NHS

National Institute for Clinical Excellence

National Institute for Clinical Excellence

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INHERITED Clinical Guideline C

NHS

National Institute for Clinical Excellence

The use of electronic fetal monitoring

The use and interpretation of cardiotocography in intrapartum fetal surveillance

May 2001

Clinical Guideline C
The Use Of Electronic Fetal Monitoring

Issue date: May 2001
Review date: January 2003

Ordering Information
Copies of this Guideline can be obtained from the NHS Response Line by telephoning 0870 1555 455 and quoting ref. 23807. A patient version of this document, Monitoring your babies heartbeat in labour, can also be obtained by quoting ref. 23809.

Distribution of Guidelines

This document has been circulated to the following:
- Health Authority Chief Executives in England and Wales
- NHS Trust Chief Executives in England and Wales
- PCG Chief Executives
- Local Health Group General Managers
- Medical and Nursing Directors in England and Wales
- Consultant Obstetricians and Gynaecologists in England and Wales
- Midwives in England and Wales
- NHS Director Wales
- Chief Executive of the NHS in England
- NHS Executive Regional Directors
- Special Health Authority Chief Executives
- Community Health Councils in England and Wales
- Patient advocacy groups
- Commission for Health Improvement
- NHS Clinical Governance Support Team
- Chief Medical, Nursing Officers and Pharmaceutical Officers in England and Wales
- Medical Director & Head of NHS Quality – National Assembly for Wales
- Clinical Effectiveness Support Unit - Wales
- Representative bodies for health services, professional organisations and statutory bodies, Royal Colleges

This Guidance is written in the following context:
This Guidance represents the view of the Institute, which was arrived at after careful consideration of the available evidence. Health professionals are expected to take it fully into account when exercising their clinical judgment. This Guidance does not, however, override the individual responsibility of health professionals to make appropriate decisions in the circumstances of the individual woman in labour, in consultation with her and, where appropriate and necessary, her guardian or carer.

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Contents

This guideline is a part of the Inherited Clinical Guidelines work programme. It was commissioned by the Department of Health before the Institute was formed in April 1999. It has followed closely the development brief that was agreed at the time of commissioning. The developers have worked with the Institute to ensure, in the time available, that the guideline has been subjected to validation and to consultation with stakeholders. However it has not been possible to subject it to the full guideline development process that the Institute has now adopted.

1. Evidence

1.1 The definitions of the types of evidence used in this guideline originate from the US Agency for Health Care Policy and Research

Table 1 Levels of evidence

Level	Type of evidence
Ia	Evidence obtained from systematic review of meta-analysis of randomised controlled trials
Ib	Evidence obtained from at least one randomised controlled trial
IIa	Evidence obtained from at least one well-designed controlled study without randomisation
IIb	Evidence obtained from at least one other type of well-designed quasi-experimental study
III	Evidence obtained from well-designed non-experimental descriptive studies, such as comparative studies, correlation studies and case studies
IV	Evidence obtained from expert committee reports or opinions and/or clinical experience of respected authorities.

The grading scheme used was based on a scheme formulated by the Clinical Outcomes Group (COG) of the NHS Executive.

Table 2 Grading of recommendations

The recommendations were graded as follows:

- **A** Requires at least one randomised controlled trial as part of a body of literature of overall good quality and consistency addressing the specific recommendation (evidence levels Ia, Ib)
- **B** Requires the availability of well-conducted clinical studies but no randomised clinical trials on the topic of the recommendation (evidence levels IIa, IIb, III)
- **C** Requires evidence obtained from expert committee reports or opinions and/or clinical experience of respected authorities. Indicates an absence of directly applicable clinical studies of good quality (evidence level IV)

Good practice points

- ✔ Recommended good practice based on the clinical experience of the Guideline Development Group

2. Guidance

For this guideline, electronic fetal monitoring (EFM) is defined as 'the use of electronic fetal heart-rate monitoring for the evaluation of fetal wellbeing in labour'.

EFM was introduced with an aim of reducing perinatal mortality and cerebral palsy. This reduction has not been demonstrated in the systematic reviews of randomised controlled trials (RCTs) . However an increase in maternal intervention rates has been shown.

2.1. Indications for the use of continuous EFM

There are a number of antenatal and intrapartum risk factors that have been shown to be associated with the development of neonatal encephalopathy, cerebral palsy or even perinatal death.

Continuous EFM should be offered and recommended for high-risk pregnancies (see Clinical Practice Algorithm) where there is an increased risk of perinatal death, cerebral palsy or neonatal encephalopathy. B

Continuous EFM should be used where oxytocin is being used for induction or augmentation of labour. C

2.2. Care of women

The assessment of fetal wellbeing is only one component of intrapartum care. It is an important area where due consideration must be given to maternal preference and priorities in the light of potential risk factors to both mother and baby, i.e. one that strikes the right balance between the objective of maximising the detection of potentially compromised babies and the objective of minimising the number of unnecessary maternal interventions. The provision of accurate information in these circumstances is essential to allow each woman to make the right decision for her.

Women must be able to make informed choices regarding their care or treatment via access to evidence-based information. These choices should be recognised as an integral part of the decision-making process. C

Women should have the same level of care and support regardless of the mode of intrapartum fetal monitoring. C

Trusts should ensure that there are clear lines of communication between carers and consistent terminology is used to convey urgency or concern regarding fetal wellbeing. C

Prior to any form of fetal monitoring, the maternal pulse should be palpated simultaneously with fetal heart-rate auscultation in order to differentiate between maternal and fetal heart rates. C

If fetal death is suspected despite the presence of an apparently recorded fetal heart rate (FHR), then fetal viability should be confirmed with real-time ultrasound assessment. C

With regard to the use of intermittent auscultation: C

- The FHR should be auscultated at specified intervals (see Section 2.3).
- Any intrapartum events that may affect the FHR should be noted contemporaneously in the maternal notes, signed and the time noted.

With regard to the use of EFM: C

- The date and time clocks on the EFM machine should be correctly set.
- Traces should be labelled with the mother's name, date and hospital number.

- Any intrapartum events that may affect the FHR should be noted contemporaneously on the EFM trace, signed and the date and time noted (e.g. vaginal examination, fetal blood sample, siting of an epidural).

- Any member of staff who is asked to provide an opinion on a trace should note their findings on both the trace and maternal case notes along with date, time and signature.

- Following birth, the care-giver should sign and note the date, time and mode of birth on the EFM trace.

- The EFM trace should be stored securely with the maternal notes at the end of the monitoring process.

2.3. Appropriate monitoring in an uncomplicated pregnancy

For a woman who is healthy and has had an otherwise uncomplicated pregnancy, intermittent auscultation should be offered and recommended in labour to monitor fetal wellbeing. A

In the active stages of labour, intermittent auscultation should occur after a contraction, for a minimum of 60 seconds, and at least: A

- Every 15 minutes in the first stage.

- Every 5 minutes in the second stage.

Continuous EFM should be offered and recommended in pregnancies previously monitored with intermittent auscultation: A

- If there is evidence on auscultation of a baseline less than 110 or greater than 160 bpm.

- If there is evidence on auscultation of any decelerations.

- If any intrapartum risk factors develop (see Clinical Practice Algorithm).

Current evidence does not support the use of the admission cardiotocography (CTG) in low-risk pregnancy and it is therefore not recommended. B

2.4. Interpretation of EFM

Interpretation of EFM traces requires a definition of what is normal. The definition of normal should be derived by the identification of cases where values outside a given range increase the likelihood of the adverse outcomes identified above. The definitions and descriptions of individual features of FHR traces shown in Tables 3 and 4 (below) are used in the Guideline and in the Clinical Practice Algorithm.

A grading system for FHR patterns is recommended. This incorporates both the proposed definitions of FHR patterns and categorisation schemes. ✔

Table 3 Categorisation of fetal heart rate traces

Category	Definition
Normal	A CTG where all four features fall into the reassuring category.
Suspicious	A CTG whose features fall into one of the non-reassuring categories and the remainder of the features are reassuring.
Pathological	A CTG whose features fall into two or more non-reassuring categories or one or more abnormal categories.

Table 4 Categorisation of fetal heart rate (FHR) features

Feature	Baseline (bpm)	Variability (bpm)	Decelerations	Accelerations
Reassuring	110–160	≥ 5	None	Present
Non-reassuring	100–109 161–180	< 5 for >40 to <90 minutes	Early deceleration Variable deceleration Single prolonged deceleration up to 3 minutes	*The absence of accelerations with an otherwise normal CTG are of uncertain significance*
Abnormal	<100 >180 Sinusoidal pattern ≥ 10 minutes	<5 for ≥ 90 minutes	Atypical variable decelerations Late decelerations Single prolonged Single prolonged deceleration >3 minutes	

- In cases where the CTG falls into the suspicious category, conservative measures should be used.
- In cases where the CTG falls into the pathological category, conservative measures should be used and fetal blood sampling be undertaken where appropriate/feasible. In situations where fetal blood sampling is not possible or appropriate then delivery should be expedited.
- For an outline of conservative measures please refer to the Clinical Practice Algorithm.

Settings on CTG machines should be standardised, so that: ✔

- Paper speed is set to 1 centimetre(cm) per minute
- Sensitivity displays are set to 20 beats per minute (bpm) /cm.
- FHR range displays of 50–210 bpm are used.

2.5. Additional tests and therapies used in combination with EFM

Units employing EFM should have ready access to fetal blood sampling facilities. A

Where delivery is contemplated because of an abnormal fetal heart-rate pattern, in cases of suspected fetal acidosis, fetal blood sampling should be undertaken in the absence of technical difficulties or contraindications. A

Fetal blood sampling should be undertaken with the mother in the left-lateral position. B

Contraindications to fetal blood sampling include: B

- Maternal infection (e.g. HIV, hepatitis viruses and herpes simplex virus)
- Fetal bleeding disorders (e.g. haemophilia)
- Prematurity (< 34 weeks).

Where there is clear evidence of acute fetal compromise (e.g. prolonged deceleration greater than three minutes), fetal blood sampling should not be undertaken and the baby should be delivered urgently. ✔

Prolonged use of maternal facial oxygen therapy may be harmful to the fetus and should be avoided. There is no research evidence evaluating the benefits or risks associated with the short-term use of maternal facial oxygen therapy in cases of suspected fetal compromise. C

During episodes of abnormal FHR patterns when the mother is lying supine, the mother should adopt the left-lateral position. B

In cases of uterine hypercontractility in association with oxytocin infusion and with a suspicious or pathological CTG, the oxytocin infusion should be decreased or discontinued. B

In the presence of abnormal FHR patterns and uterine hypercontractility not secondary to oxytocin infusion, tocolysis should be considered. A suggested regime is **subcutaneous terbutaline 0.25 milligrams.** A

In cases of suspected or confirmed acute fetal compromise, delivery should be accomplished as soon as possible, accounting for the severity of the FHR abnormality and relevant maternal factors. The accepted standard has been that ideally this should be accomplished within 30 minutes. B

Table 5 Classification of fetal blood sample (FBS) results C

Fetal blood sample result (pH)[a]	Subsequent action
≥ 7.25	FBS should be repeated if the FHR abnormality persists
7.21–7.24	Repeat FBS within 30 minutes or consider delivery if rapid fall since last sample
≤ 7.20	Delivery indicated

[a] All scalp pH estimations should be interpreted taking into account the previous pH measurement, the rate of progress in labour and the clinical features of the mother and baby.

2.6. Education and training

Continuous EFM only provides a printed recording of the FHR pattern. The interpretation of the FHR record is subject to human error. Education and training improve standards of evaluating the FHR.

Trusts should ensure that staff with responsibility for performing and interpreting the results of EFM should receive annual training with assessment to assure that their skills are kept up-to-date. Details of key elements of training are in the full guideline. C

2.7. Risk Management and the use of EFM

EFM traces should be kept for a minimum of 25 years. C

Tracer systems should be developed to ensure that CTGs removed for any purpose (e.g. risk management, teaching purposes) can always be located. C

2.8. Key outcome measures

The key outcome measures that should be used to assess the impact and role of EFM are summarised below.

Absolute outcome measures of fetal/neonatal hypoxia to be collected at a local and regional level should be: B

- Perinatal death.
- Cerebral palsy.
- Neurodevelopmental disability.

Collection and interpretation at a national level would then be possible.

Intermediate fetal/neonatal measures of fetal hypoxia to be collected should be: B

- Umbilical artery acid-base status.
- Apgar score at five minutes.
- Neonatal encephalopathy.

These should be collected on a local (hospital/Trust) level.

Maternal outcome measures that should be collected include: C

- Operative delivery rates (caesarean section and instrumental vaginal delivery)

These should be collected on a local (hospital/Trust) level.

Umbilical artery acid-base status should be assessed by collection of paired samples from the umbilical artery and umbilical vein. B

Umbilical artery acid-base status should be performed as a minimum after: C

- Emergency caesarean section is performed.
- Instrumental vaginal delivery is performed.

- A fetal blood sample has been performed in labour.
- Birth, if the baby's condition is poor.

3. Full Guideline

3.1 These recommendations are derived from the guideline entitled "The Use Of Electronic Fetal Monitoring: The use and interpretation of cardiotocography in intrapartum fetal surveillance", commissioned from the Royal College of Obstetricians and Gynaecologists. It is available on their website, www.rcog.org.uk, on the Institute's website, www.nice.org.uk, and on the National Electronic Library for Health's website, www.nelh.nhs.uk. The Guideline developers are listed in Appendix A.

3.2 This guideline was commissioned by the Department of Health before the Institute was formed in April 1999. It has followed closely the development brief which was agreed at the time of commissioning. The developers have worked with the Institute to ensure, in the time available, that the guideline has been the subject of validation and consultation with stakeholders. However, it has not been possible to subject it to the full guideline development process which the Institute has now adopted.

4. Scope

4.1 Clinical guidelines have been defined as systematically developed statements which assist clinicians and patients in making decisions about appropriate treatment for specific conditions. The Guideline Development Group has developed this Guideline with the following aims:

- To evaluate the impact of intrapartum EFM on neonatal and maternal outcomes.
- To develop standards for the use of EFM, including:
  - Indications for use.
  - Definitions of normal and abnormal parameters.
  - Which adjuvant or additional monitoring tests/techniques should be employed.
- To evaluate methods for improving interpretation of CTG and the development of standards for training in evaluation of fetal heart-rate patterns.
- To evaluate the impact of EFM on risk management aspects of perinatal medicine.
- To increase awareness of the role of EFM in intrapartum care among medical practitioners, midwives and pregnant women.
- To consider the resource implications of the use of EFM.
- To suggest areas for future research from a review of the currently available evidence.

5. Implementation in the NHS

5.1 The implementation of this guideline should be undertaken within the strategic framework of the health improvement plans for each local health community.

5.2 Local health communities will need to review existing service provision against this guidance. This review should result in a strategy which identifies the resources required to implement fully the recommendations set out in Section 2 of the guidance, the people and processes involved and the timeline over which full implementation is envisaged.

- Relevant local clinical guidelines and protocols for fetal monitoring should be reviewed in the light of this guidance.

- Clinicians with responsibility for the intrapartum care of women should review their current practice in line with the recommendations set out in Section 2.

- To enable clinicians to audit their own compliance with this guidance it is recommended that comprehensive clinical records should at least include those items described in Section 2.

- The following audit criteria can be used to support the evaluation of clinical practice, and continuous improvement in intrapartum care of the mother and baby. The audit criteria require the recording of admission risk factors, in addition to the subsequent clinical observations and interpretations.
  - Number and percentage of women assessed as at high risk on admission, and subsequently (based on the guidance in Section 2 and the algorithm).
  - Number and percentage of women who receive continuous electronic fetal monitoring, and the main indication for continuous EFM (based on the guidance in Section 2 and the algorithm).

- This information should be incorporated into local audit data recording systems and consideration given (if not already in place) to the establishment of appropriate categories in routine electronic record-keeping systems.

- Further local evaluation of the use of fetal monitoring may be needed, and could include clinical audit of aspects of structure (e.g. availability of blood sampling facilities, assessment and training of staff), process (e.g. fetal heart rate features, blood pH etc), and outcomes (e.g. maternal satisfaction and operative delivery rates, and neonatal outcomes such as cerebral palsy, perinatal deaths).

- Prospective clinical audit programmes should record the proportion of treatments adhering to this guidance. Such programmes are likely to be more effective in improving patient care when they form part of the organisation's formal clinical governance arrangements and where they are linked to specific postgraduate activities.

6. Future research recommendations

6.1 The following further research is recommended.

Adequately powered randomised controlled trials are needed to:

- Evaluate the performance of EFM compared to IA in a low risk pregnancy setting with regard to perinatal mortality

- Evaluate the performance of different forms of IA, and how the performance of these modalities is affected by different frequencies of monitoring in comparison to EFM

- Evaluate the performance of admission CTG.

- Evaluate the performance of intrapartum vibroacoustic stimulation testing as an alternative to fetal blood sampling.

- Evaluate the role of maternal facial oxygen therapy during period of acute fetal compromise.

Further studies are needed to develop measures of maternal satisfaction and responses to intrapartum care (including fetal monitoring).

7. Related NICE Guidance

7.1. Induction of Labour Guideline – provisional issue date June 2001.

7.2. Caesarean Section Guideline – provisional completion in Winter 2002.

8. Review Date

8.1 The Institute's Guidance Executive will consider changes in the evidence base for this guideline in January 2004. A decision will be made as to the need for and the extent of any update.

INHERITED *Clinical Guideline C*

NHS

National Institute for Clinical Excellence

The use of electronic fetal monitoring

Clinical Practice Algorithm

May 2001

Consideration should be given to maternal preference and priorities

Admission assessment

Are any of the following risk factors present?
(this list is not exhaustive)

Maternal problems
- Previous caesarean section
- Pre-eclampsia
- Post-term pregnancy(>42 weeks)
- Prolonged mebrane rupture (>24 hours)
- Induced labour
- Diabetes
- Antepartum haemorrhage
- Other maternal medical disease

Fetal problems
- Fetal growth restriction
- Prematurity
- Oligohydramnios
- Abnormal Doppler artery velocimetry
- Multiple pregnancies
- Meconium-stained liquor
- Breech presentation

Yes → **Offer and recommend continuous EFM**

Intrapartum risk factors
- Oxytocin augmentation
- Epidural analgesia
- Vaginal bleeding in labour
- Maternal pyrexia
- Fresh meconium-stained liquor

Yes → **Offer and recommend continuous EFM**

No → **Intermittent ausculation**

For full minute after a contraction
But at least every: 15 minutes in the first stage
5 minutes in the second stage

→ **Abnormal FHR on auscultation**

Baseline≤110bpm or ≥160bpm
Any decelerations

→ **Continuous electronic fetal monitoring**

Cardiotograph (CTG) Classification

NORMAL	A CTG where **all four** features fall into the category
SUSPICIOUS	A CTG whose features fall into **one** of the non-reassuring categories and the remainder of the features are reassuring
PATHOLOGICAL	A CTG whose features fall into **two or more** non-reassuring catagories or **one or more** abnormal categories

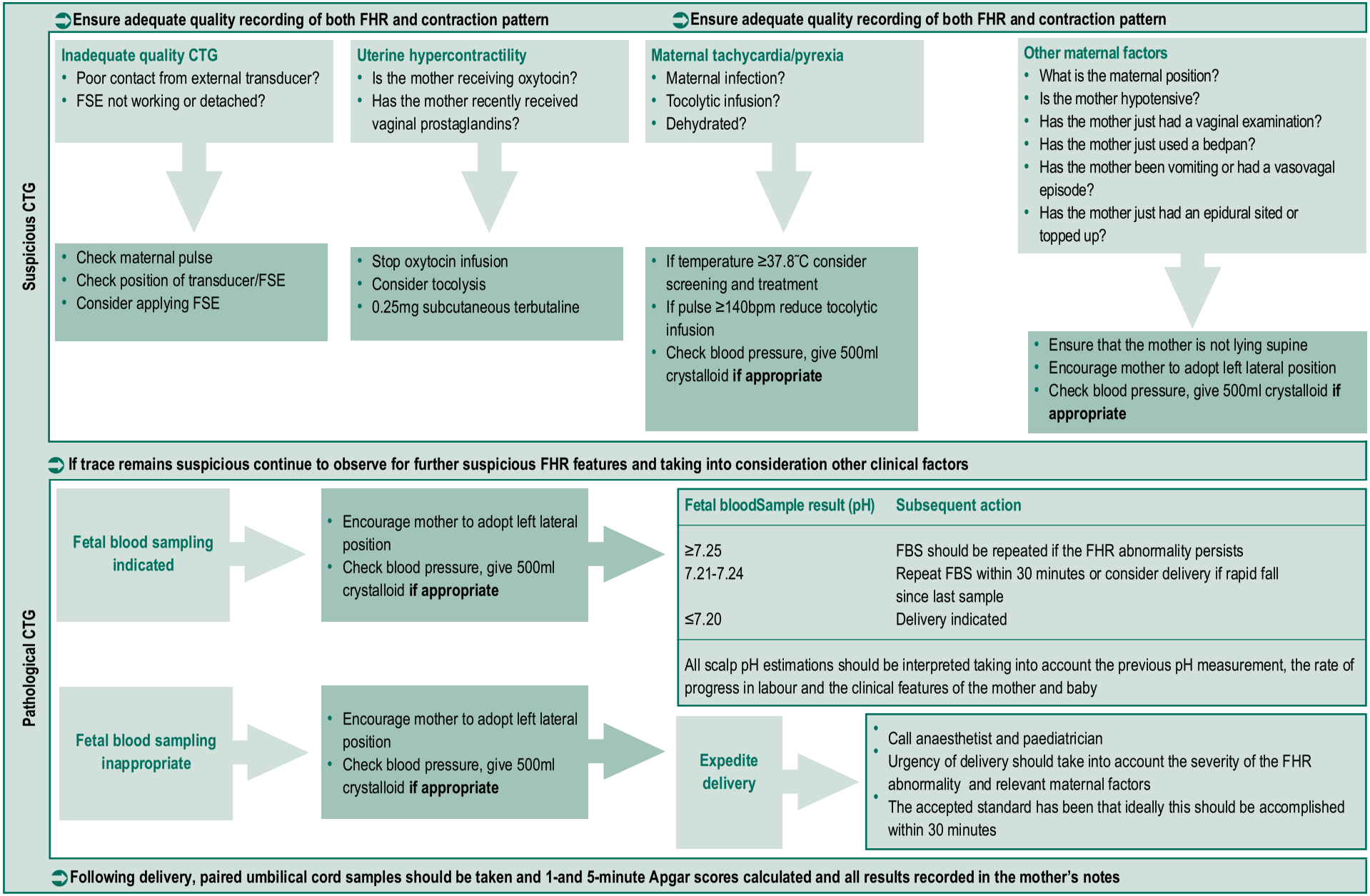
Fetal heart-rate feature classification

	Baseline (bpm)	Variability (bpm)	Decelerations	Accelerations
Reassuring	110-160	≥5	None	Present
Non-reassuring	100-109 161-180	<5 for≥40 but <90 minutes	Early deceleration Variable decelerations Single prolonged deceleration up to 3 minutes	
Abnormal	<100 >180 Sinusoidal pattern for ≥10 minutes	<5 for ≥90 minutes	Atypical variable decelerations Late decelerations Single prolonged deceleration greater than 3 minutes	

The absence of accelerations with an otherwise normal CTG is of uncertain significance

CTG=cardiotograph
EFM= electronic fetal monitoring
FBS= fetal blood sample
FHR= fetal heart rate
FSE= fetal scalp electrode

This algorithm should, where necessary, be interpreted with reference to the full Guideline (The use of Electronic Fetal Monitoring)


Suspicious CTG
Ensure adequate quality recording of both FHR and contraction pattern
Ensure adequate quality recording of both FHR and contraction pattern
Inadequate quality CTG
• Poor contact from external transducer?
• FSE not working or detached?
Uterine hypercontractility
• Is the mother receiving oxytocin?
• Has the mother recently received vaginal prostaglandins?
Maternal tachycardia/pyrexia
• Maternal infection?
• Tocolytic infusion?
• Dehydrated?
Other maternal factors
• What is the maternal position?
• Is the mother hypotensive?
• Has the mother just had a vaginal examination?
• Has the mother just used a bedpan?
• Has the mother been vomiting or had a vasovagal episode?
• Has the mother just had an epidural sited or topped up?
• Check maternal pulse
• Check position of transducer/FSE
• Consider applying FSE
• Stop oxytocin infusion
• Consider tocolysis
• 0.25mg subcutaneous terbutaline
• If temperature ≥37.8˚C consider screening and treatment
• If pulse ≥140bpm reduce tocolytic infusion
• Check blood pressure, give 500ml crystalloid if appropriate
• Ensure that the mother is not lying supine
• Encourage mother to adopt left lateral position
• Check blood pressure, give 500ml crystalloid if appropriate
If trace remains suspicious continue to observe for further suspicious FHR features and taking into consideration other clinical factors
Pathological CTG
Fetal blood sampling indicated
• Encourage mother to adopt left lateral position
• Check blood pressure, give 500ml crystalloid if appropriate
Fetal bloodSample result (pH)
Subsequent action
≥7.25
FBS should be repeated if the FHR abnormality persists
7.21-7.24
Repeat FBS within 30 minutes or consider delivery if rapid fall since last sample
≤7.20
Delivery indicated
All scalp pH estimations should be interpreted taking into account the previous pH measurement, the rate of progress in labour and the clinical features of the mother and baby
Fetal blood sampling inappropriate
• Encourage mother to adopt left lateral position
• Check blood pressure, give 500ml crystalloid if appropriate
Expedite delivery
• Call anaesthetist and paediatrician
• Urgency of delivery should take into account the severity of the FHR abnormality and relevant maternal factors
• The accepted standard has been that ideally this should be accomplished within 30 minutes
Following delivery, paired umbilical cord samples should be taken and 1-and 5-minute Apgar scores calculated and all results recorded in the mother's notes

INHERITED *Clinical Guideline C*

The Use Of Electronic Fetal Monitoring

The use and interpretation of cardiotocography in intrapartum fetal surveillance

Issue date: May 2001 **Review date:** January 2004

The algorithm overleaf forms part of the guideline referenced above.
Copies of the guideline can be obtained free of charge from the Institute's website **(www.nice.org.uk)**, and the NHS Response Line by telephoning 0870 1555 455 and quoting ref. 23807. A patient version of this document, *Monitoring your baby's heartbeat during labour*, can also be obtained by quoting ref. 23809 for an English only version or ref. 23810 for an English/Welsh version.

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Appendix A

The Guideline Development Group is a multiprofessional team brought together on a project basis, to consider the evidence of clinical and cost effectiveness and develop the guideline.

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Chairman

Professor S Arulkumaran FRCOG
Royal College of Obstetricians and Gynaecologists

Dr J Chapple
Faculty of Public Health Medicine

Mr AJ Dawson
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Dr G Lewis
Department of Health observer

Dr M Macintosh
Confidential Enquiry into Stillbirths and Deaths in Infancy

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Ms J Rogers
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Professor P Steer FRCOG
British Association of Perinatal Medicine

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Mr R Cookson
Health Economist from the University of East Anglia

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Research Fellow, Clinical Effectiveness Support Unit, Royal College of Obstetricians and Gynaecologists

Appendix B

Guidelines Advisory Committee

The Guidelines Advisory Committee (GAC) is a standing committee of the Institute. It has responsibility for agreeing the scope and commissioning brief for clinical guidelines and for monitoring progress and methodological soundness. The GAC considers responses from stakeholders and advises the Institute on the acceptability of the guidelines it has commissioned. The members of the GAC are:

Stephanie A Amiel, BSc, MD, FRCP
RD Lawrence Professor of Diabetic Medicine,
Kings College

Mr. Charles Collins
Consultant General Surgeon,
Taunton

Joyce Cormie
Consumer Representative

Professor Mike Drummond
Director, Centre for Health Economics (CHE)
University of York

Chairman: Professor Martin Eccles
Professor of Clinical Effectiveness,
Centre for Health Services Research,
University of Newcastle upon Tyne

David Edwards
Chief Executive,
University Hospital of Wales and Llandough Hospital NHS Trust

Vice Chair: Professor Gene Feder
St Bartholomews and the Royal London
School of Medicine & Dentistry

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Professor of Health Services Research and
Programme Director in the Health Services
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Helen Spiby
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Amanda Wilde
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Fiona Wise
Chief Executive,
Enfield Community Care Trust

Carol Youngs
Assistant Director,
Contact a Family

Dr John Young
Medical Director,
MSD

Appendix C

Monitoring your babies heartbeat in labour – Patient Information

The patient information in this appendix has been designed to support the production of your own information leaflets. You can download it from our website at www.nice.org.uk where it is available in English and Welsh. If you would like printed copies of the leaflets please ring the NHS Response Line on 0870 1555 455 and quote reference number 23809 for the English patient leaflet and 23810 for the bi-lingual patient leaflet.

About this booklet

- Is for pregnant women, their partners and their families.
- Gives information to help you make choices about how your baby's heartbeats are monitored during labour.
- Gives information on how doctors and midwives monitor babies' heartbeats during labour in hospital.
- Is based on a national evidence based clinical guideline on Electronic Fetal Monitoring.

About clinical guidelines

Clinical guidelines are recommendations for good practice and exist to help patients and their healthcare team make the right decisions about health care. The guidelines are developed by teams of healthcare professionals, patients and scientists who look at the best evidence about care for a particular condition.

The advice in this booklet is adapted from a guideline produced by the Royal College of Obstetricians and Gynaecologists (RCOG) on behalf of the National Institute for Clinical Excellence (NICE) for the NHS in England and Wales.

Everyone has the right to be fully informed and to share in decision-making about health care. Health care staff should respect and take into account the wishes of the people in their care. Guidelines are recommendations for good practice. There may be good reasons why your treatment differs from the recommendations in this booklet, depending on your individual circumstances and wishes.

The National Institute for Clinical Excellence (NICE) is a part of the NHS. It produces guidance for both the NHS and patients on medicines, medical equipment and clinical procedures and where they should be used.

Why monitor a baby's heartbeat in labour?

If you go into hospital to give birth, various checks will be offered to you and your unborn baby. This will include listening to, or monitoring your baby's heartbeat.

Most babies come through labour without problems but there are a few who don't cope so well. During contractions blood can't get through the placenta (afterbirth) so easily. This is normal and most babies cope without any problems. If a baby is not coping well, this may be reflected in the pattern of their heartbeat.

What are the methods for fetal heart monitoring?

One of the best ways of finding out if your baby is having difficulties is to listen to their heartbeat regularly throughout the labour. This is known as Fetal Heart Monitoring.

Your baby's heartbeat can be monitored in a number of different ways which are explained on the following pages.

Your baby's heart rate can be measured either at regular intervals ('intermittent auscultation') or continuously (electronic fetal monitoring). Before starting any monitoring the midwife or doctor will listen to your heartbeat as well as your baby's heart to make sure they can tell them apart.

Intermittent auscultation (with a Pinard stethoscope or a hand held "Doppler"):

If you are healthy and have had a trouble-free pregnancy this is the recommended method of monitoring your baby's heartbeat during labour. This should happen every fifteen minutes during the early stages of labour, increasing to once every five minutes (or once every contraction) in the later stages.

Current research evidence does not support the need for your baby's heartbeat to be monitored using an electronic fetal heart monitor when you arrive at the hospital.

Intermittent Auscultation can be done using either a Pinard stethoscope, or a hand held 'Doppler'. A Pinard is a trumpet shaped stethoscope. It enables your doctor or midwife to hear your baby's heartbeat through your abdomen (tummy). A 'Doppler' is a small hand held device which looks like microphone. When it is placed against your abdomen it allows you, your midwife and your doctor to listen to your baby's heartbeat using Doppler USS.

With intermittent monitoring, your ability to move around will only be limited when the baby's heartbeat is being listened to. At other times you will be able to stand up and move around.

Continuous monitoring with an Electronic Fetal Heart Rate Monitor

Sometimes your midwife or doctor may offer and recommend continuous monitoring. This may be for a number of reasons relating to you or your baby's health. The reasons for using continuous monitoring should be discussed between you, your midwife and/or your doctor. For example:

- Your midwife or doctor has already listened to your baby's heartbeat using a Pinard stethoscope or 'Doppler' and thinks that your baby may not be coping well.
- You have a health problem such as:
  - Diabetes
  - Infection
  - Pre eclampsia (high blood pressure)
  - Problems with your heart or kidneys
- Factors relating to your current or a previous pregnancy such as:
  - Your pregnancy has lasted more than 42 weeks
  - You are having Epidural analgesia (pain relief injected into the back)
  - You have had bleeding from your vagina during or before labour
  - Your labour is induced (started artificially) or strengthened with a drip (oxytocin)
  - You have a twin/triplet pregnancy.
  - You have previously had Caesarean Section
  - Your baby is small or premature
  - Your baby is a breech presentation (going to be born bottom first)

You may wish to have continuous monitoring for your own reasons.

Continuous monitoring keeps track of your baby's heartbeat for the whole of your labour. This is done using a piece of equipment called an electronic fetal heart rate monitor which records your baby's heartbeat.

Usually elastic belts are used to hold sensors against your abdomen. These sensors detect your baby's heartbeat and are connected to the monitor.

The monitor records your baby's heartbeat as a pattern on a strip of paper. This is sometimes called a "trace" or a "CTG".

Your midwife or doctor will read and interpret the trace to help get an idea of how well your baby is coping with labour. It is normal for there to be changes in the pattern of the heartbeat, for example, when your baby is sleeping or moving around.

You should ask your midwife or doctor if you want the trace explained to you.

Being attached to the monitor can limit your ability to move around. Whilst it may be okay to stand up or sit down, it will not be possible to have a bath or move from room to room.

Occasionally a Fetal Scalp Electrode (sometimes called a "clip") may be offered and recommended. The reasons for doing this should be discussed with you. The electrode picks up your baby's heartbeat directly. It is attached to your baby's scalp through the vagina and is then connected to the monitor.

What happens if a problem is suspected?

The trace may make your midwife or doctor suspect that your baby is not coping well. If this happens, further action may be taken. This could include immediate delivery of your baby or carrying out a further test called Fetal Blood Sampling.

Occasionally the trace can make your midwife or doctor suspect that your baby is not coping well when in fact they are fine. Fetal blood sampling can help to clarify this and may avoid you having an unnecessary Caesarean Section. Compared with the monitor alone, it is a more accurate way of checking if your baby is not coping well.

Fetal blood sampling involves taking one or two drops of blood from your baby's scalp (through your vagina). This blood is tested for oxygen levels to show if your baby is not coping well with labour. The test can take between ten and twenty minutes.

There may be reasons why fetal blood sampling is not appropriate for you, for example if you have certain infections. Your midwife or doctor should discuss this with you.

Further information

For further information about fetal monitoring, and all other aspects of pregnancy and childbirth, talk to your midwife or doctor.

Everyone has the right to be fully informed and to share in decision-making about health care. You can discuss this guideline with your midwife or doctor. If you have access to the internet and would like to find out more about childbirth, visit the NHS Direct website www.nhsdirect.nhs.uk or telephone NHS Direct on 0845 4647.

For further information about NICE, the Clinical Guidelines Programme or other versions of this guideline (including the sources of evidence) you can visit the NICE website at www.nice.org.uk. Full copies of the NICE guideline can be requested from 0870 1555 455, quoting the reference number 23807.

For other versions of the Clinical Guideline including sources of evidence for the recommendations made in this booklet contact The Clinical Effectiveness Support Unit, The Royal College of Obstetricians and Gynaecologists (RCOG) www.rcog.org.uk or efm@rcog.org.uk.

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MIDIRS (July 1996) "Listening to your baby's heartbeat during labour" - one of the Informed Choice Series of information leaflets

Appendix D

Definitions and descriptions of individual features of fetal heart-rate (FHR) traces

Term	Definition
Baseline fetal heart rate	The mean level of the FHR when this is stable, excluding accelerations and decelerations. It is determined over a time period of 5 or 10 minutes and expressed in bpm. Preterm fetuses tend to have values towards the upper end of this range. A trend to a progressive rise in the baseline is important as well as the absolute values
Normal Baseline FHR	110–160 bpm
Moderate bradycardia[a]	100–109 bpm
Moderate tachycardia[a]	161–180 bpm
Abnormal bradycardia	<100 bpm
Abnormal tachycardia	>180 bpm
Baseline variability	The minor fluctuations in baseline FHR occurring at three to five cycles per minute. It is measured by estimating the difference in beats per minute between the highest peak and lowest trough of fluctuation in a one-minute segment of the trace
Normal baseline variability	Greater or equal to 5 bpm between contractions
Non-reassuring baseline variability	Less than 5 bpm for 40 minutes or more but less than 90 minutes
Abnormal baseline variability	Less than 5 bpm for 90 minutes or more
Accelerations	Transient increases in FHR of 15 bpm or more and lasting 15 seconds or more. The significance of no accelerations on an otherwise normal CTG is unclear
Decelerations	Transient episodes of slowing of FHR below the baseline level of more than 15 bpm and lasting 15 seconds or more
Early decelerations	Uniform, repetitive, periodic slowing of FHR with onset early in the contraction and return to baseline at the end of the contraction
Late decelerations	Uniform, repetitive, periodic slowing of FHR with onset mid to end of the contraction and nadir more than 20 seconds after the peak of the contraction and ending after the contraction. In the presence of a non-accelerative trace with baseline variability < 5 bpm, the definition would include decelerations < 15 bpm
Variable decelerations	Variable, intermittent periodic slowing of FHR with rapid onset and recovery. Time relationships with contraction cycle are variable and they may occur in isolation. Sometimes they resemble other types of deceleration patterns in timing and shape
Atypical variable decelerations	Variable decelerations with any of the following additional components: i. loss of primary or secondary rise in baseline rate, ii. slow return to baseline FHR after the end of the contraction. iii. prolonged secondary rise in baseline rate, iv. biphasic deceleration, v. loss of variability during deceleration, vi. continuation of baseline rate at lower level.
Prolonged deceleration	An abrupt decrease in FHR to levels below the baseline that lasts at least 60–90 seconds. These decelerations become pathological if they cross two contractions, i.e. greater than 3 minutes
Sinusoidal pattern	a regular oscillation of the baseline long-term variability resembling a sine wave. This smooth, undulating pattern, lasting at least 10 minutes, has a relatively fixed period of 3–5 cycles per minute and an amplitude of 5–15 bpm above and below the baseline. Baseline variability is absent

[a] These ranges of baseline are not associated with hypoxia in the presence of accelerations, with normal baseline variability and no decelerations

Appendix E

Abbreviations

bpm	Beats per minute
BP	Blood pressure
CTG	Cardiotocograph(y)
EFM	Electronic fetal monitoring
FBS	Fetal blood sampling
FHR	Fetal heart rate
FSE	Fetal scalp electrode
IA	Intermittent auscultation
RCT	Randomised controlled trial
VE	Vaginal examination