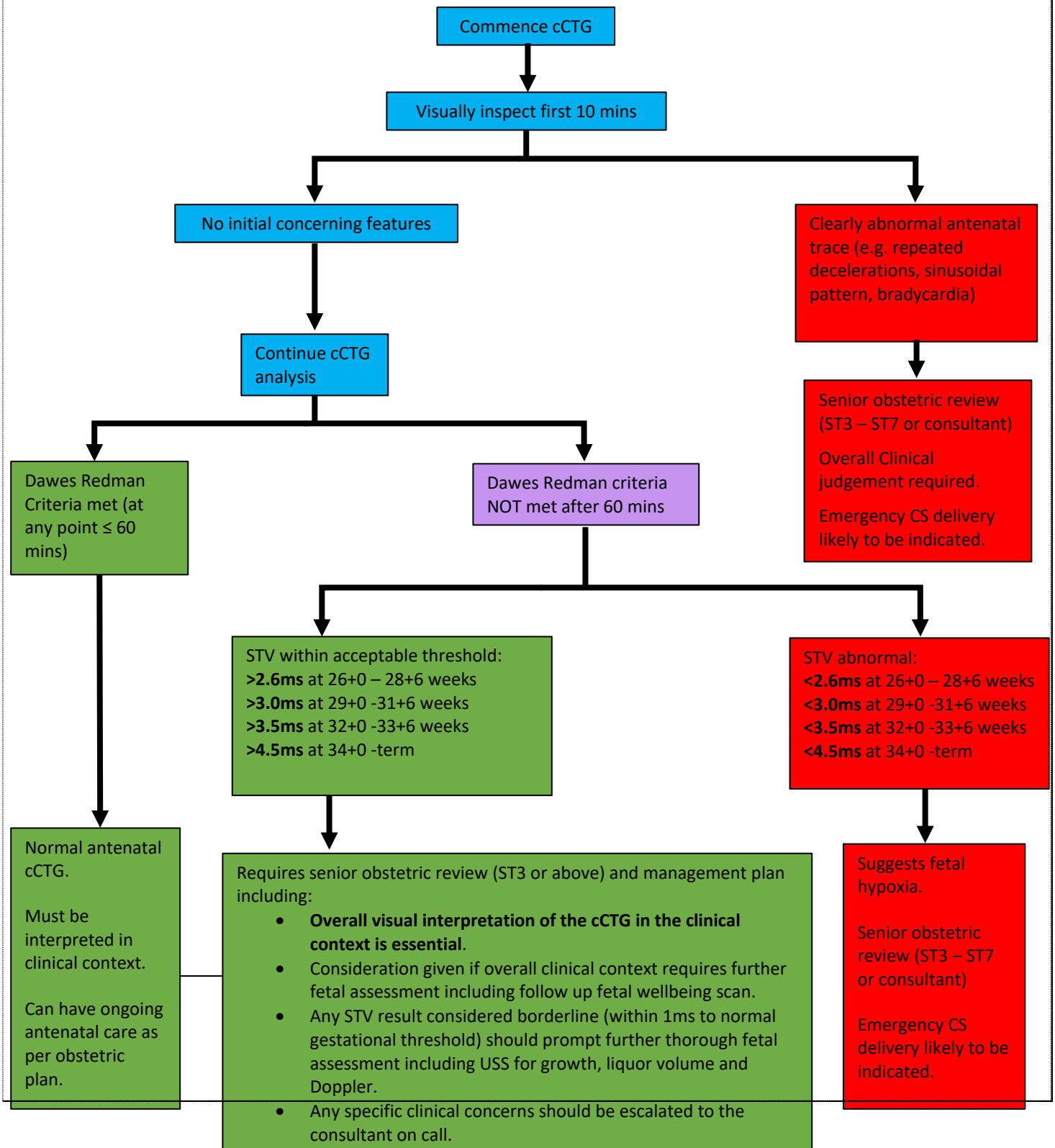
Computerised Cardiotocography
Guidance on How to Use and Interpret

TARGET AUDIENCE	All Maternity Staff (Doctors and Midwives)
PATIENT GROUP	Pregnant women in the third trimester

Clinical Summary



Computerised CTG: Guidance on How to Use and Interpret

Contents

1. Aim of this guideline

To assist midwives and obstetricians in when to use and how to interpret antenatal computerised CTG (cCTG) including the Dawes Redman Criteria.
NB. Computerised CTG refers to an objective interpretation of an antenatal CTG by computer software using the Dawes Redman criteria. It DOES NOT refer to a digital CTG trace which is linked on Badger and appears on a central monitor.

2. Background of antenatal CTG monitoring

There is no clear evidence that traditional antenatal CTG improves perinatal outcomes or has an impact on caesarean section rates. A comparison of computerised CTG (cCTG) versus traditional CTG showed a reduction in perinatal mortality with cCTG. Saving Babies' Lives Care Bundle 2 recommends the use of cCTG in antenatal fetal assessment. Computerised fetal heart rate analysis using Dawes Redman criteria offers advantages over traditional CTG (even when interpreted by an experienced expert), providing an objective and reproducible interpretation of the fetal heart rate. In addition, this type of CTG corrects the parameters analysed for gestational age, reduces the time for interpretation and includes the assessment of the short-term variation (STV), which has been shown to be the best predictor of fetal wellbeing.
NB. STV is a measure of the beat-to-beat variation of fetal heart rate (expressed in milliseconds) which cannot be interpreted by the human eye. It is related to but NOT THE SAME as fetal heart rate variability (expressed in bpm).

3. When to use cCTG

Use of cCTG should primarily be used for the antenatal assessment of the SGA/FGR baby (especially if umbilical artery Doppler is abnormal i.e. PI >95th centile or AREDF).

Evidence basis for use is from 26+0 weeks' gestation or beyond, however can be used at earlier gestations in specific circumstances at consultant discretion.

cCTG can be used in other antenatal context, for example women presenting with reduced fetal movements. Separate guidance exists for this clinical presentation.

4. When NOT to use cCTG

- Where there is ANY uterine activity.
    - Latent or active phase of labour
    - Threatened or actual preterm labour

  - During induction of labour
- Senior obstetrician discretion due to additional scan findings e.g. confirmed or suspected fetal anomaly that is non survivable.
- If a traditional CTG has already been commenced, and is CLEARLY ABNORMAL, this should be acted on appropriately; a computerised CTG should not be used in addition to seek reassurance.

5. Duration and frequency of monitoring

Duration: The maximum length of analysis is 60 minutes. During this time, the computer analyses the CTG data and compares it with the Dawes Redman criteria at 10 minutes and every 2 minutes thereafter. The practitioner commencing the CTG must return within 10 minutes to ensure there is good quality pick up and assess visually whether there are any obviously abnormal features or not.

Frequency: cCTG should typically be performed no more frequently than every 24 hours. There is no evidence that repeating cCTG at 6-hourly or 12-hourly intervals improves outcomes, however in some circumstances medical staff may request for a repeat cCTG to be carried out earlier than 24 hours. Inpatients on cCTG monitoring do not require additional 6-hourly traditional CTG monitoring.

See appendix 2 for directions on how to set up and use the cCTG machine.

6. Interpretation of computerised CTG including Dawes Redman Criteria

CTG is not a replacement of clinical judgement. In the presence of other associated signs or symptoms suggestive of maternal or fetal compromise further assessment is required, even if a cCTG is deemed normal. It is also important to remember that intrapartum NICE CTG guidance is NOT applicable in the antenatal period. Dawes Redman analysis assesses fetal wellbeing based on a specific data set. Low STV is the best predictor of fetal acidaemia and risk of in utero demise. Mean STV increases as gestation advances. Typically, in healthy fetuses it increases from about 6ms at 26 weeks to 8ms at term. Considering information applied from TRUFFLE (Trial of Randomised Umbilical and Fetal Flow in Europe), if the STV falls below the threshold for the gestation, delivery should be considered due to suspected hypoxia in the fetus. If any other features of the antenatal CTG are suspected to be abnormal, such as repeated decelerations, fetal bradycardia or sinusoidal pattern, an immediate obstetric review must be sought.

When a cCTG is carried out the following outcomes are possible:

1. **Dawes Redman Criteria MET (at any point ≤ 60 mins):** Regard this as a normal antenatal cCTG however it is still important to **look at the whole clinical context**. The patient can have ongoing antenatal care as per their obstetric plan.
2. **Dawes Redman Criteria NOT met after 60 mins but STV within an acceptable range:** Meeting this STV threshold is reassuring that immediate delivery is not required however does not rule out fetal growth restriction and further fetal assessment **may** be required. The whole clinical picture and cCTG trace should be reviewed by a senior doctor (ST3 - ST7 or consultant), and a plan for ongoing management made. **Overall visual interpretation of the cCTG in the clinical context is essential**.
   Consideration given if overall clinical context requires further fetal assessment including follow up fetal wellbeing scan. Any STV result considered borderline (eg

within 1ms to normal gestational threshold) should prompt further thorough fetal assessment including USS for growth, liquor volume and Doppler.
Any specific clinical concerns should be escalated to the consultant on call.

3. **Dawes Redman Criteria NOT met after 60 mins and STV abnormal:** This requires **IMMEDIATE** senior obstetric review (ST3 – ST7 or consultant) to assess the whole clinical picture including visual inspection of the cCTG. If STV falls below the threshold for the gestation see flowchart) this is an **ABNORMAL ANTENATAL cCTG** suggesting fetal hypoxia and immediate delivery should be considered. A consultant **MUST** be involved in the decision making in this situation.
4. **Clearly abnormal antenatal CTG (e.g. prolonged repeated decelerations, bradycardia, sinusoidal pattern):** As soon as this is recognised there should be **IMMEDIATE** senior obstetric review (ST3 -ST7 or consultant) to assess the whole clinical picture including visual inspection of the cCTG. An emergency CS delivery is likely to be indicated. A consultant **MUST** be involved in the decision making in this situation.

It is important to bear in mind that when the criteria are not all met by 60 minutes, this DOES NOT automatically indicate that the cCTG is abnormal. It does however indicate that the computerised analysis is not certain that all the parameters are within normal limits, and the cCTG trace therefore requires careful human interpretation and particular attention paid to the STV.

See Summary page above for guidance on how to interpret a cCTG in a flow chart format.
See Appendix 3 for the possible reasons for failure to meet the Dawes Redman criteria.

References/Evidence

1. Grivell RM, Alfirevic Z, Gyte GML, Devane D. Antenatal cardiotocography for fetal assessment. Cochrane Database Syst Rev 2010;(1):CD007863.
2. Lees C, Marlow N, Arabin B, Bilardo CM, Brezinka C, Derks JB, Duvekot J, Frusca T, Diemert A, Ferrazzi E, Ganzevoort W, Hecher K, Martinelli P, Ostermayer E, Papageorghiou AT, Schlembach D, Schneider KT, Thilaganathan B, Todros T, van Wassenaer-Leemhuis A, Valcamonico A, Visser GH, Wolf H; TRUFFLE Group. Perinatal morbidity and mortality in early-onset fetal growth restriction: cohort outcomes of the trial of randomized umbilical and fetal flow in Europe (TRUFFLE). Ultrasound Obstet Gynecol. 2013 Oct;42(4):400-8. doi: 10.1002/uog.13190. PMID: 24078432.
3. Serra V, Bellver J, Moulden M, Redman CW. Computerized analysis of normal fetal heart rate pattern throughout gestation. Ultrasound Obstet Gynecol 2009;34:74–9
4. Serra V, Moulden M, Bellver J, Redman CW. The value of the short–term fetal heart rate variation for timing the delivery of the growth–retarded fetuses. BJOG 2008;115:1101–7.
5. Turan S, Turan OM, Berg C, Moyano D, Bhide A, Bower S, et al. Computerized fetal heart rate analysis, Doppler ultrasound and biophysical profile score in the prediction of acid–base status of growth–restricted fetuses. Ultrasound Obstet Gynecol 2007;30:750
6. Guide to: A midwife's perspective on fetal monitoring and the value of Dawes-Redman CTG analysis Recommendations for midwives Beth Albert, lead midwife and manager, feto-maternal medicine unit, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust.
7. Davis Jones G, Cooke WR, Vatish M, Redman CW. Computerized Analysis of Antepartum Cardiotocography: A Review. Maternal Fetal Med 2022;4:130–140. doi: 10.1097/FM9.0000000000000141
8. R. Katie Morris, Edward Johnstone, Christoph Lees, Victoria Morton, Gordon Smith, the Royal College of Obstetricians and Gynaecologists. Investigation and Care of a Small-for-Gestational-Age Fetus and a Growth Restricted Fetus (Green-top Guideline No. 31) First published: 13 May 2024

Appendices

1. Governance information for Guidance document

Lead Author(s):	David Rutherford
Endorsing Body:	
Version Number:	2
Approval date	
Review Date:	
Responsible Person (if different from lead author)	Lesley Walker

CONSULTATION AND DISTRIBUTION RECORD	
Contributing Author / Authors	Lesley Walker Gordon Buchanan
Consultation Process / Stakeholders:	CEG process and Obs Group meetings
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CHANGE RECORD			
Date	**Lead Author**	**Change**	**Version No.**
July 2023	David Rutherford and Lesley walker	Original version	1
15/04/2024	David Rutherford	Updated STV thresholds including new borderline category	2
			3
		.	4
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2. Directions for use:

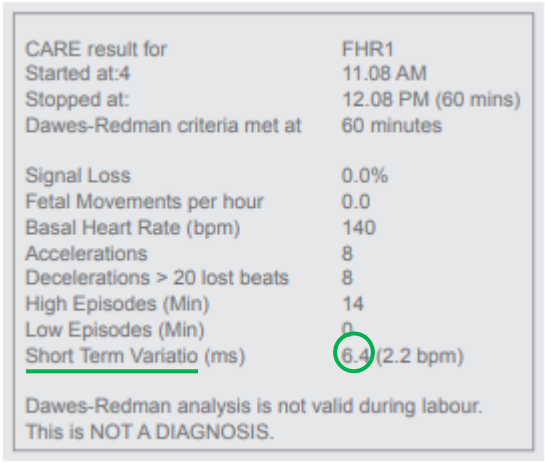
1. Switch cCTG machine on.
2. Press and hold “Patient name, ID and gestational age” at top of screen.
3. Input patient name, CHI and gestational age.
4. Exit screen pressing X.
5. Locate FH and attach fetal monitoring and toco leads to woman.
6. Link CTG to Badger.
7. Press and hold printer icon on control bar at bottom left hand side of screen until it turns green.
    a. The printed CTG trace will then commence.
8. Ensure “Dawes Redman” is visible on control bar at bottom of screen. This should be light purple.

9. Up to 60 minutes of analysis will then automatically commence.
10. Check CTG to ensure not obviously pathological e.g. recurrent decelerations, sinusoidal pattern or fetal bradycardia. (NB. Alert obstetric ST3 – ST7/consultant for urgent review if present)
11. Wait up to 60 minutes for full analysis.
12. While printing or recording
    a. For the first 10 minutes the Dawes-Redman button will be **light purple**.
    b. Between 10 and 60 minutes, if the Criteria are not yet met, the Dawes Redman button will be **dark purple**.
    c. At any time between 10 and 60 minutes, if the Criteria are met, the Dawes-Redman button will be **green**.
    d. After 60 minutes, if the Criteria are not met, the Dawes-Redman button will be **light blue**.

e. Analysis stops at 60 minutes (regardless of whether all the criteria have been met or not) and after printing the table of results, monitoring of the fetus and the mother continues.

13. If Dawes Redman criteria are met at any time during the analysis a report can be printed by pressing the printer icon.
14. If after 60 mins the Dawes Redman criteria are NOT met inform the obstetric on call ST3 – ST7 or consultant for review.
15. Ensure the outcome of the cCTG including the STV has been documented within the appropriate CTG note in Badger.

The following is an example of a report demonstrating that the Dawes Redman Criteria have been met and that the STV is normal for the gestation:



CARE result for	FHR1
Started at:4	11.08 AM
Stopped at:	12.08 PM (60 mins)
Dawes-Redman criteria met at	60 minutes
Signal Loss	0.0%
Fetal Movements per hour	0.0
Basal Heart Rate (bpm)	140
Accelerations	8
Decelerations > 20 lost beats	8
High Episodes (Min)	14
Low Episodes (Min)	0
Short Term Variatio (ms)	6.4 (2.2 bpm)

Dawes-Redman analysis is not valid during labour.
This is NOT A DIAGNOSIS.

3. Reasons for failure to meet Dawes Redman criteria.

1. Basal heart rate outside normal range
2. Large decelerations
3. No episodes of high variation
4. No movements and fewer than 3 accelerations
5. Baseline fitting is uncertain
6. Short-term variation is abnormal for the gestation
7. Possible error at the end of the record
8. Decelerations at the end of the record
9. High-frequency sinusoidal rhythm
10. Suspected sinusoidal rhythm
11. Long term variations in high episodes below acceptable levels
12. No accelerations