48h post C/S
    - Breast feed immediately to reduce risk of hypoglycemia in infant

### Treatment

- 2 week trial of diet
- Insulin: any rapid-acting agent in multiple dosing
- Metformin or Glyburide
  - Can be used off-label if not compliant

### Antenatal fetal testing (NST or BPP)

- 2x/week starting @32 weeks GA
  - not necessary for A1 women (maintain euglycemia on diet)
- Ultrasound for growth @ 36 weeks
  - OR @28, 32, and 36 weeks
  - Require C/S if ≥4500g
- Induction
  - Diet controlled: by 41 weeks
  - Medically managed: @39 weeks
  - Suboptimal treatment/co-morbid conditions: @38 weeks

---

<sup>31</sup> **Elective C/S Prep**

Give “OB Planned CS Prep” handout to patients. They should not wax/trim/shave pubic area from 30 weeks onwards, and should purchase and use chlorhexidine wash the morning of surgery. Both are done to reduce infection rates.

<sup>32</sup> At 18 weeks ~ 5% of women have low-lying placenta on U/S, but < 0.5% have placenta previa at term. Repeat U/S in third trimester is necessary to ensure placenta has migrated and is no longer previa.

<sup>33</sup> Primip q 5 min or can't stand the pain, multip q 10 min, SROM, bleeding, etc. Ensure Pt has after hours #.

<sup>34</sup> **Group B Strep** is a major cause of sepsis among newborns. GBS colonization among all women ranges from 10-30%. The current incidence in Canada is approximately 0.64/1000 live births with 9% of these cases being fatal. Screening and treatment has been found to reduce morbidity and mortality by 70%. SOGC guidelines recommend universal screening of all pregnant women with a first trimester urine culture and a vaginal rectal culture between 35-37 weeks. If either culture is positive, or if the patient has had a previous infant with GBS complications, the women should receive intrapartum chemoprophylaxis with antibiotics. Penicillin G is considered to be the antibiotic of choice. **Women with penicillin allergies need to have allergy clarified; those at risk of anaphylaxis should have sensitivities ordered at the time of culture.** The proper culture technique is 1 rectovaginal swab (distal 2” of vagina, done without a speculum, and then rectum with same swab). (Money, D.M. and Dobson, S.)

**Risk factors for which intrapartum chemoprophylaxis is recommended:**

1. Positive GBS culture at 35-37 weeks
2. Preterm labour (< 37 wks) or preterm PROM\*
3. Previous delivery of newborn with GBS disease (regardless of current GBS colonization)\*
4. Previously documented GBS bacteriuria during current pregnancy\*
5. Prolonged rupture of membranes (>18 hrs)\*\*
6. Maternal fever during labour (> 38 C)\*\*

\* Regardless of GBS culture result

\*\* If culture not done or results unknown

**Intrapartum antibiotic regimens:** (ideally started ≥ 4 hrs. before delivery, stopped after delivery)

---

**Table 2. Recommended Antibiotics for Intrapartum Prophylaxis**

---

1. Penicillin G 5 million units IV, then 2.5 million every 4 hours  
or
  2. If the woman is penicillin allergic but not at risk of anaphylaxis:  
cefazolin 2 g IV then 1 g every 8 hours  
or
  3. If the woman is penicillin allergic and at risk of anaphylaxis:  
clindamycin 900 mg IV every 8 hours or erythromycin 500 mg  
IV every 6 hours
- 

Note: If GBS resistance is demonstrated to clindamycin or erythromycin by culture and sensitivity, then give vancomycin 1 g IV every 12 hours.

---

(Money, D.M. and Dobson, S)

All patients should have their antibiotic allergies noted on the antenatals. Patients with known penicillin allergies should have sensitivities to clindamycin and erythromycin, due to increasing resistance to both antibiotics. If patient has resistance to both antibiotics, or, no sensitivity is done than patient will require treatment with vancomycin 1g IV q12h. Additionally, any patient not treated with penicillin will require an NICU consult, as the neonates will not be considered to have had adequate prophylaxis.

\* Regardless of GBS culture result

\*\* If culture not done or results unknown

<sup>35</sup> Circumcision is not a medically necessary procedure. It is no longer covered by OHIP, and the parents will be required to pay approximately \$300-400 for the procedure.

---

### <sup>36</sup> **Management of HSV in Pregnancy**

- Primary infection
  - Acyclovir (if clinically severe)
  - Elective C. Section if occurs in 3<sup>rd</sup> TM
  - HSV cultures in neonate
- Recurrent infection
  - Elective C. Section if clinically-apparent lesion within 4h of ROM OR if experiencing prodrome
  - Management
    - Antivirals
      - Prophylaxis (prevent shedding/lesions) starting at 36 weeks, continued until delivered
      - Anytime if very severe
      - Regimens:
        - Acyclovir 400 mg TID or 200 mg QID
        - Valacyclovir 500 mg BID
    - Labour and Delivery
      - Avoid scalp stimulation and sampling
      - C/S if clinically-apparent lesions

### <sup>37</sup> **Indications for Induction and Timing**

- Benefits of delivery > Risks associated with induction (for both mom and fetus)
  - ≥ 41 weeks GA
  - PROM
  - Potential fetal compromise
    - IUGR
    - Non-reassuring surveillance
  - Maternal medical conditions
    - Renal disease
    - Pre-eclampsia/ HTN (gestational, chronic)
    - Type I DM
  - Antiphospholipid syndrome
  - Suspected/proven chorioamnionitis
  - Placental abruption
  - Fetal death

### **FURTHER GUIDELINES AND RESOURCES:**

Society of Obstetricians and Gynecologists of Canada (SOGC): [www.sogc.medical.org/index.html](http://www.sogc.medical.org/index.html)

Money, D.M. and Dobson, S. The Prevention of Early-Onset Neonatal Group B Streptococcal Disease. *J Obstet. Gynaecol Can* 2004; 26(9): 826-32

Gagnon, A. Douglas, R.D. Obstetrical Complications Associated With Abnormal Maternal Serum Markers Analytes. *J Obstet. Gynaecol Can* 2008; 30(10): 918-932

Summers, A.M. Langlois, S. Wyatt, P. Wilson, R.D. Prenatal Screening for Fetal Aneuploidy. *J Obstet. Gynaecol Can* 2007; 29(2): 146-161

Wilson, R.D. et al. Pre-conceptional Vitamin Folic Acid Supplementation 2007: The use of folic acid in combination with a multivitamin supplement for the prevention of neural tube defects and other congenital anomalies. *J Obstet. Gynaecol Can* 2007; 29(12): 1003-1013

Wilson, R.D. et al. Amended Canadian Guidelines for Prenatal Diagnosis (2005) Change to 205-Techniques for Prenatal Diagnosis. *J Obstet. Gynaecol Can* 2005; 27(11): 1048-1054

Wilson, R.D. Langlois, S. Johnson, J. Mid-Trimester Amniocentesis Fetal Loss Rate. *J Obstet. Gynaecol Can* 2007; 29(7): 586-590

Crane, J. Induction of Labour at Term. *J Obstet Gynaecol Can* 2001;23(8)717-28

Davies G.A.L., Wolfe, L.A., Mottola, M.F., MacKinnon C. Exercise in Pregnancy and the Postpartum Period. *J Obstet Gynaecol Can* 2003;25(6):516–22.

Van den Hof M.C, Wilson R.D. Fetal Soft Markers in Obstetric Ultrasound. *J Obstet Gynaecol Can* 2005;27(6):592–612

---

Berger H, Crane J, Farine D. Screening for Gestational Diabetes Mellitus. *J Obstet Gynaecol Can* 2002;24(11):894–903.

Money D, Steben M. Guidelines for Screening and Management of Herpes Simplex Virus in Pregnancy. *J Obstet Gynaecol Can* 2008;30(6):514–519

Yudin M, Money D. Screening and Management of Bacterial Vaginosis in Pregnancy. *J Obstet Gynaecol Can* 2008;30(8):702–708

Martel M, MacKinnon CJ. Guidelines for Vaginal Birth After Previous Caesarean Section. *J Obstet Gynaecol Can* 2005;27(2):164–174

Physical Activity Readiness Medical Exam for Pregnancy

PARmed-X for Pregnancy

[www.csep.ca/forms.asp](http://www.csep.ca/forms.asp)

Guide to Revised Antenatal Record of Ontario

[www.oma.org/phealth/00anten.htm](http://www.oma.org/phealth/00anten.htm)

Maternity Care Calendar & Guidelines

[www.maternitycalendar.com/default\\_flash.cfm](http://www.maternitycalendar.com/default_flash.cfm)

Nutrition for Health Pregnancy

Publications Health Canada, Ottawa ON K1A 0K9 (613) 954-5995

[www.hc-sc.gc.ca](http://www.hc-sc.gc.ca)

SB Policies on Perinatal Infections

P&P manuals - available in Infection Control Manual under Updated Perinatal Policies, Section P

Mount Sinai Hospital

[www.mountsinai.on.ca/care/placenta-clinic](http://www.mountsinai.on.ca/care/placenta-clinic)

#### Vaccines in Pregnancy

- ACIP Childhood/Adolescent Immunization Work Group; Akinsanya-Beysolow I, Jenkins R, Meissner HC; Centers for Disease Control and Prevention. Advisory Committee on Immunization Practices (ACIP) recommended immunization schedule for persons aged 0 through 18 years – United States 2013. *MMWR Surveill Summ* 2013; 62 (Suppl 1): 2-8.
- Matlow J, Pupco A, Bozzo P, Koren G; Tdap vaccination during pregnancy to reduce pertussis infection in young infants. *Canadian Family Physician*; 59: 497-498.
- SOGC Clinical Practice Guideline: Immunization in Pregnancy, 2009
- Statement on Seasonal Influenza Vaccine for 2012-2013, National Advisory Community on Immunization (NACI), August 2012
- Update on Pertussis Vaccination in Pregnancy: An Advisory Committee Statement. National Advisory Community on Immunization (NACI) Feb 7, 2014

#### Cord Blood Banking

- SOGC Clinical Practice Guideline: Umbilical cord blood banking: implications for perinatal care providers, 2005
- Cairo MS, Kurtzberg J, Lubin BH, Shearer WT. Cord Blood Banking for Potential Future Transplantation. *Pediatrics*, 2007; 119(1): 165-170.

#### Prenatal Genetic Screening

- Audibert, F, Gagnon, A. et al. Prenatal Screening for and Diagnosis of Aneuploidy in Twin Pregnancies. *J Obstet. Gynaecol Can* 2011; 33(7): 754-767
- Gagnon, A. Douglas, R.D. Obstetrical Complications Associated With Abnormal Maternal Serum Markers Analytes. *J Obstet. Gynaecol Can* 2008; 30(10): 918-932
- Wilson, R.D. et al. Amended Canadian Guidelines for Prenatal Diagnosis (2005) Change to 205- Techniques for Prenatal Diagnosis. *J Obstet. Gynaecol Can* 2005; 27(11): 1048-1054
- Wilson, R.D. Langlois, S. Johnson, J. Mid-Trimester Amniocentesis Fetal Loss Rate. *J Obstet. Gynaecol Can* 2007; 29(7): 586-590
- Wapner, R.J. et al. Chromosomal Microarray versus Karyotyping for Prenatal Diagnosis. *New England Journal of Medicine* 2012 367:23 2175-2184.

- Wilson, R.D. et al. Prenatal Screening, Diagnosis and Pregnancy Management of Fetal Neural Tube Defects. *J Obstet. Gynaecol Can* 2014; 36 (10): 927-939
- Hillman, S.C. et al. Use of Prenatal chromosomal microarray: Prospective cohort study and systematic review and meta-analysis. *Ultrasound Obst Gynecol* 2013; 41:610-620

#### Diabetes

- Canadian Diabetes Association: D Thompson et al. (2013) *Can. J. Diabetes* 37: S168-S183
- HAPO Study Group *New Engl J Med* 2008;358:1991

#### Thyroid

- Stagnaro-Green A, Abalovich M, Alexander, E, et al. Guidelines of the American Thyroid Association for the diagnosis and management of thyroid disease during pregnancy and postpartum. *Thyroid*. 2011; 21(10):1081-1125

#### Ferritin

- Based on information from Dr. Jeannie Callum at OB Grand Rounds October 18, 2013

#### GBS

- Money, D.M. and Dobson, S. The Prevention of Early-Onset Neonatal Group B Streptococcal Disease. *J Obstet. Gynaecol Can* 2004; 26(9): 826-32

#### Maternal Age Over 40:

- Fretts, Ruth Management of infertility and pregnancy in women of advanced age. [Online: Updated Aug 19, 2013] UpToDate Topic 145, Version 12.0

#### VBAC

- Wells C.E., Cunningham F.G. Choosing the route of delivery after cesarean birth. [Online: Updated Aug 29, 2013] UpToDate Topic 4479 Version 30.0
- Martel M, MacKinnon C.J. Guidelines for Vaginal Birth After Previous Caesarean Section. *J Obstet Gynaecol Can* 2005;27(2):164–174

#### GDM

- Coustan D.R., Kovanovic C.L. Screening and diagnosis of diabetes mellitus during pregnancy. [Online: Updated Aug 29, 2013] UpToDate Topic 6797 Version 26.0
- Coustan D.R., Kovanovic C.L. Medical management and follow-up of gestational diabetes mellitus. [Online: Updated July 17, 2013] UpToDate Topic 6790 Version 41.0
- Thompson D, Berger H, Feig D, Gagnon R, Kader T, Keely E, Kozak S, Ryan E, Semner M, Vinkuroff C. Diabetes and Pregnancy. *CDA Clinical Practice Guidelines*. Chapter 36: 1-7
- Berger H, Crane J, Farine D. Screening for Gestational Diabetes Mellitus. *J Obstet Gynaecol Can* 2002;24(11):894–903.

#### Exercise in Pregnancy

- PARmed-X for Pregnancy. Canadian Society for Exercise Physiology. [Online] [www.csep.ca/forms](http://www.csep.ca/forms)
- Davies G.A.L., Wolfe, L.A., Mottola, M.F., MacKinnon C. Exercise in Pregnancy and the Postpartum Period. *J Obstet Gynaecol Can* 2003;25(6):516–22.

#### Soft Markers

- Van den Hof M.C, Wilson R.D. Fetal Soft Markers in Obstetric Ultrasound. *J Obstet Gynaecol Can* 2005;27(6):592–612

#### Induction

- Crane, J. Induction of Labour at Term. *J Obstet Gynaecol Can* 2001;23(8):717-28

#### HSV

- Money D, Steben M. Guidelines for Screening and Management of Herpes Simplex Virus in Pregnancy. *J Obstet Gynaecol Can* 2008;30(6):514–519

#### BV

- Yudin M, Money D. Screening and Management of Bacterial Vaginosis in Pregnancy. *J Obstet Gynaecol Can* 2008;30(8):702–708

#### ASA in Pregnancy

- Bujold E; Tapp, S; Auldbert, F; Ferreira, E; Forest, J.C.; Rey, E; Fraser, W.D; Chaillet, N; and Giguere, Y. *Prevention of adverse pregnancy outcomes with low-dose ASA in early pregnancy: new perspective for future randomized trials*
- Magee, LA et al. *Diagnosis, Evaluation, and Management of the Hypertensive Disorders of Pregnancy: Executive Summary*. *J Obstet Gynaecol Can* 2014;36(5):416-438