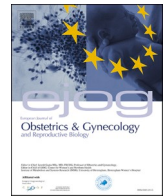




Contents lists available at ScienceDirect

European Journal of Obstetrics & Gynecology and Reproductive Biology

journal homepage: www.journals.elsevier.com/european-journal-of-obstetrics-and-gynecology-and-reproductive-biology

Use of intrapartum tocolysis in Europe: results from a cross-sectional survey

ARTICLE INFO

Keywords:

Fetal hypoxia
Uterine tachysystole
Fetal distress
Labor
Tocolytics

ABSTRACT

Background: Intrapartum acute tocolysis is used to temporarily reduce uterine activity in situations such as uterine tachysystole or suspected intrapartum fetal hypoxia. Despite its frequent use in clinical practice, evidence supporting its effectiveness and safety remains limited, and guidance on indications, choice of agent, and administration is inconsistent.

Objective: To describe current practices of intrapartum acute tocolysis among European specialists in intrapartum care, focusing on indications, agents used, frequency, route of administration, and availability of local protocols.

Methods: A cross-sectional, questionnaire-based survey was conducted among European obstetricians and midwives involved in intrapartum care, between March and April 2023. The survey contained 15 questions divided into two sections. The first section covered respondent and institutional characteristics, including professional role, type of institution, annual number of births, and caesarean delivery rate. The second section addressed the use of intrapartum acute tocolysis, including first- and second-line tocolytic agents, frequency of use, clinical indications, routes of administration, contraindications, and availability of local protocols. The online questionnaire was disseminated through professional obstetric and midwifery networks.

Results: A total of 217 responses were analysed, mostly from healthcare professionals working in hospital settings (96.8 %). Use of intrapartum acute tocolysis was reported by 85.7 % (186/217) of respondents. The main indications were suspected intrapartum fetal hypoxia and uterine tachysystole. Betamimetics were the most frequently reported agents (63.4 %), followed by oxytocin receptor antagonists (42.1 %), but there were marked regional variations. Most respondents administered tocolysis intravenously (90.8 %). Of these, 62.7 % used bolus administration and 37.3 % continuous infusion. Contraindications varied widely, with maternal cardiovascular disease being the most common, and only 66.1 % of respondents reported the availability of local protocols.

Conclusion: Intrapartum acute tocolysis is widely practiced across Europe, yet there is wide variation in indications, choice of agent, route of administration, and institutional guidance. These findings highlight the need for harmonized, evidence-based guidelines to support safe and consistent clinical practice.

Introduction

Hypoxic-ischemic encephalopathy accounts for approximately 10–20 % of cases of cerebral palsy in high-income countries [1–3]. It is commonly associated with intrapartum fetal hypoxia and acidosis. Excessive uterine activity may contribute to this process by compressing intramyometrial vessels, thereby reducing placental perfusion and/or causing umbilical cord compression [4]. Intrapartum acute tocolysis was introduced for clinical situations – such as uterine tachysystole associated with suspected intrapartum fetal hypoxia – where temporary uterine relaxation may improve fetal oxygenation, reverse fetal hypoxia, or provide additional time for alternative interventions [5]. Several pharmacological agents have been proposed for this purpose, including betamimetics, oxytocin receptor antagonists (atosiban), magnesium sulfate, nitric oxide donors, and calcium channel blockers (nifedipine) [6].

Despite widespread use, robust evidence on the effectiveness of intrapartum acute tocolysis remains limited. A recent Cochrane review

concluded that there were insufficient data to determine whether intrapartum acute tocolysis improves fetal oxygenation or short-term neonatal outcomes in cases of uterine tachysystole or suspected intrapartum fetal hypoxia [7]. In contrast, another recent meta-analysis restricted to women with non-reassuring fetal heart rate tracings suggested that intrapartum acute tocolysis may prolong the time to delivery and improve short-term neonatal outcomes [8]. There are also concerns about maternal safety, particularly with betamimetics, which can have both maternal and fetal cardiovascular side effects [9–11].

Currently, most international guidelines acknowledge the option of administering intrapartum acute tocolysis for uterine tachysystole or suspected intrapartum fetal hypoxia, yet they offer little direction regarding the first-line agent, dosage, or timing [12–15]. Differences between countries and institutions regarding approved drug indications, drug availability, local protocols, and clinicians' preferences further complicate standardization and clinical decision-making. As a result, much uncertainty remains regarding the use of intrapartum acute tocolysis across Europe, raising concerns about the consistency and

<https://doi.org/10.1016/j.ejogrb.2026.115259>

Received 4 May 2026; Received in revised form 7 June 2026; Accepted 17 June 2026

Available online 18 June 2026

0301-2115/© 2026 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

safety of this practice. To date, no large-scale survey has evaluated the use of intrapartum acute tocolysis in European maternity units.

The aim of this study was to evaluate current practices regarding intrapartum acute tocolysis in Europe, focusing on the indications, pharmacological agents used, frequency of use, route of administration, and availability of local protocols.

Materials and methods

We conducted a cross-sectional, questionnaire-based survey among obstetricians and midwives involved in intrapartum care across Europe. The questionnaire was developed by the Special Interest Group on Intrapartum Care of the European Association of Perinatal Medicine (SIGIC-EAPM), comprising obstetricians and midwives with clinical and research expertise in intrapartum care.

The survey contained 15 questions divided into two sections. The first section covered respondent and institutional characteristics, including professional role, type of institution, annual number of births, and caesarean section rate. The second section addressed the use of intrapartum acute tocolysis, including first- and second-line tocolytic agents, frequency of use, clinical indications, routes of administration, contraindications, and availability of local protocols. Questions were mainly multiple-choice, with open-ended items to allow elaboration. The survey was administered in English ([Supplementary material](#)).

The initial draft questionnaire underwent internal pilot testing among SIGIC-EAPM members and one study's external collaborator (K. S.) between January and February 2023, using a think-aloud approach to evaluate clarity, relevance, and completion time (estimated time to complete: six minutes). Minor revisions were made before formal implementation. The final version was converted into an internet-based survey for dissemination (SurveyMonkey).

The online questionnaire was widely disseminated between March and April 2023, using European professional obstetric and midwifery networks, including all member societies of the EAPM. Additionally, SIGIC-EAPM members advertised it during conferences and workshops, and forwarded it by email to local stakeholders. As dissemination relied on professional networks, the exact number of healthcare professionals reached could not be determined.

Participation was voluntary, anonymous, and without financial or other incentives. Respondents could interrupt the survey at any time, and both completed and partially completed answers were automatically saved in the system. Respondents could also skip individual questions and leave the survey unfinished. To prevent duplicate responses, submissions were restricted to one per IP address.

The study received approval from the Ethics Committee of the University of Lübeck, Germany (Aktenzeichen: 2023–252). All participants provided electronic informed consent before starting the survey. Data were collected and stored in pseudonymized form, and no direct identifying information about respondents, their institutions, or their countries was retained. This study was conducted and reported in accordance with the CROSS guidelines [16].

Statistical analysis

Data were exported from the survey platform into a secure Microsoft Excel (Microsoft, Redmond, WA, USA) database, which was accessible only to members of the research team. Descriptive statistical analysis was performed with R (version 4.4.1; R Foundation for Statistical Computing, Vienna, Austria) using RStudio (version 2024.09.0 + 375). Missing data were handled as follows: cases with missing information on the use of intrapartum acute tocolysis were excluded from the analysis; for all other variables, analyses were performed using available data, and missing values were excluded on a case-by-case basis, but reported in the results tables. No data imputation was conducted.

Categorical variables are presented as absolute numbers and percentages. Free-text responses were reviewed and grouped thematically

by one author (R.R.Z) to summarize key opinions. Because some survey items allowed multiple responses, percentages may sum up to more than 100 %. Responses containing non-interpretable content were excluded from the relevant analyses.

Results

A total of 303 responses to the online questionnaire were received, of which two did not include informed consent and were therefore excluded, leaving 301 responses eligible for analysis. Of these, 72 did not provide information on whether intrapartum acute tocolysis was used or not, six reported its use for preterm birth but did not specify whether it was used during labour, and six were from non-European countries. All of these responses were excluded, and therefore a total of 217 responses were included in the final analysis ([Fig. 1](#)).

Respondents represented a broad geographic distribution across Europe, including Western ($n = 64$, 33.9 %), Eastern ($n = 39$, 20.6 %), Northern ($n = 41$, 21.7 %), and Southern Europe ($n = 45$, 23.8 %). The full distribution of respondents by country is summarized in [Supplementary Table 2](#). The demographic characteristics of respondents and of their institutions are summarized in [Table 1](#). Participants were obstetricians (58.4 %) or midwives (41.6 %), and the vast majority worked in hospital settings (96.8 %). Institutions varied in size and activity, with most clustered around 1000–3000 births per year, and with caesarean section rates between 20 and 40 %.

[Table 2](#) summarises responses regarding the use of intrapartum acute tocolysis. This practice was reported by 85.7 % (186/217) of respondents. Among users, almost 60 % indicated that it was applied in fewer than 10 % of deliveries. The main indications for the use of intrapartum acute tocolysis were suspected intrapartum fetal hypoxia and uterine tachysystole, each cited by slightly more than 70 % of respondents. A small number of respondents reported using intrapartum acute tocolysis to balance the effect of oxytocin during labour augmentation (6.5 %) or to reduce contractions while awaiting epidural anaesthesia or caesarean section (3.2 %).

The most commonly reported tocolytic agents were betamimetics (63.4 %), followed by oxytocin receptor antagonists (atosiban) (42.1 %) and nitric oxide donors (16.4 %) ([Table 2](#)). Choice of tocolytic agent varied considerably across European regions ([Fig. 2](#)). Betamimetics predominated in Eastern and Southern Europe, whereas oxytocin receptor antagonists were more frequently reported in Western and Northern Europe. Among respondents who used betamimetics, the most frequently selected agents were salbutamol and terbutaline, followed by ritodrine, hexoprenaline and fenoterol ([Supplementary Table 3](#)). Most respondents reported that their institution used a single tocolytic agent (71.6 %), while 19.1 % reported the use of two different agents, and 9.3 % reported three or more.

The majority of respondents reported administering intrapartum acute tocolysis intravenously (90.8 %), but other routes were also cited ([Table 2](#)). Among respondents using intravenous administration, 62.7 % reported bolus administration and 37.3 % used continuous infusion. A wide range of contraindications to intrapartum acute tocolysis was identified, the most common being maternal cardiovascular disease, followed by suspected placental abruption, maternal allergy, maternal hypotension, maternal tachycardia, and vaginal bleeding ([Table 3](#)).

The majority of respondents (66.1 %) reported that a local protocol for intrapartum acute tocolysis was available, whereas the remainder stated that no such protocol was available or that they were unsure whether one existed ([Table 2](#)). Among those with a local protocol, 72.5 % indicated that it had been updated within the past five years, 11.7 % stated that it had been updated more than five years ago, and 15.8 % were unsure of when the last update had occurred. A total of 30 respondents provided open-text comments at the end of the questionnaire. Most comments expressed support for the benefits of intrapartum acute tocolysis ($n = 15$), while others highlighted implementation barriers, and the need for clearer guidance or institutional support ($n = 6$). A

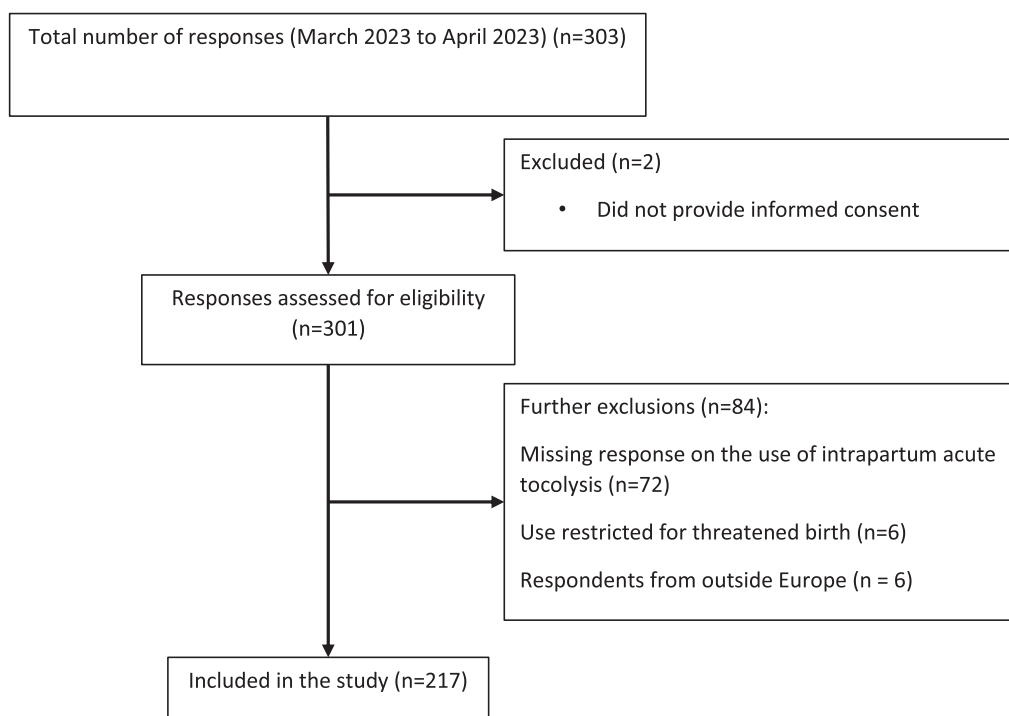


Fig. 1. Flow chart of respondent selection for the European survey on intrapartum acute tocolysis.

Table 1

Characteristics of respondents and their institution.

Variable	n (%)
What is your professional role? (n = 185)	
Obstetrician/leading position	53 (28.7)
Obstetrician/consultant position	55 (29.7)
Midwife/leading position	20 (10.8)
Midwife/staff position	57 (30.8)
Missing	32
What is the setting of your clinical work? * (n = 217)	
Hospital	210 (96.8)
Research/teaching	16 (7.4)
Community	8 (3.7)
How many babies are born per year in your institution? (n = 210)	
>4000	40 (19.1)
3000–3999	34 (16.2)
2000–2999	53 (25.2)
1000–1999	58 (27.6)
500–999	17 (8.1)
<500	8 (3.8)
Missing	7
What is the Caesarean section rate in your institution? (n = 210)	
>50 %	11 (5.2)
40–49 %	15 (7.1)
30–39 %	65 (31.0)
20–29 %	63 (30.0)
<20 %	52 (24.8)
Not sure	4 (1.9)
Missing	7

The number of respondents (n) that answered each question is provided after the title of each question.

*Multiple answers were available.

small number of respondents expressed scepticism or opposition to its use (n = 4), the need to reserve it for selected situations (n = 3), or raised concerns about overuse and preference for alternative intrauterine

resuscitation measures (n = 2).

Discussion

In this survey among European healthcare professionals, most respondents indicated using intrapartum acute tocolysis in their current clinical practice, although typically in fewer than 10 % of labours. The intervention was primarily applied for suspected intrapartum fetal hypoxia and/or uterine tachysystole. Substantial variation existed in the choice of pharmacological agent, and only two-thirds of respondents reported that their institution had a local protocol.

The main strengths of this study are the large sample size and wide geographic coverage across Europe. However, some degree of selection bias cannot be excluded, as voluntary participation may have preferentially attracted clinicians with a particular interest in intrapartum care and supporters of acute tocolysis. Response bias is inherent to survey-based research, and participants may have over- or underestimated aspects of their own clinical practice. In addition, the distribution of respondents across countries was uneven, with some countries being heavily overrepresented and others represented by only a few respondents, which may limit the generalizability of these findings to the broader European context. Furthermore, because respondents were not linked to unique institutions, it is possible that more than one response was received from the same hospital.

The frequent use of intrapartum acute tocolysis reported in our survey and the major indications for its use are consistent with the well-known association between increased uterine activity, CTG abnormalities, and intrapartum fetal hypoxia [17,18]. This is also in line with international guideline recommendations in these situations, which recommend discontinuation of oxytocin infusion and, when appropriate, administration of an acute tocolytic agent [12,15,19]. Respondents also reported the use of acute tocolysis for less common indications, such as while awaiting caesarean delivery for suspected intrapartum fetal hypoxia [20,21], waiting for epidural anaesthesia, or to counteract the effect of oxytocin infusion.

Use of betamimetics was reported more frequently than atosiban, but available evidence suggests that they have comparable effects in

Table 2

Survey responses on use, indications, agents, and route of administration, and availability of local protocols for intrapartum acute tocolysis.

Variable	n (%)
In your workplace, do you use intrapartum acute tocolysis? (n = 217)	
Yes	186 (85.7)
No	28 (12.9)
Not sure	3 (1.4)
In your opinion, how often is intrapartum acute tocolysis used? * (n = 185)	
< 10 %	106 (57.3)
10 – 19 %	42 (22.7)
20 – 29 %	20 (10.8)
30 – 39 %	8 (4.3)
40 – 49 %	3 (1.6)
> 50 %	6 (3.2)
Missing	1
What is the main reason to apply intrapartum acute tocolysis? * [#] (n = 185)	
Fetal distress	134 (72.4)
Uterine tachysystole	134 (72.4)
Pause for epidural anesthesia or before caesarean section	6 (3.2)
To counteract excessive uterine activity during oxytocin augmentation	12 (6.5)
Missing	1
Which tocolytic agent do you use? * [#] (n = 183)	
Betamimetics	116 (63.4)
Oxytocin receptor antagonists	77 (42.1)
Calcium channel blockers	10 (5.5)
Nitric oxide donors	30 (16.4)
Magnesium sulphate	25 (13.7)
Missing	3
Which route of administration do you use for intrapartum acute tocolysis? * [#] (n = 174)	
Intravenous	158 (90.8)
Sublingual/oral	36 (20.7)
Subcutaneous	32 (18.4)
Other	35 (20.1)
Missing	12
Is a local protocol for intrapartum acute tocolysis available in your institution? * (n = 183)	
Yes	121 (66.1)
No	41 (22.4)
Not sure	21 (11.5)
Missing	3

*Analysis performed only on respondents that answered “yes” to the use of intrapartum acute tocolysis.

[#] Multiple answers allowed.

reducing uterine activity [22,23]. Possible explanations for this finding include local availability of the drug, acquisition costs, and familiarity with specific agents, although these factors were not assessed in our survey. Atosiban is the only tocolytic agent approved by the European Medicines Agency, albeit only for threatened preterm birth, whereas betamimetics are authorised through national procedures in several European countries but their obstetric use is highly restricted [24]. Slightly more than 10 % of respondents reported the use of magnesium sulphate, despite a randomized controlled trial demonstrating that it is less effective than betamimetics for intrapartum acute tocolysis [25]. Other tocolytic agents were also mentioned, although they have not been evaluated for this indication in randomized controlled trials [7].

Most tocolytic agents are produced for intravenous use [26], which aligns with the predominant practices observed in our survey. Existing studies on intrapartum acute tocolysis have almost exclusively evaluated short-term, intermittent administration [7], despite nearly 40 % of respondents reporting the use of continuous infusion. It is unclear whether this approach was used mainly before caesarean delivery for suspected intrapartum fetal hypoxia [27], but it raises concern about a potentially increased risk of side effects, particularly with betamimetics [28].

Table 3

Contraindications to intrapartum acute tocolysis.

Contraindications	n (%) *
Maternal cardiovascular disease	21 (30.0)
Suspected placental abruption	20 (28.6)
Allergy / hypersensitivity	17 (24.3)
Maternal hypotension	8 (11.4)
Maternal tachycardia	8 (11.4)
Vaginal bleeding	8 (11.4)
Chorioamnionitis	7 (10.0)
Fetal distress	4 (5.7)
Uterine rupture	4 (5.7)
Asthma (bronchial)	3 (4.3)
Preeclampsia	3 (4.3)
Diabetes mellitus	2 (2.9)
Pulmonary disease	2 (2.9)
Renal insufficiency	2 (2.9)
Maternal anemia	1 (1.4)
Multiple pregnancy	1 (1.4)
Myasthenia gravis	1 (1.4)
Rupture of membranes	1 (1.4)
Thyrotoxicosis	1 (1.4)
Umbilical cord prolapse	1 (1.4)

*Only respondents who provided at least one contraindication were included in the analysis (n = 70). Percentages are calculated as a proportion of these respondents. Multiple responses were allowed.

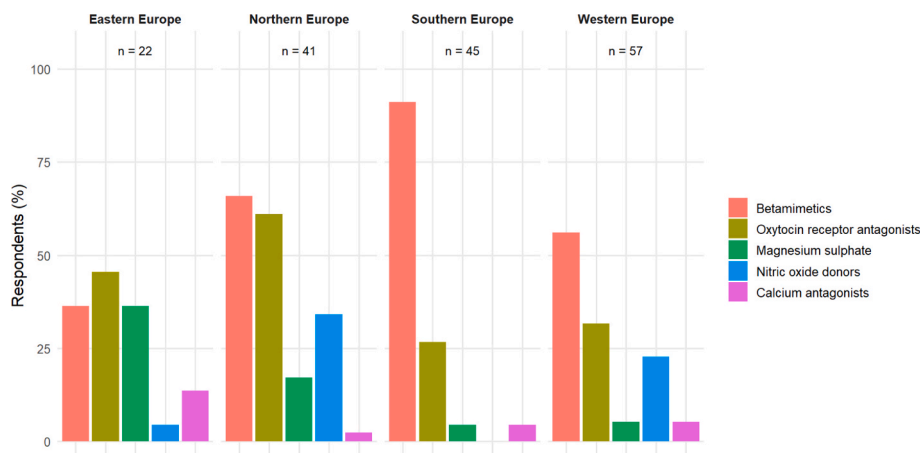


Fig. 2. Regional variation in the use of intrapartum tocolytic agents across Europe. Each bar represents the proportion of respondents (n = 165) from a given European region who reported the use of a specific tocolytic class.

Existing international guidelines rarely address the major side effects or contraindications associated with specific tocolytic agents, which may have contributed to the wide variability in contraindications reported by respondents. This may also reflect the fact that our survey inquired about intrapartum acute tocolysis in general, whereas side effects and contraindications differ according to drug class [9–11]. Beta-mimetics are more often associated with maternal and fetal adverse effects, whereas oxytocin receptor antagonists may have a more favourable side effect profile [22,23].

The variation in practice across institutions and centres in our study highlights the need for further research to better define the epidemiology and clinical thresholds for intervention in the two main indications for intrapartum acute tocolysis, namely uterine tachysystole and suspected intrapartum fetal hypoxia. Future studies should also incorporate the maternal perspective, including pain, discomfort, and lack of rest between contractions, as these factors may influence the clinical need for intrapartum acute tocolysis. In addition, further research should help clarify the effectiveness and safety of intrapartum acute tocolysis according to indication, choice of agent, and route of administration.

Conclusion

In conclusion, intrapartum acute tocolysis is widely practiced across Europe, yet its use varies substantially in terms of indications, choice of agent, route of administration, and institutional guidance. Betamimetics remain the most commonly used agents despite limited high-quality evidence supporting their effectiveness. Our findings highlight the need for harmonized, evidence-based guidelines from national and international scientific societies to support safe and consistent clinical practice.

CRedit authorship contribution statement

Ruben Ramirez Zegarra: Writing – original draft, Visualization, Software, Methodology, Investigation, Formal analysis. **Christiane Schwarz:** Writing – original draft, Supervision, Project administration, Methodology, Investigation, Conceptualization. **Katja Stahl:** Software, Formal analysis, Data curation. **Petra C.A.M. Bakker:** Writing – review & editing, Methodology, Conceptualization. **Georges-Emmanuel Roth:** Writing – review & editing, Methodology, Conceptualization. **Marcos J. Cuerva:** Writing – review & editing, Methodology, Conceptualization. **Diogo Ayres-de-Campos:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Ines Nunes:** Writing – original draft, Supervision, Project administration, Methodology, Conceptualization.

Funding

None.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ejogrb.2026.115259>.

References

- [1] American College of Obstetricians and Gynecologists (ACOG). Neonatal encephalopathy and cerebral palsy: executive summary. *Obstetrics and gynecology*. 2004;103(4):780–781. doi:10.1097/01.AOG.0000120142.83093.30.
- [2] Nelson KB, Ellenberg JH. Antecedents of cerebral palsy. Multivariate analysis of risk. *N Engl J Med* 1986;315(2):81–6. <https://doi.org/10.1056/NEJM198607103150202>.
- [3] Blair E, Stanley FJ. Intrapartum asphyxia: a rare cause of cerebral palsy. *J Pediatr* 1988;112(4):515–9. [https://doi.org/10.1016/s0022-3476\(88\)80161-6](https://doi.org/10.1016/s0022-3476(88)80161-6).
- [4] Ayres-de-Campos D, Arulkumaran S. FIGO intrapartum fetal monitoring expert consensus panel. FIGO consensus guidelines on intrapartum fetal monitoring: Physiology of fetal oxygenation and the main goals of intrapartum fetal monitoring. *Int J Gynaecol Obstet* 2015;131(1):5–8. <https://doi.org/10.1016/j.ijgo.2015.06.018>.
- [5] Keirse MJNC. The history of tocolysis. *BJOG*. 2003;110 Suppl:94–97. <http://www.ncbi.nlm.nih.gov/pubmed/12763121>.
- [6] Chandraharan E, Arulkumaran S. Acute tocolysis. *Curr Opin Obstet Gynecol* 2005;17(2):151–6. <https://doi.org/10.1097/01.gco.0000162184.45854.88>.
- [7] Leathersich SJ, Vogel JP, Tran TS, Hofmeyr GJ. Acute tocolysis for uterine tachysystole or suspected fetal distress. *Cochrane Database Syst Rev*. 2018;7(7):CD009770. doi:10.1002/14651858.CD009770.pub2.
- [8] Xodo S, de Heus R, Berghella V, Londero AP. Acute tocolysis for intrapartum nonreassuring fetal status: how often does it prevent cesarean delivery? a systematic review and meta-analysis of randomized controlled trials. *Am J Obstet Gynecol MFM* 2022;4(5):100639. <https://doi.org/10.1016/j.ajogmf.2022.100639>.
- [9] Lamont RF, Jorgensen JS. Safety and efficacy of tocolytics for the treatment of spontaneous preterm labour. *Curr Pharm Des* 2019;25(5):577–92. <https://doi.org/10.2174/1381612825666190329124214>.
- [10] Lamont CD, Jorgensen JS, Lamont RF. The safety of tocolytics used for the inhibition of preterm labour. *Expert Opin Drug Saf* 2016;15(9):1163–73. <https://doi.org/10.1080/14740338.2016.1187128>.
- [11] Food and Drug Administration (FDA). FDA Drug Safety Communication: New warnings against use of terbutaline to treat preterm labor. 20Accessed November 15, 2025. <https://www.fda.gov/drugs/drug-safety-and-availability/fda-drug-safety-communication-new-warnings-against-use-terbutaline-treat-preterm-labor>.
- [12] ACOG Clinical Practice Guideline No. 10: Intrapartum Fetal Heart Rate Monitoring: Interpretation and Management. *Obstetrics and gynecology*. 2025;146(4):583–599. doi:10.1097/AOG.0000000000006049.
- [13] National Institute for Health and Clinical Excellence (NICE). Fetal monitoring in labour. 2022. Accessed November 17, 2025. <https://www.nice.org.uk/guidance/ng229>.
- [14] Dore S, Ehman WN. 396-fetal health surveillance: intrapartum consensus guideline. *J Obstet Gynaecol Can* 2020;42(3):316–348.e9. <https://doi.org/10.1016/j.jogc.2019.05.007>.
- [15] Ayres-de-Campos D, Spong CY, Chandraharan E. FIGO consensus guidelines on intrapartum fetal monitoring: cardiotocography. *Int J Gynecol Obstet* 2015;131(1):13–24. <https://doi.org/10.1016/j.ijgo.2015.06.020>.
- [16] Sharma A, Minh Duc NT, Luu Lam Thang T, Nam NH, Ng SJ, Abbas KS, et al. A consensus-based checklist for reporting of survey studies (CROSS). *J Gen Intern Med* 2021;36(10):3179–87. <https://doi.org/10.1007/s11606-021-06737-1>.
- [17] Bakker PCAM, Kurver PHJ, Kuik DJ, Van Geijn HP. Elevated uterine activity increases the risk of fetal acidosis at birth. pp. 313.e1–6 *Am J Obstet Gynecol* 2007;196(4). <https://doi.org/10.1016/j.ajog.2006.11.035>.
- [18] Simpson KR, James DC. Effects of oxytocin-induced uterine hyperstimulation during labor on fetal oxygen status and fetal heart rate patterns. pp. 34.e1–5 *Am J Obstet Gynecol* 2008;199(1). <https://doi.org/10.1016/j.ajog.2007.12.015>.
- [19] National Institute for Health and Clinical Excellence (NICE). Inducing labour. 2021. Accessed November 17, 2025. <https://www.nice.org.uk/guidance/ng207>.
- [20] Kulier R, Gülmezoglu AM, Hofmeyr GJ, Van Gelderen CJ. Betamimetics in fetal distress: randomised controlled trial. *J Perinat Med* 1997;25(1):97–100. <https://doi.org/10.1515/jpm.1997.25.1.97>.
- [21] Buckley VA, Wu J, De Vries B. Outcomes following acute tocolysis prior to emergency caesarean section. *Aust N Z J Obstet Gynaecol* 2020;60(6):884–9. <https://doi.org/10.1111/ajo.13170>.
- [22] Afschar P, Schöll W, Bader A, Bauer M, Winter R. A prospective randomised trial of atosiban versus hexoprenaline for acute tocolysis and intrauterine resuscitation. *BJOG* 2004;111(4):316–8. <https://doi.org/10.1111/j.1471-0528.2004.00095.x>.
- [23] de Heus R, Mulder EJH, Derks JB, Kurver PHJ, van Wolfswinkel L, Visser GHA. A prospective randomized trial of acute tocolysis in term labour with atosiban or ritodrine. *Eur J Obstet Gynecol Reprod Biol* 2008;139(2):139–45. <https://doi.org/10.1016/j.ejogrb.2008.01.001>.
- [24] European Medicines Agency. Restrictions on use of short-acting beta-agonists in obstetric indications – CMDh endorses PRAC recommendations. 2013. Accessed March 18, 2026. <https://www.ema.europa.eu/en/medicines/human/referrals/short-acting-beta-agonists>.
- [25] Magann EF, Cleveland RS, Dockery JR, Chauhan SP, Martin JN, Morrison JC. Acute tocolysis for fetal distress: terbutaline versus magnesium sulphate. *Aust N Z J Obstet Gynaecol* 1993;33(4):362–4. <https://doi.org/10.1111/j.1479-828x.1993.tb02109.x>.
- [26] de Heus R, Mulder EJH, Derks JB, Visser GHA. Acute tocolysis for uterine activity reduction in term labor: a review. *Obstet Gynecol Surv*. 2008;63(6):383–388; quiz 405. doi:10.1097/OGX.0b013e31816ff75b.
- [27] Briozzo L, Martinez A, Nozar M, Fiol V, Pons J, Alonso J. Tocolysis and delayed delivery versus emergency delivery in cases of non-reassuring fetal status during labor. *J Obstet Gynaecol Res* 2007;33(3):266–73. <https://doi.org/10.1111/j.1447-0756.2007.00522.x>.
- [28] Herzog S, Cunze T, Martin M, Osmers R, Gleiter C, Kuhn W. Pulsatile vs. continuous parenteral tocolysis: comparison of side effects. *Eur J Obstet Gynecol Reprod Biol* 1999;85(2):199–204. [https://doi.org/10.1016/s0301-2115\(99\)00030-5](https://doi.org/10.1016/s0301-2115(99)00030-5).

Ruben Ramirez Zegarra^{a,b,*} , Christiane Schwarz^{c,*}, Katja Stahl^c ,
Petra C.A.M. Bakker^d, Georges-Emmanuel Roth^e, Marcos J. Cuerva^f,
Diogo Ayres-de-Campos^g, Ines Nunes^{h,i,1} on behalf of the EAPM Special
Interest Group on Intrapartum Care¹

^a Department of Obstetrics and Gynecology, University Hospital Basel,
University of Basel, Basel, Switzerland

^b Division of Clinical Epidemiology, Department of Clinical Research,
University Hospital Basel, University of Basel, Basel, Switzerland

^c Universität zu Lübeck, Institute for Health Sciences, Dept. Midwifery,
Germany

^d Department of Obstetrics and Gynecology, Amsterdam University Medical
Center, Amsterdam Medical Center, Amsterdam, the Netherlands

^e Department of Obstetrics and Gynecology, CHU Strasbourg, University of
Strasbourg, France

^f Department of Obstetrics and Gynecology, Hospital Universitario La Paz,
Madrid, Spain

^g Department of Obstetrics and Gynecology, Santa Maria University
Hospital, University of Lisbon Medical School, Lisbon, Portugal

^h Department of Medical Sciences, RISE-HEALTH - University of Aveiro,
Portugal

ⁱ Department of Obstetrics and Gynaecology, Gaia/Espinho Local Health
Unit, Clinical Academic Center Egas Moniz Health Alliance, Portugal

* Corresponding authors at: Department of Obstetrics and Gynecology,
University Hospital Basel, Spitalstrasse 21, Basel 4056, Switzerland.

E-mail addresses: ruben.ramirez@usb.ch (R. Ramirez Zegarra),
christiane-schwarz@gmx.de, christiane.schwarz@uni-luebeck.de (C.
Schwarz).

¹ Members of the EAPM Special Interest Group on Intrapartum Care are
listed in [Supplementary Table 1](#).