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SPECIAL COMMUNICATION

Twenty-five years after the FIGO guidelines for the use of fetal monitoring: Time for a simplified approach?

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ABSTRACT

Twenty-five years after the FIGO Workshop that produced the "Guidelines for the use of fetal monitoring," these remain the only broad international consensus effort in this field. Documents of a similar nature have been produced by national institutions, with subsequent updates of the initial concepts. The 3-class classification system has now been adopted by all the major guidelines, and while there are numerous similar features, and indeed many ideas were inspired by the FIGO guidelines, many key aspects still lack consensus. Making guidelines simpler and more objective may be an important step to guarantee a wide application and assimilation of the recommendations, as well as an enhanced reproducibility and increased memory retention.

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1. Introduction

The year of 2010 marks the passing of 25 years since the workshop organized by the FIGO Subcommittee on Standards in Perinatal Medicine produced the "Guidelines for the use of Fetal Monitoring," which were approved by FIGO's Executive Board in 1986 [1]. These guidelines were an important landmark in the history of fetal heart rate (FHR) monitoring, because they constituted the first wide-scale agreement on essential aspects of the method, such as terminology, indications, technique, and interpretation. In the 10 years that preceded the workshop, it was reported that 21 different analysis criteria had been used in 45 published studies [2].

Twenty-five years later, the FIGO guidelines remain the sole broad international consensus document on FHR monitoring, and in many countries they are still the reference text in this area. Notwithstanding their decisive contribution to the field of fetal monitoring, some shortcomings have become apparent over the years, and the document has naturally become somewhat outdated. The largest limitations are the lack of an objective definition of some of the described FHR features (Table 1), and the excessively complex rules considered for the classification of tracings, making them prone to rapid memory decay (Table 2). Decelerations are described as "sporadic," "mild," "of very short duration," "severe," "periodically recurring," "repeated," "non-recurrent," "variable," "prolonged," "late," "severe variable," and "severe late," without an objective definition of any of these characteristics, which makes wide variation in interpretation likely. Moreover, both identification of individual FHR features [3,4] and overall tracing classification [5,6] have been shown to suffer from wide intra- and interobserver disagreement.

Several national organizations have also produced fetal monitoring guidelines, and documents of a similar nature have been published by the American College of Obstetricians and Gynecologists (ACOG) [7–10], the National Institute of Child Health and Human Development (NICHHD) [11–13], the Royal College of Obstetricians and Gynaecologists (RCOG) [14], and the National Institute of Clinical Excellence (NICE) [15]. These guidelines focus specifically on intrapartum monitoring, but some refer that the principles can also be applied to antepartum tracings [10,13]. Although aimed at a national level, the international impact of these documents cannot be ignored.

Table 1 compares the FHR terminology proposed in the FIGO guidelines with those contained in the most recent documents endorsed by ACOG, in association with the NICHHD, and the Society for Maternal-Fetal Medicine (SMFM) [10,13], as well as those published by the RCOG and NICE [14,15]. A comparison of the FHR classification systems proposed by these organizations is provided in Table 2. The 3-class classification system has now been adopted by all, and while there are numerous similar points in these guidelines, and indeed many ideas were inspired by the FIGO guidelines, many aspects still lack consensus.

1.1. FHR baseline

The definition of the FHR baseline is relatively similar among the guidelines, and refers to a mean level of the FHR when this is stable, in the absence of periodic events. The ACOG/NICHHD/SMFM guidelines propose the subsequent rounding to increments of 5 beats per minute

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Table 1
Comparison of the definitions of FHR features contained in the FIGO guidelines [1], the RCOG/NICE guidelines [14,15], and the ACOG/NICHHD/SMFM guidelines [10,13].

Feature	Guideline	Definition
BASELINE	FIGO	Baseline fetal heart rate is the mean level of the fetal heart rate when this is stable, accelerations and decelerations being absent. It is determined over a time period of 5 or 10 min and expressed in bpm
	RCOG/NICE	Mean level of the FHR when this stable, excluding accelerations and decelerations. It is determined over a time period of 5 or 10 minutes and expressed in bpm
	ACOG/NICHHD/SMFM	Mean FHR rounded to increments of 5 bpm during a 10-minute segment, excluding: periodic or episodic changes, periods of marked FHR variability, segments of baseline that differ > 25 bpm
Normal baseline	FIGO	110–150 bpm
	RCOG, NICE	110–160 bpm
	ACOG/NICHHD/SMFM	110–160 bpm
Tachycardia	FIGO	(no definition)
	RCOG/NICE	>180 bpm (161–180 bpm is moderate tachycardia)
	ACOG/NICHHD/SMFM	>160 bpm
Bradycardia	FIGO	< 80 bpm
	RCOG, NICE	<100 bpm (100–109 bpm is moderate bradycardia)
	ACOG/NICHHD/SMFM	<110 bpm
VARIABILITY	FIGO	Oscillations of fetal heart rate around its mean level (long-term variability). This is usually only quantitated by description of the amplitude of the oscillations around the baseline heart rate. Under physiological conditions the fetal beat-to-beat intervals are constantly subject to small changes. This is called short-term variability and cannot be reliably interpreted by the naked eye using standard equipment
	RCOG/NICE	The minor fluctuations in baseline FHR occurring at 3–5 cycles per minute. It is measured by estimating the difference in bpm between the highest peak and lowest trough of fluctuation in a 1-minute segment of the trace
	ACOG/NICHHD/SMFM	Fluctuations in the baseline FHR that are irregular in amplitude and frequency. It is visually quantitated as the amplitude of peak-to-through in bpm
Normal variability	FIGO	Between 5–25 bpm
	RCOG/NICE	Greater than or equal to 5 bpm between contractions
	ACOG/NICHHD/SMFM	Amplitude range 6–25 bpm (moderate variability)
Reduced variability	FIGO	< 5 bpm for more than 40 minutes (suspicious if variability 5–10 bpm for more than 40 minutes)
	RCOG/NICE	Less than 5 bpm for 40–90 minutes (non-reassuring) or >90 minutes (abnormal variability)
	ACOG/NICHHD/SMFM	Amplitude range 5 bpm or less (minimal variability)
Increased variability	FIGO	>25 bpm
	RCOG/NICE	–
	ACOG/NICHHD/SMFM	Amplitude range greater than 25 bpm (marked variability)
ACCELERATIONS	FIGO	Transient increase in heart rate of 15 bpm or more and lasting 15 seconds or more
	RCOG/NICE	Transient increases in FHR of 15 bpm or more and lasting 15 seconds or more
	ACOG/NICHHD/SMFM	A visually apparent abrupt increase (onset to peak in less than 30 seconds) in the FHR. Beyond 32 weeks of gestation, an acceleration has a peak of 15 bpm or more above the baseline, with a duration of 15 seconds or more but less than 2 minutes from onset to return (if <32 weeks, >10 bpm, and >10 seconds). Prolonged accelerations last 2 minutes or more but less than 10 minutes. An acceleration lasting more than 10 minutes is a baseline change
DECELERATIONS	FIGO	Transient episodes of slowing of fetal heart rate below the baseline level of more than 15 bpm and lasting 10 seconds or more
	RCOG/NICE	Transient episodes of slowing of FHR below the baseline level of more than 15 bpm and lasting 15 seconds or more
	ACOG/NICHHD/SMFM	–
Early decelerations	FIGO	–
	RCOG/NICE	Uniform, repetitive, periodic slowing of FHR with onset early in the contraction and return to baseline at the end of the contraction
	ACOG/NICHHD/SMFM	Visually apparent usually symmetrical gradual decrease and return of the FHR associated with a uterine contraction. A gradual decrease is defined as from the onset to the FHR nadir of 30 seconds or more. The decrease in FHR is calculated from the onset to the nadir of the deceleration. The nadir of the deceleration occurs at the same time as the peak of the contraction. In most cases, the onset, nadir, and recovery of the deceleration are coincident with the beginning, peak, and ending of the contraction, respectively.
Late decelerations	FIGO	–
	RCOG/NICE	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 less than 5 bpm, the definition would include decelerations less than 15 bpm
	ACOG/NICHHD/ SMFM	Visually apparent usually symmetrical gradual decrease and return of the FHR associated with a uterine contraction. A gradual decrease is defined as from the onset to the FHR nadir of 30 seconds or more. The decrease in FHR is calculated from the onset to the nadir of the deceleration. The deceleration is delayed in timing, with the nadir of the deceleration occurring after the peak of the contraction. In most cases, the onset, nadir, and recovery of the deceleration occur after the beginning, peak, and ending of the contraction, respectively.
Variable decelerations	FIGO	–
	RCOG/NICE	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 [a]
	ACOG/NICHHD/SMFM	Visually apparent abrupt decrease in FHR. An abrupt decrease is defined as from the onset of the deceleration to the beginning of the FHR nadir of less than 30 seconds. The decrease in FHR is calculated from the onset to the nadir of the deceleration. The decrease in FHR is 15 bpm or greater, lasting 15 seconds or greater, and less than 2 minutes in duration. When variable decelerations are associated with uterine contractions, their onset, depth, and duration commonly vary with successive uterine contractions
Prolonged decelerations	FIGO	–
	RCOG/NICE	An abrupt decrease in FHR to levels below the baseline that lasts at least 60–90 seconds. These decelerations become pathological if they cross 2 contractions (i.e. greter than 3 minutes)
	ACOG/NICHHD/SMFM	Visually apparent decrease in the FHR below the baseline. Decrease in FHR from the baseline that is 15 bpm or more, lasting 2 minutes or more but less than 10 minutes in duration. If a deceleration lasts 10 minutes or longer, it is a baseline change

Table 1 (*continued*)

Feature	Guideline	Definition
SINUSOIDAL PATTERN	FIGO	Regular cyclic changes in the fetal heart rate baseline, such as the sine wave. The characteristics of the pattern being: the frequency is less than 6 cycles per min, the amplitude is at least 10 bpm and the duration should be 20 minutes or longer
	RCOG/NICE	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
	ACOG/NICHHD/SMFM	Visually apparent, smooth, sine-wave–like undulating pattern in FHR baseline with a cycle frequency of 3–5 per minute which persists for 20 minutes or more

[a] The RCOG/NICE guidelines also define "atypical variable decelerations" when the following additional components are found: loss of primary or secondary rise in baseline rate, slow return to baseline FHR after the end of a contraction, prolonged secondary rise in baseline rate, byphasic deceleration, loss of variability during deceleration, continuation of baseline rate at lower level.

(bpm), as well as the exclusion of periods of marked FHR variability (>25 bpm) and segments of baseline that differ by more than 25 bpm. As alluded to previously [16], all of these FHR baseline definitions include an interdependence of definitions with those of accelerations and decelerations. While it is necessary to eliminate accelerations and decelerations before estimating the baseline, it is also required that the baseline is known before accelerations and decelerations are identified. A slightly more complex definition of FHR baseline has been proposed (Table 3), which overcomes this interdependence of definitions, and has been shown to display a very high interobserver agreement [16].

1.2. Normal FHR baseline, tachycardia, and bradycardia

The lower limit of normality at 110 bpm is in agreement among all guidelines. The upper limit is set at 160 bpm by the ACOG/NICHHD/SMFM and the RCOG/NICE guidelines, as opposed to the 150 bpm cut-off proposed by FIGO. Tachycardia is defined by the ACOG/NICHHD/SMFM and the RCOG/NICE guidelines as a baseline rate exceeding 160 bpm, but there is no agreement on the cut-off value used to define bradycardia. The RCOG/NICE guidelines further define the concepts of moderate tachycardia (161–180 bpm) and moderate bradycardia (100–109 bpm).

1.3. Variability

The definition of long-term variability is relatively similar among the 3 guidelines. The cut-off value used to define decreased variability is also in agreement among the guidelines, but the duration needed to establish this diagnosis varies between FIGO and RCOG/NICE, and remains undefined in the ACOG/NICHHD/SMFM guidelines. Increased variability is not considered by the RCOG/NICE guidelines. The FIGO guidelines define short-term variability, but make no distinction between this and long-term variability, referring that they are visually determined as a unit.

1.4. Accelerations

The FIGO and RCOG/NICE guidelines define accelerations in a similar fashion. On the other hand, the ACOG/NICHHD/SMFM guidelines focus on the abruptness of the increase in FHR, and define the concept of a prolonged acceleration, as well as a maximum limit beyond which this becomes a baseline change.

1.5. Decelerations

The ACOG/NICHHD/SMFM guidelines do not provide a general definition of a deceleration, but describe the different types individually. The RCOG/NICE and FIGO guidelines provide similar cut-off values for the amplitude of FHR drop needed to identify a deceleration, but disagree on their duration. It is possible that there was an error in transcribing the FIGO workshop consensus on the definition of decelerations, as a 10-second interval is not easily identified by visual evaluation. "Transient episodes of slowing of fetal heart rate below the baseline level of more than 10 bpm and lasting 15 seconds or more" may have been the intended definition. The 10 bpm cut-off would aim at identifying the traditional shallow late decelerations that occur in the context of chronic fetal hypoxia.

1.6. Classification of decelerations

The FIGO guidelines do not provide a definition of early, variable, and late decelerations, and there are also some differences between the ACOG/NICHHD/SMFM and RCOG/NICE guidelines in these definitions. The RCOG/NICE guidelines provide a traditional description of these decelerations, and only quantify the lag time between contraction peak and the nadir of late decelerations. The ACOG/NICHHD/SMFM guidelines include a quantification of the gradual versus the abrupt nature of the onset of decelerations. The FIGO guidelines do not include a definition of prolonged decelerations, while RCOG/NICE and ACOG/NICHHD/SMFM agree that these are decelerations that last for more than 2 minutes. However, the RCOG/NICE guidelines further state that they are only pathological if greater than 3 minutes, while ACOG/NICHHD/SMFM establish a maximum duration of 10 minutes for them.

1.7. Sinusoidal pattern

All of the guidelines agree on the regular, cyclic, oscillatory, sine-wave–like nature of this pattern, with a period that is described by FIGO as less than 6 cycles per minute and by the other guidelines as 3–5 cycles per minute. There are minor disagreements on the amplitude and the required duration of this pattern.

1.8. Normal cardiotocograph

There are no major disagreements among the 3 guidelines on the reassuring features that are necessary for this classification. The FIGO guidelines require that accelerations are present in antepartum tracings, but not in intrapartum tracings. The fact that a small number of cases with normal neonatal outcome have no accelerations, in the context of an otherwise normal tracing, is highlighted in the RCOG/NICE guidelines, and accelerations are not required for classifying a tracing as normal according to the ACOG/NICHHD/SMFM guidelines. The RCOG/NICE guidelines require that no decelerations are present, while FIGO allows the presence of sporadic, mild decelerations of short duration, and ACOG/NICHHD/SMFM allow the presence of early decelerations.

1.9. Suspicious cardiotocograph

Wide disagreement is found among the 3 guidelines regarding the classification of suspicious tracings (Table 2). Many of the previously mentioned disagreements concerning the identification of individual

Table 2
Comparison of cardiotocograph classification criteria as proposed by the FIGO guidelines [1], the RCOG/NICE guidelines [14,15], and the ACOG/NICHHD/SMFM guidelines [10,13].

FIGO - ANTEPARTUM	FIGO – INTRAPARTUM	RCOG/NICE	ACOG/NICHHD/SMFM
NORMAL PATTERN - Baseline heart rate between 110 and 150 bpm - Amplitude of heart rate variability between 5 and 25 bpm - Absence of decelerations except for sporadic, mild decelerations of very short duration - Presence of two or more accelerations during a 10-minute period	NORMAL PATTERN - Baseline heart rate between 110 and 150 bpm - Amplitude of heart rate variability between 5 and 25 bpm	NORMAL (a CTG where all of the following 4 reassuring features are present) - Baseline rate: 110–160 bpm - Variability: ≥5 bpm - No decelerations - Accelerations: present	CATEGORY I (category I FHR tracings include all of the following) - Baseline rate: 110–160 bpm - Baseline variability: 6–25 bpm - Late or variable decelerations: absent - Early decelerations: present or absent - Accelerations: present or absent
SUSPICIOUS PATTERN (fetal heart rate patterns are suspicious if any of the following signs are present) - Baseline heart rate between 150 and 170 bpm or between 100 and 110 bpm - Amplitude of variability between 5 and 10 bpm for more than 40 minutes - Increased variability above 25 bpm - Absence of accelerations for more than 40 minutes - Sporadic decelerations of any type unless severe	SUSPICIOUS PATTERN - Baseline heart rate between 150 and 170 bpm or between 100 and 110 bpm - Amplitude of variability between 5 and 10 bpm for more than 40 minutes - Increased variability above 25 bpm - Variable decelerations	SUSPICIOUS (a CTG where one of the following features is present and all others fall into the reassuring category) - Baseline rate 100–109 bpm 161–180 bpm - Baseline variability <5 bpm for 40–90 minutes - Decelerations Typical variable decelerations with over 50% of contractions occurring for over 90 minutes Single prolonged deceleration for up to 3 minutes - Accelerations The absence of accelerations with an otherwise normal trace is of uncertain significance	CATEGORY II (Category II FHR tracings include all FHR tracings not categorised as Category I or Category III. Examples of Category II FHR tracings include any of the following) - Baseline rate Bradycardia not accompanied by absent baseline variability Tachycardia - Baseline variability Minimal variability Absent variability with no recurrent decelerations Marked variability - Accelerations Absence of induced accelerations after fetal stimulation - Periodic or episodic decelerations Recurrent variable decelerations accompanied by minimal or moderate baseline variability Prolonged deceleration 2–10 minutes Recurrent late decelerations with moderate baseline variability Variable decelerations with other characteristics such as slow return to baseline, overshoots or shoulders
PATHOLOGICAL PATTERN (fetal heart rate patterns are pathological when any of the following signs are present) - Baseline heart rate below 100 or above 170 bpm - Persistence of a heart rate variability of less than 5 bpm for more than 40 minutes - Periodically recurring and repeated decelerations of any type - Sporadic and non-recurrent decelerations of the following types: severe variable decelerations; prolonged decelerations; late decelerations - A sinusoidal pattern	PATHOLOGICAL PATTERN - Baseline heart rate below 100 or above 170 bpm - Persistence of heart rate variability of less than 5 bpm for more than 40 minutes - Severe variable decelerations or severe repetitive early decelerations. - Prolonged decelerations - Late decelerations: the most ominous trace is a steady baseline without baseline variability and with small decelerations after each contraction - A sinusoidal pattern	PATHOLOGICAL (a CTG with one or more of the following features or two or more features in the previous category) - Baseline rate <100 bpm >180 bpm Sinusoidal pattern ≥ 10 minutes - Baseline variability <5 bpm for ≥90 minutes - Decelerations atypical variable decelerations with over 50% contractions for >30 minutes Late decelerations for >30 minutes Prolonged deceleration >3 minutes	CATEGORY III (Category III FHR tracings include either) - Absent baseline FHR variability and any of the following: Recurrent late decelerations Recurrent variable decelerations Bradycardia - Sinusoidal pattern

FHR features are reflected in this category, including the definitions of tachycardia, bradycardia, duration of reduced variability, increased variability, absence of accelerations, and classification of decelerations.

1.10. Pathological cardiotocograph

Major disagreements are also found in the classification of tracings as pathological. Cases of fetal tachycardia and bradycardia have been taken out of this class in the ACOG/NICHHD/SMFM guidelines, but not in others. Disagreements are again mostly related to the significance attributed to different durations of reduced variability, with or without concomitant decelerations, required duration of a sinusoidal pattern, and the quantitative and qualitative evaluation of decelerations.

2. Discussion

Lack of universally accepted guidelines and poor interobserver agreement on tracing interpretation have probably contributed to the limited effectiveness of cardiotocograph monitoring and are a major limitation to the general recognition of this technology. Consensus

Table 3
Simplified criteria for definition of FHR features and tracing classification.

Definition of basic FRH features	
BASELINE	The mean FHR of the lowest stable horizontal segment(s) lasting at least 2 min. For the selection of these segments, the following conditions should preferably be met: long-term variability less than 15 bpm, absence of fetal movements and uterine contractions, and a mean FHR within physiological limits
VARIABILITY	
Long-term variability	Minor oscillations in FHR around its mean level. This is visually estimated by measuring the difference between the highest peak and lowest trough in a 1-minute segment considered to be representative of these oscillations
Short-term variability	Mean beat-to-beat intervals in FHR signals. Visual analysis is limited in the estimation of this parameter, but reduced short-term variability is presumed to occur when there is an abnormally smooth FHR signal
ACCELERATIONS	Transient and abrupt increases in FHR of 15 bpm or more over the baseline, lasting 15 seconds or more. An acceleration lasting more than 10 minutes is a baseline change
DECELERATIONS	Transient episodes of slowing of FHR below the baseline of more than 15 bpm and lasting 15 seconds or more
Prolonged decelerations	Decelerations lasting >5 minutes
SINUSOIDAL PATTERN	Regular oscillations of the baseline, resembling a sine wave. This smooth (low beat-to-beat variability), undulating pattern lasts at least 20 minutes, has a cycle frequency of 3–5 cycles/min, and an amplitude of 5–15 bpm
TRACING CLASSIFICATION	
NORMAL (a CTG where all of the following features are present) - Baseline rate: 110–160 bpm - Long-term variability: ≥5 bpm in the majority of the tracing - Accelerations: at least 2 in 50 minutes - No decelerations except if sporadic (≤2 in 50 minutes) and lasting less than 2 minutes	
SUSPICIOUS (a CTG where one or more of the features of normally are absent, but no pathological features occur)	
PATHOLOGICAL (a CTG where one or more of the following features are present) - Long-term variability <5 bpm for more than 60 minutes (in the absence of medication that affects this parameter) - Reduced short-term variability, including the sinusoidal pattern, lasting for more than 30 minutes - Repetitive decelerations (associated with >50% of contractions) with decreased long-term variability for more than 30 minutes - Prolonged deceleration	

Note: Classification of decelerations as early, variable, or late is derived from experimental studies in animals, but outside this setting it is one of the least reproducible aspects of FHR interpretation [3,4,17]. Moreover, it is likely that more than one pathophysiologic event may be involved *in vivo* in the genesis of the majority of decelerations. Several reports have suggested that the most ominous variants are decelerations lasting for more than 5 minutes, irrespective of the type [18,19].

guidelines are usually developed by experts, but they are applied by a large number of healthcare professionals, the majority of whom have other areas of main professional focus. Given the large and diversified target audience, it is likely that many of the concepts contained in guidelines are only partly assimilated and/or are prone to rapid memory decay. Keeping guidelines as simple as possible may be the key to broader use and generalized assimilation of the concepts. Another aspect that may be of importance to increase assimilation and retention of knowledge is the establishment of clear associations between the different tracing classifications and clinical management, for example: normal tracings – no actions required; suspicious tracings – continue monitoring, perform additional testing, or minor interventions (such as reducing maternal temperature); pathological tracings – immediate intervention to revert the cause of fetal hypoxia or rapid delivery if reversal is not foreseen. Some may argue that oversimplification may lead to rare cases of hypoxia being missed, and it is important to assure that these errors fall more toward the side of over-intervention than to under-diagnosis. On the other hand, one must keep in mind that many more errors probably occur because of the incomplete understanding and limited retention of what is a complex set of information.

We believe that further simplification of the existing fetal monitoring guidelines is possible and our suggestions are given in Table 3. This simplified classification system was introduced in our department in 2006, and an evaluation of its reproducibility and validity is currently underway.

3. Conclusion

The FIGO guidelines remain the only broad international consensus effort in FHR monitoring and more recent documents of a similar nature produced by national institutions still contain many contradictory aspects. Making guidelines simpler and more objective may be an important step to guarantee wide application and assimilation of the recommendations, as well as enhanced reproducibility, and increased memory retention.

Conflict of interest

The authors have no conflict of interest to disclose.

References

[1] FIGO subcommittee on Standards in Perinatal Medicine. Guidelines for the use of fetal monitoring. Int J Gynecol Obstet 1987;25(3):159–67.
[2] Devoe LD, Castillo RA, Sherline DM. The nonstress test as a diagnostic test: a critical reappraisal. Am J Obstet Gynecol 1985;152(8):1047–53.
[3] Bernardes J, Costa-Pereira A, Ayres-de-Campos D, van Geijn HP, Pereira-Leite L. Evaluation of interobserver agreement of cardiotocograms. Int J Gynecol Obstet 1997;57(1):33–7.
[4] Donker DK, van Geijn HP, Hasman A. Interobserver variation in the assessment of fetal heart rate recordings. Eur J Obstet Gynecol Reprod Biol 1993;52(1):21–8.
[5] Paneth N, Bommarito M, Stricker J. Electronic fetal monitoring and later outcome. Clin Invest Med 1993;16(2):159–65.
[6] Ayres-de-Campos D, Bernardes J, Costa-Pereira A, Pereira-Leite L. Inconsistencies in classification by experts of cardiotocograms and subsequent clinical decision. Br J Obstet Gynaecol 1999;106(12):1307–10.
[7] American College of Obstetricians and Gynecologists. Intrapartum fetal heart rate monitoring. ACOG Technical Bulletin, 132; September 1989. p. 1–6.
[8] American College of Obstetricians and Gynecologists. Technical bulletin 207: Fetal heart rate patterns: monitoring, interpretation, and management. Int J Gynecol Obstet 1995;51(1):65–74.
[9] American College of Obstetricians and Gynecologists. Practice bulletin 70: Intrapartum fetal heart rate monitoring. Obstet Gynecol 2005;106(6):1453–60.
[10] American College of Obstetricians and Gynecologists. Practice bulletin 106: Intrapartum fetal heart rate monitoring: nomenclature, interpretation, and general management principles. Obstet Gynecol 2009;114(1):192–202.
[11] Zuspan FP, Quilligan EJ, Iams JD, van Geijn HP. Predictors of intrapartum fetal distress: the role of electronic fetal monitoring. Report of the National Institute of Child Health and Human Development consensus development task force. Am J Obstet Gynecol 1979;135(3):287–91.
[12] National Institute of Child Health and Human Development research planning workshop. Electronic fetal heart rate monitoring: research guidelines for interpretation. Am J Obtet Gynecol 1997;177(6):1385–90.

[13] Macones GA, Hankins GDV, Spong CY, 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. JOGNN 2008;37:510–5.
[14] Royal College of Obstetricians and Gynaecologists. The use of electronic fetal monitoring. Evidence-based clinical guideline, number 8. London: RCOG Press; 2001.
[15] National Collaborating Centre for Women's and Children's Health, commissioned by the National Institute for Health and Clinical Excellence. Intrapartum care. London: RCOG Press; 2007.
[16] Ayres-de-Campos D, Bernardes J, Marsal K, Nickelsen C, Makarainen L, Banfield P, et al. Can the reproducibility of fetal heart rate baseline estimation be improved? Eur J Obstet Gynecol Reprod Biol 2004;112(1):49–54.
[17] Ayres-de-Campos D, Bernardes J. Early, variable and late decelerations: can a consensus be reached in their identification? Int J Gynecol Obstet 1999;65(3):305–6.
[18] Puertas A, Navarro M, Velasco P, Montoya F, Miranda JA. Intrapartum fetal pulse oximetry and fetal heart rate decelerations. Int J Gynecol Obstet 2004;85(1):12–7.
[19] Low JA, Victory R, Derrick EJ. Predictive value of electronic fetal monitoring for intrapartum fetal asphyxia with metabolic acidosis. Obstet Gynecol 1999;93(2):285–91.