USING ULTRASOUND TO DETERMINE GESTATIONAL AGE: THE NEW SOGC GUIDELINES.

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LEARNING OBJECTIVES:

- **To review the SOGC guideline on gestational age assessment.**
- **To review sources of error with clinical dating.**
- **To review the evidence for ultrasound based gestational age assessment.**

Special thanks

- Organizing Committee: PSBC
- Co Author: Dr Kimberley Butt (New Brunswick)
- SOGC Diagnostic committee members
- SOGC Executive
  - Published and on line
  - Feb 2014
  - http://sogc.org/guidelines/determination-gestational-age-ultrasound/

The Opening Statement…

- *When performed with quality and precision, ultrasound alone is more accurate than a "certain" menstrual date for determining gestational age in the first and second trimesters (≤ 23 weeks) in spontaneous conceptions, and it is the best method for estimating the delivery date. (II)*

Main Take home points

- Clinical (as opposed to biological) gestational age should be based on the following rules.

1) Known conception date using reproductive technologies.
2) Use the earliest ultrasound (TA or TV) estimate if between 7 (CRL ≥ 10 mm) and 22+6 weeks of gestation.
3) First trimester US is the most accurate, so whenever possible, get a dating scan.
4) After 23 weeks, can use US or clinical judgement
5) Clinical judgement may still be needed, but it is the exception rather than the rule.

The idea is not new....

- United Kingdom/Sweden

Hughes R, Aitken E, Anderson J, Barry C, Benton M, Elliot J; National Institute for Health and Clinical Excellence. Antenatal care. Routine care for the healthy pregnant woman. NICE clinical guideline 62. London: RCOG Press; 2008.

Bottomley C, Bourne T. Dating and growth in the first trimester. Best Pract Res Clin Obstet Gynaecol 2009;23:439–52.

- International Society of Ultrasound in Obs and Gyne (ISUOG)

Salomon LJ, Alfirevic Z, Bilardo CM, Chalouhi GE, Ghi T, Kagan KO, et al. ISUOG practice guidelines: performance of first-trimester fetal ultrasound scan. Ultrasound Obstet Gynecol 2013;41(1):102–13.

Important points....

- This isn't meant to be biological dating. We are not trying to predict WHEN conception occured (ie work backwards) but setting up a common frame of reference / starting point to count days of gestation

- Some women are very aware of when they ovulate and we should not discount this, however many women are not so.

Why is dating so important?

- Timing of investigations
  Serum screening, NT, GDM etc
- Interpretation of investigations
  Ultrasound for SFD
- Therapies
  Corticosteroids , $MGSO_4$,
- Viability/Peri-viable period
- Timing of delivery
  - IUGR fetuses, Hypertension, PPROM, Post Dates, DM
- Initiation of Fetal surveillance

Clinical Illustration…

- 34 year old G2T1L1 referred for SFD

- Tech/Patient Hx:
  - LMP Oct 30, 2013
  - Cycles are regular, 28 days
  - US report given, 20 week scan, within 8 days of expected.

- GA by LMP = 32+1
  - First US within 5 days
  - US result, AC at the 3 %tile, therefore Mod IUGR.
  - Surveillance protocol: NST/AFI Dopplers 2 x a week
  - Steroids given, NICU consult.
  - FUP Growth US is ordered

Clinical Case

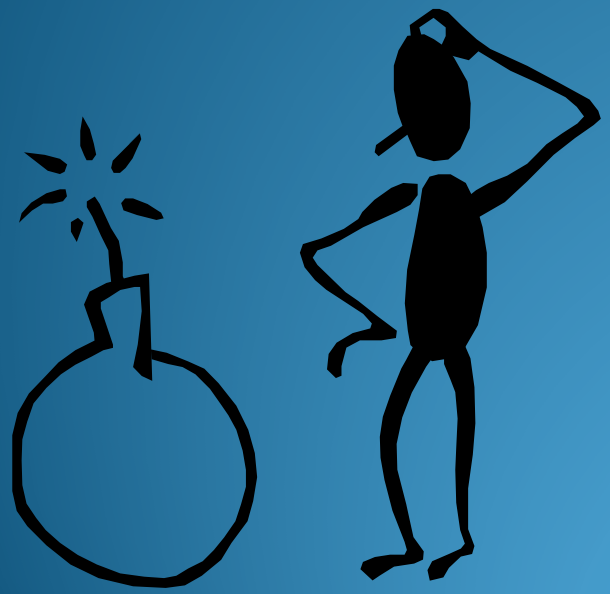
- Returns for growth scan 2 wks later
- Requisition LMP is Oct 23, not Oct 28 as previously noted. Patient confirms correction (Oct 28 end of her LMP, not start) and cycle length incorrect.
- Consequently, pregnancy dated using available US.
- Sonologist recalculates GA as 33+0, not 34+1
- Biometry now is normal range, in fact, previous scan when re analyzed is in normal range as well.

Clinical Case 2

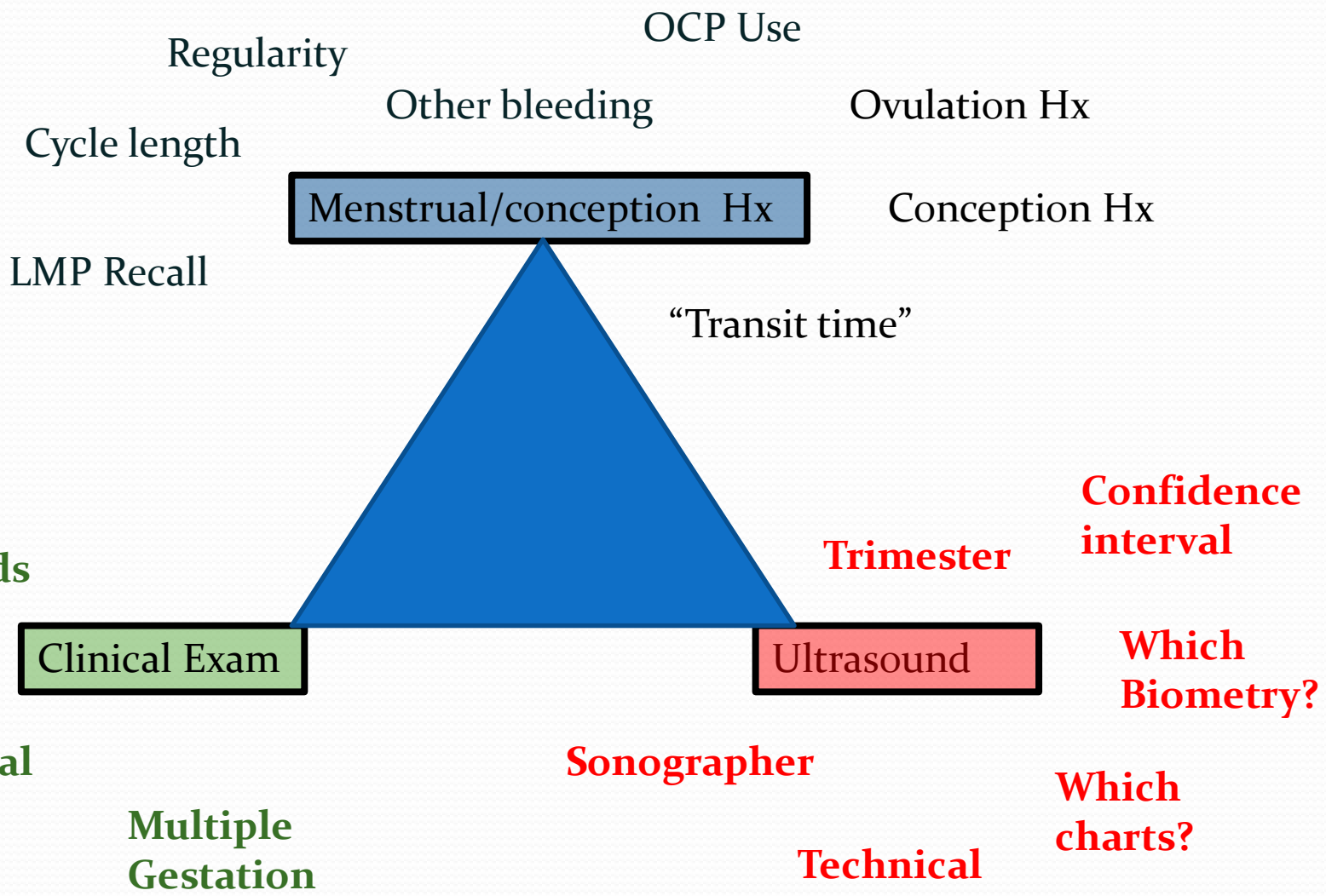
- “Patient comes for fetal monitoring as now Post dates at 41+0.
- LMP known, cycle length regular, 1st trimester US available.
- Fetal monitoring RN double checks GA calculations and does not get same GA, instead its 40+2 and patient should not be monitored further
- Difference?
  - First Trimester CRL is 10+3 by one chart (5 days difference from LMP), 10+6 by another (8 days difference)

CONFUSED???

So are we .....



WHY SO DIFFICULT? FACTORS IN DETERMINING GA

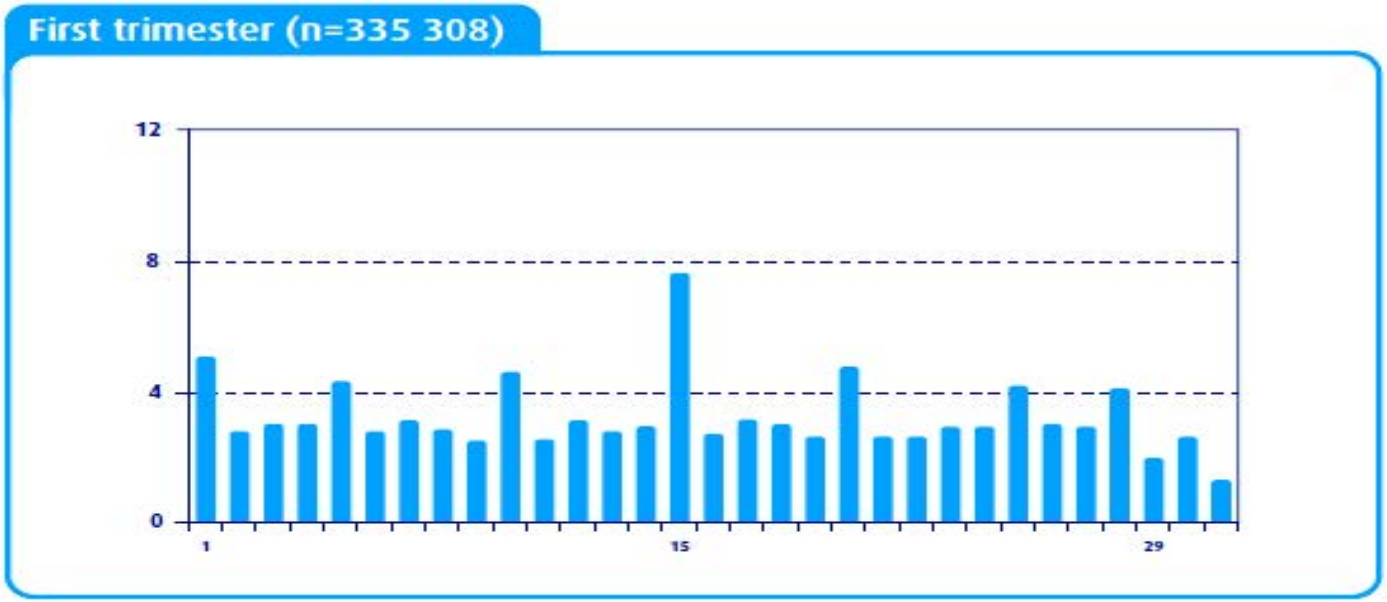


Some issues with Menstrual Hx

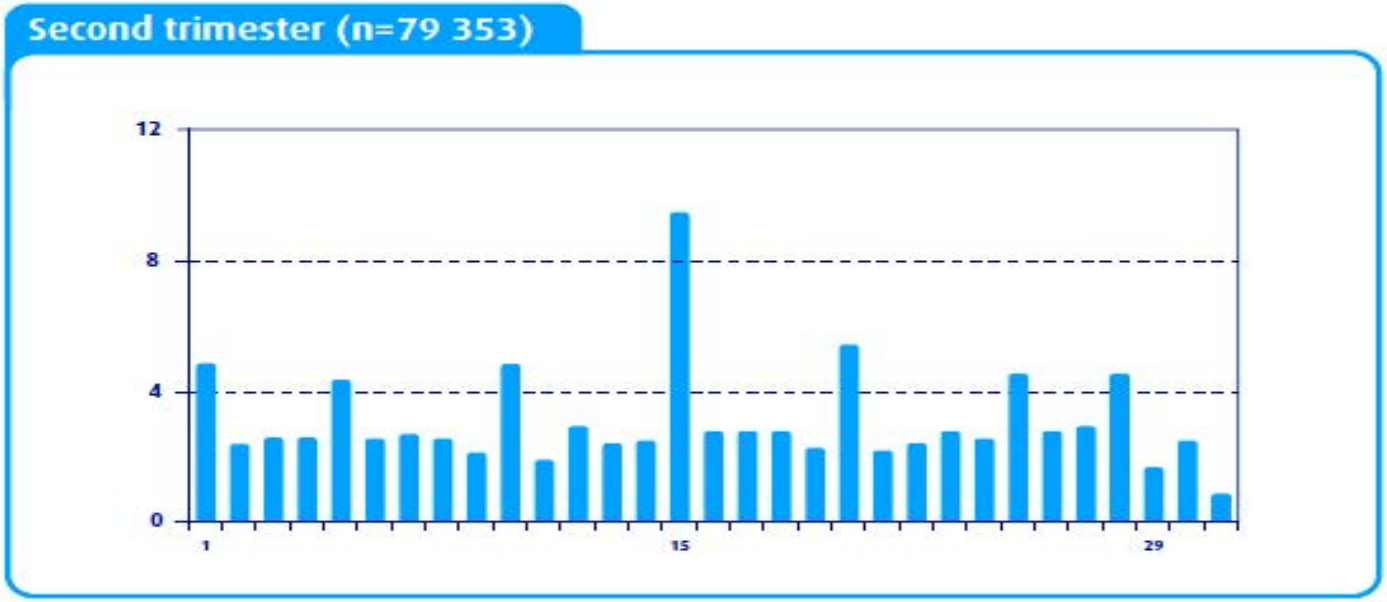
- S. Campbell (1985)
  - Up to 40% the history is incorrect

- Waller (2000): Digit Bias….
  - > 500,000 records
  - Day 15 is 2.5 x more likely to be stated.

Figure 1. Number perference in the first day of the last menstrual period by onset of prenatal care, California birth certificates, 1987.



Digit Bias for days 1, 5, 10, 15, 20, 25 and 28



Problems: Conception history

- Baerwold (2003)
  - Concept of Multiple follicular development/ ovulation
- Leppaluoto (1974)
  - Sperm survival in genital tract longer than once believed

  (5 days vs 24 hours)
- Mahendru (2012)
  - Fertilization to implantation time may alter the “start” of the clock (up to 11 days difference).
  - CRL of fetus depends on when implantation occurs

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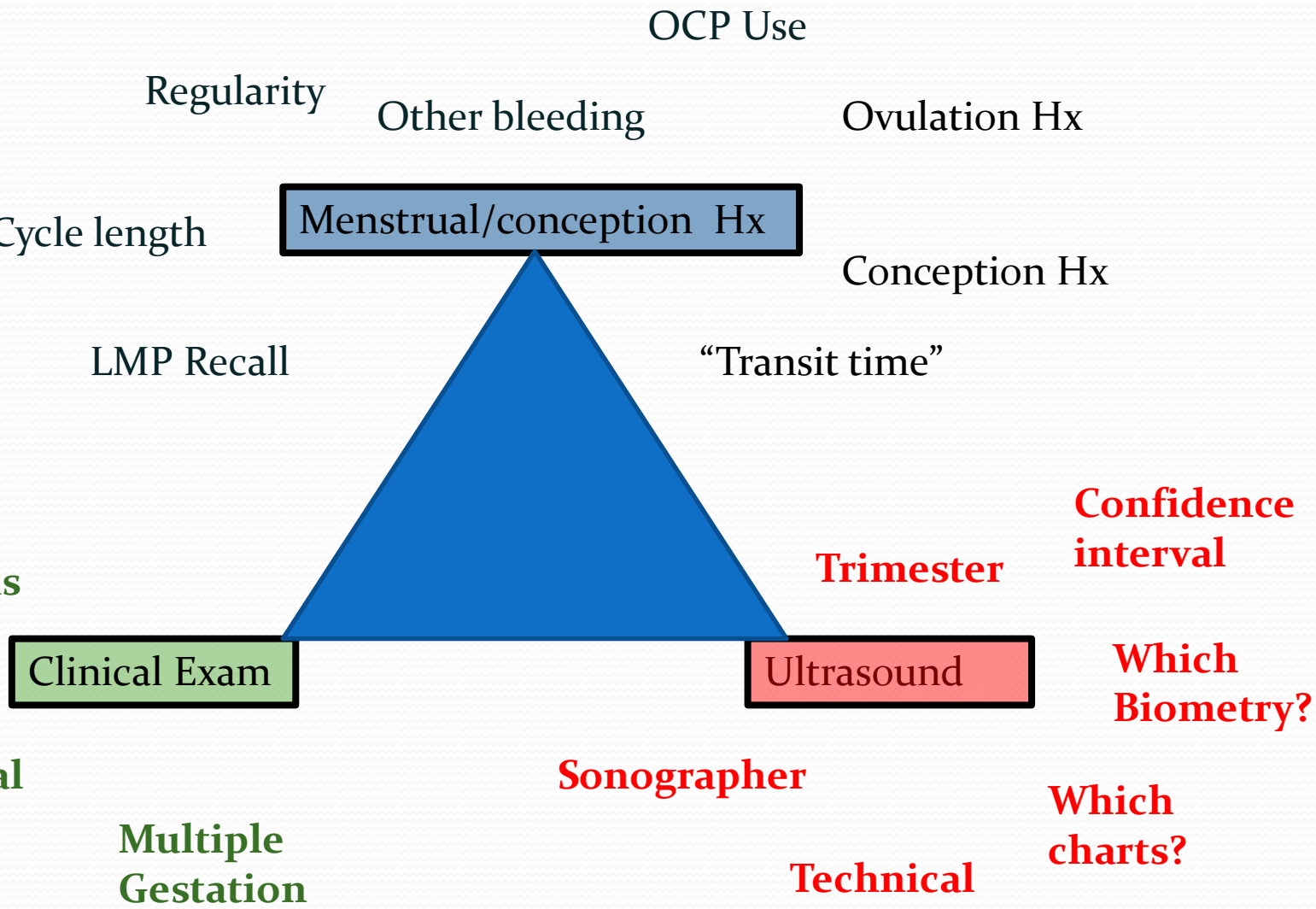

Benefits of using ultrasound dating

- Better at predicting EDD.
  - Mongelli M, Wilcox M, Gardosi J. Estimating the date of confinement: ultrasonographic biometry versus certain menstrual dates. Am J Obstet Gynecol 1996;174:278–81.
  - Tunón K, Eik-Nes SH, Grøttum P. A comparison between ultrasound and a reliable last menstrual period as predictors of the day of delivery in 15,000 examinations. Ultrasound Obstret Gynecol 1996;8:178–85.

Benefits of using ultrasound dating

- Less Post dates inductions (RCT's)
  - Bennett KA: First trimester ultrasound screening is effective in reducing postterm labor induction rates: a randomized controlled trial. Am. J Obstet Gynecol 2004;190:1077–81.
  - Harrington DJ: Does a first trimester dating scan using crown rump length measurement reduce the rate of induction of labour for prolonged pregnancy? An uncompleted randomised controlled trial of 463 women. BJOG 2006;113:171–6.
  - Crowther CA, Kornman L, O'Callaghan S, George K, Furness M, Willson K. Is an ultrasound assessment of gestational age at the first antenatal visit of value? A randomised clinical trial. Br J Obstet Gynaecol 1999;106:1273–9.

Benefits of using ultrasound dating

- Result in less pregnancies classified as premature

  - Blondel B, Morin I, Platt RW, Kramer MS, Usher R, Breart G. Algorithms for combining menstrual and ultrasound estimates of gestational age: consequences for rates of preterm and postterm birth. BJOG 2002;109:718–20.

Benefits of using ultrasound dating

- Improves accuracy of serum screening for aneuploidy

  - Benn PA: Down syndrome and neural tube defect screening: the value of using gestational age by ultrasonography. Am J Obstet Gynecol 1997;176:1056–61.

  - Wald NJ: Maternal serum screening for Down's syndrome: the effect of routine ultrasound scan determination of gestational age and adjustment for maternal weight. Br J Obstet Gynaecol 1992;99:144–9.

The Practical Benefits of using ultrasound dating rules

- A simpler set of rules that everyone uses so we are all on same page.
- Less dependant on consistency, accuracy of history/information
- Less likely to be variances among caregivers

Main Take home points

- Clinical (as opposed to biological) gestational age should be based on the following rules.

1) Known conception date using reproductive technologies.
2) Use the earliest ultrasound (TA or TV) estimate if between 7 (CRL ≥ 10 mm) and 22+6 weeks of gestation.
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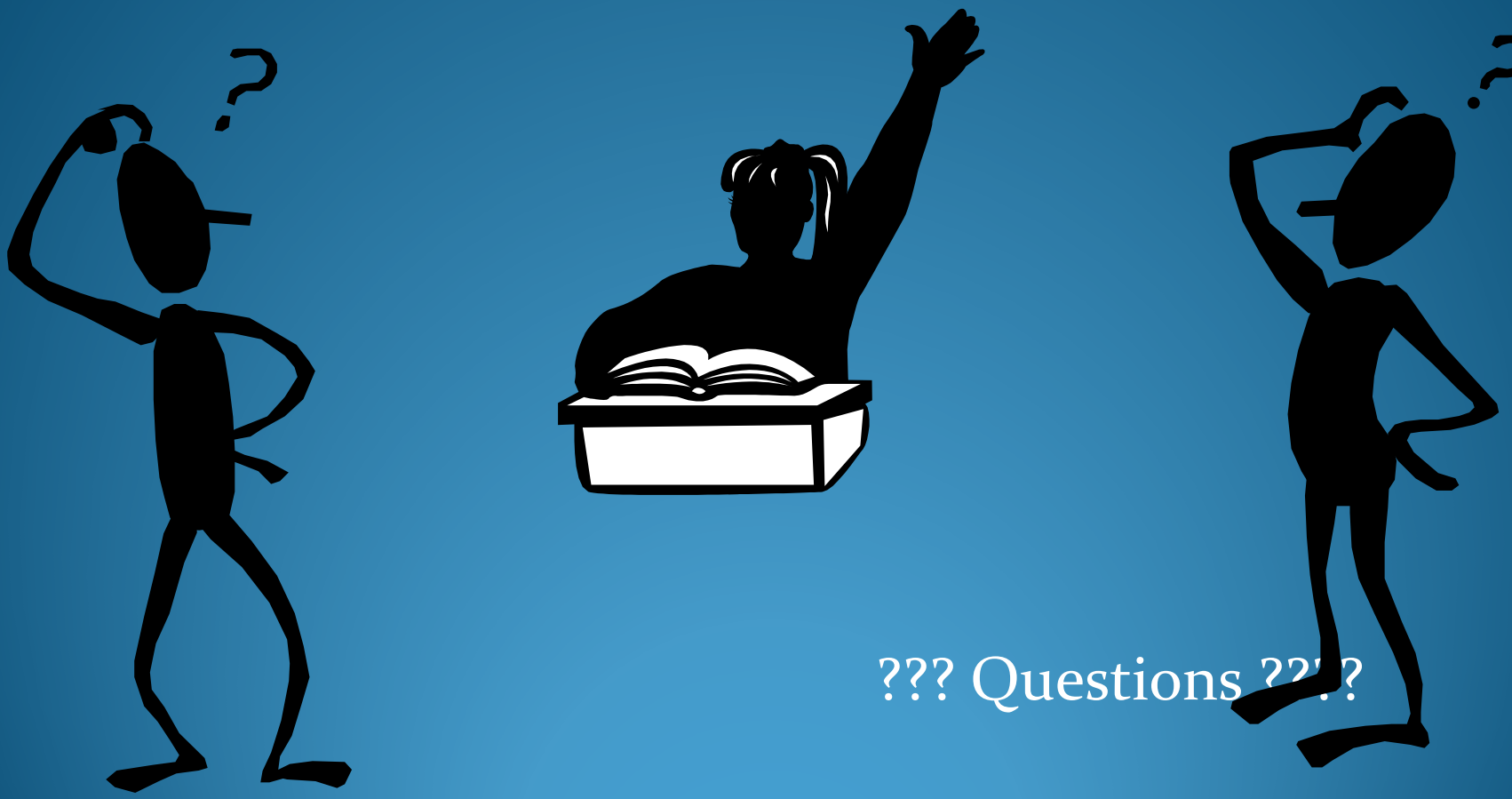
Thank you for listening



??? Questions ???

SOGC recommendations

- 1. First-trimester crown-rump length is the best parameter for determining gestational age and should be used whenever appropriate. (I-A)

- 2. If there is more than one first-trimester scan with a mean sac diameter or crown-rump length measurement, the earliest ultrasound with a crown-rump length equivalent to at least 7 weeks (or 10 mm) should be used to determine the gestational age. (III-B)

- 3. Between the 12th and 14th weeks, crown-rump length and biparietal diameter are similar in accuracy. It is recommended that crown-rump length be used up to 84 mm, and the biparietal diameter be used for measurements > 84 mm. (II-1A)
- 4. Although transvaginal ultrasound may better visualize early embryonic structures than a transabdominal approach, it is not more accurate in determining gestational age. Crown-rump length measurement from either transabdominal or transvaginal ultrasound may be used to determine gestational age. (II-1C)

- 5. If a second- or third-trimester scan is used to determine gestational age, a combination of multiple biometric parameters (biparietal diameter, head circumference, abdominal circumference, and femur length) should be used to determine gestational age, rather than a single parameter. (II-1A)

- 6. When the assignment of gestational age is based on a thirdtrimester ultrasound, it is difficult to confirm an accurate due date. Follow-up of interval growth is suggested 2 to 3 weeks following the ultrasound. (III-C)

Why this approach?

- On a population level, clinical estimates of gestational age are less accurate than ultrasound estimates.
- Studies suggest it will lead to
  - It is the most accurate at predicting EDD
  - Less Post dates inductions
  - Result in less pregnancies classified as premature
  - Improves accuracy of serum screening for aneuploidy.

Current state of affairs…

- Recent agreement among perinatal epidemiologists to use common method to date a pregnancy
- History based calculation, with ultrasound to confirm the gestational age.
- Mentor: Dr Liston suggested the DI Committee think about adapting their algorithm.

- Little did he know where this was going…

Problems: Menstrual history

- Beginning, middle or end of menstrual flow?
- Accurate recall of date of start of menses
- Irregular bleeding/spotting.
- Accurate estimation of cycle length – use of hormonal contraception
- Variation in cycle length
- Previous LMP does not foretell next ovulation
- Incomplete or inconsistent information between providers.

Problems: Ultrasound

- Inter and Intra observer (sonographer) variation
- Technical issues
- Confidence intervals increase with gestational age
- No consensus of what parameters to use
- Different ultrasound biometry charts
- Acceptable range of error

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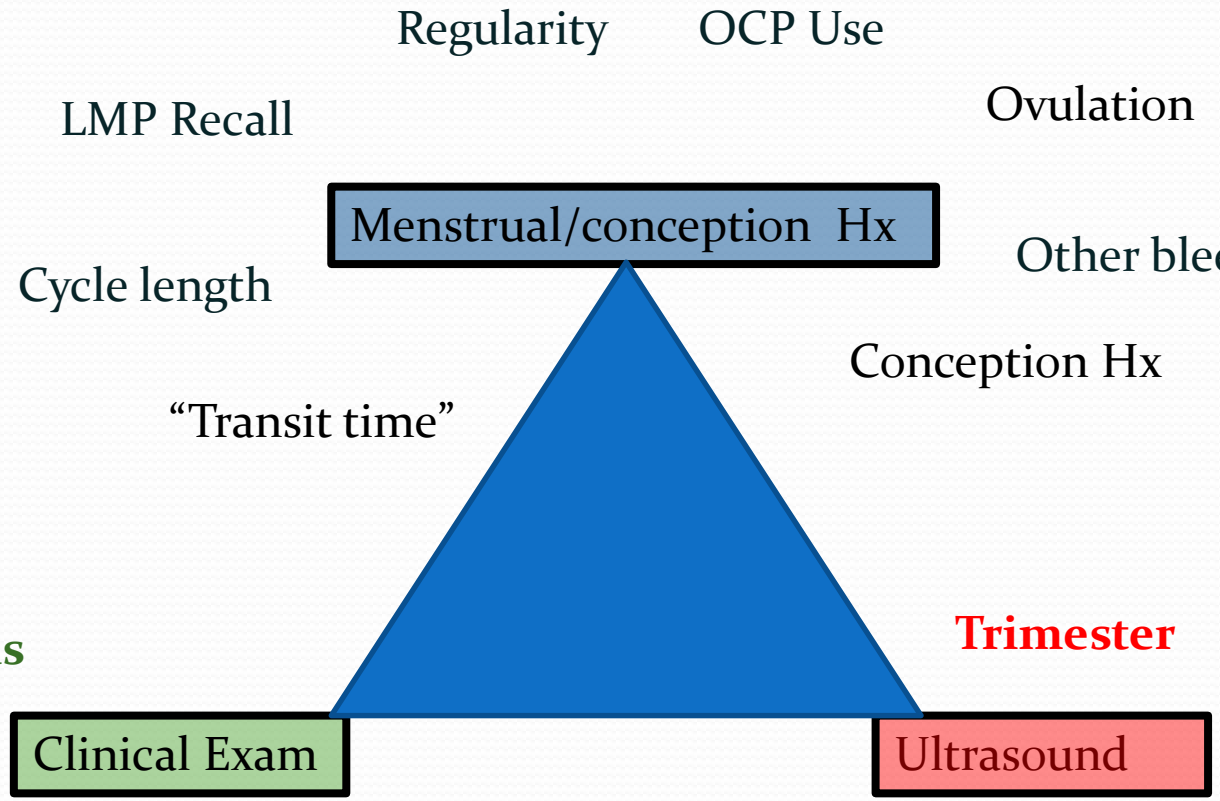

Conflict of Interest

- None to declare.

Clinical Case

- Patient is normalized and no further scans are ordered.

The basics of “old school”…

- History
  - LMP, Cycle length,
  - ? Using OCP within 3 months…
  - Regularity of cycles
  - Conception date
  - Date of Positive Pregnancy test
- Physical exam – estimate of uterine size
- Ultrasound confirmation (or redate)
  - First T (3 to 7 days)
  - Second T (7 to 14 days)
  - Which biometry charts
  - Which biometry parameters.