177 **A KNOWLEDGE BASED SYSTEM FOR APPROPRIATE INTERVENTION DURING LABOR BASED ON FETAL ELECTROCARDIOGRAM** ROBERTO LUZIETTI, MD[1], KARL GUSTAV ROSÉN, MD[2], GIAN CARLO DIRENZO, MD[1], FECG EUROPEAN STUDY GROUP[3]; [1]Centre of Perinatal and Reproductive Medicine, University of Perugia, Perugia, Italy; [2]Neoventa Medical, Goteborg, Sweden; [3]FECG, European Study Group

OBJECTIVE: Evidences from randomised clinical trials demonstrate that it is possible to obtain substantial improvements in intrapartum fetal surveillance and perinatal outcome when standard CTG interpretation is combined with analysis of ST waveform changes of the fetal intrapartum electrocardiogram (FECG).The objective of this project was to develop and test a model to support the effective clinical transfer of the research based knowledge acquired on intrapartum ST waveform analysis and the appropriate routine use of this technique.

STUDY DESIGN: Combined intrapartum CTG and ST waveform analysis was routinely utilised in ten academic centres across Europe. In each Centre the clinical use of the technique was accompanied by a specifically developed teaching and training program on CTG plus ST interpretation and by a system of users testing and accreditation. The main outcome parameter was the incidence of fetal umbilical cord metabolic acidosis at birth.

RESULTS: The outcome of the initial 2181 cases recorded during the first year of the project, showed a incidence of cord metabolic acidosis of 0.66%. This low incidence is comparable with that reported from a recent randomised controlled trial on 4400 cases (CTG plus ST monitoring versus CTG monitoring only) of a reduction in cord artery metabolic acidosis rate from 1.44% to 0.57% in the CTG plus ST arm of the trial.

CONCLUSION: The preliminary results of the project show that by a structured and dedicated training program in the use and interpretation of intrapartum ST waveform analysis of the fetal ECG, it is possible to achieve in the routine clinical practice the same significant improvements in labour ward outcome obtained in randomised controlled trials and further confirm the role of ST waveform analysis in intrapartum fetal monitoring.

178 **NON-REASSURING FETAL HEART RATE PATTERNS HAVE A SIGNIFICANTLY LOWER FETAL OXYGEN SATURATION THAN NORMAL PATTERNS** JORGE CARRILLO[1], ALVARO INSUNZA[1], RODRIGO LATORRE[1], MARCELO MERCADO[1], FREDDY CARDENAS[1], RAUL TAPIA[1], ENRIQUE PAIVA[1], [1]Hospital Padre Hurtado, SSMSO, Obstetrics and Gynecology, Santiago, RM

OBJECTIVE: Our aim was to evaluate the correlation between pre-defined fetal heart rate (FHR) patterns and the simultaneous monitoring of intrapartum fetal oxygen saturation (FSpO2).

STUDY DESIGN: A post-hoc analysis of the electronic fetal monitoring (EFM) from 155 laboring patients recruited to an observational study on fetal pulse oximetry (FPO) was done. The FHR patterns were analyzed in consecutive, non-superimposed 10-minute epochs and classified as normal, suspicious or pathologic according to standardized definitions based on the NIH Workshop Guidelines. Only 10-min segments with the posting of at least one 2-min average of FspO2 were considered for the analysis.

RESULTS: We analyzed 16,300 minutes of EFM, with 6633 simultaneous 2-minute FSpO2 averages posted in the paper strip. Episodes of pathologic FHR patterns have a significantly lower fetal oximetry saturation than normal episodes (46.79% +/- 11.32% vs 50.85% +/- 9.26%, $P < .005$). As well, suspicious FHR patterns had a lower FSpO2 than normal epochs (47.83%, ±10.09%, $P < .005$).

CONCLUSION: In our study, non-reassuring FHR episodes had lower fetal oxygen saturations, and they were statistically different from normal episodes. The clinical importance of these findings, regarding neonatal outcome, should be tested in the ongoing analysis of our prospective observational study.

Table

Correlation of fetal oxigen saturation to FHR patterns

	FEAT OXYGEN SATURATION SPO2F (%)	NUMBER OF SAMPLES
FHR pattern	(Mean +/-SD)	(2-minute averages)
Normal	50.85 +/- 9.26	3116
Suspicious	47.83 +/- 10.09	2361
Pathologic	46.79 +/- 11.32	1156

179 **AGREEMENT BETWEEN FETAL PULSE OXIMETRY AND FETAL ECG IN EPISODES OF SUSPECTED HYPOXIA** ANDREAS K. LUTTKUS[1], JENS H. STUPIN[1], INGRID FOERTSCH[1], MARTINA PORATH[1], JOACHIM W. DUDENHAUSEN[1], [1]Humboldt-Universitat zu Berlin, Clinic of Obstetrics, Berlin

OBJECTIVE: Pulse oximetry continuously measures the fetal oxygen saturation. In the fetal ECG the ST waveform represents the ability of the myocardium to respond to hypoxia, as T wave increases result from potassium release occurring during metabolic acidosis. Since anaerobic metabolism is a fetal defense against hypoxia, the T/QRS rise (ST event) provides information about the fetal hypoxic situation during labor. The fetal ECG becomes abnormal when significant metabolic acidemia in the myocardium occurs, while pulse oximetry shows an early reduction in oxygenation. Aim of this study is to evaluate the agreement between pulse oximetry and ST events.

STUDY DESIGN: In a prospective, observational trial of 35 fetuses oxygen saturation (SpO2, fetal pulse oximeter, OBS-500®, OB Scientific, Germantown, USA) and the ECG (STAN® S21, Neoventa, Sweden) were simultaneously monitored. Informed consent was obtained. Oxygen saturation and ST events of the fetal ECG were evaluated. Episodes of desaturation were defined as reduction of SpO2 of more than 20% (absolute) within 1 minute or SpO2 <30%. Clinical management was based on fetal heart rate monitoring and fetal blood gas analysis.

RESULTS: In fifteen of 35 fetuses significant ST events occurred while FHR monitoring was non reassuring. Pulse oximetry showed relevantly more episodes of desaturation when significant ST events had occurred. The median saturation in cases with ST events was lower than in recordings without ST events (60 vs. 74%) and the umbilical artery blood gas status showed a relevant lower pH (7.19 vs. 7.33) and higher lactate (5.1 vs. 3.4 mmol/L).

CONCLUSION: Fetal pulse oximetry (OBS-500®) and fetal ECG both appear to be able to detect early stages of intermittent hypoxia. These findings should be considered in the development of a biosensor which combines different methods of monitoring.

180 **FETAL PULSE OXIMETRY: CORRELATION BETWEEN OXYGEN DESATURATION, DURATION AND FREQUENCY AND NEONATAL OUTCOMES** DAVID GORENBERG[1], CAROL PATTILLO[1], POONEH HENDI[1], PAMELA RUMNEY[2], THOMAS GARITE[1]; [1]University of California, Irvine, Obstetrics and Gynecology, Orange, CA; [2]Long Beach Memorial Medical Center, Maternal-Fetal Medicine, Long Beach, CA

OBJECTIVE: To identify the threshold of fetal arterial oxyhemoglobin saturation that predicts neonatal acidosis and adverse outcomes.

STUDY DESIGN: Fetal pulse oximetry (FPO) data during the final 2 hours of labor were analyzed from subjects previously enrolled in a multicenter RCT of FPO (AJOG 2000;183:1049-58). Fetal oxygen saturation (FSpO2) data were evaluated in relation to neonatal outcomes including umbilical artery blood gas, Apgar scores, neonatal resuscitation and neonatal complications. Episodes (epochs) of at least 10 seconds duration were categorized into the following groups: 1) FSpO2 <30% and ≥ 25%, 2) FSpO2 <25% and ≥20%, 3) FSpO2 <20%, and controls of randomly selected patients with FSpO2 ≥30%. We also examined whether number or duration of epochs of FSpO2 <30% correlated with adverse neonatal outcomes.

RESULTS: 215 of 508 fetal heart rate tracings were identified which included a minimum of 1 epoch <30%. 36 were excluded due to the epoch(s) occurring >2 hours prior to delivery. Analysis of mean umbilical artery pHs revealed a statistically significant difference between groups 1 and 3 compared to controls (Table 1). The incidence of a composite index of adverse neonatal outcome was significantly greater when the number of epochs <30% exceeded 10 (Table 2). Analysis of duration of FSpO2 <30% as correlated with neonatal compromise was not statistically significant.

CONCLUSION: This study confirms previous findings that FSpO2 <30% is the critical threshold for the decline of fetal arterial pH. There appears to be an association between adverse neonatal outcomes and more than 10 epochs below 30%.

Table 1

FSpO2 values in relation to umbilical artery pH

	CONTROLS	GROUP 1	GROUP 2	GROUP 3
FSpO2	≥30% n = 189	<30%≥25% n = 36	<25%≥20% n = 52	<20% n = 79
Mean umbilical artery pH	7.25	7.20*	7.22	7.21*

P value *<.01

Table 2

FSpO2 epochs below 30% in relation to neonatal outcome

NUMBER OF EPOCHS FSPO2 <30%	NO ADVERSE NEONATAL OUTCOME	ADVERSE NEONATAL OUTCOME*	*P* VALUE
1	17 (53%)	15 (46%)	.85
2	18 (69%)	8 (30%)	.10
3	14 (56%)	11 (44%)	.88
4	11 (50%)	11 (50%)	.64
5-10	29 (59%)	20 (40%)	.45
>10	6 (30%)	14 (70%)	.019