

Corso di Laurea in Ostetricia
C.I. “ Patologia ostetrica e primo soccorso”

Prof. P. Greco

Cardiotocografia in travaglio di parto

CARDIOTOCOGRAFIA IN TRAVAGLIO DI PARTO

DEFINIZIONE/STORIA/TECNICHE

SIGNIFICATO FISIO-PATOLOGICO

INTERPRETAZIONE/CLASSIFICAZIONE/SIGNIFICATO CLINICO

APPLICAZIONE CLINICA/MEDICINA EVIDENZA

The Use of Electronic Fetal Monitoring

The use and interpretation of cardiotocography in intrapartum fetal surveillance

Evidence-based Clinical Guideline Number 8

Clinical Effectiveness Support Unit



Royal College of Obstetricians and Gynaecologists
Setting standards to Improve Women's Health

Dewhurst's Textbook of Obstetrics & Gynaecology

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London, UK

SEVENTH EDITION



Regione Emilia-Romagna
Divisione Generale Sanità e Politiche Sociali

Agenzia Sanitaria Regionale

Progetto n. 3

LA SORVEGLIANZA DEL BENESSERE FETALE INTRAVAGLIO DI PARTO

Linea guida basata su prove di efficacia

Aziende USL di Bologna, Cesena, Forlì, Modena, Rimini
Azienda Ospedaliera di Bologna

CAVEAS
CENTRO AZIENDALE
di FETOPROTEZIONE

del Istituto di Anestesiologia

Continuous cardiotocography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour (Review)

Alfredic Z. Devane D, Gyre GML



THE COCHRANE COLLABORATION®

This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2013, Issue 5

<http://www.thecochranelibrary.com>

WILEY

NICE National Institute for Health and Care Excellence

Intrapartum care: care of healthy women and their babies during childbirth

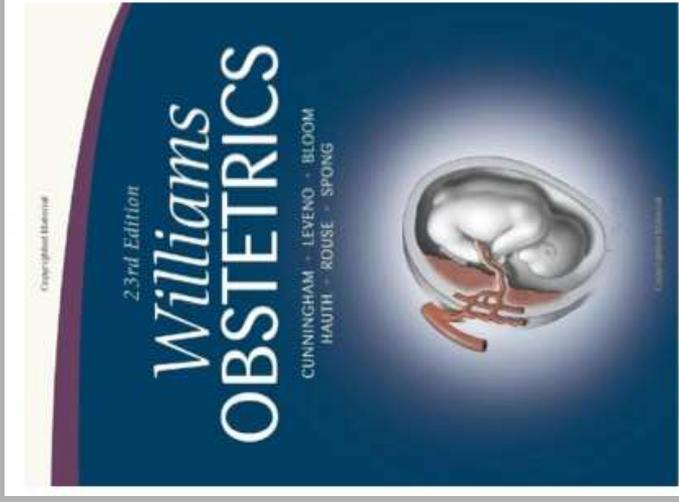
Issued: December 2014

NICE clinical guideline 190
guidance.nice.org.uk/CG190



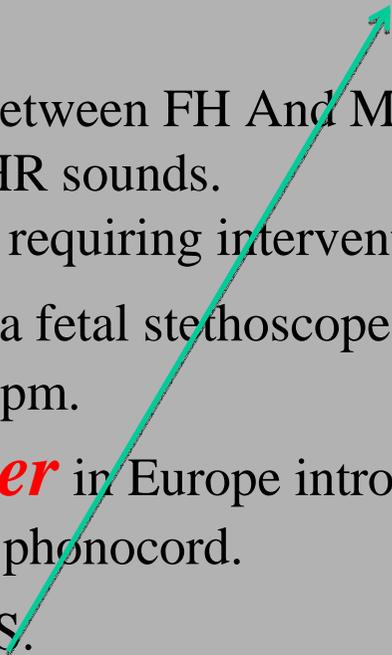
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STORIA DELLA OSSERVAZIONE DEL CUORE FETALE

ANTEPARTUM



- ✓ 1818-*Francios Major* in Geneva-DDx between FH And Maternal Pulse
- ✓ 1827- *John C Ferguson* ±described FHR sounds.
- ✓ 1849-*Killian* indicated FHR parameters requiring interventions.
- ✓ 1876-*Pinard* produced his design for a fetal stethoscope.
- ✓ 1893-*Winkel* set normal FHR 120-169 bpm.
- ✓ 1958-*Hon* in USA and *Hammacher* in Europe introduced first EFM.
- ✓ 1964- *Doppler* ultrasound scan replaced phonocord.
- ✓ 1966- *Saling* in Berlin introduced FBS.
- ✓ 1968-Hamacher and *Hewitt-Packard* developed first fetal monitor.
- ✓ 1985- *Dublin RCT* changed terminology for the CTG interpretation





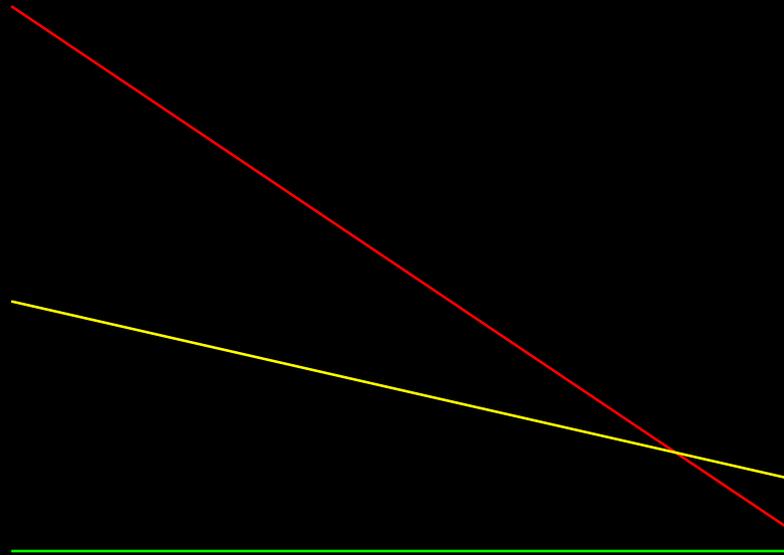
The aim of intrapartum EFM was to prevent harm, it became commercially available in the 1960s with the emphasis on improving fetal birth outcomes by detecting fetal **hypoxia** before it led to **perinatal mortality** or **cerebral palsy**.

The basic principle of intrapartum monitoring is to detect developing fetal hypoxia with the aim of preventing subsequent acidaemia and cell damage.

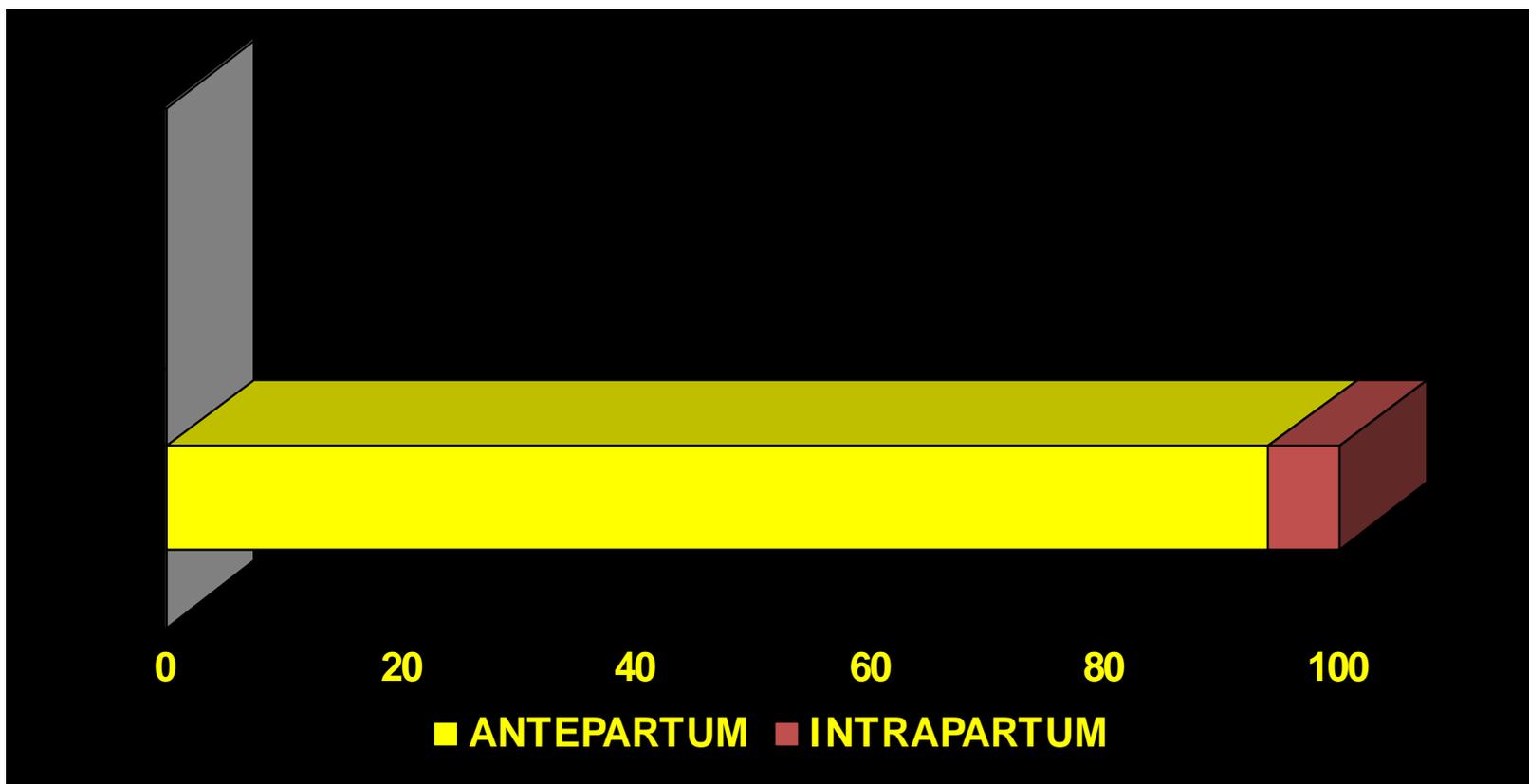
PARALISI CEREBRALE



— Mort Mat — Mort Perin — C.P.



CP



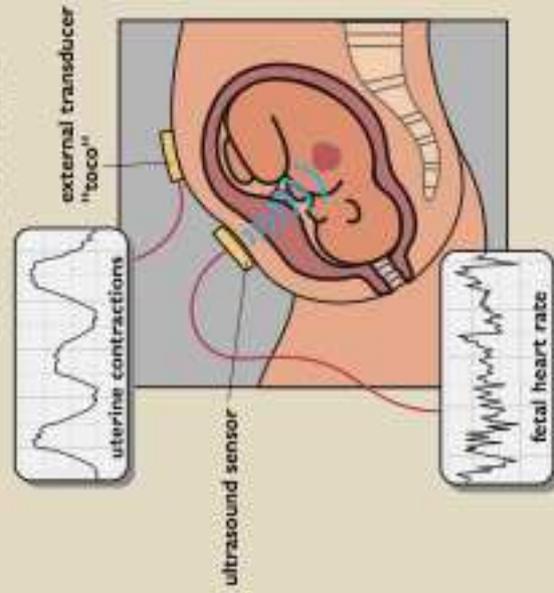
METODICHE

MONITORAGGIO INTERNO
(DIRETTO)

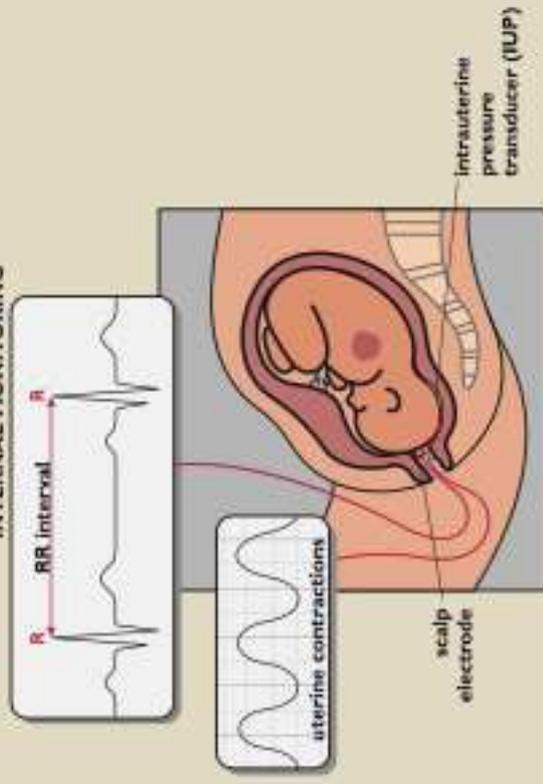
MONITORAGGIO ESTERNO

Recording of fetal heart rate and uterine activity

EXTERNAL MONITORING

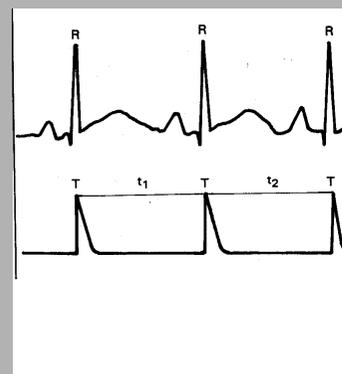


INTERNAL MONITORING

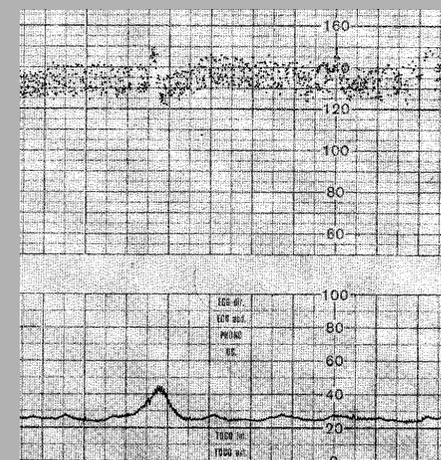
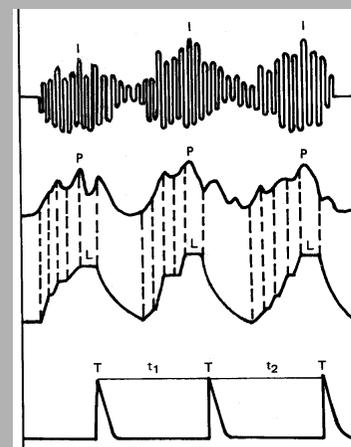


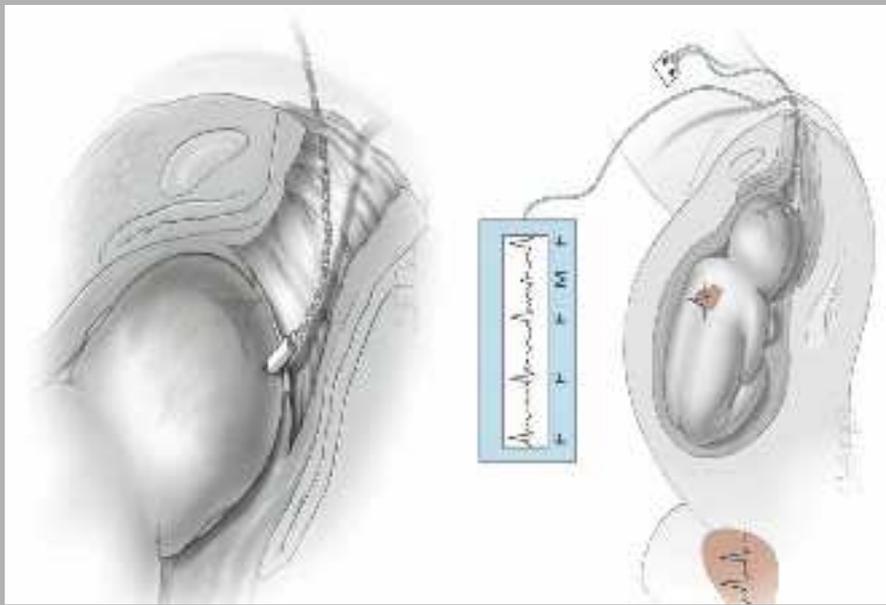
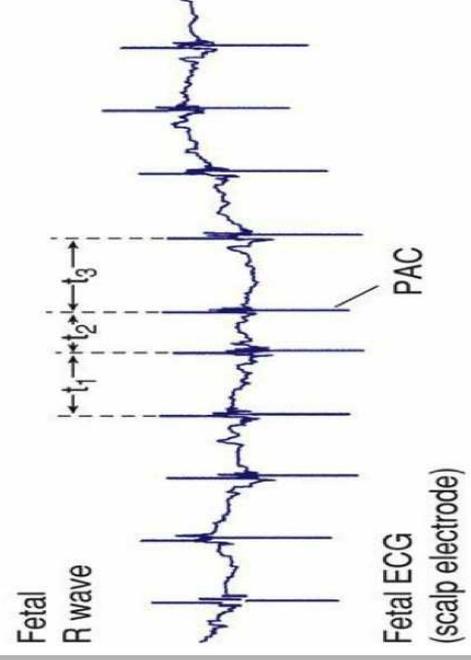
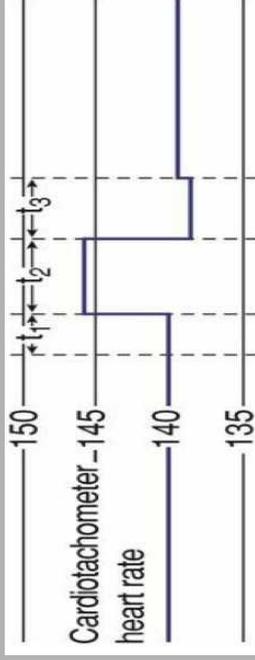
CARDIOTOCOGRAFIA

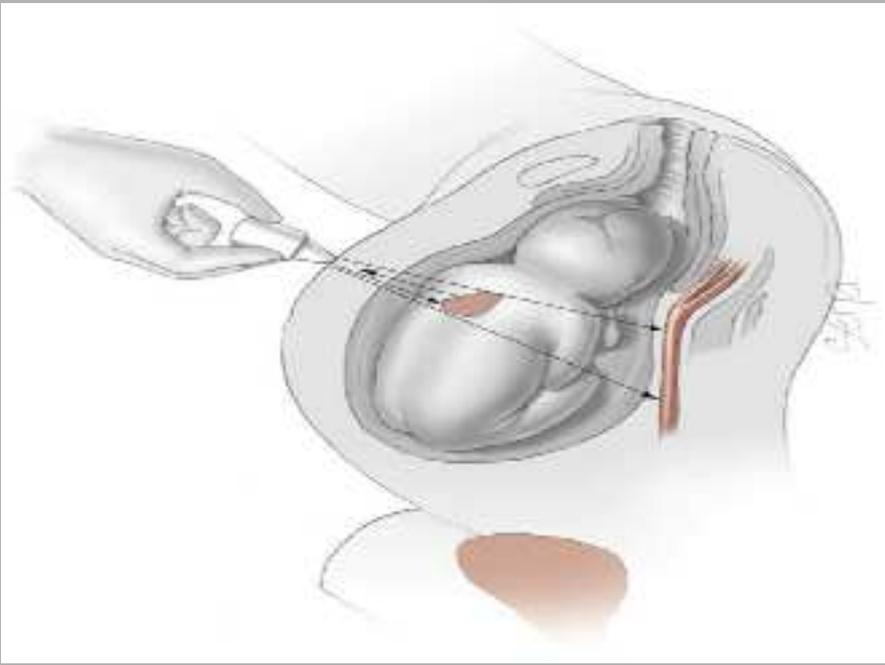
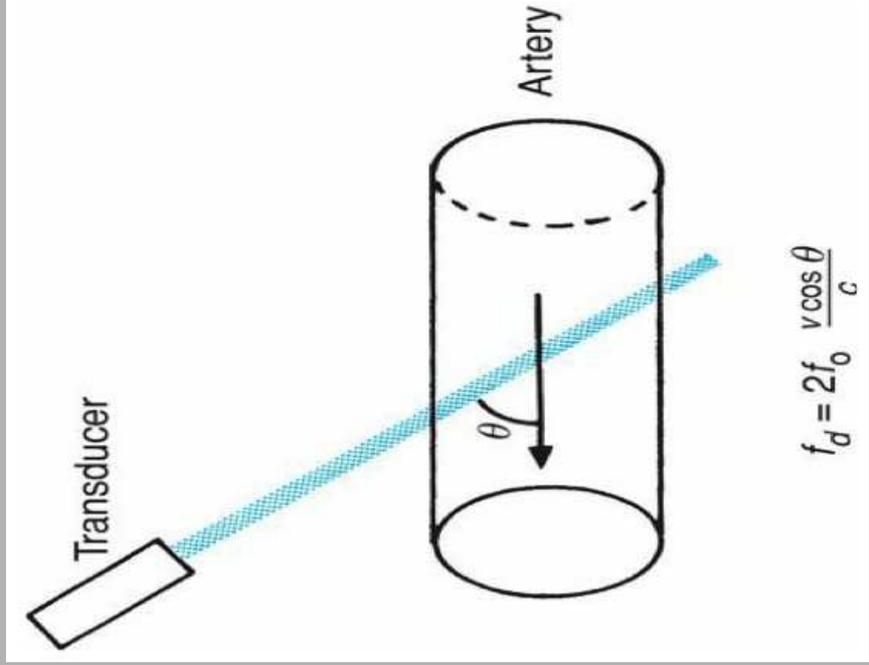
• ECG DALLO SCALPO

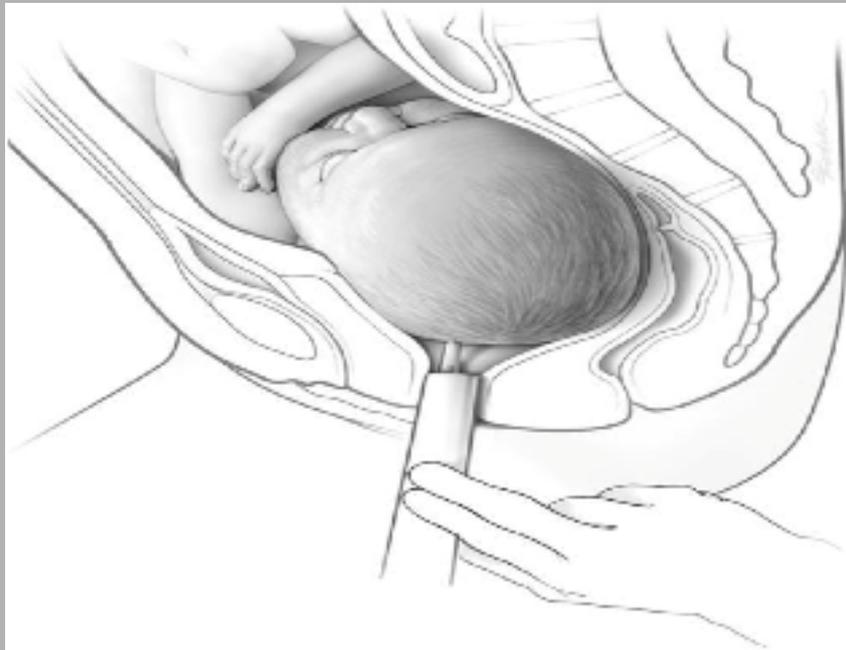


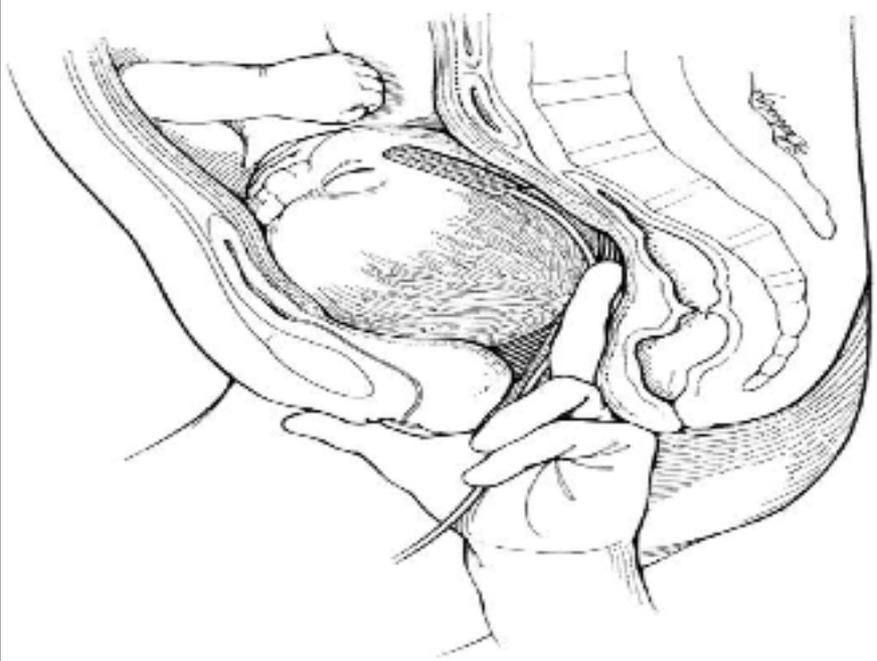
• ULTRASONOCARDIOGRAFIA

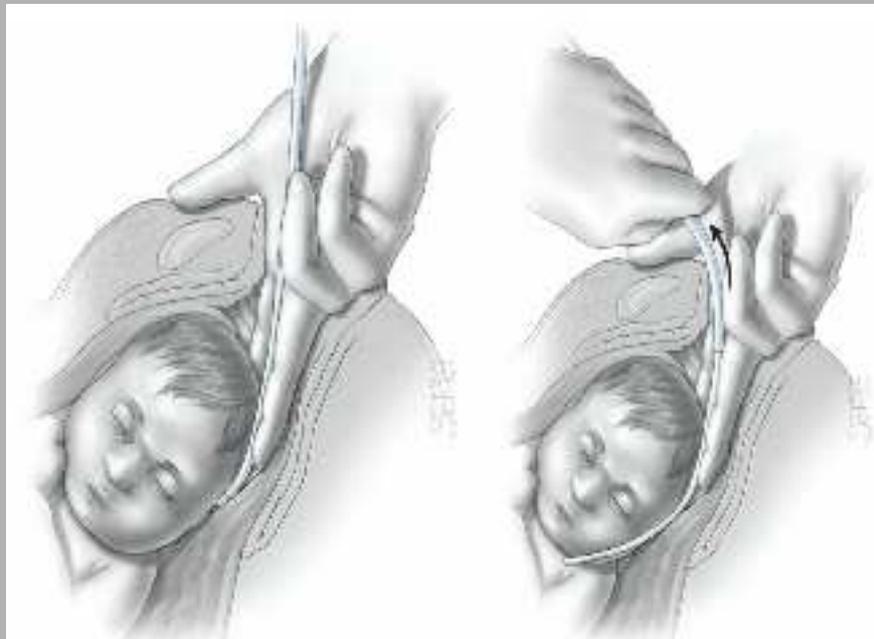


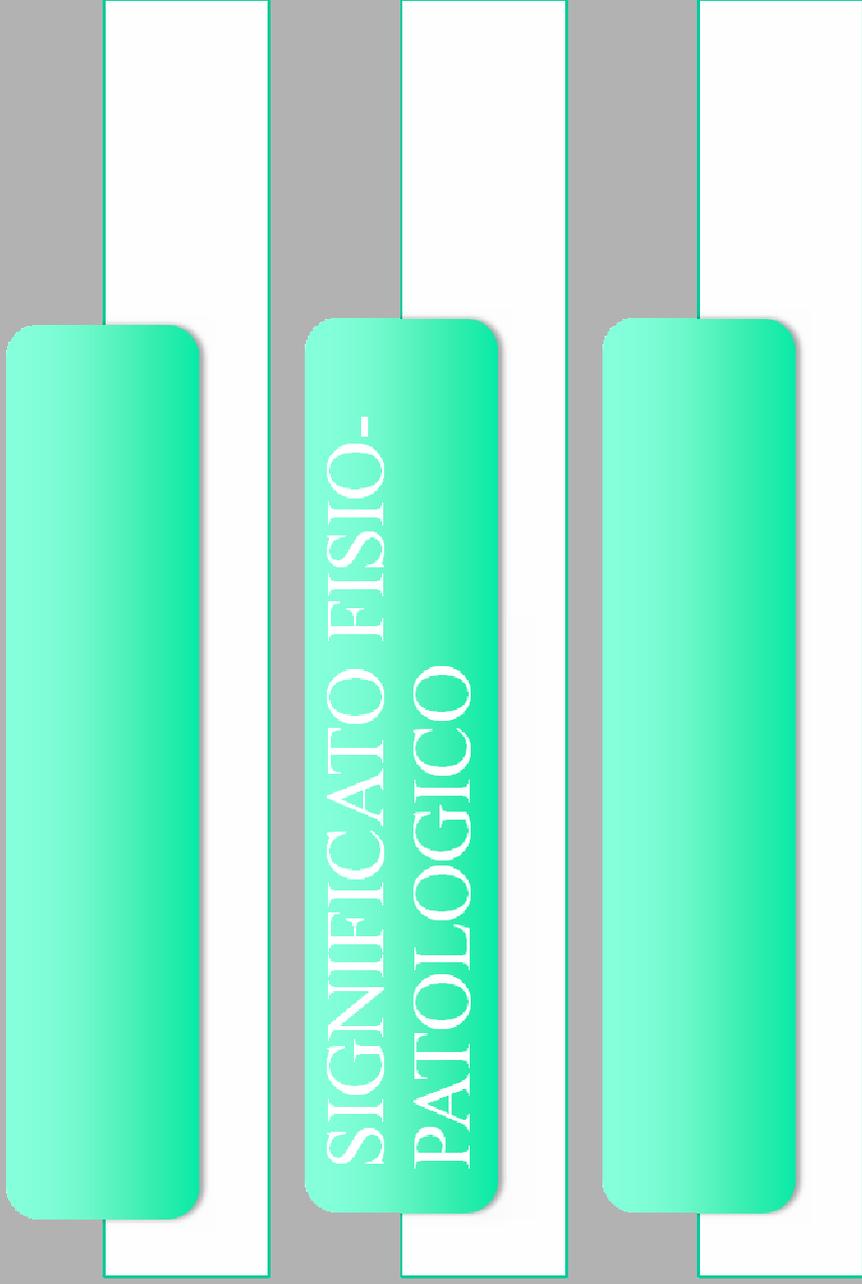




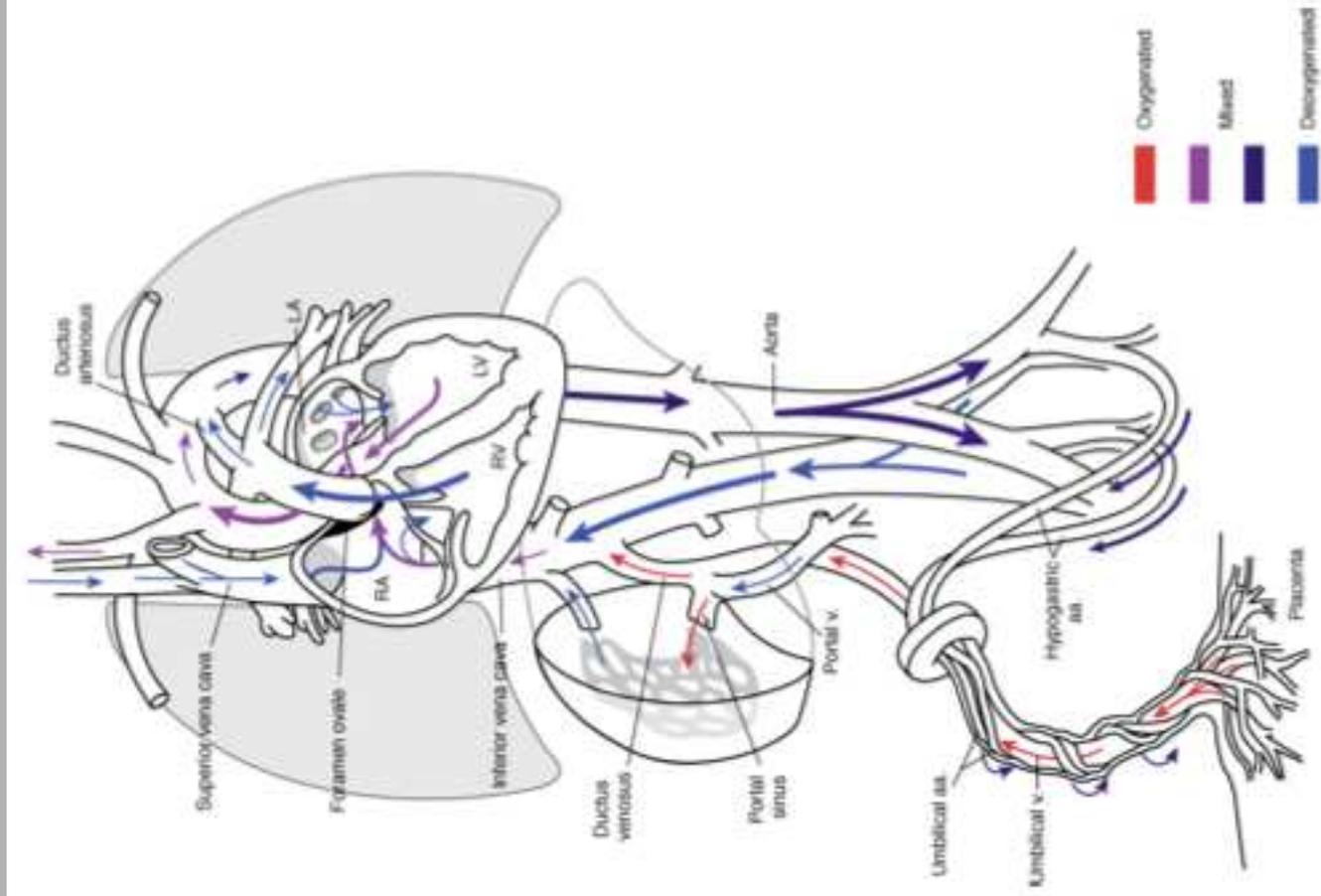
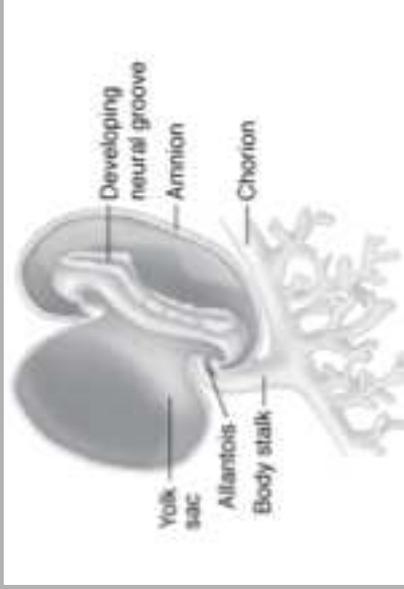








SIGNIFICATO FISIO-
PATOLOGICO

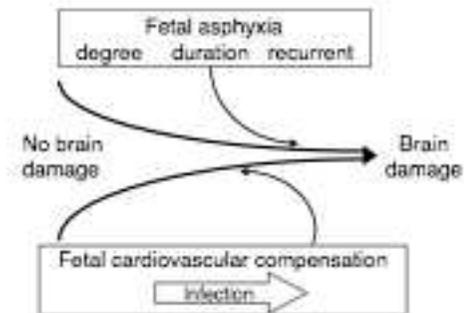
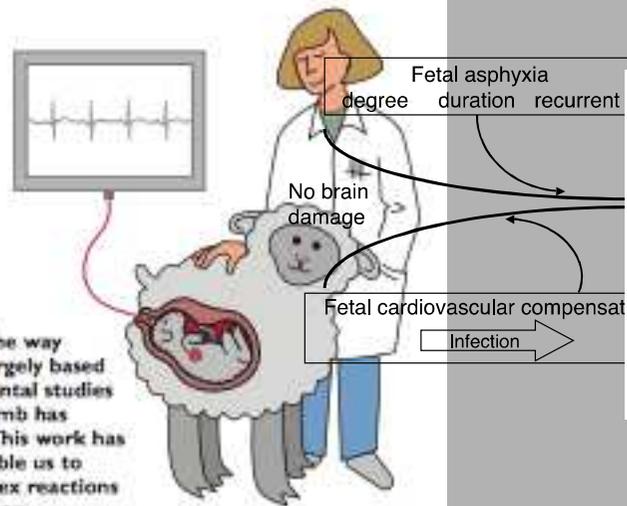


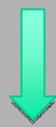
Source: Cunningham FG, Leveno KJ, Miller EL, Smith SC, eds. *Williams Obstetrics*, 2nd Edition. <http://www.accessmedicine.com>. Copyright © The McGraw-Hill Companies, Inc. All rights reserved.

PURTROPPO ANCORA ADESSO!

Basic Physiology

Our knowledge of the way the fetus reacts is largely based on animal experimental studies in which the fetal lamb has served as a model. This work has been needed to enable us to interpret the complex reactions that exist during labor.

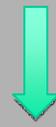
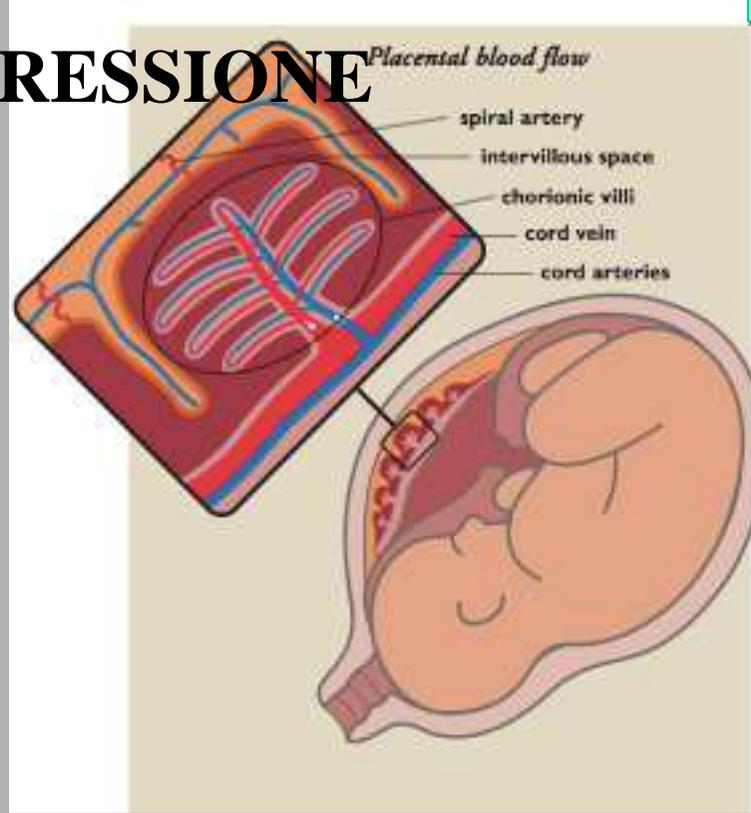




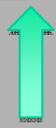
PRESSIONE



Hb



PO₂ SatO₂



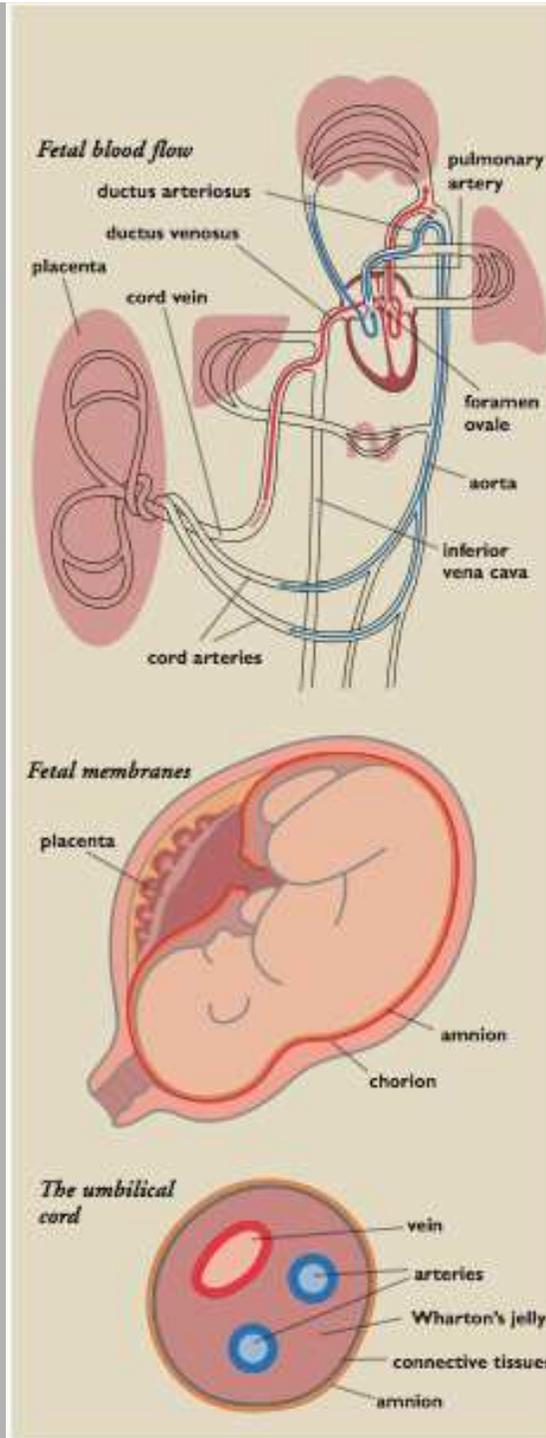
Leg Hb-

O₂

PRO

**MEMBRAN
E**

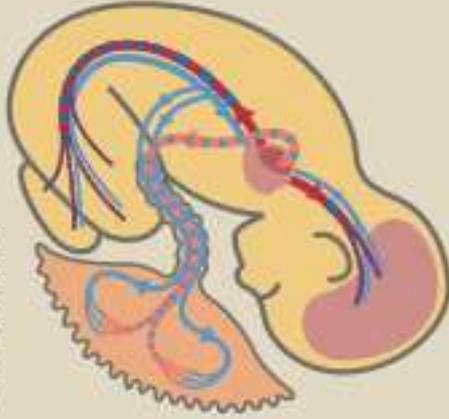
**LIQUIDO
AMNIOTIC
O
GELATINA
DI
WHARTON**



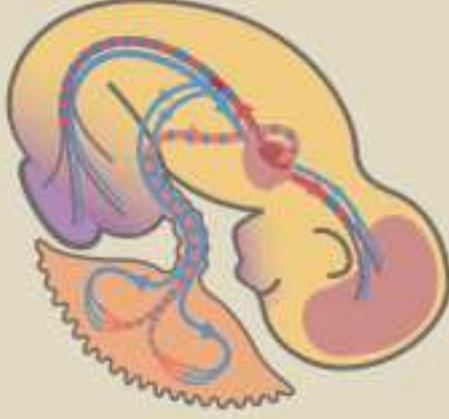
CONTRO

**CONTRAZIONI
I UTERINE**

Basic definitions



hypoxemia – affects the arterial blood



hypoxia – affects the peripheral tissues

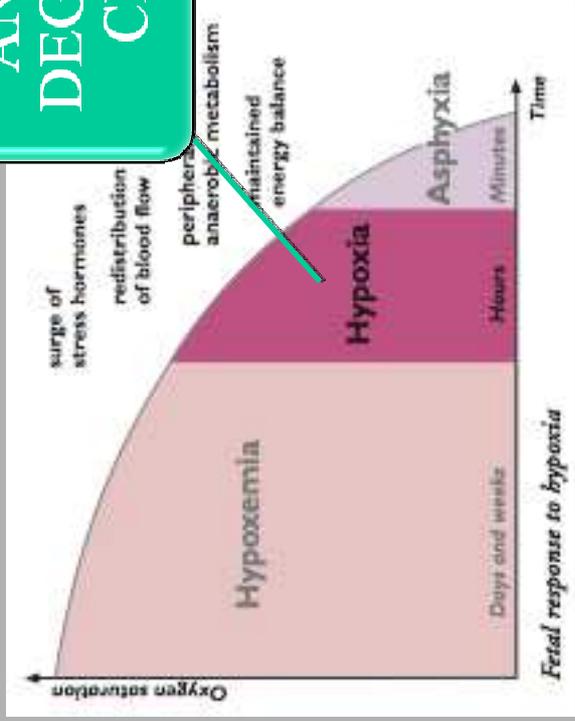
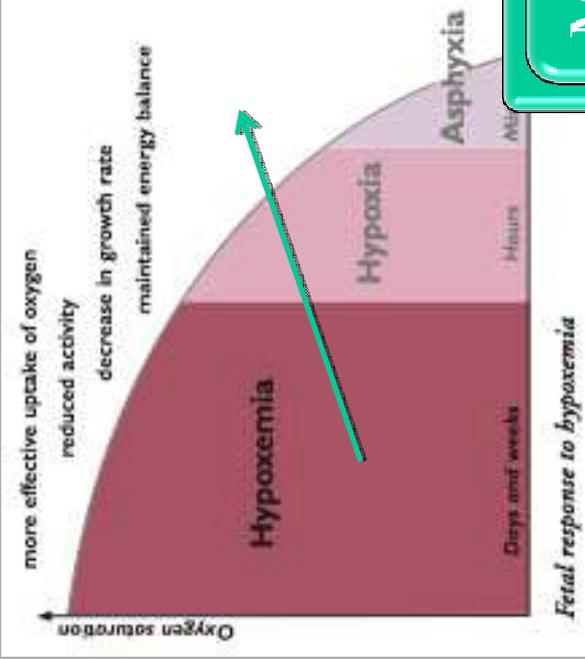


asphyxia – affects the central organs

IPOSSIEMIA

IPOSSIA

ASFISSIA /ACIDOSI

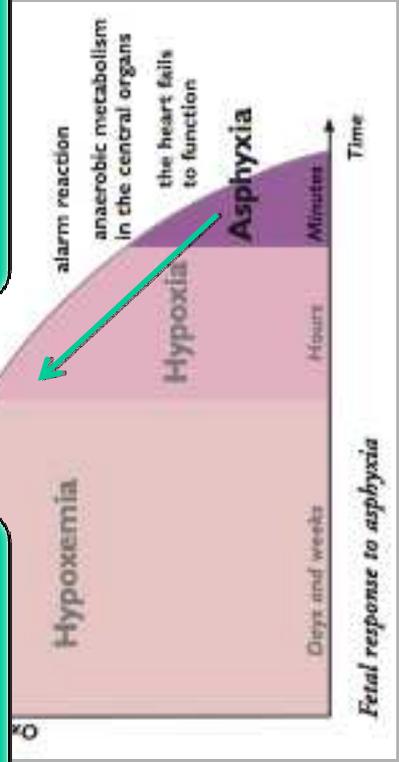


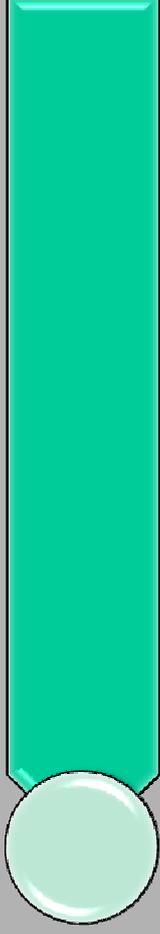
COMPENSO

RESPIRO,
MOVIMENTI
CRESCITA

METABOLISMO ANAEROBIO DEGLI ORGANI CENTRALI

INSUFFICIENZA CARDIACA





INTERPRETAZIONE
/CLASSIFICAZIONE
/SIGNIFICATO
CLINICO





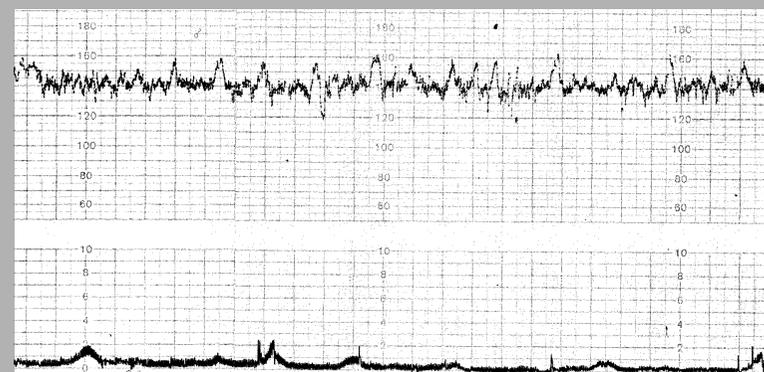
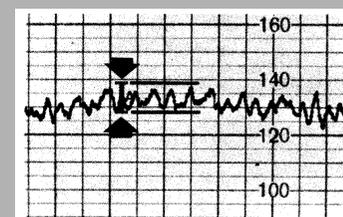
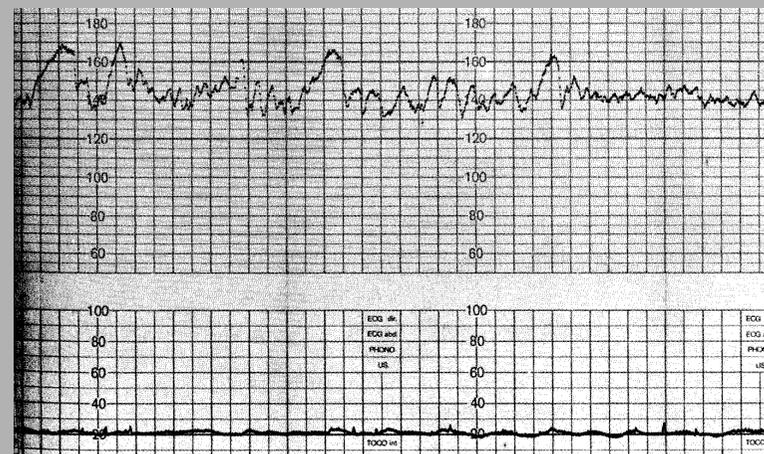
CARDIOTOCOGRAFIA

IL TRACCIATO

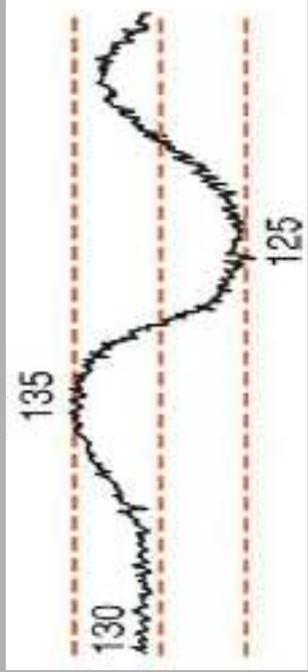
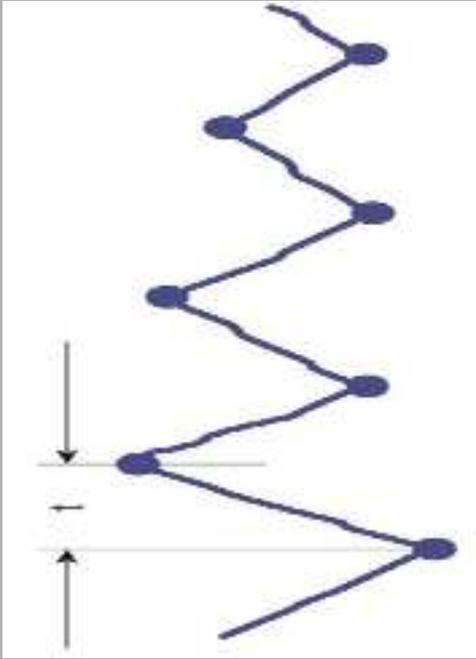
• LA LINEA DI BASE

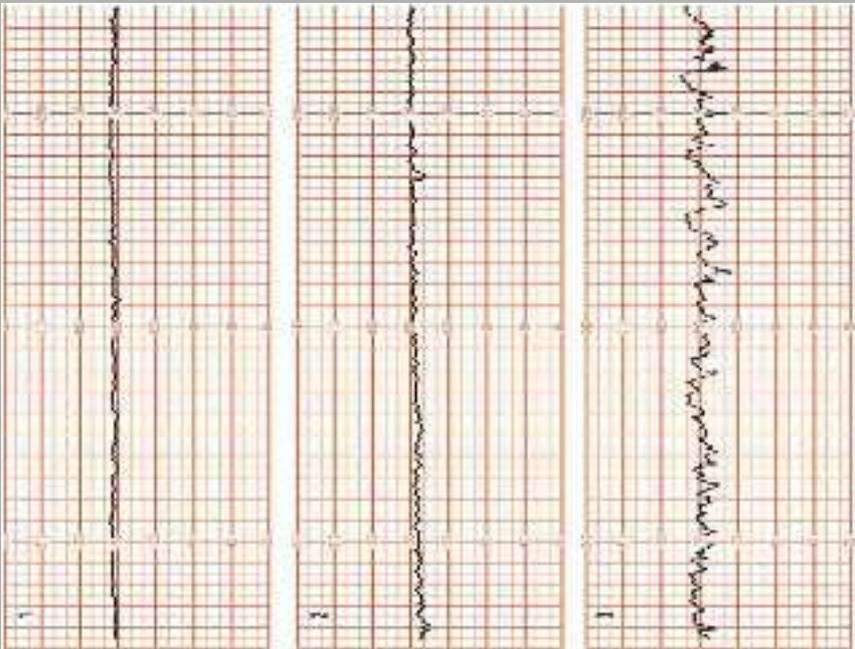
• VARIABILITA' A LUNGO
TERMINE

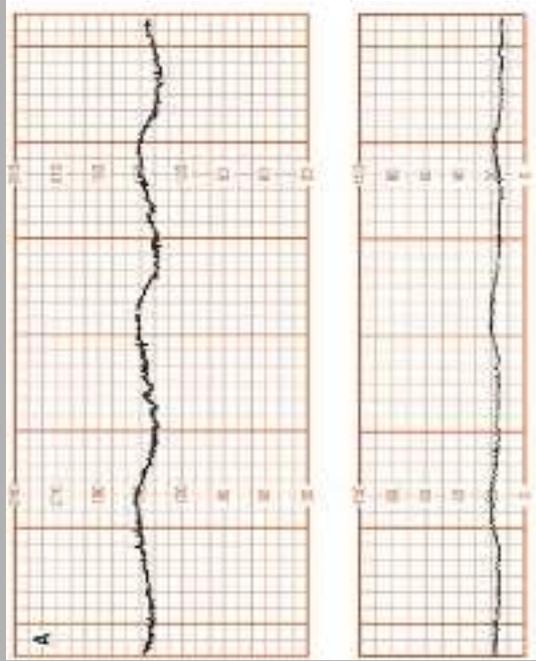
• ACCELERAZIONI

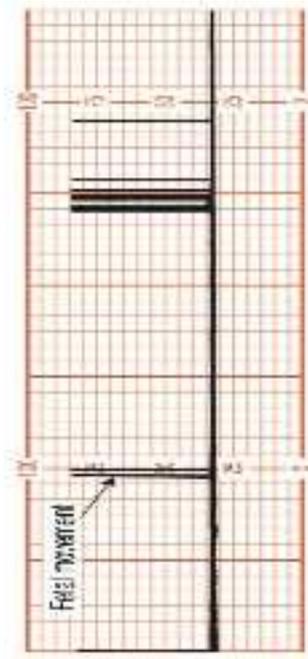
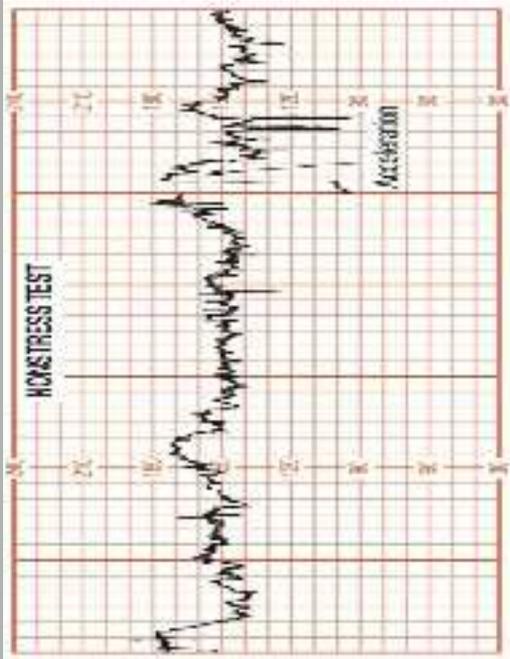








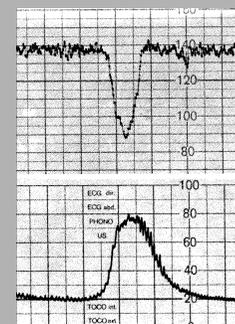




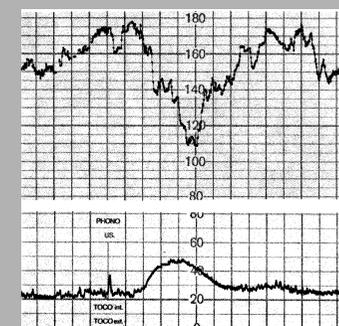
CARDIOTOCOGRAFIA

IL TRACCIATO

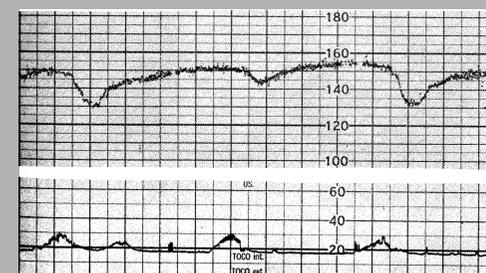
• **DECELERAZIONI PRECOCI**

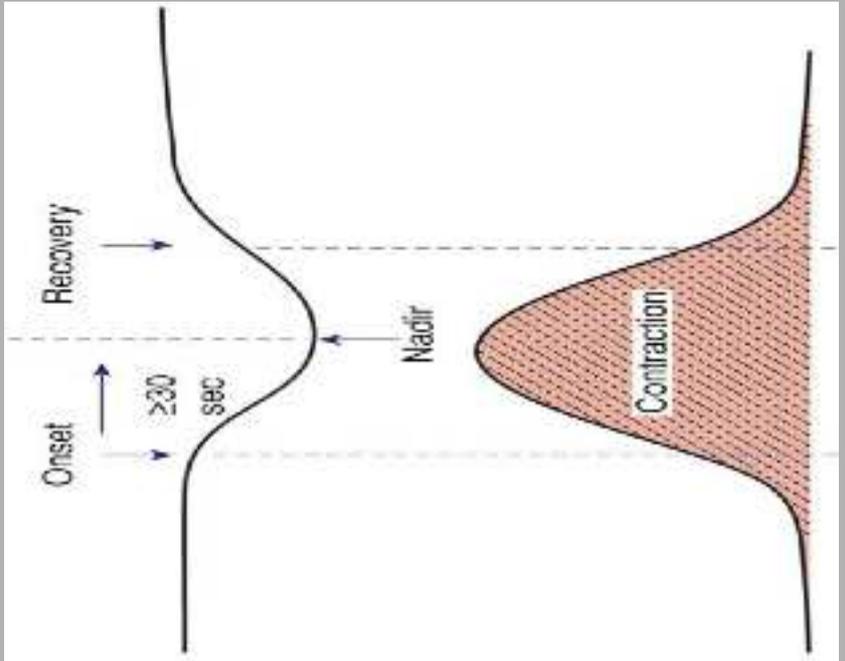
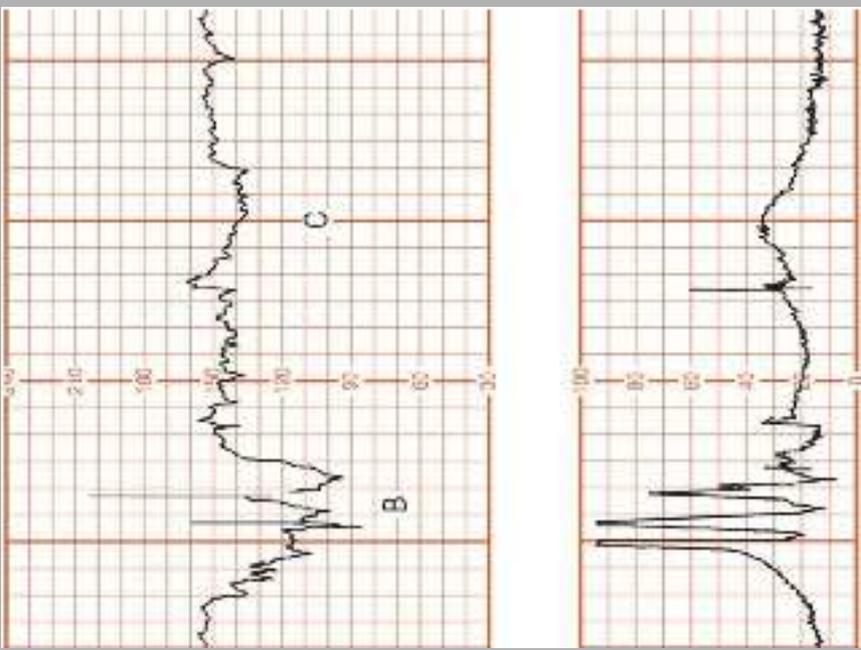


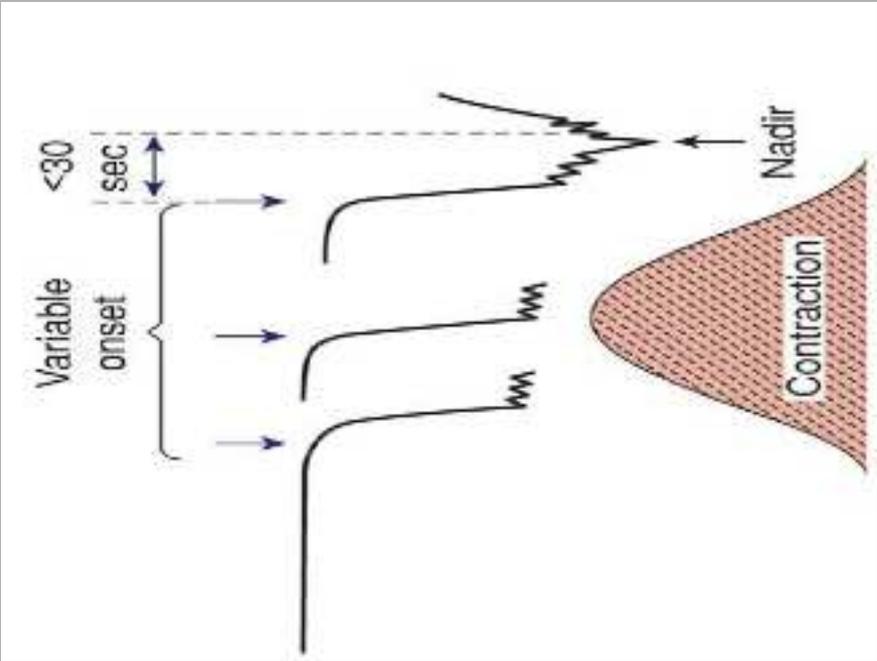
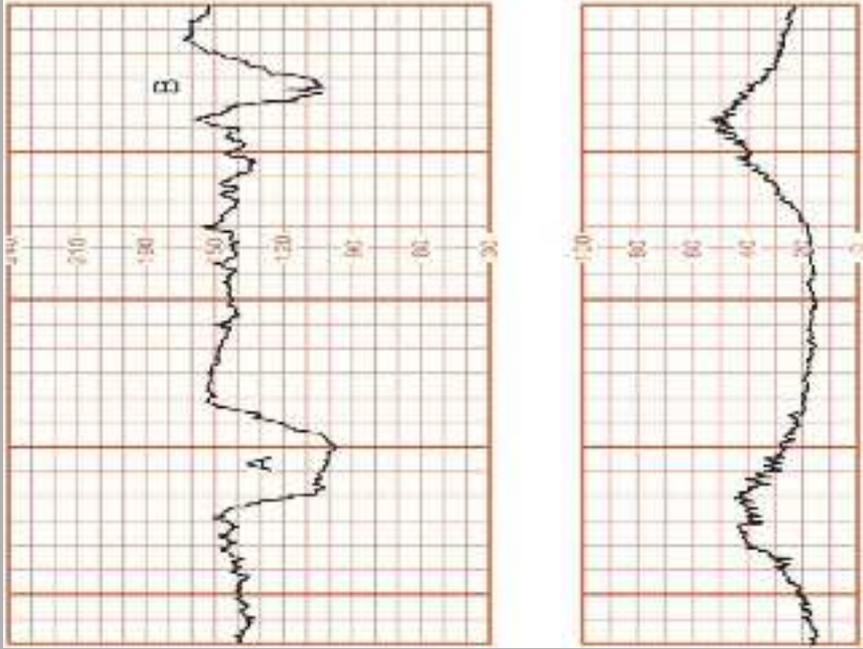
• **DECELERAZIONI VARIABILI**

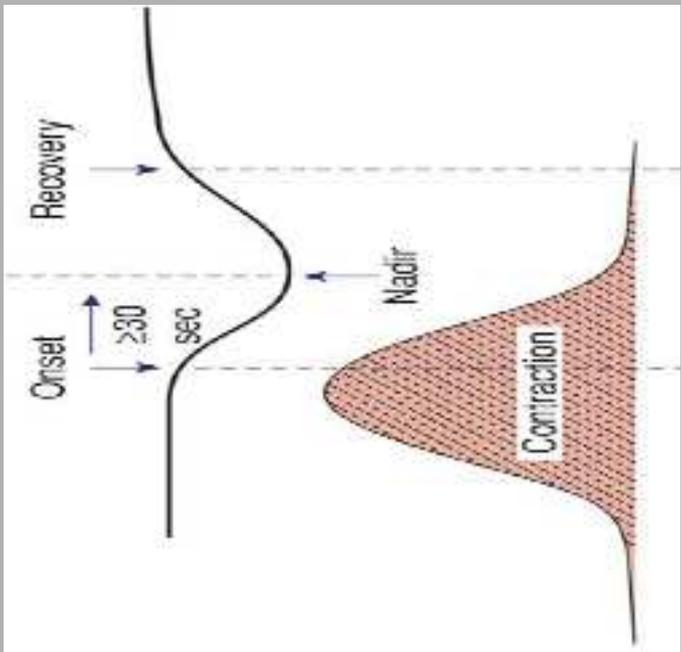
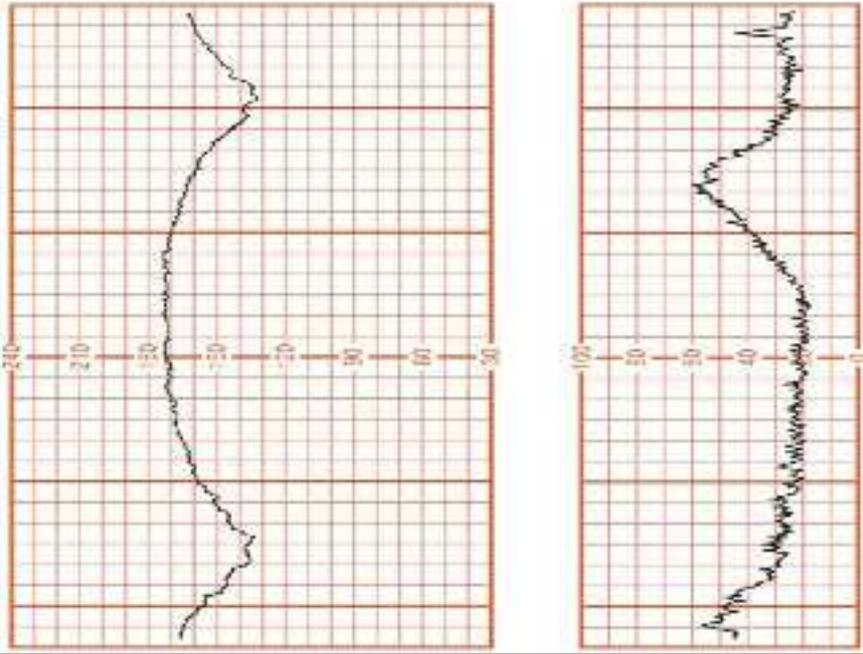


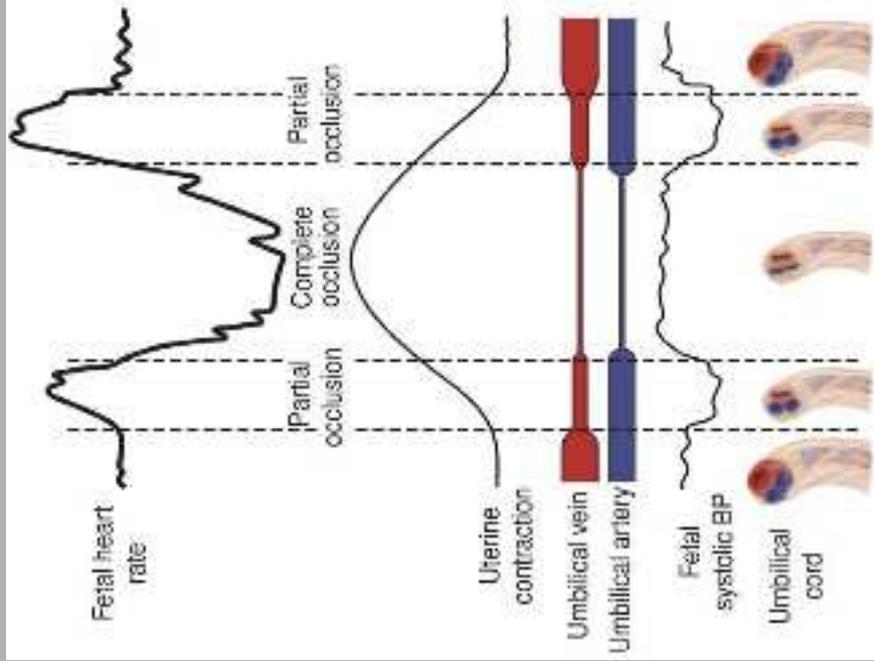
• **DECELERAZIONI TARDIVE**

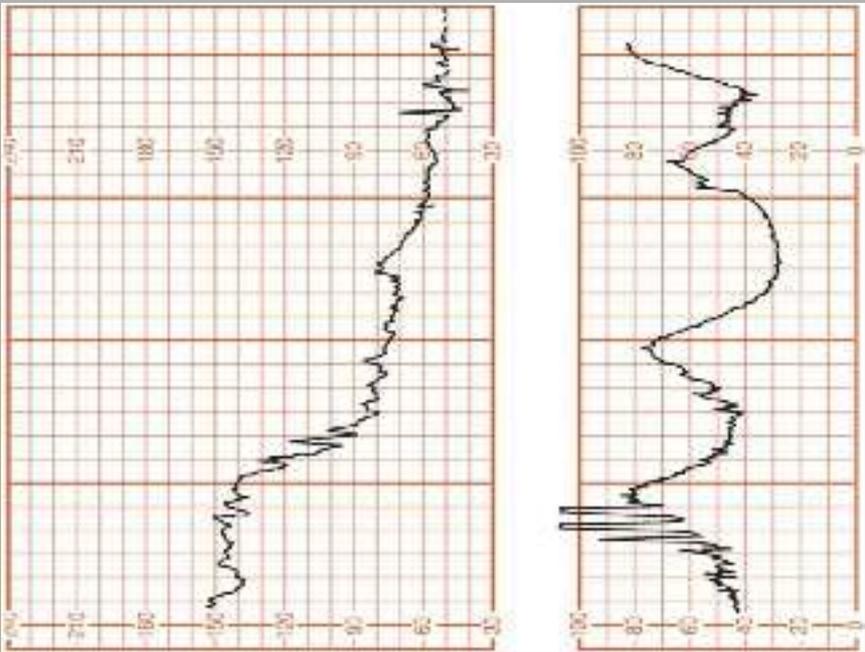














Modificazioni del CTG ipossia-indotte

- ∅ Accelerazioni
- ∅ Variabilità della linea di base
- ↑↑ Frequenza cardiaca fetale
- Decelerazioni tardive
- ↓↓ Frequenza cardiaca fetale

Classificazione del CTG (RCOG 2001)

	Linea di base	Variabilità	Decelerazioni	Accelerazioni
Rassicurante	110-160	≥ 5	Assenti	Presenti
Non rassicurante	100-109 161-180	$< 5 / \geq 40'$	Precoci Variabili	NB L'assenza di accelerazioni senza altri segni non ha un significato patologico
Patologico	< 100 > 180	$< 5 / \geq 90'$	Variabili Tardive	

Normale: un CTG dove **tutti e quattro** i parametri rientrano nella categoria “rassicurante”

Sospetto: un CTG in cui **un** parametro è non rassicurante, i rimanenti rientrano nella categoria “rassicurante”

Patologico: un CTG in cui almeno **due** parametri rientrano nella categoria non rassicurante ed almeno **uno** in quella patologica

Feature		
Description	Baseline (beats/minute)	Baseline variability (beats/minute)
Normal/reassuring	100–160	5 or more
		Decelerations
		None or early

Non-reassuring	161–180	<p>Variable decelerations:</p> <ul style="list-style-type: none"> dropping from baseline by 60 beats/minute or less and taking 60 seconds or less to recover present for over 90 minutes occurring with over 50% of contractions. <p>OR</p> <p>Variable decelerations:</p> <ul style="list-style-type: none"> dropping from baseline by more than 60 beats/minute or taking over 60 seconds to recover present for up to 30 minutes occurring with over 50% of contractions. <p>OR</p> <p>Late decelerations:</p> <ul style="list-style-type: none"> present for up to 30 minutes occurring with over 50% of contractions. 	<p>Abnormal</p>	<p>Above 180 or below 100</p>	<p>Less than 5 for over 90 minutes</p>	<p>Non-reassuring variable decelerations (see row above):</p> <ul style="list-style-type: none"> still observed 30 minutes after starting conservative measures occurring with over 50% of contractions. <p>OR</p> <p>Late decelerations:</p> <ul style="list-style-type: none"> present for over 30 minutes do not improve with conservative measures occurring with over 50% of contractions. <p>OR</p> <p>Bradycardia or a single prolonged deceleration lasting 3 minutes or more.</p>
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Categoria I

Linea di base 110-160 bpm;
Variabilità FCF moderata (6-25 bpm);
Decelerazioni tardive o variabili assenti;
Decelerazioni precoci assenti o presenti;
Accelerazioni presenti o assenti.

NICHD Macones GA, Hankins GD, Spong Y, Hauth J, Moore T. The 2008 National Institute of Child health and human development workshop report on Electronic fetal Monitoring. Update on definitions, interpretation and research guidelines. Obstet Gynecol 2008; 112, 3:661-6.

Categoria II

Linea di base bradicardia con variabilità conservata o tachicardia;
Variabilità FCF minima (0-5 bpm), assente senza decelerazioni ripetitive, aumentata (> 25 bpm);
Accelerazioni assenti o indotte dopo stimolazione fetale;
Decelerazioni periodiche o episodiche variabili ripetute con variabilità minima o moderata, prolungate ≥ 2 minuti, <10 minuti, tardive ripetute con variabilità moderata, decelerazioni variabili complicate.

Categoria III

Variabilità della FCF assente e presenza di decelerazioni tardive o variabili ripetute, bradicardia, quadro sinusoidale.

Sistema di interpretazione del tracciato CTG a tre categorie

Categoria I

Il tracciato presenta tutte le seguenti caratteristiche:

- Linea di base: 110-160 bpm
- Variabilità della linea di base: moderata (6-25 bpm)
- Decelerazioni variabili o tardive: assenti
- Decelerazioni precoci: presenti o assenti
- Accelerazioni: presenti o assenti

Modif. di Marcones NIC (D. Istituto Kennedy Shriver National Institute of Child Health and Human Development, Ott. 4, 2008) 112.3.2008

Categoria II

Il tracciato presenta caratteristiche non incluse nelle Categorie I o III. Costituisce una significativa percentuale di tracciati incontrati nella pratica clinica. Presenta una qualsiasi delle seguenti caratteristiche:

Frequenza della linea di base

- Bradicardia non associata ad assenza di variabilità della linea di base
- Tachicardia

Variabilità della linea di base

- Variabilità minima (>0 e ≤ 5 bpm)
- Variabilità assente ma non accompagnata da decelerazioni ricorrenti
- Variabilità marcata (>25 bpm)

Accelerazioni

- Assenza di accelerazioni (anche dopo stimolazione fetale)

Decelerazioni periodiche o episodiche

- Decelerazioni variabili ricorrenti associate a minima o moderata variabilità
- Decelerazioni prolungate ≥ 2 min ma <10 min
- Decelerazioni tardive ricorrenti con variabilità della linea di base moderata
- Decelerazioni variabili con altre caratteristiche come lento ritorno alla linea di base, "overshoots"

Categoria III

Il tracciato presenta una qualsiasi delle seguenti caratteristiche:

- Assenza di variabilità della linea di base più una delle seguenti:
 - Decelerazioni tardive ricorrenti
 - Decelerazioni variabili ricorrenti
 - Bradicardia
- Pattern sinusoidale



tracciato **normale**, linea di base 110-160 bpm, variabilità 6-25 bpm, decelerazioni nessuna o variabili non complicate o decelerazioni precoci, accelerazioni presenti, **nessun intervento clinico**;

tracciato **atipico**, bradicardia 100-110 bpm, tachicardia >160 bpm per >30 minuti, ma <80 minuti, aumento della linea di base, variabilità ≤ 5 bpm per 40-80 minuti, decelerazioni variabili non complicate, ripetitive (>3), decelerazioni tardive occasionali, decelerazioni prolungate singole >2 minuti, ma <3 minuti, assenza di accelerazioni, richiesta **frequente e continua vigilanza**;

tracciato **anormale**, bradicardia <100 bpm, tachicardia >160 bpm per >80 minuti, variabilità <5 bpm >80 minuti, >25 bpm per >10 minuti, sinusoidale, decelerazioni variabili complicate, decelerazioni tardive >50% delle contrazioni, decelerazione singola prolungata >3 minuti, ma <10 minuti, accelerazioni assenti, richiesta di **intervento immediato**.

Società Canadese di Ostetricia e Ginecologia Fetal Health surveillance: antepartum and intrapartum consensus guideline. The Society of Obstetricians and Gynecologists of Canada (SOGC): JOGC 29, 9, suppl 4, 2007.

Classificazione del tracciato CTG in periodo espulsivo secondo Piquard.

TIPO 0

Nessuna variazione della linea di base e della variabilità in relazione alle contrazioni

TIPO 1

Decelerazioni variabili medio-gravi con buona variabilità e ritorno a frequenza di base normale

TIPO 2a

Bradycardia progressiva \pm decelerazioni con buona variabilità

TIPO 2b

Bradycardia progressiva con riduzione variabilità

TIPO 3

Drastica caduta della linea di base \pm accelerazioni durante la contrazione con riduzione variabilità

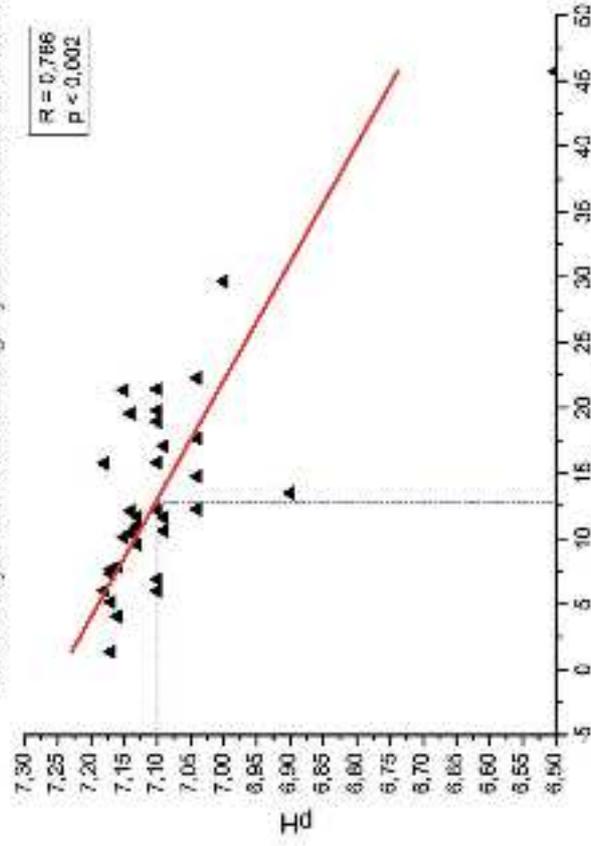
ORIGINAL ARTICLE

The correlation between fetal bradycardia area in the second stage of labor and acidemia at birth

Andrea L. Tranquilli¹, Alessandra Biagini¹, Pantaleo Greco², Mariarosaria Di Tommaso³, and Stefano R. Giannubilo¹

¹Department Clinical Sciences, Università Politecnica Marche, Ancona, Italy, ²Department of Experimental Medical Sciences, Università di Foggia, Foggia, Italy, and ³Department of Health Sciences, Università di Firenze, Unit of Obstetrics and Gynecology, Firenze, Italy

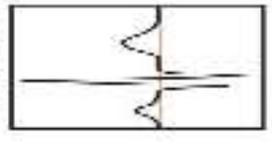
Fetal bradycardia in the 2nd stage of labor and acidemia at birth



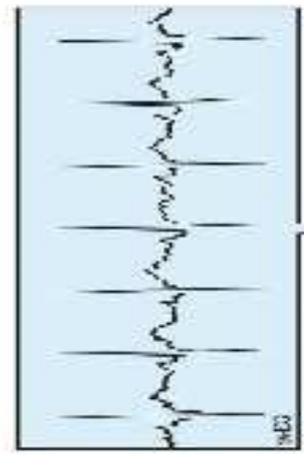
1. **DATA**

2. **ANALYSIS**

3. **RESULTS**



4. **CONCLUSION**

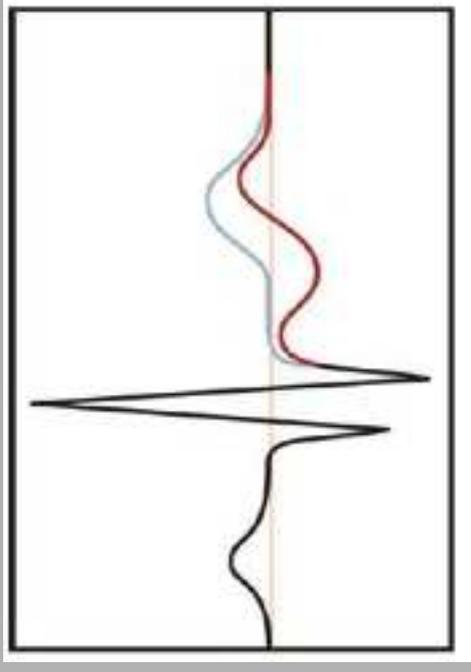
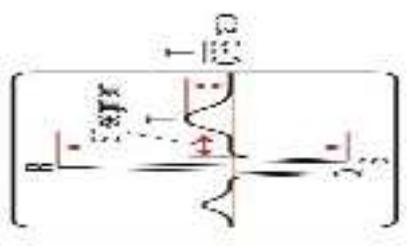
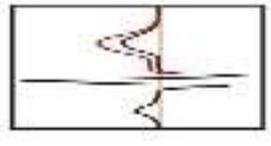


5. **DISCUSSION**

6. **REFERENCES**

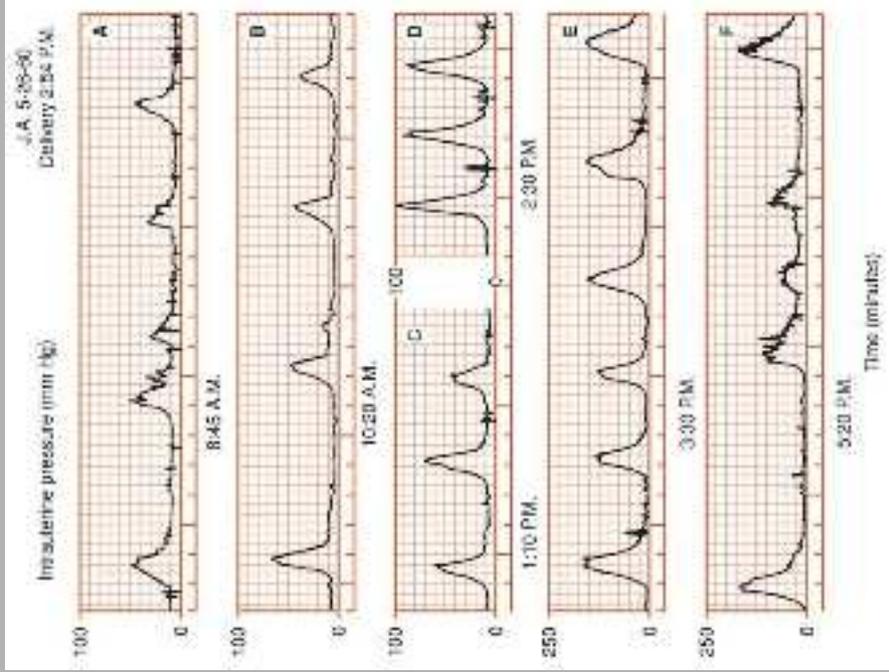
7. **APPENDIX**

8. **CONCLUSION**

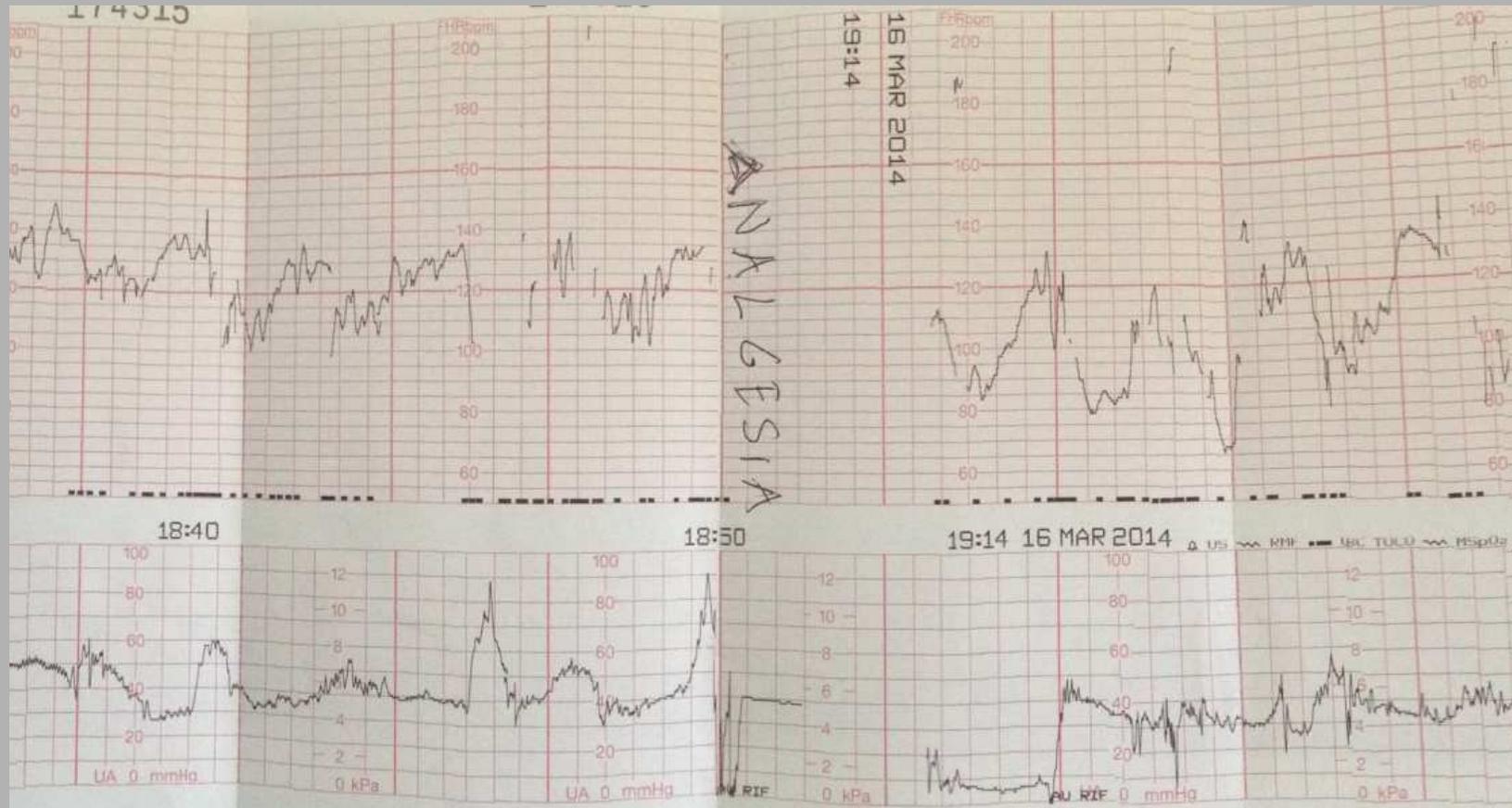


Surveillance	Low-Risk Pregnancies	High-Risk Pregnancies
Acceptable methods		
Intermittent auscultation	Yes	Yes ^a
Continuous electronic monitoring (internal or external)	Yes	Yes ^b
Evaluation intervals		
First-stage labor (active)	30 min	15 min ^{c,d}
Second-stage labor	15 min	5 min ^d

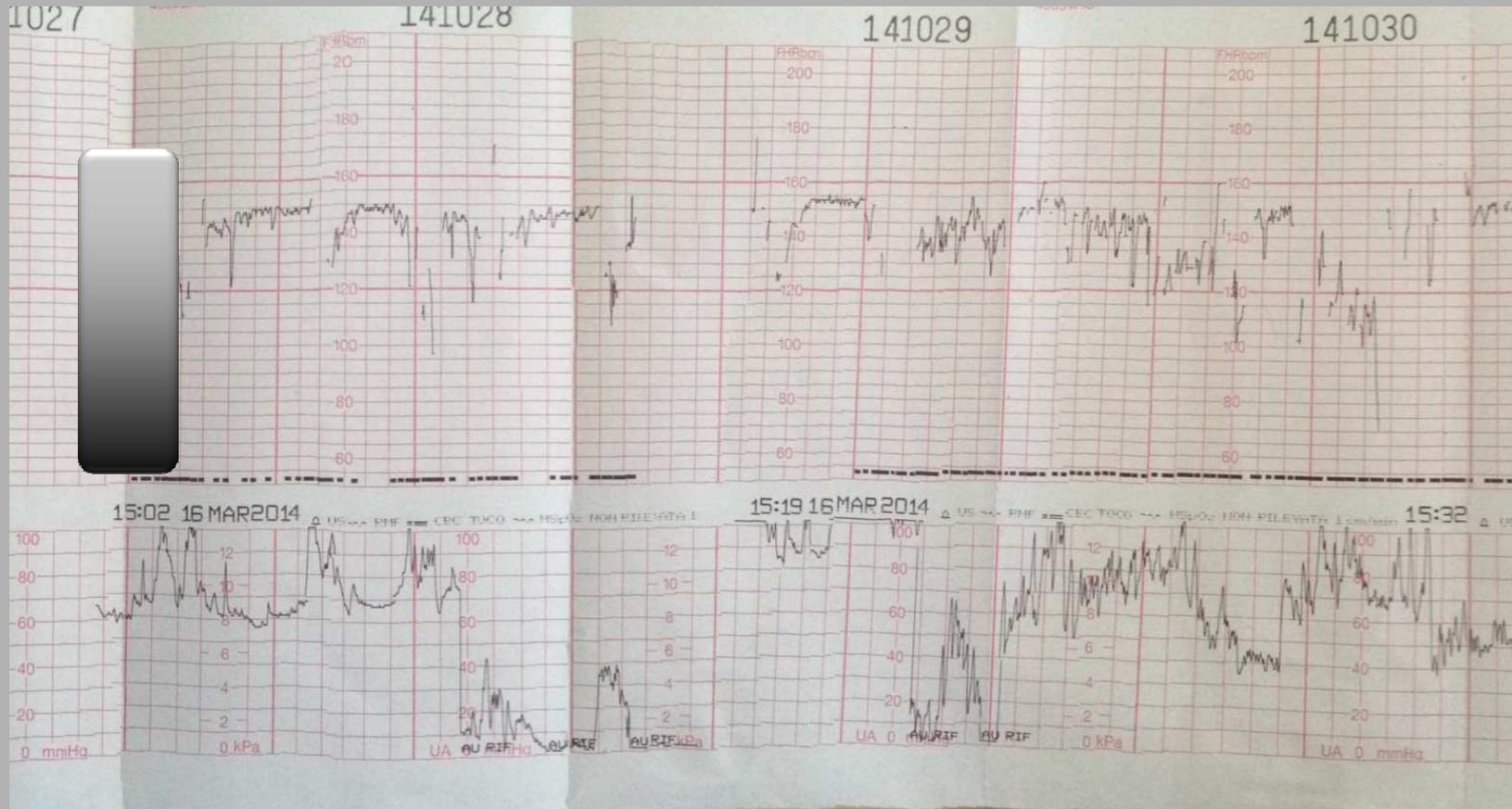
^aPreferably before, during, and after a uterine contraction.
^bIncludes tracing evaluation and charting at least every 15 min.
^cTracing should be evaluated at least every 5 min.
 From the American Academy of Pediatrics and the American College of Obstetricians and Gynecologists, 2012.



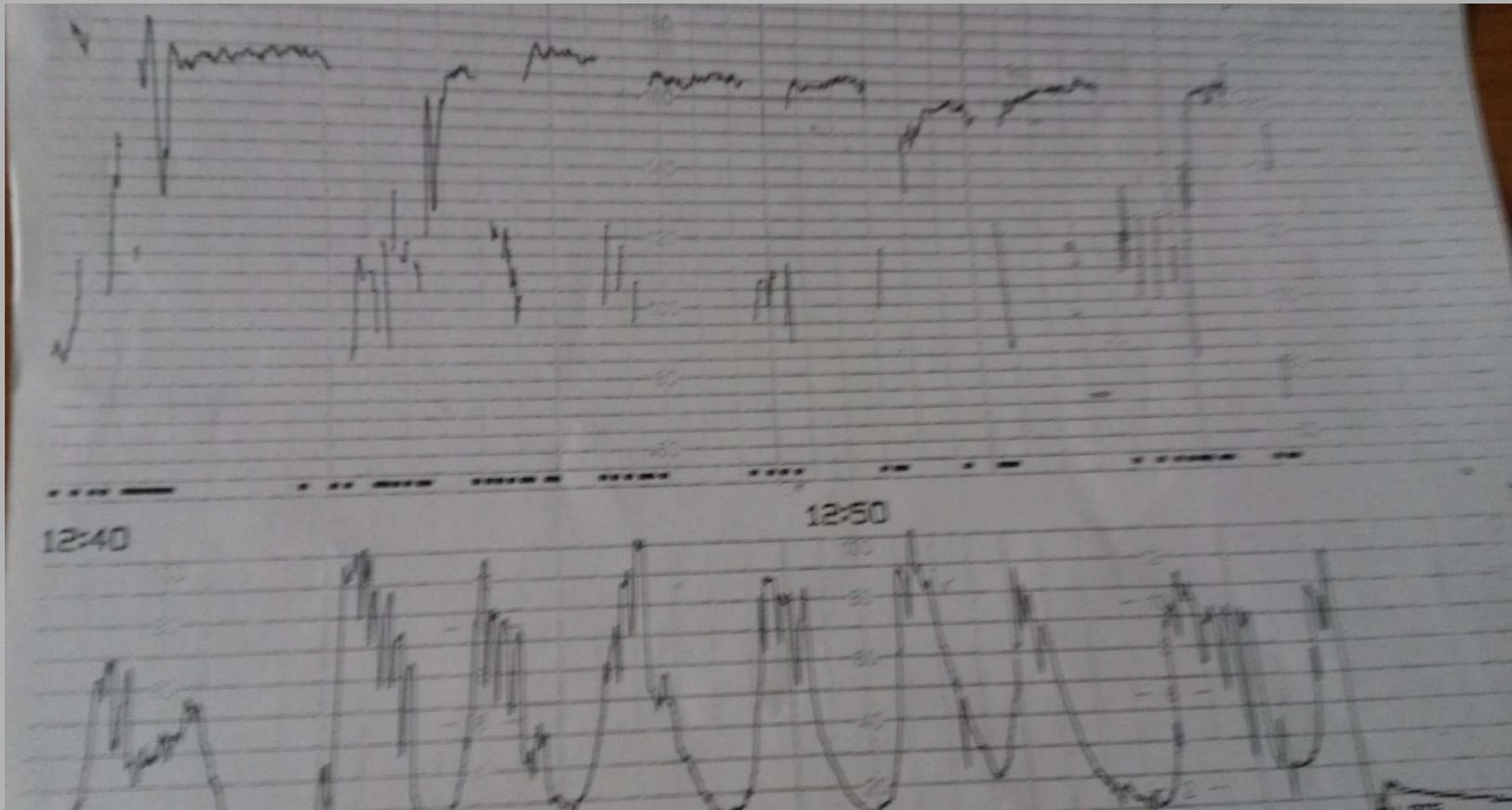
pH: 7.0



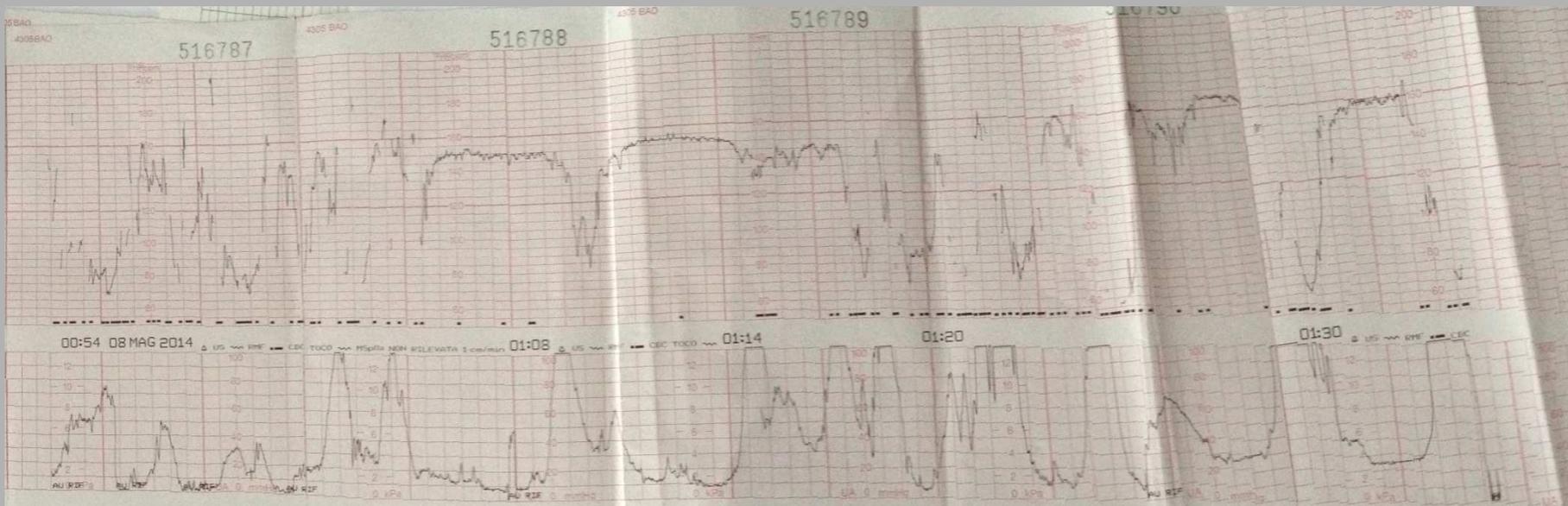
pH: 6.93



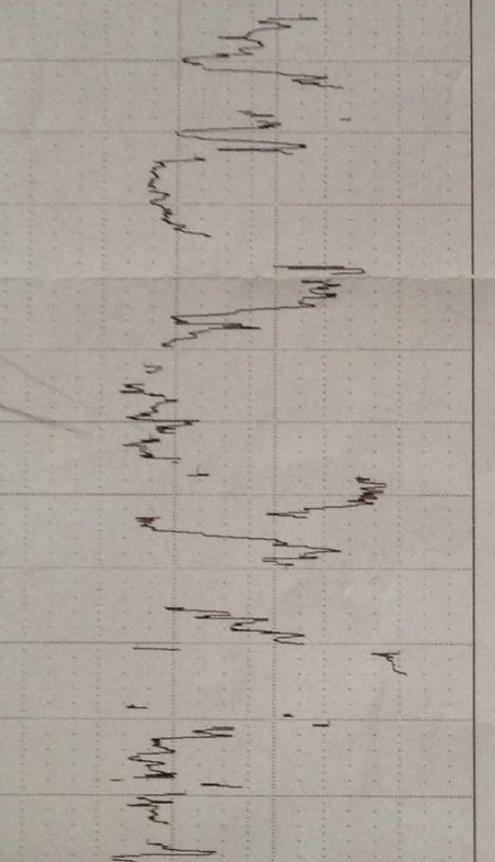
pH: 7.01



pH: 6.89



210
180
150
120
90
60
30



01:32
08/05/14

ULT-J 1 CM/MIN

100%

210

180

150

120

90

60

30

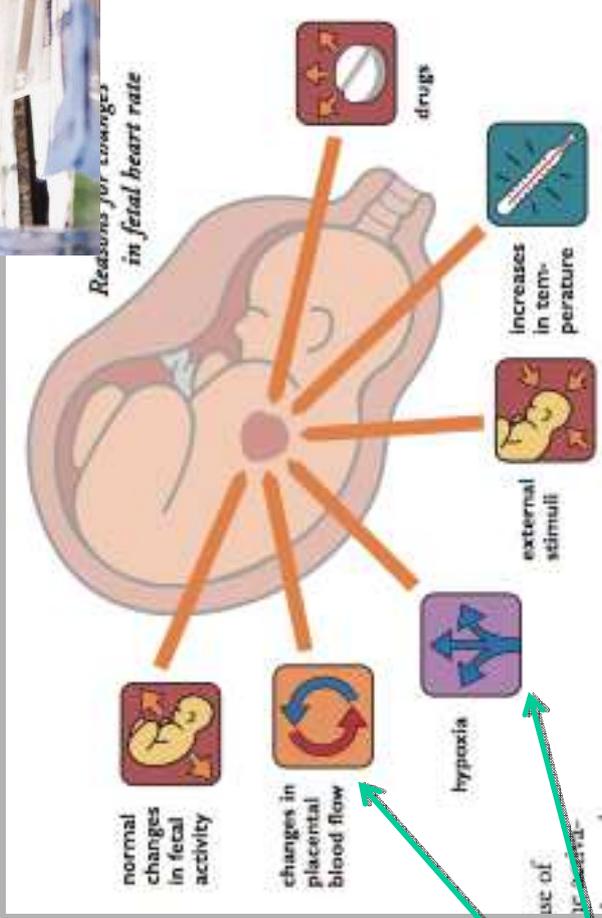
SITRASFORSC
CA PO 12 SAL

OPERATORIA

01:50
08/05/14 48% PS

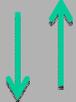
ULT-J 1

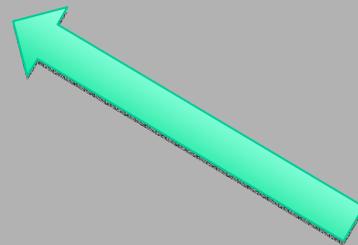
100%



VARIAZIONI FISIOLOGICHE DELLA FHR

ATTIVITA' FETALE

 **FLUSSO PLACENTARE**



**SISTEMA NERVOSO
AUTONOMO**

INTERPRETAZIONE DEL CTG

CLASSIFICAZIONE DEL CTG

**DISPUTE SUL SIGNIFICATO
CLINICO**

Continuous cardiotocography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour (Review)

Alfirevic Z, Devane D, Gyte GML



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This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2013, Issue 5

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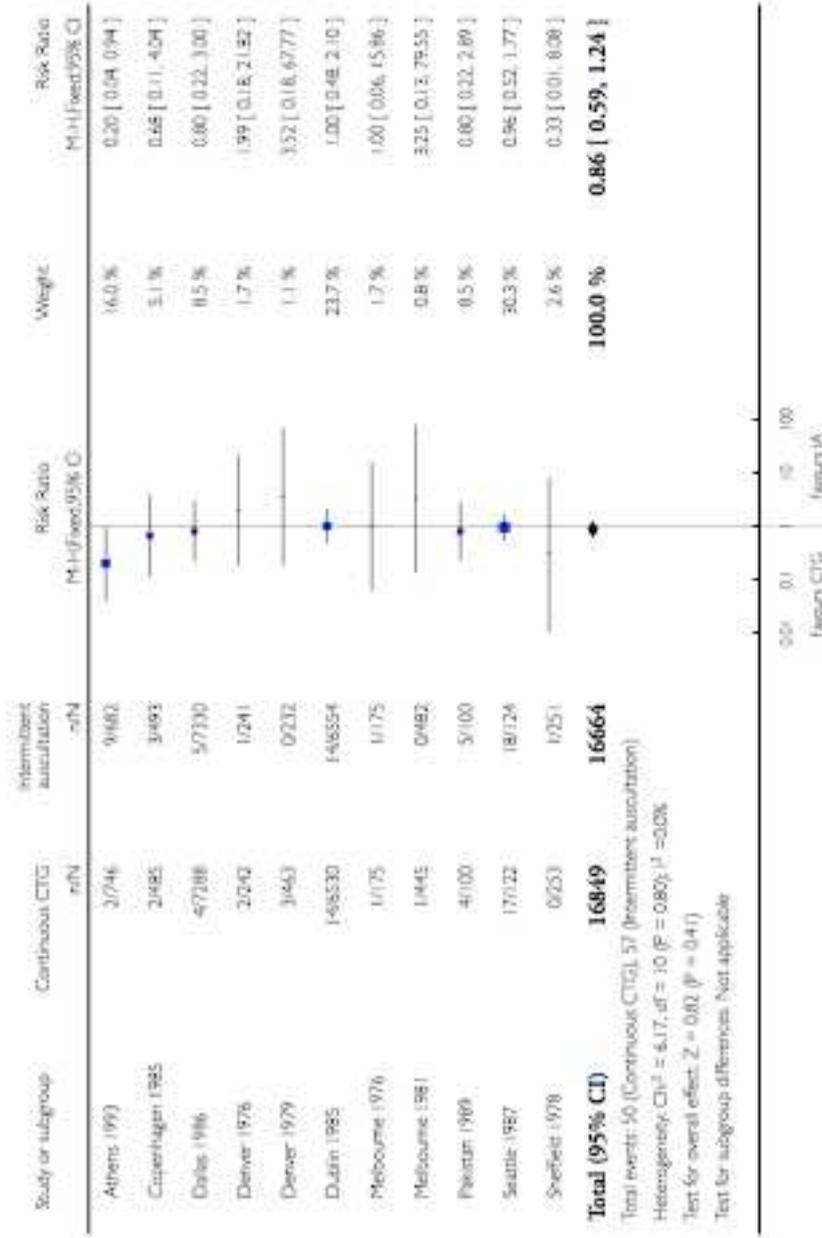
WILEY

Analysis 1.1. Comparison 1 Continuous CTG versus intermittent auscultation, Outcome 1 Perinatal mortality (primary outcome).

Review: Continuous cardiotography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour

Comparison: 1 Continuous CTG versus intermittent auscultation

Outcome: 1 Perinatal mortality (primary outcome)

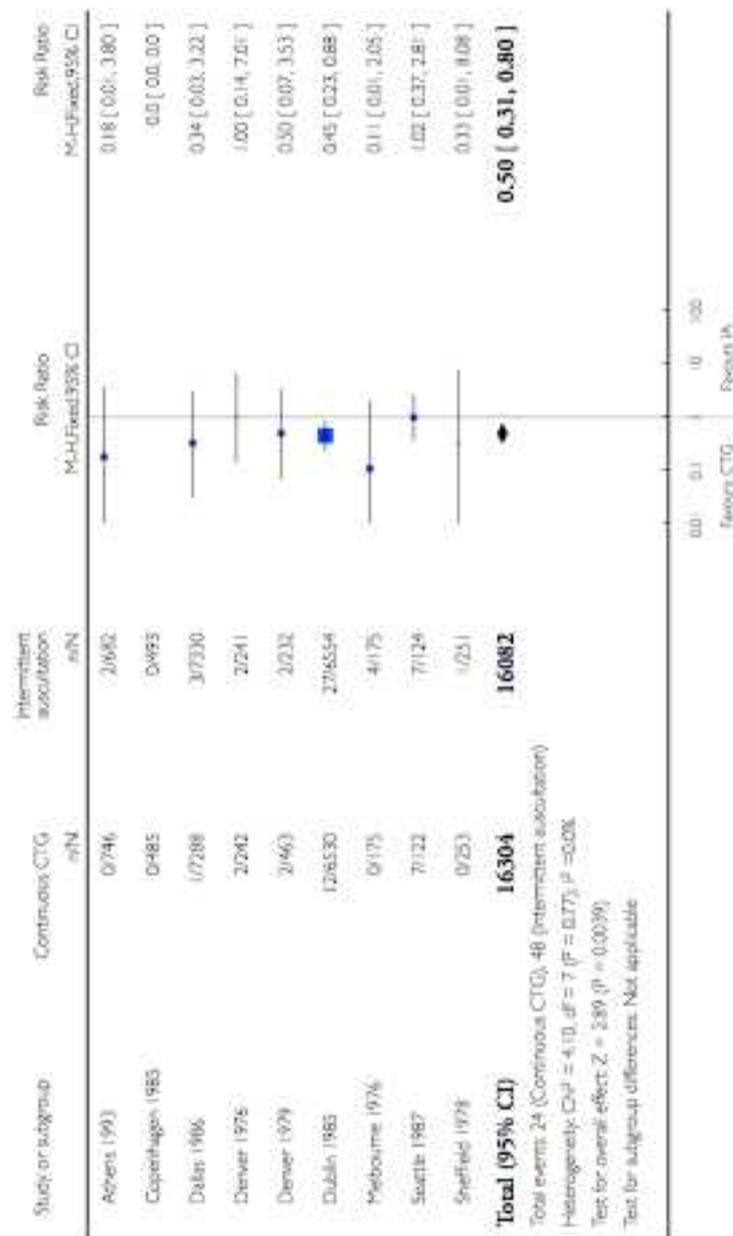


Analysis 1.2. Comparison 1 Continuous CTG versus intermittent auscultation, Outcome 2 Neonatal seizures (primary outcome).

Review: Continuous cardiotocography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour

Comparison: 1 Continuous CTG versus intermittent auscultation

Outcome: 2 Neonatal seizures (primary outcome)

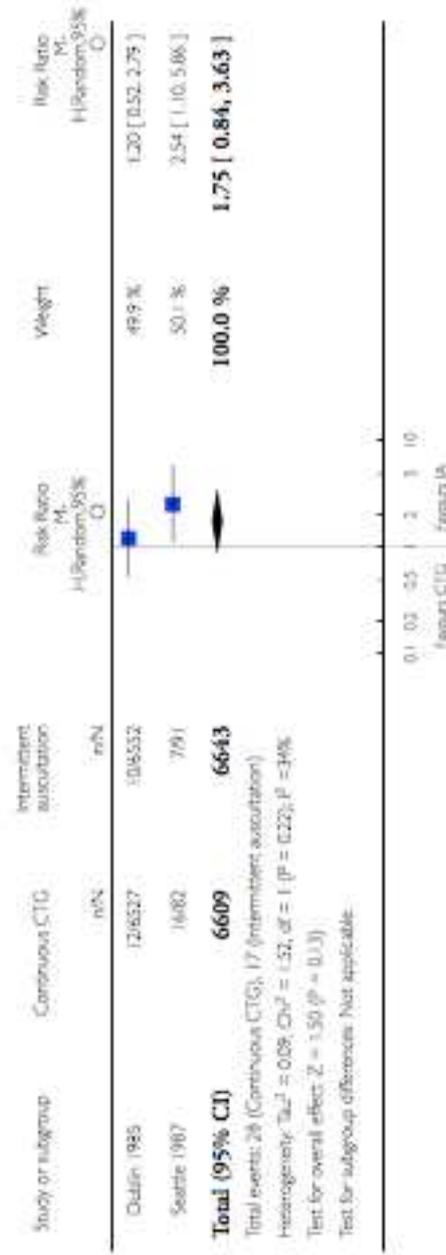


Analysis 1.3. Comparison 1 Continuous CTG versus intermittent auscultation, Outcome 3 Cerebral palsy (primary outcome).

Review: Continuous cardiotography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour

Comparison: 1 Continuous CTG versus intermittent auscultation

Outcome: 3 Cerebral palsy (primary outcome)

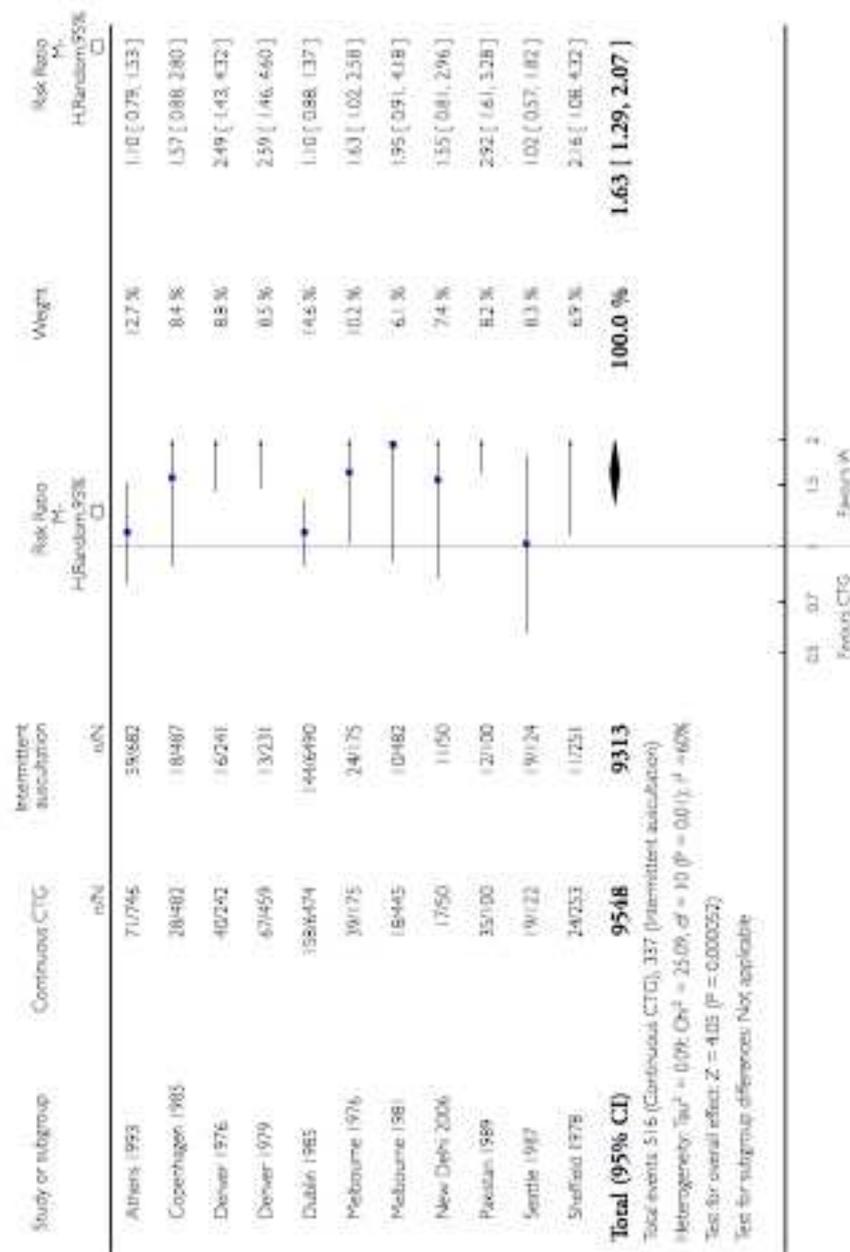


Analysis 1.4. Comparison 1 Continuous CTG versus intermittent auscultation, Outcome 4 Caesarean section (primary outcome).

Review Continuous cardiotocography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour

Comparison 1 Continuous CTG versus intermittent auscultation

Outcome 4 Caesarean section (primary outcome)

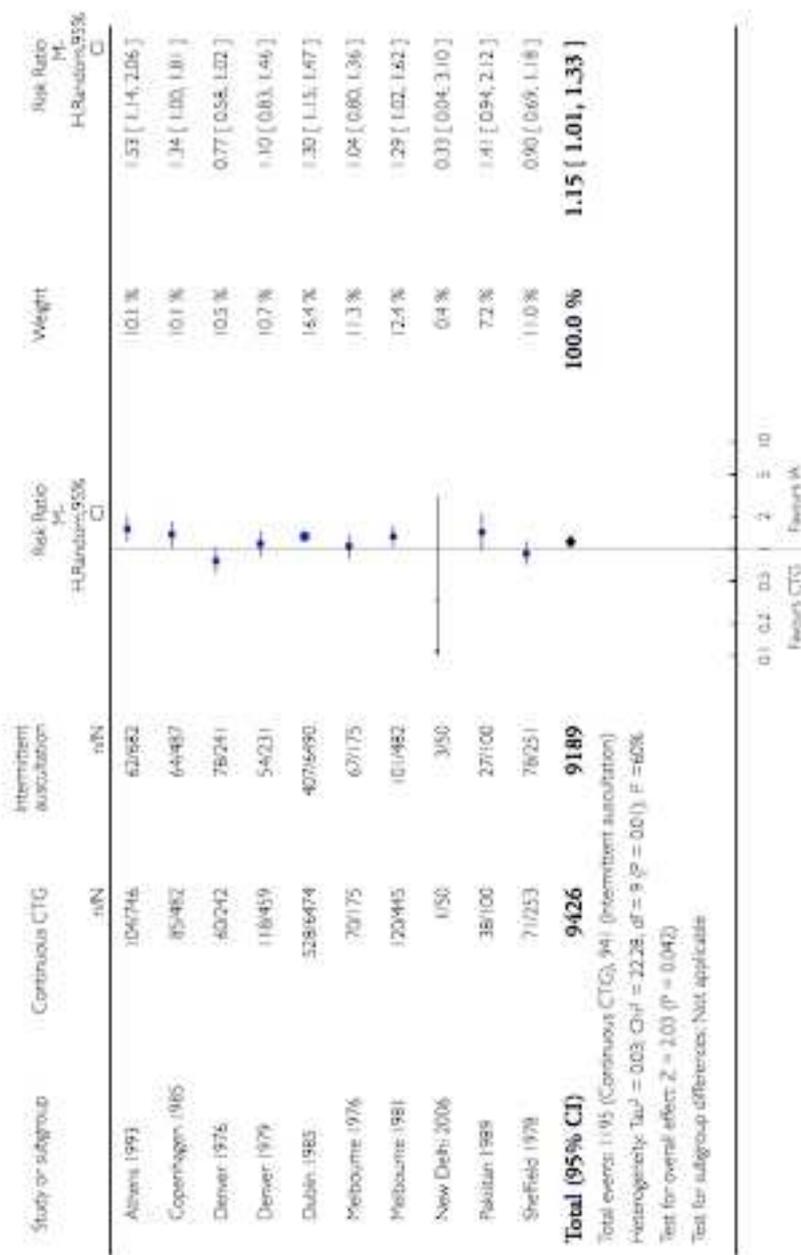


Analysis 1.5. Comparison 1 Continuous CTG versus intermittent auscultation, Outcome 5 Instrumental vaginal birth (primary outcome).

Review: Cardiotocography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour

Comparison: 1 Continuous CTG versus intermittent auscultation

Outcome: 5 Instrumental vaginal birth (primary outcome)

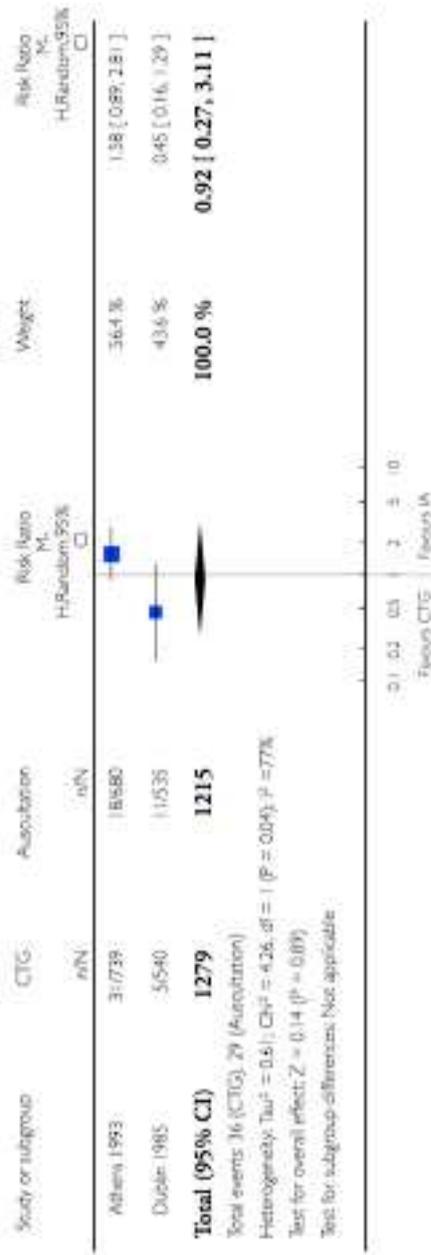


Analysis 1.6. Comparison 1 Continuous CTG versus intermittent auscultation, Outcome 6 Cord blood acidosis (primary outcome).

Review: Continuous cardiotocography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour

Comparison: 1 Continuous CTG versus intermittent auscultation

Outcome: 6 Cord blood acidosis (primary outcome)

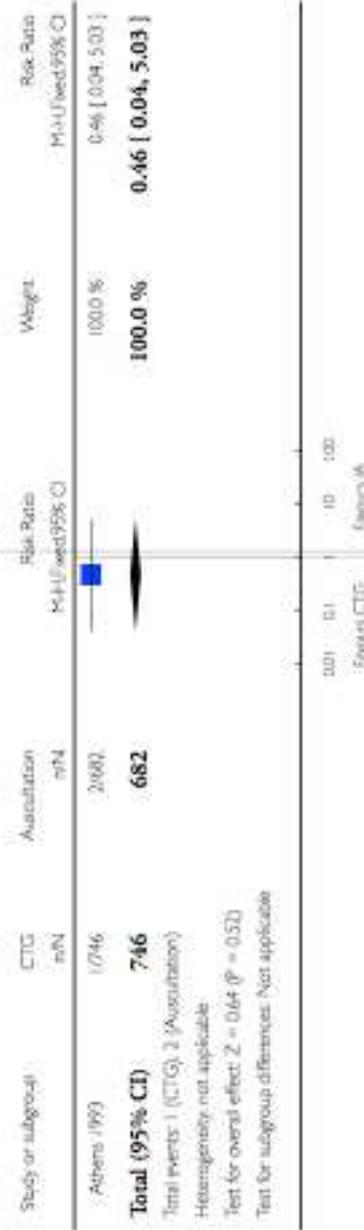


Analysis 1.8. Comparison 1 Continuous CTG versus intermittent auscultation, Outcome 8 Hypoxic ischaemic encephalopathy.

Review: Continuous cardiography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour

Comparison: 1 Continuous CTG versus intermittent auscultation

Outcome: 8 Hypoxic ischaemic encephalopathy

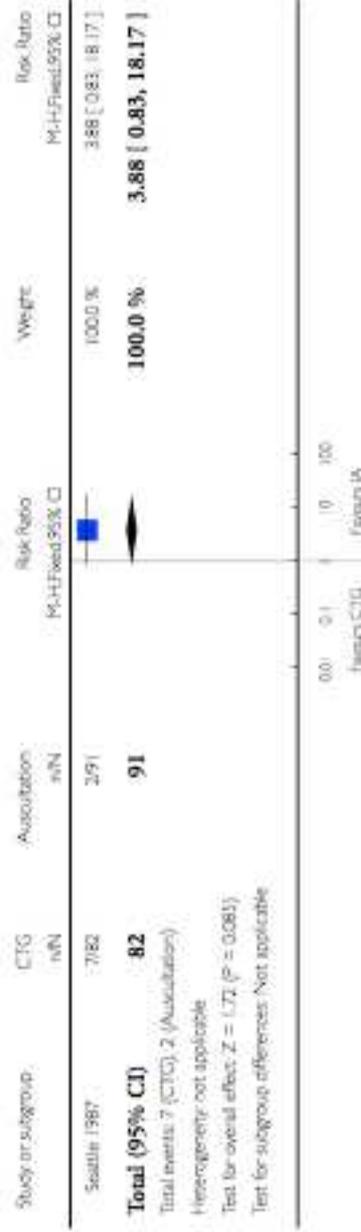


Analysis 1.9. Comparison 1 Continuous CTG versus intermittent auscultation, Outcome 9 Neurodevelopmental disability at least 12 months of age.

Review: Continuous cardiotocography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour

Comparison: 1 Continuous CTG versus intermittent auscultation

Outcome: 9 Neurodevelopmental disability at least 12 months of age

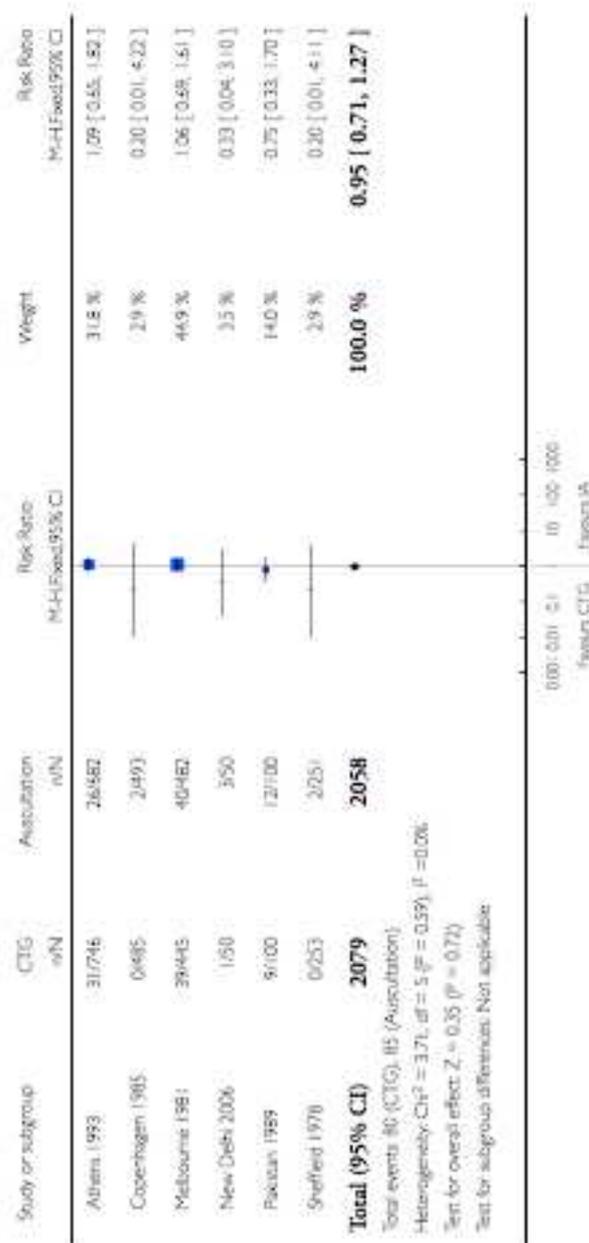


Analysis 1.10. Comparison 1 Continuous CTG versus intermittent auscultation, Outcome 10 Apgar score < 7 at 5 minutes.

Review: Continuous cardiotocography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour

Comparison: 1 Continuous CTG versus intermittent auscultation

Outcome: 10 Apgar score < 7 at 5 minutes

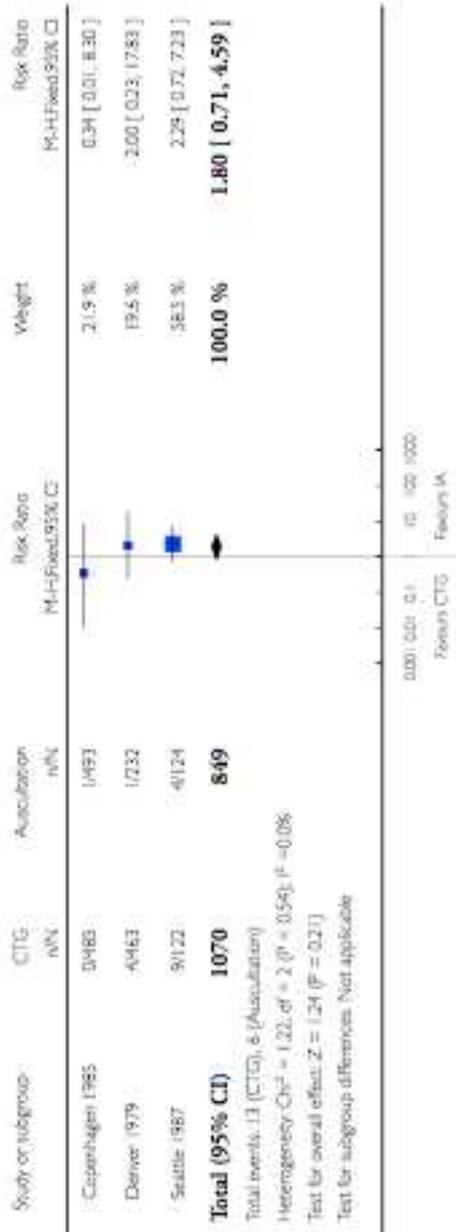


Analysis 1.1.1. Comparison 1 Continuous CTG versus intermittent auscultation, Outcome 1 Apgar score < 4 at 5 minutes.

Review Continuous cardiotography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour

Comparison 1 Continuous CTG versus intermittent auscultation

Outcome 1 Apgar score < 4 at 5 minutes



Analysis 1.12. Comparison 1 Continuous CTG versus intermittent auscultation, Outcome 12 Neonatal ICU admissions.

Review: Continuous cardiotography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour

Comparison: 1 Continuous CTG versus intermittent auscultation

Outcome: 12 Neonatal ICU admissions

