Sexual & Reproductive Healthcare 26 (2020) 100552

Contents lists available at ScienceDirect

Sexual & Reproductive Healthcare

journal homepage: www.elsevier.com/locate/srhc

Recommendations for intrapartum fetal monitoring are not followed in low-risk women: A study from two Norwegian birth units

Ida Karin Rosset[a,1], Kaia Lindahl[b,*,1], Ellen Blix[c], Anne Kaasen[c]

[a] Department of Obstetrics, Oslo University Hospital, PO Box 4950 Nydalen, N-0424 Oslo, Norway
[b] Department of Obstetrics, Akershus Univsersity Hospital, PO Box 1000, N-1478 Lørenskog, Norway
[c] Faculty of Health Sciences, OsloMet – Oslo Metropolitan University, Postboks 4, St. Olavs plass, 0130 Oslo, Norway

ARTICLE INFO

Keywords:
Fetal monitoring
Cardiotocography
Intermittent auscultation
Admission CTG
Low-risk women
High-risk women

ABSTRACT

Objective: International and national intrapartum fetal monitoring guidelines recommend intermittent auscultation in low-risk women, and admission cardiotocography and continuous cardiotocography in high-risk women. The present study aimed to investigate fetal monitoring practices for low- and high-risk women in two hospitals in Norway, and if practice were according to national and international guidelines.
Study design: To this cross sectional study, data on methods of fetal monitoring and women's risk status were collected from the patient journals of 998 women with intended vaginal birth in 2017 and 2018.
Main outcome measures: Type of fetal monitoring related to risk status.
Results: On admission, 401 (40%) of the women were classified as low-risk and 597 (60%) as high-risk. An admission cardiotocography was reported for 327 (82%) low-risk women and 554 (93%) high-risk women. Of the low-risk women, 187 (47%) remained low-risk throughout labor. During labor, 99 (53%) of the women that remained low-risk were monitored with intermittent auscultation, 62 (33%) with cardiotocography, 24 (13%) with partial cardiotocography, and two (1%) had no monitoring documented. In the high-risk women, intermittent auscultation was used for 11 (2%) during labor, cardiotocography for 544 (91%), partial cardiotocography for 35 (6%), and seven (1%) women had no monitoring documented.
Conclusions: The majority of low-risk women had an admission cardiotocography and during labor many low-risk women were monitored with continuous cardiotocography. This is not in accordance with guidelines which recommend intermittent auscultation. In addition, almost one-tenth of high-risk women were not monitored with continuous cardiotocography, as recommended.

Introduction

The aim of intrapartum fetal monitoring is to discover fetuses that may be short of oxygen and allow timely intervention to prevent long-term injuries and death [1,2]. Both Norwegian and international guidelines recommend intermittent auscultation (IA) for low-risk women and continuous cardiotocography (CTG) for women at high risk for complications [2–6].

Intrapartum care in Norway

- Three levels of intrapartum care are provided in governmental hospitals in Norway. Level 1 comprises highly specialized units providing advanced obstetric and anesthetic services, including neonatal intensive care units. Level 2 comprises units in smaller hospitals that have obstetric and anesthetic services. Level 3 includes free-standing and alongside midwifery-led units providing care for low-risk women. All maternity care is provided free of charge. Women's risk status is assessed throughout pregnancy, on admission, and through labor to determine to which level of care she should be assigned [7].
- There is one-to-one midwifery care for all women, regardless of risk status or mode of delivery. Midwives are responsible for normal births, perform all spontaneous deliveries, and assist obstetricians in operative deliveries. Obstetricians are responsible and involved in care for high-risk women, are called upon in cases of complications or elevated risk, and perform operative deliveries [7].
- Intermittent auscultation is recommended for low-risk women [2].
- Continuous cardiotocography supplemented by ST waveform analysis or fetal blood sampling is recommended for high-risk women [2].
- An admission carditocography is not recommended for low-risk women [3].

Previous studies showed that the use of admission CTG increases rates

Abbreviations: CTG, cardiotocography; IA, intermittent auscultation

* Corresponding author at: Department of Obstetrics, Akershus Univsersity Hospital, PO Box 1000, N-1478 Lørenskog, Norway.
E-mail addresses: ikrosset@gmail.com (I.K. Rosset), kaia.lindahl@ahus.no (K. Lindahl), ellblx@oslomet.no (E. Blix), annkaa@oslomet.no (A. Kaasen).
[1] Equal first authors.

https://doi.org/10.1016/j.srhc.2020.100552
Received 24 January 2020; Received in revised form 24 April 2020; Accepted 1 September 2020

of minor interventions in low-risk women, including the use of continuous CTG in labor [8,9], and fetal blood sampling [8]. Continuous CTG is associated with increased rates of cesarean sections and assisted vaginal delivery, without improving neonatal outcomes [10]. In prolonged labor, CTG was associated with a reduced risk for neonatal seizures, although not with reduced risks for cerebral palsy or mortality [11,12].

A recent Norwegian national survey [13] examined whether the procedures for fetal monitoring were consistent with national recommendations and quality requirements. The results showed that most birth units had routines for fetal monitoring according to recommendations and quality requirements. However, one-fourth of the units had routines that deviated from national recommendations [13], such as routine admission CTG or intermittent CTG in low-risk women, or CTG without access to ST waveform analysis or fetal blood sampling. An earlier Norwegian study found that one-fifth of the units had not developed local criteria for when to apply different fetal monitoring methods [14]. There is still a lack of knowledge about how these routines are applied in practice.

The present study aimed to investigate fetal monitoring practices for low and high-risk women on admission to the birth unit and during active labor in two hospitals in Norway, and whether these practices are according to national and international guidelines.

Methods

This cross-sectional study was conducted at a level 1 unit and a level 2 unit, which have approximately 5000 and 700 deliveries annually, respectively [15]. Both hospitals have local procedures for fetal monitoring according to national guidelines [2,3], and both have access to CTG supplemented by ST waveform analysis.

In total, there were 1424 births in the two units during the study period; 998 of these women were included in this study. The inclusion criteria were all women aged over 18 years with a planned vaginal delivery who gave birth at the level 1 unit from September 1 to November 30, 2017 (n = 1093), and at the level 2 unit from May 1 to May 31, 2017, August 15 to December 15, 2017, and January 1 to January 31, 2018 (n = 331). We excluded women with multiple pregnancies, intrauterine fetal death, planned cesarean sections, and for which the patient file was unavailable. These last mentioned women were excluded because it was not possible to obtain the information we needed for the data set. Data were collected during periods of normal employee service, avoiding periods when there are usually more vacation staff.

For the purpose of this study, a data extraction form was developed based on the study objective, including 26 variables. These variables covered the women's parity, their risk status on admission and whether this changed during labor, fetal monitoring method applied on admission and in the first and second stage of active labor, and duration of each method used. These data were collected from the women's electronic patient journals, including the partograms. Two of the authors, IKR and KL, performed data collection.

The active first stage of labor was defined from 3 to 4 cm until full dilatation of the cervix, and the active second stage from when the women started pushing until the birth of the baby. Intermittent CTG was defined as CTG applied in a short period of time (20–40 min) with distinct intermissions [16]. IA was defined as monitoring with a Pinard stethoscope or Doppler, alone or in combination with CTG registration less than 40 min. Partial CTG was defined as a combination of IA and CTG, with the CTG registration lasting 40 min or longer.

Local procedures define a low-risk woman as a healthy woman with a normal pregnancy, with a single fetus in a head presentation, spontaneous onset of labor at a gestational age between 37 weeks and 41 weeks + 6 days. High-risk women are those with an increased risk for complications, disease or damage to the mother or child due to preexisting maternal or fetal risk factors (e.g., preeclampsia or diabetes) or complications arising during labor [7]. Based on recommendations from the UK National Institute for Health and Care Excellence and the Norwegian Society of Gynecology and Obstetrics [2,5], women with epidural analgesia were not categorized as high-risk in this study.

Statistical analyses

Frequency and cross tabulation analyses were conducted, with these analyses stratified by the women's risk status (low- and high-risk). Data were analyzed using SPSS version 25 (IBM, Armonk, NY, USA).

Ethical approval

The study was approved by the NSD-Norwegian Centre for Research Data (case number: 60863), and by the data protection officer at the two study hospitals (case number 2018-081 for the level 1 unit, and case number 80087 for the level 2 unit).

Results

Throughout labor 187 women remained low-risk and 214 had their risk-status changed from low to high. None of the women classified as high-risk on admission had their risk status changed (See Table 1).

Table 1
Sample characteristics of the women included.

	n	%
Women included	998	
Parity		
Nulliparous	439	44
Multiparous	559	56
Risk status on admission		
Low	401	40
High	597	60

An admission CTG was performed for 327 (82%) low-risk women, and eight (2%) were monitored with IA. There was no documentation on fetal monitoring upon admission for 67 (16%) low-risk women. An admission CTG was performed for 554 (93%) high-risk women, three (1%) were monitored with IA. There was no documentation available for 40 (7%) high-risk women.

Table 2 shows the fetal monitoring methods that were applied partially or fully throughout labor. Of the 214 women who changed from low- to high-risk during labor, CTG was applied before change of risk status in 103 (48%) women, at the time when risk status changed in 101 (47%) women. In 10 (5%) women it was not documented when the change in risk status occurred. Even though the women were registered under one of the monitoring variables in Table 2, the monitoring method might only have been applied in one of the stages of labor. One (0.5%) of the low-risk women had no fetal monitoring method documented in the first stage of labor, and 27 (14%) had no method documented in the second stage. Among the high-risk women, there was no documentation of fetal monitoring method for eight (1%) women in the first stage of labor and 62 (10%) women in the second stage. Of the women who changed risk status from low to high during labor, 11 (5%) had no fetal monitoring method documented in the second stage of labor.

Table 2
Methods of fetal monitoring for the women included.

	Low-risk throughout labor		High-risk throughout labor		Change from low- to high-risk during labor	
	n = 187	%	n = 597	%	n = 214	%
IA[1]	99	53	11	2	9	4
CTG[2]	62	33	544	91	116	54
Partial CTG[3]	24	13	35	6	85	40
Fetal monitoring not documented throughout labor	2	1	7	1	4	2

IA: intermittent auscultation, CTG: cardiotocography.
[1] IA and CTG lasting under 40 min.
[2] Continuous CTG.
[3] Partial CTG, IA and CTG lasting 40 min or longer.

Discussion

On admission, the majority of the women had an admission CTG independent of risk status. One-third of the low-risk women were monitored with CTG, despite guidelines recommending IA. Almost 10% of the high-risk women were not monitored with continuous CTG, even though this fetal monitoring method is advised for this group.

The use of CTG for low-risk women is not consistent with international and national recommendations [2,3,5,6]. However, the extensive use of CTG described in this study is consistent with earlier research [17,18].

There may be several reasons why CTG is applied in low-risk births. For example, there may be concern among clinicians as to whether IA is an adequate method of fetal monitoring [6,19], or fear of litigations or criticism resulting in the use of CTG as an assurance [6]. In other words, clinicians may choose to disregard the guidelines, perhaps to protect themselves. CTG may also be used as a replacement for attention and care in labor due to lack of staff [6], despite the demand for one-to-one care in active labor in Norway [7]. Epidural analgesia use may also increase the use of CTG, as local procedures are ambiguous about which fetal monitoring methods are recommended in such cases. However, national and international guidelines do not regard continuous CTG as a requirement with application of epidural analgesia [2,5].

The use of admission CTG and CTG in low-risk women may contribute to unnecessary interventions in labor. Performing an admission CTG increases the probability of continuous CTG in labor [8,9], which in turn contributes to increased instrumental vaginal deliveries and cesarean sections [10]. Research indicates the use of continuous CTG is related to a small reduction in neonatal seizures [11,12]. However, as other maternal and fetal outcomes are not improved, the practice of applying CTG for low-risk women cannot be justified [6,10]. In addition, continuous CTG has a restrictive effect on women's mobility in labor [6]. The advantages of upright positions and movement in labor are well documented [20], and clinicians' practice of applying CTG with low-risk women is controversial in this context.

A small group of high-risk women were not monitored according to recommendations [2–5]. This was a noteworthy finding, as this group has a higher risk for adverse maternal and fetal outcomes, compared with the low-risk women [2]. A possible reason may be that the cervix was fully dilated when the woman was admitted to the labor ward, and that the baby was born shortly after arrival. Another reason may be that the woman's relevant risk factor does not directly affect the fetus, and therefore continuous CTG monitoring is not necessary. As an example, this could apply to women with previous postpartum hemorrhage, who are considered high risk, however this risk factor does not affect the fetus.

An high number of women were at high risk for complications, which is relevant as risk status determines the choice of fetal monitoring method. This finding is unexpected because these women are initially a part of a general population, with access to universal health care and good nutritional status. Previous research has established that all labor wards in Norway have selection criteria according to governmental quality requirements [14]; therefore, it is likely that the women are classified into an appropriate group. Labor care units face greater challenges in the modern context; for example, with increasing age and overweight among pregnant women [21,22]. Women over 38 years of age or with a BMI over 35 are considered be at high risk for complications. However, these factors alone cannot account for the high frequency of high-risk women, as they only make up 18% of the population in the counties where the study hospitals are localized [21,23].

A strength of this retrospective study was that the clinicians' practice was not affected by an increased focus on fetal monitoring methods; however, this limits the possibility of providing supplementary information. Another strength was the relatively large number of women included, which accounted for 30% of all births in 2017 at the two hospitals together [15]. As the women's risk status was not always stated clearly in the journal file, the authors had to divide the women into the low- or high-risk group using the local procedures available at each hospital. This selection was based on the information found in the electronic patient journal or the partogram, and therefore, as in all retrospective studies, there might be information bias, which in turn could affect the results. To minimize bias; two of the authors classified the women's risk status together. The data were gathered from approximately the same period from both hospitals. To ensure a reliable registration of the units practices, periods with more vacation staff were avoided as they may not be familiar with the hospitals local routines. As an example, in Sweden, admission CTG is routine for all women regardless of risk status. This study cannot state how fetal monitoring is practiced in a broader context. According to our experience, CTG is in excessive use with low risk women.

Our focus has not been to investigate risk status. However, given the unexpectedly high frequency of high-risk women at the end of birth in this study, we recommend that further research should investigate contributing factors related to this issue. Further research that explores factors that facilitate or hinder guideline adherence on both individual and organizational levels may be beneficial to improve clinical practice.

Conclusion

The majority of both low-and high-risk women were monitored with an admission CTG. For low-risk women this is inconsistent with current research and national and international guidelines. In active labor, there is an extensive use of continuous CTG, despite guidelines recommending IA for low-risk women. The main part of the high-risk women are monitored with continuous CTG, as recommended. However, there is a small group that are monitored with IA or have no fetal monitoring method documented, despite the increased risk of adverse fetal and maternal outcomes for these women. Finally, this study also found a high percentage of high-risk women in the study population.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of Competing Interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.srhc.2020.100552.

References

[1] Lewis D, Downe S. FIGO consensus guidelines on intrapartum fetal monitoring: intermittent auscultation. Int J Gynaecol Obstet 2015;131(1):9–12. https://doi.org/10.1016/j.ijgo.2015.06.019. (17.10.19).

[2] Norwegian Society of Gynecology and Obstetrics. Fosterovervåkning i fødsel, avnavling og syre-baseprøver fra navlesnor. [Fetal monitoring during birth, fetal scalp blood sampling and umbilical cord blood gas analysis] (in Norwegian). In: Yli BM, Kessler J, Eikeland T, et al. editors. Veilder i fødelseshjelp. Oslo: NGF; 2014: Chapter 26. Available online at: http://legeforeningen.no/Fagmed/Norsk-gynekologisk-forening/Veiledere/Veileder-i-fodselshjelp-2014/Fosterovervakning-under-fodsel-avnavling-og-syre-baseprover-fra-navlesnor/ (19.10.19).

[3] Norwegian Society of Gynecology and Obstetrics. CTG før fødsel og innkomst-CTG. [Antenatal CTG and admission CTG] (in Norwegian). In: Kessler J, Blix E, Eikeland T, et al. editors. Veileder i fødselshjelp. Oslo: NGF; 2014: Chapter 25. Available online at: http://legeforeningen.no/Fagmed/Norsk-gynekologisk-forening/Veiledere/Veileder-i-fodselshjelp-2014/CTG-for-fodsel-og-innkomst-CTG/ (19.10.19).

[4] Ayres-de-Campos D, Spong CY, Chandraharan E. FIGO consensus guidelines on intrapartum fetal monitoring: cardiotocography. Int J Gynaecol Obstet 2015;131(1):13–24. https://doi.org/10.1016/j.ijgo.2015.06.020. (17.10.19).

[5] National Institute for Health and Care Excellence (NICE). Intrapartum care for healthy women and babies 2014 (updated 2017). Available online at: https://www.nice.org.uk/guidance/cg190/chapter/Recommendations#monitoring-during-labour (24.10.19).

[6] World Health Organization (WHO). WHO recommendations: Intrapartum care for a positive childbirth experience. Geneva: World Health Organization; 2018. Available online at: http://apps.who.int/iris/bitstream/handle/10665/260178/9789241550215-eng.pdf?sequence=1 (10.10.19).

[7] Norwegian Directorate of Health. Et trygt fødetilbud: kvalitetskrav for fødeinstitusjoner. [Safe Maternity Care: Quality Requirements for Maternity Units]. (in Norwegian). Oslo: Helsedirektoratet; 2010. Available online at: https://www.helsedirektoratet.no/produkter?tema=nasjonal_veileder (10.10.19).

[8] Devane D, Lalor JG, Daly S, McGuire W, Cuthbert A, Smith V. Cardiotocography versus intermittent auscultation of fetal heart on admission to labour ward for assessment of fetal wellbeing. Cochrane Database Syst Rev 2017(1). https://doi.org/10.1002/14651858.CD005122.pub5.

[9] Smith V, Begley C, Newell J, et al. Admission cardiotocography versus intermittent auscultation of the fetal heart in low-risk pregnancy during evaluation for possible labour admission – a multicentre randomised trial: the ADCAR trial. BJOG : Int J Obstet Gynaecol 2018. https://doi.org/10.1111/1471-0528.15448. Epub 2018 Sep 19.

[10] Alfirevic Z, Devane D, Gyte GML, Cuthbert A. Continuous cardiotocography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour. Cochrane Database System Rev 2017(2). https://doi.org/10.1002/14651858.CD006066.pub3.

[11] MacDonald D, Grant A, Sherdian-Pereira M, Boylan P, Chalmers I. The Dublin randomized controlled trial of intrapartum fetal heart rate monitoring. Am J Obstet Gynecol 1985;152:524–39. https://doi.org/10.1016/0002-9378(85)90619-2.

[12] Grant A, O'Brian N, Joy M-T, Hennessy E, MacDonald D. Cerebral palsy among children born during the Dublin randomised trial of intrapartum monitoring. Lancet 1989:1233–5.

[13] Kaasen A, Aanstad KJ, Pay ASD, Økland I, Blix E. National survey of routines for intrapartum fetal monitoring in Norway. Acta Obstet Gynecol Scand 2019;98(3):390. https://doi.org/10.1111/aogs.13500. Epub 2018 Nov 21.

[14] Johansen LT, Pay ASD, Broen L, Roland B, Oian P. Are stipulated requirements for the quality of maternity care complied with? Tidsskrift Den Norske Legeforening 2017;137(17):1299–303. https://doi.org/10.4045/tidsskr.16.1070.

[15] Norwegian Institute of Public Health. Medical Birth Registery, Norway. Institutional Statistics. Table Is1: Enkelt- og flerfødsler 2017 [Single- and multiple births 2017]. (in Norwegian). Available online at: statistikkbank.fhi.no/mfr/ (23.10.19).

[16] Herbst A, Ingemarsson I. Intermittent versus continuous electronic monitoring in labour: a randomised study. BJOG: Int J Obstet Gynaecol 1994;101(8):663–8. https://doi.org/10.1111/j.1471-0528.1994.tb13181.x.

[17] Holzmann M, Nordström L. Follow-up national survey (Sweden) of routines for intrapartum fetal surveillance. Acta Obstet Gynecol Scand 2010;89(5):712–4. https://doi.org/10.3109/00016340903545009.

[18] Devane D, Lalor J, Bonnar J. The use of intrapartum electronic fetal heart rate monitoring: a national survey. Ir Med J. 2007;100(2):360–2.

[19] Blix E, Öhlund LS. Norwegian midwives' perception of the labour admission test. Midwifery 2007;23(1):48–58. https://doi.org/10.1016/j.midw.2005.10.003.

[20] Lawrence A, Lewis L, Hofmeyr GJ, Styles C. Maternal positions and mobility during first stage labour. Cochrane Database of System Rev 2013(10). https://doi.org/10.1002/14651858.CD003934.pub4.

[21] Norwegian Institute of Public Health. Medical Birth Registry, Norway. Institutional Statistics. F3b: Mors gjennomsnittsalder etter paritet 2017 [Average age of the mother related to parity 2017]. (in Norwegian). Available online at: http://statistikkbank.fhi.no/mfr/ (05.10.19).

[22] Norwegian Directorate of Health. Nasjonal faglig retningslinje for svangerskapsdiabetes. [National Guidelines for Gestational diabetes]. (in Norwegian). Helsedirektoratet; 2018. Available online at: https://www.helsedirektoratet.no/retningslinjer/svangerskapsdiabetes/diagnostikk-og-tiltak-for-a-finne-uoppdaget-diabetes-og-svangerskapsdiabetes (15.01.20).

[23] Norwegian Institute of Public Health. Medical Birth Registry, Norway. Institutional Statistics. F18a: Mors kroppsmasseindeks før svangerskapet 2017 [Mothers body-massindex before pregnancy 2017]. (in Norwegian). Available online at: http://statistikkbank.fhi.no/mfr/ (23.10.19).