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GUIDELINES

ESAIC focused guidelines for the management of the failing epidural during labour epidural analgesia

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BACKGROUND Labour epidural analgesia reportedly fails in up to 10 to 25% of cases. A joint taskforce of European Society of Anaesthesiology and Intensive Care (ESAIC) experts was created to develop this focused guideline on the management of failing epidural analgesia in a previously well functioning epidural catheter.

DESIGN Six clinical questions were defined using a PICO (Population/Intervention/Comparison/Outcome) strategy to conduct a systematic literature search. The questions pertained to clinical management of failing epidural (PICOs 1, 2 and 3), human resource and team training (PICOs 4 and 5) and clinical management of a failing epidural for intrapartum caesarean delivery (PICO 6). The taskforce produced recommendations and clinical practice statements (CPS) and validated them through a Delphi process. The final version of the guideline was submitted to all ESAIC members for critical review and approved by the Guidelines Committee and the ESAIC Board of Directors.

RESULTS In the initial search, 3737 titles were identified, 93 were retained for complete article analysis and 56 were finally allocated to the PICOs. The full-text analysis of the selected articles precluded extraction of significant data for all PICOs except for PICO 6, for which six articles were identified. Based on the experience, knowledge and opinion of the experts, the task force proposed and validated two recommendations and 11 CPSs.

CONCLUSION This guideline complemented other recently published expert opinion papers. We hope that this new guidance will serve clinicians to increase parturient safety and quality of care during labour and delivery, while at the same time provide inspiration for further research to fill the current knowledge gaps.

Introduction

Neuraxial analgesia is considered the gold standard for labour analgesia.[1] Although the rate of labour epidural analgesia (LEA) is as high as 90% among women in some European centres,[2] there is significant regional variation. Multiple factors likely contribute to this variation including the availability of adequate information to solve maternal concerns about the safety and reliability of LEA.[3]

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In past years, research in labour analgesia has increasingly focused on enhancing the quality and safety of LEA, with a concomitant decrease in complications.[4] Since the landmark COMET study in 2000,[5] preceded by other older studies,[6,7] low concentrations of local anaesthetics are administered for maintenance of LEA, enabling a reduced motor block and increased parturient mobility during labour. Administration of adjunct neuraxial epidural opioids has contributed to a gradual enhancement in LEA effectiveness.[8] Furthermore, the introduction of innovative administration methods, such as programmed intermittent epidural bolus (PIEB), has further improved the quality of LEA.[9] Finally, advanced techniques such as combined spinal epidural (CSE) analgesia and dural puncture epidural (DPE) techniques have also played a role in refining LEA, paving the way for tailored analgesic approaches.[10,11]

In the last decade, there has been an increasing awareness among obstetric anaesthesia providers regarding failing epidural rates, ranging from to 0.9 up to 25% of cases.[12–15] The rate of failing epidurals remains difficult to establish since the published literature has yet to apply a standard definition and experts tend to disagree on such.[16] While there is substantial variation in the literature on the definition of a failing epidural, Thangamuthu *et al.*,[16] using a Delphi approach, suggested a definition of a failing epidural as an epidural with one or more of the following criteria: lack of adequate pain relief by 45 min from the start of epidural placement, dural puncture, re-siting or abandoning the epidural, and maternal dissatisfaction with analgesia at the follow-up visit.

A primary failing epidural refers to an epidural that does not provide adequate pain relief from the beginning, while secondary failure describes an epidural that initially worked but then stops providing effective pain management. These failing/sub-optimal LEAs are variably characterised by an inadequate level of nerve block, lateralisation, patchiness, or insufficient intensity despite achieving an appropriate sensory level. The detection of breakthrough pain during labour, corresponding to the onset of pain in a parturient with previously well functioning epidural analgesia, can be considered as a clinical sign of a failing epidural. Such failing epidurals have become the primary outcome of many studies, in order to compare different regimes of epidural analgesia administration, different techniques of neuraxial blocks during delivery, different concentrations of local anaesthetics, or different adjuvants added to the local anaesthetics.[17]

Recommendations for the treatment of failing epidural were published by Guasch *et al.*[18] in 2017. However, an important clinical question remained concerning the optimal management strategies. Given the limited guidance available in the literature and the diverse nature of studies within obstetric anaesthesia, we recognised the necessity of fostering a collaborative effort in this field. This document aims to provide clinicians attending parturients with a practical guideline rooted in the latest evidence regarding failing epidural. It intends to offer guidance for managing instances of failing epidural across various clinical scenarios, where decisions and actions may be required. The guidance endeavours to address aspects of care concerning workforce and organisational strategies within obstetric anaesthesia services to enhance the management of failing epidurals. This guideline aims to offer a comprehensive resource for clinical practice and to provide a future research agenda by updating and complementing existing documents on this topic.

Given the broad scope of issues associated with failing epidural analgesia, the task force was elected to specifically address, in this focus guideline, the scenario of secondary epidural failure (a failing epidural in parturients who initially received adequate analgesia from a well functioning epidural catheter placed for LEA). Thus, this guideline will specifically exclude issues related to the initiation phase of epidural analgesia, otherwise known as primary failure of LEA.

Definitions

Failing epidural analgesia: LEA that does not provide adequate analgesia to a parturient, irrespective of its cause. For this focus guideline, we considered that failing epidural analgesia corresponds to failing analgesia in a previously working catheter during labour, after the administration of one manual epidural top-up supplement either for analgesia or to convert an analgesic to an anaesthetic block (secondary failure).

Incomplete block is defined as a block with an insufficient sensory level (lower than T10), a lateralised block, a patchy block, or a block with insufficient intensity despite an apparently adequate level of sensory block.

Breakthrough pain is defined as the onset of pain in a parturient with previously well functioning epidural analgesia.

Pro-active management: Pro-active management of labour epidural analgesia corresponds with an active management of pain relief during labour, with close surveillance of a parturient from the insertion of the epidural catheter, early recognition of breakthrough pain, early epidural catheter re-insertion, and anticipation of possible complications of labour analgesia.

Rescue intervention: Rescue intervention refers to any procedure intended to address failing epidural analgesia. This may include the administration of a top-up dose via the epidural catheter, adjusting the catheter's position through retraction or resiting, employing CSE or DPE technique as a rescue strategy.

Satisfactory pain relief: Satisfactory pain relief is defined as achieving a high satisfaction score with labour analgesia during the follow-up visit, or as a significant reduction in pain scores following any intervention.

High risk parturient: Parturients can be considered at high risk if they are affected by a pre-existing medical conditions or develop pregnancy-related complications with the potential to cause serious adverse outcomes, including life-threatening situations in the peripartum period. In the context of labour epidural analgesia, a parturient with a high risk of intrapartum caesarean delivery or with a history of previous caesarean delivery can also be considered at high risk.

Material and methods

A joint task force was established by the European Society of Anaesthesiology and Intensive Care (ESAIC), comprising members from the Obstetric Anaesthesia sub-forum of the scientific committee, along with co-opted international experts in obstetric anaesthesiology. This team also included representatives from the ESAIC Guidelines Committee and the Methodology Group, collaborating to develop a focus guideline on managing failing LEA.

After several meetings to define the scope and the priorities in the management of failing LEA, the group of experts suggested several clinical questions relevant to daily practice and clinical management of LEA. Clinical questions were formulated in the structure of six Population/Intervention/Comparison/Outcome (PICO) groups to guide the research and analysis.

The initial list of PICOs was then revised and finally the task force approved a consolidated set of PICOs. The generated PICOs were based on the research questions addressed in this article. The main clinical queries arising from the shortcomings and related to the failure of an epidural analgesia:

(1) Should an epidural catheter be replaced in case of failing analgesia?
(2) In the case of a failing epidural with decision to resite catheter, what is the best technique?
(3) Should labour analgesia be pro-actively managed using objective scales to measure block efficacy and manage failing epidural analgesia?
(4) Is a failing epidural managed differently whether the parturient is left to direct medical supervision or parturient invigilation is delegated to non-anaesthesiology healthcare professionals?
(5) Does team training in failing epidural analgesia improve the management of failing epidural blocks?
(6) In a parturient with LEA, what is the best management for a failing conversion to anaesthesia for intrapartum caesarean delivery?

Eligibility criteria

Type of studies

Data analysis included all randomised controlled trials (RCTs) and observational studies that addressed the six PICO questions. Meta-analyses and systematic reviews meeting the inclusion criteria were also included. Narrative reviews, case series and case reports or conference abstracts were not included. We further searched for other relevant guidelines on this topic.

Type of participants

The literature review focused on parturients who had undergone LEA that provided adequate analgesia, characterised by a significant reduction or complete alleviation of pain 20 to 30 min after the initial bolus. However, subsequently the parturient experienced failing analgesia during labour or an unsuccessful augmentation of LEA for intrapartum caesarean delivery.

Type of interventions

We included the following interventions related to the management of failing epidural:

1. Rescue interventions: Rescue techniques for failing epidural block (top up through the existing catheter, new neuraxial block, administrative of sedative agents, general anaesthesia) (PICOs 1 and 2).
2. Predictors of failing epidural: Use of predictors of failure when managing a failing epidural (PICO 3).
3. Management: Personnel in charge of managing failing epidural (PICO 4).
4. Training: Type of training for managing failing epidural (PICO 5).
5. Intrapartum Caesarean: Catheter re-siting or spinal anaesthesia for a failing epidural in the context of intrapartum caesarean delivery (PICO 6).

Type of comparators

We included as comparators the different types of rescue techniques (PICOs 1 and 2: Rescue interventions), an expectant strategy (PICO 3: predictors for failing epidural), non-anaesthesiology healthcare provider (PICO 4: management), the absence of specific training in LEA maintenance and failing epidural analgesia (PICO 5: training) and epidural top-ups and/or systemic supplementations (PICO 6: conversion of epidural for intrapartum caesarean delivery).

Type of outcomes

Outcomes considered in this guideline were related:

1. To obtain a satisfactory pain relief after the interventions.
2. The number of breakthrough pain episodes presented during labour,
3. The time (minutes) until adequate analgesia is achieved when a rescue intervention was adopted.
4. The delay in catheter re-siting,
5. Parturient satisfaction,
6. The requirement for general anaesthesia in case of intrapartum caesarean delivery.

The PICO criteria are summarised in Table 1.

Table 1 Summary of the PICOs designed for the guideline

No.	Patient (problem)	Intervention	Control	Outcome
1	Parturient with inadequate pain relief after initial adequate epidural analgesia (*and failed first attempt to optimise analgesia)*	Resiting the epidural catheter (epidural, CSE, DPE)	Additional top-up (increased LA concentration +/_ opioids or other adjuvant)	Adequate analgesia after intervention
2	Parturient with a failing epidural catheter for labour analgesia and an indication for resiting	CSE / DPE / Spinal	New epidural	Adequate analgesia after intervention
3	Parturient with functioning epidural analgesia	Pro-active management with objective hourly evaluation (VAPS, sensory level, Bromage score, MEOWS)	Expectant management. Evaluation only if breakthrough pain.	Decrease of breakthrough pain incidence Increase of early identification of failure Decrease of time to adequate analgesia when breakthrough pain Adequate analgesia
4	Parturient with functioning epidural analgesia	Delegate management of the epidural analgesia to midwife/nurse/trainee	Direct specialised medical "supervision"	Equivalence of management in case of breakthrough pain? Delay in re-siting catheter Adequate analgesia
5	Parturient with initial adequate epidural analgesia	Team training / protocols for multidisciplinary management of pain during labour	No team-training / No protocol	Incidence of breakthrough pain Time to adequate analgesia Detection of breakthrough pain Parturient satisfaction with epidural analgesia
6	In parturients having an epidural not properly working during intrapartum caesarean delivery	Resiting it or going for a spinal	Epidural or systemic supplementation (opioids, etc)	Leads to a decreased need for GA during CD

CD, caesarean delivery; CSE, combined spinal epidural; DPE, dural puncture epidural; LA, local anaesthetic; MEOWS, modified early obstetric warning score; VAPS, visual analogue pain score.

Literature search design

The literature search strategy was developed by the trial search information specialist Janne Vendt (Rigshospitalet, Diagnostic Centre, Medical Library, Copenhagen University Hospital, Copenhagen, Denmark) in close collaboration with the author N.B. and the ESAIC group methodologist C.S.R.

We searched for eligible studies in the following databases: Medline (Ovid SP), Central (Cochrane Database of Systematic Reviews (Issue 9 of 12 September 2022), A combination of subject headings and free-text terms was used for the topic search and in Medline we added search terms for study types.

An additional search for systematic reviews was run in Epistemonikos on 22 September 2022, and the bibliographic references and citations of included studies and systematic reviews were checked for other eligible studies.

Members of the task force were also prompted to include any relevant articles they were aware of that might have been omitted and to undertake further searches independently.

Search results

The titles resulting from the searches were screened by part of the task force members (N.B., C.S.R., S.O.Z., I.V., P.K., K.E., S.R., P.Y.D.), and finally assigned to each PICO question.

The screening followed a double-blind two-stage process by titles and then by relevant titles with abstracts, which was monitored by N.B. and C.S.R. In case of disagreement between evaluators, a third expert was consulted to reach consensus with regard to the inclusion or rejection of the article.

A third round of title and abstract screening allowed the selected articles to be assigned to the relevant PICO.

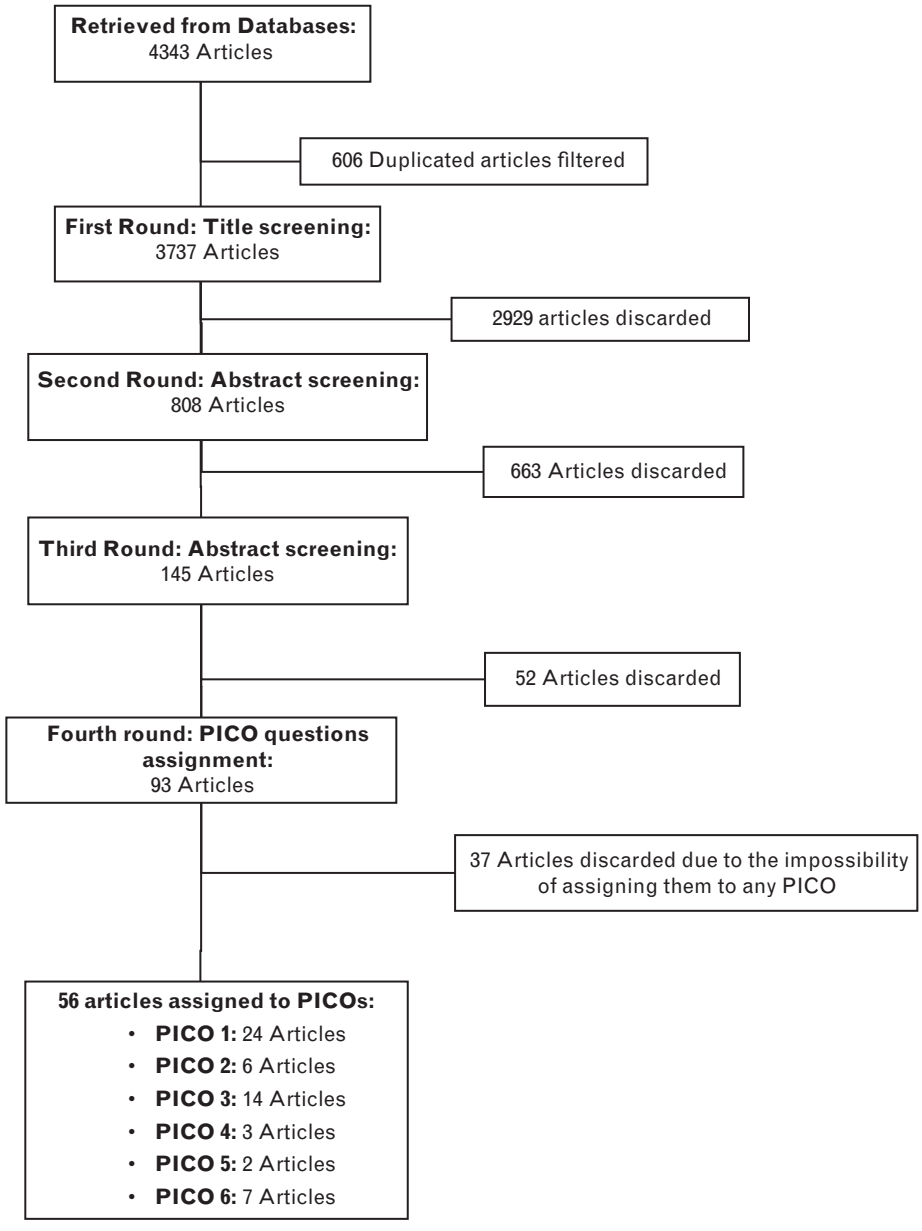
The task force groups retrieved the list of potentially relevant articles for full-text assessment and data extraction by the task force groups using Rayyan software (https://www.rayyan.ai).

During the initial research 4343 articles were retrieved. After excluding duplicates 3737 titles were identified and screened, resulting in 808 abstracts. From these, 145 relevant abstracts were retained and 93 were used to select a total of 56 appropriate titles for a detailed GRADE (Grading of Recommendations, Assessment, Development and Evaluation) analysis (Fig. 1)

Selection of studies

All articles meeting the inclusion criteria were included. In each PICO, a group of experts consisting of at least an obstetric anaesthesia expert and a methodologist assessed the relevant full-text articles (PICO 1 : A.K., P.K. E., S.R.; PICO 2 : E.G., A.I.; PICO 3 : C.S.R. N.L., M.V.dV.; PICO 4 : S.O.Z., N.B.; PICO 5 : C.F.W., O. V. dB., K.L.; PICO 6 : A.A., K.E., I.V.). Disagreements were resolved by a third party (N.B., C.S.R., I.V.).

Fig. 1 Flow chart for citations screening.



Data extraction and management

All authors extracted data in a similar manner in relation to study design, parturient characteristics, intervention, and outcome measures. The respective data were entered in a predesigned Excel spreadsheet. Task force group authors reached consensus regarding extracted data through discussion.

Assessment of risk of bias in included studies

Review authors were supplied with literature for assessment of risk of bias by the ESAIC methodologists (C.S.R., A.A.), and then assessed the risk of bias of each of the studies selected for each PICO question. Risk of bias assessment for RCTs was conducted in accordance with the Cochrane Handbook for Systematic Reviews and Interventions, evaluating the following domains:

(1) Random sequence generation (selection bias);
(2) Allocation concealment (selection bias);
(3) Blinding of participants and personnel (performance bias);
(4) Blinding of outcome assessors (detection bias);
(5) Incomplete outcome data, intention-to-treat (attrition bias);
(6) Selective reporting.

Table 2 Classification of the level of Evidence according to the GRADE (Grading of Recommendations Assessment, Development and Evaluation) System

Level of evidence	Definition	Criteria
High	High confidence in the correlation between true and estimated effect.	**Randomised studies** **Increase if** Effect +1 large +2 very large Dose Response +1 obvious Gradient **Decrease if** Risk of bias −1 significant −2 very significant Inconsistency −1 significant −2 very significant
Moderate	Moderate confidence in the estimated effect. It is possible that the true effect is very different from the estimated effect.	
Low	Limited confidence in the estimated effect. The true effect may be very different from the estimated effect.	**Observational studies** **Increase if** All confounding factors +1 would reduce observed effect +1 would suggest a spurious effect if there is no observed effect **Decrease if** No direct evidence −1 significant −2 very significant Imprecision −1 likely −2 very likely
Very Low	Very little confidence in the estimated effect. The true effect is very probably different from the estimated effect.	

Overall bias was defined by the assessor based on the assessment in the respective domains. Basically, trials were assessed as having a low risk of bias if all the domains were considered adequate, as having a moderate risk of bias if one domain was considered inadequate, and as having a high risk of bias if more than one domain were considered inadequate or unclear. Disagreement regarding assessment of risk of bias was settled in discussion with the methodologists (C.S.R., A.A.).

Observational studies were assessed by the SIGN checklist for cohort studies (https://www.sign.ac.uk/what-we-do/methodology/checklists/).

Assessment of quality of evidence

In accordance with the ESAIC policy, the GRADE (The Grading of Recommendations Assessment, Development and Evaluation) methodology was used to rate the recommendations based on the findings of the included studies in conjunction with their methodological quality. The ESAIC guidelines committee selected the GRADE system for assessing levels of evidence and grading as this method has the merit of simplicity. Two levels also make the interpretation of the implications of strong and weak recommendations simpler for clinicians. The Task force members were asked to define relevant outcomes across all clusters and rank the relative importance of outcomes, following a process proposed by the methodology group. After selecting the relevant articles for each PICO, one member per group was in charge for the final grading of the papers (P.K., E.G., C.S.R., N.B., C.F.W., A.A.). Decisions to downgrade the level of evidence for a recommendation were based on the quality and type of the included literature, observed inconsistencies, indirectness or directness of the evidence, overall impression of the quality of the evidence and the presence of publication bias as indicated by GRADE. Decisions to upgrade the level of evidence for recommendations were based on study quality and magnitude of effect, dose-response gradient, and plausible residual confounding. The GRADE definitions are summarised in Table 2.

Development of recommendations and clinical practice statements

When possible, each group provided evidence-based recommendations relevant to the PICO and clinical questions assigned to them when possible. In cases where no studies were eligible for inclusion in a GRADE assessment, we opted for a Clinical Practice Statement (CPS), defined as a statement that includes guidance to optimise parturient care, based on an assessment of the benefits and harms of alternative care options that were discussed with the panel of authors of this guideline. CPS were produced on important topics when there was a lack of research evidence, and the conviction that the CPS added important opinions to the overall guideline topic.

These were then discussed and rediscussed as required by the entire expert panel regarding the data synthesis, the risk of bias and the quality of the evidence.

A two-step Delphi process was employed to produce expert recommendations and to discuss the methodological quality of the supporting literature, particularly when the quality of evidence was low or when rephrasing of recommendations was needed. Every single recommendation, suggestion or statement was subject to the voting and consensus process. A stringent threshold of 75% agreement was set to validate each CPS and recommendation, ensuring the highest level of rigour and validity.

First round: At the first round, the statements of task force groups were discussed and refined. A set of 2 recommendations and 11 statements was identified for further development.

Second round: For the second and final round of the DELPHI process, the task force members were asked to indicate approval or rejection of each of the eight statements which were not approved in the first round, with the option for suggesting changes. An affirmative (positive) rating was adopted when the approval rate was 75%.

Finally, both recommendations and the 11 CPS reached full agreement (17 supporting votes out of 17 participating members being eligible to vote).

The recommendations and CPS were merged into a shared document by one author (N.B.). The final version of the document was composed by the authors and subsequently reviewed and endorsed by all members of the expert panel.

Summary of recommendations

R1. We recommend that anaesthesiologists consistently take responsibility for initiating and executing suitable corrective strategies for addressing failing epidural. (Strong recommendation, very low quality of evidence)

R2. We suggest that each instance of failed augmentation of Labour Epidural Analgesia for intrapartum caesarean delivery be addressed on an individual basis. Depending on the circumstances, both neuraxial anaesthesia (such as epidural top-up, new spinal, or combined spinal-epidural techniques) and general anaesthesia may be appropriate choices. (Conditional recommendation, very low quality of evidence)

Summary of clinical practices statements

CPS 1. We recommend that if the parturient experiences inadequate pain relief during labour, the attending anaesthesiologist should assess the proper placement of the epidural catheter, the management of Labour Epidural Analgesia so far and the obstetric condition of the parturient.

CPS 2. We recommend that the rescue intervention should be performed according to the likely cause of the epidural failure, following a clear algorithm.

CPS 3. We recommend that the Combined Spinal-Epidural technique be considered when resiting a catheter to decrease onset time and increase efficiency of the block.

CPS 4. We note that the Dural Puncture Epidural technique may serve as an effective strategy for catheter re-siting, especially in high-risk parturients when Combined Spinal Epidural may not be preferred.

CPS 5. We recommend that motor and sensory block, pain, and clinical status be monitored with objective scales and recorded periodically (every 1-to-2 h depending on the clinical situation) in high-risk parturients with Labour Epidural Analgesia.

CPS 6. We suggest that motor and sensory block, pain, and clinical status be monitored and recorded periodically with objective scales during Labour Epidural Analgesia in healthy parturients.

CPS 7. We recommend that the healthcare provider responsible for the provision of Labour Epidural Analgesia is an anaesthesiologist (trainee or specialist), and that Labour Epidural Analgesia management is always under their direct authority. Supervision can be delegated to other healthcare providers.

CPS 8. We recommend that appropriate training is ensured to support optimal management of the failing epidural if maintenance of Labour Epidural Analgesia is delegated to other healthcare personnel.

CPS 9. We recommend that each centre has a local multidisciplinary protocol regarding the detection and treatment of failing epidural after initially adequate Labour Epidural Analgesia has been achieved.

CPS 10. We recommend that multidisciplinary education and simulation training is organised on a periodic basis to increase adherence to the protocol and awareness and communication with other healthcare providers and parturients.

CPS 11. We recommend a pro-active early management of failing epidural as the preferred technique to facilitate a successful conversion to anaesthesia for intrapartum caesarean delivery.

PICO 1: When a previously working Labour Epidural Analgesia fails, should the catheter be re-sited or an epidural top-up administered?

Clinical practice statements

CPS 1. We recommend that if the parturient experiences inadequate pain relief during labour, the attending anaesthesiologist should assess the proper placement of the epidural catheter, the management of Labour Epidural Analgesia so far and the obstetric condition of the parturient.

CPS 2. We recommend that the rescue intervention should be performed according to the likely cause of the epidural failure, following a clear algorithm.

Step-by-Step algorithm for failing epidural management is shown in Fig. 2:
1. In the case of an adequate but completely ineffective rescue intervention or life-threatening cause of failure, such as accidental inadvertent intrathecal or intravascular catheter, resite the epidural.
2. In the case of partially effective rescue intervention, administer up to two manual 6 to 10 ml epidural top-up boluses using bupivacaine 1.25 mg ml^{-1} or an equivalent dose of another local anaesthetic, with 20 to 30 min interval between them. Increasing concentrations compared to maintenance solution can be used if sensory level is adequate but pain relief is incomplete. Pain relief should be re-assessed after 20 to 30 min and if analgesia is not fully achieved, a new top-up bolus vs. re-siting the catheter should be considered at each step.
3. In case of insufficient effect on one side, retract the catheter until 3 to 4 cm remain in the epidural space and administer one 6 to 10 ml epidural bolus. Positioning the parturient in the lateral decubitus position with the parturient lying on the side with less block when receiving the bolus might be of benefit. Pain relief should be re-assessed after 20 to 30 min and resiting the catheter should be indicated if analgesia is not fully achieved.

Rationale

Among the 24 articles allocated to this PICO, none directly compared various techniques for rescuing a failing epidural. Consequently, due to the absence of specific evidence, we are unable to provide evidence-based recommendations regarding whether to administer a top-up through the epidural catheter or to replace it in cases of epidural failure.

The management of a failing epidural necessitates initial identification of its cause to make an informed decision on whether to administer a top-up through the existing catheter or to establish a new neuraxial block. Potential reasons for the failure of an initially functional catheter may include its secondary migration, a history of previous epidural failures, a high body mass index (BMI), the employment of low-concentration local anaesthetics, anatomical variations in the epidural space, catheter insertion when cervical dilation exceeds 7 cm, rapid labour progression, uterine rupture in patient with a history of previous caesarean delivery, and a history of opioid tolerance, among others.[13,19–21]

After ruling out a cause of failure which could be associated with a life-threatening complication such as an intrathecal or intravascular catheter, the first step in addressing a failing epidural should be to rule out mechanical failure. Epidural catheters are known to migrate relative to the skin as the parturient moves, with the most significant changes observed in parturients with a BMI over 30, presenting a risk of obstruction or accidental dislodgement.[22] Once mechanical issues are ruled out or addressed, retracting the catheter by 1 cm increments, and flushing it with saline may be beneficial in managing a failing epidural. Should the obstruction remain when the catheter is positioned with 3 cm remaining within the epidural space, resiting is advised. Although this approach lacks substantial evidence, it has been suggested by some authors based on case reports accumulated over the years.[23]

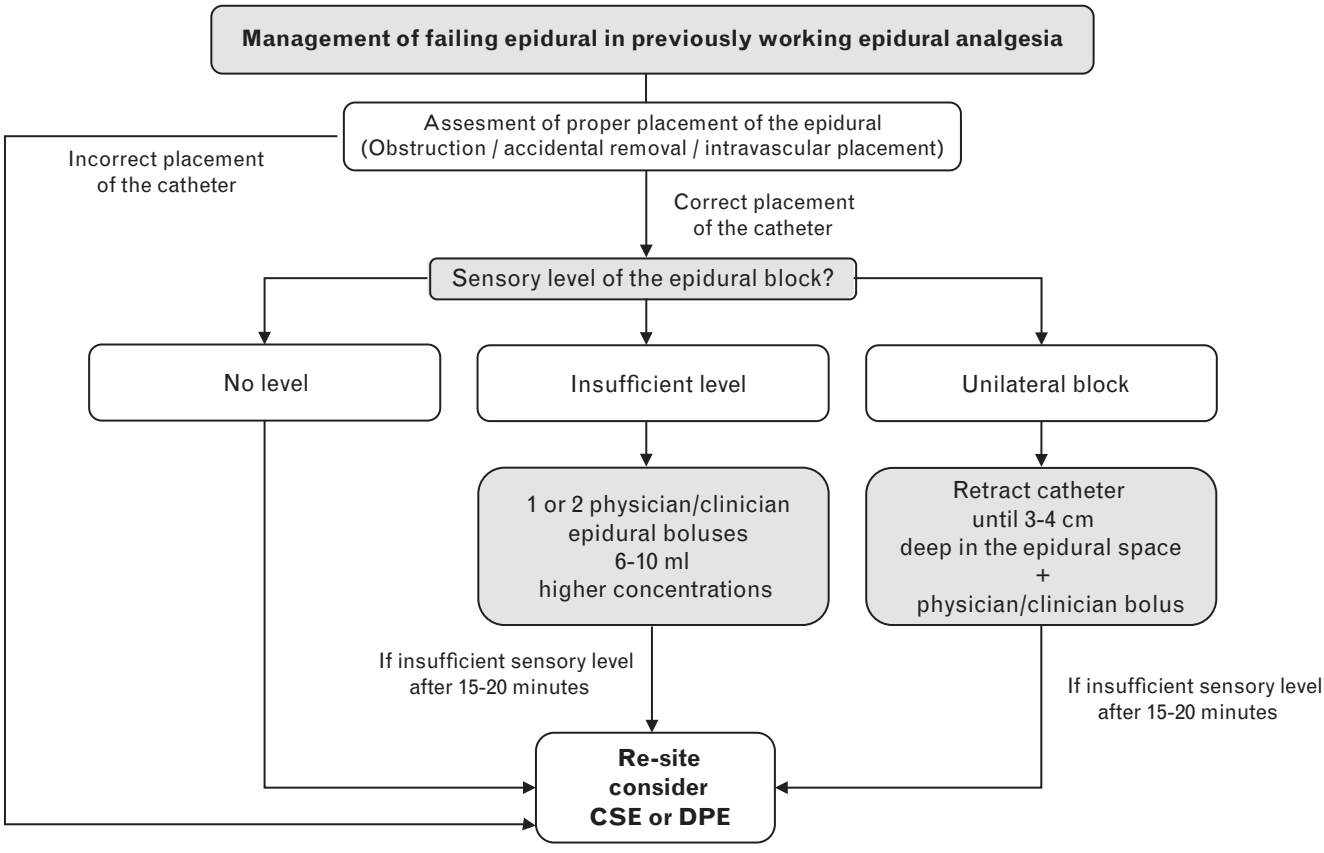
The decision to top up the catheter should consider various parameters:

When using PIEB or Patient-Controlled Epidural Analgesia (PCEA) without background infusions, it is important to take into consideration the time since the last bolus was administered when assessing a failing epidural.[18] Concerning time since the last programmed bolus, Bittencourt *et al.*[17], in a biased coin up-and-down sequential allocation trial, found that the optimal interval for PIEB of epidural analgesia using bupivacaine 0.125% plus fentanyl 2 mcg ml^{-1} was approximately 35 min. More recently, Yao *et al.*[24] calculated an effective interval for 50% (EI50) and 90% (EI90) of parturients for 10 ml ropivacaine 0.1% plus sufentanil 0.5 μg ml^{-1} of 52 and 37 min respectively after a dural puncture epidural technique.

Although there is no definitive evidence to specify the exact timing for assessing analgesia efficacy following an epidural top-up for an insufficient epidural, certain insights can be drawn from the time it takes for analgesia to commence after administering an epidural bolus for initial pain relief. In a recent RCT, Wang *et al.*[25] observed that the onset of labour epidural analgesia typically occurred within 10 to 15 min when using 15 ml of bupivacaine at concentrations of 0.125% or 0.1%, combined with either 5 or 10 μg of sufentanil, depending on the local anaesthetic concentration. Given these considerations, we recommend administering a top-up if it has been over 20 to 25 min since the last bolus was administered. Furthermore, a bolus should be deemed ineffective if pain relief is not achieved within 15 to 20 min.

The parturient's obstetric condition significantly influences the effectiveness of LEA. In instances of precipitous labour, characterised by rapid cervical dilation, the LEA may not achieve adequate pain relief quickly or intensely enough to manage the escalating pain intensity. This can result in epidural failure, despite the catheter being well positioned and previously functioning effectively.[26] Additionally, the position of the foetus during delivery can modify the experience of pain, thereby affecting epidural effectiveness. Specifically, a foetal occiput posterior position is associated with prolonged labour and increased lower back pain, which can also lead to an ineffective epidural.[27] The parturient's obstetric

Fig. 2 Management of failing epidural in previously working epidural analgesia.



CSE, combined spinal epidural; DPE, dural puncture epidural.

history should also be examined, since new onset pain in a previously functioning epidural could be a sign of uterine rupture, especially in parturients who have undergone previous uterine surgery.[21] Possible additional signs of uterine rupture could, but not necessarily, include shoulder pain, hypotension, foetal heart rate abnormalities.

If an epidural that was previously effective ceases to function entirely (resulting in a complete loss of sensory level), and the administration of an adequate epidural top-up does not provide any discernible effect on the parturient, we recommend repositioning the epidural catheter. This ineffectiveness may be attributed to the catheter migrating to more superficial structures or entering a blood vessel. The likelihood of restoring the catheter's functionality by administering a high dose of local anaesthetic is minimal and pursuing this approach may result in a significant waste of valuable time and may endanger the patient.

There is little concrete evidence to recommend specific management of a parturient with an inadequate analgesia.[16,20] However, we suggest that a stepwise approach could enhance the management of a failing epidural. The first step should involve administering a manual epidural top-up bolus, using a volume between 6 and 10 ml of a local anaesthetic at an appropriate concentration (such as bupivacaine at 1.25 mg ml^{-1} or an equivalent dose of another local anaesthetic). If the parturient's pain is located below the current sensory level, the local anaesthetic concentration should be increased for the bolus dose. Conversely, if the parturient's pain is above the current sensory level, the volume of the bolus dose should be increased, with the specific volume selected based on the dermatomal block level present at the time of bolus administration. Should the parturient fail to achieve any pain relief within 15 to 20 min, it is advised to reposition the epidural catheter.

In cases where the parturient obtains partial pain relief following the initial top-up, a second manual bolus using a higher concentration of local anaesthetic (for instance, bupivacaine 2.5 mg ml^{-1} or an equivalent dose of another local anaesthetic) may be administered if the sensory block level has increased above the pain level but pain relief is incomplete. This approach is particularly relevant for parturients experiencing severe pain. If, after 15 to 20 min following this second bolus, the parturient's pain relief remains inadequate, we recommend repositioning the epidural catheter.

A common issue with labour epidurals is an asymmetric block, where one side experiences insufficient analgesia. Despite correct catheter placement, approximately 5 to 8% of epidural blocks may result in this type of incomplete pain relief.[28] The cause is often attributed to either an anatomical barrier obstructing the free flow of the local anaesthetic or a less-than-ideal positioning of the catheter tip.[29] Research has indicated that inserting the catheter more than 7 cm into the epidural space can adversely affect the quality of the block, with 5 cm identified as the optimal insertion depth. While specific scientific guidance on management is lacking, we suggest retracting the catheter to a depth of 3 to 4 cm in the epidural space before administering a new bolus dose. Additionally, positioning the parturient so that the side lacking adequate analgesia is facing downwards before or just following the dose may improve analgesia.

Further research is needed to provide clinicians with detailed management strategies for the early stages of a failed epidural and to establish definitive criteria for deciding whether to try and augment the existing block or to replace the catheter in such scenarios.

PICO 2: When a previously working epidural fails and the catheter is to be resited, what is the best technique?

Clinical practice statements

CPS 3. We recommend that the Combined Spinal-Epidural technique be considered when resiting a catheter to decrease onset time and increase efficiency of the block.

CPS 4. We note that the Dural Puncture Epidural technique may serve as an effective strategy for catheter re-siting, especially in high-risk parturients when Combined Spinal-Epidural may not be preferred.

Rationale

In our literature search, among the 6 publications relevant to PICO 2, none helped to guide recommendations on the optimal technique when resiting the epidural catheter when LEA failed. The incidence of catheter resite ranges from 1.6% to 6.8%, being around 0.8% in centres with a greater use of LEA.[30] Some risk factors have been identified for the need to resite a LEA catheter, with breakthrough pain being the most important. In a retrospective study, a predictive model has been proposed by the Singapore group,[30] that needs to be validated in other centres with a similar LEA practice.

When a CSE is performed, the initial success rate of spinal or epidural analgesia is not influenced by the loss of resistance method used to identify the epidural space. However, if cerebrospinal fluid (CSF) is not observed flowing through the needle, there is an increased risk of failure.[31] This absence of CSF may indicate the need for a rescue technique to ensure successful analgesia.

To date, DPE as a primary technique, has not been shown to have a lower risk of catheter resiting,[32] however proponents suggest that drug transfer through the dural hole may improve maternal analgesia with the additional advantage of a better sacral spread and lack of foetal cardiotocographic (CTG) adverse events. If using a DPE technique, a larger bore spinal needle seems indicated, as a 27G pencil point needle does not improve labour epidural analgesia, nor the risk of resiting.[25] In comparison with CSE, DPE had a lower incidence of haemodynamic side effects in healthy parturients.[33] This rescue technique might thus be an interesting option for high-risk parturients with a failing epidural, to decrease the risk of cardiovascular collapse.

CSE is a valuable technique when catheter re-siting is required. Compared to a normal LEA it has a faster onset of analgesia,[26] a lower rate of failure,[28] and is associated with increased maternal satisfaction.[30] In addition, CSE uses less local anaesthetic.

DPE may in future prove to be beneficial as more evidence emerge on its application. CPS and recommendations for PICO 1 and PICO 2 were summarised in an algorithm (Figure 2).

PICO 3: Should labour analgesia be proactively managed using objective scales to measure block efficacy and manage failing epidural analgesia?

Clinical practice statements

CPS 5. We recommend that motor and sensory block, pain, and clinical status be monitored with objective scales and recorded periodically (every 1-to-2 h depending on the clinical situation) in high-risk parturients with Labour Epidural Analgesia.

CPS 6. We suggest that motor and sensory block, pain, and clinical status be monitored and recorded periodically with objective scales during Labour Epidural Analgesia in healthy parturients.

Rationale

Despite the established use of assessment modalities such as VAPS (visual analogue pain scale) and MEOWS (modified early obstetric warning score) in other areas of obstetric care, there are no recommendations on their use to monitor the effectiveness of LEA. Similarly, while motor and sensory block assessment can be used to evaluate LEA, there is a lack of clarity around the frequency with which they should be assessed and who the responsible clinician is. Moreover, there is no established relationship between improved maternal and foetal outcomes and the use of these assessment modalities. Due to this lack of information, we screened 14 articles to determine whether the structured use of these scales in labour could be associated with a lower incidence of failed LEA. However, we did not identify any

randomised clinical trials or observational studies evaluating these interventions consistently to support the use of these scales to evaluate the effectiveness of LEA. We also found that very few studies assessed different concentrations of local anaesthetics when using these objective scales for evaluating labour pain. The evaluation of pain, the degree of motor or sensory blockade or the parturient's clinical/condition present a significant challenge as it almost always refers to qualitative assessments, even using quantitative scales.[28,33,34]

Therefore, studies are needed to evaluate the usefulness of these scales in managing epidurals in labour and to compare them with current non-standardised clinical practice. The main outcomes that we consider relevant are:

- a decrease in the incidence of breakthrough pain,
- an increase in early identification of failure,
- a decrease in the time to adequate analgesia when breakthrough pain occurs.

Overall, the panel considers that the addition of standardised assessment of LEA will likely improve maternal outcomes, even if the implementation is challenging due to staffing problems.

Table 3 summarised recommendations to assess the failing epidural block.

PICO 4: In parturients with functioning Labour Epidural Analgesia is direct specialised medical supervision better than the delegation of management of the epidural analgesia to midwives, nurses, or trainees for failing epidural?

Recommendation

R1. We recommend that anaesthesiologists consistently take responsibility for initiating and executing suitable corrective strategies for addressing failing epidural. (Strong recommendation, very low quality of evidence)

Table 3 Recommendations of epidural block assessment for a failing epidural analgesia

H.E.L.P.:
H – How was LEA working so far? (analgesic level and VAPS)
Good analgesia: Block suitable for augmentation for CD
Insufficient/Poor/Patchy analgesia: Possible failing block
E – Epidural top-ups received from a clinician? (indication of failing block)
0 to 2 top-ups: Block suitable for augmentation for CD
> 2 top-ups: Possible failing block
L – Legs raising is possible? (indication of potential spinal catheter)
Yes: Minimal/no motor block (Bromage score). Block suitable for augmentation for CD
No: Legs heavy, motor block, high Bromage score. Possible spinal catheter
P – Place hands on parturient's legs to assess bilateral similar temperature
Similar warm – Block suitable for augmentation for CD
Similar cold – Possible failing block
Different: Possible unilateral block; possible failing block

CD, caesarean delivery; LEA, labour epidural analgesia; VAPS, visual analogue pain score.

Clinical practice statements

CPS 7. We recommend that the healthcare provider responsible for the provision of Labour Epidural Analgesia is an anaesthesiologist (trainee or specialist), and that Labour Epidural Analgesia management is always under their direct authority. Supervision can be delegated to other healthcare providers.

CPS 8. We recommend that appropriate training is ensured to support optimal management of the failing epidural if maintenance of Labour Epidural Analgesia is delegated to other healthcare personnel.

Rationale

Anaesthesiologists and obstetricians work closely when providing LEA, but the anaesthesiologist is ultimately responsible for supervising LEA, even if its observation is delegated to nurses or midwives, due to structural or institutional arrangements.[36]

In terms of the clinical management and clinical outcomes of failed blocks during labour, the literature search did not find any study comparing LEA supervised by a nurse/midwife with LEA supervised by an attending anaesthesiologist. In an observational cohort study including 2568 parturients, Charles *et al.*[37] identified those who benefited from supervision of epidural analgesia by registered nurses vs. anaesthesiologists/anaesthetic nurses in the United States. This study measured the incidence of hypotension and sentinel events such as respiratory distress, cardio-respiratory distress, loss of consciousness or seizures, but not the occurrence of failed epidural block. They also did not compare the incidence of adverse events between groups, making it difficult to conclude whether one type of supervision is better.

Even though there is little evidence to support our experts' recommendations, the shortage of anaesthesiologists in many European countries sometimes leads to the delegation of supervision of anaesthetic techniques to non-anaesthesiologist healthcare providers who have the obligation to report and inform the anaesthesiologist in case of failing analgesia.[38] Protocols are required in Great Britain and Ireland: these guide the nurses and midwives in their administration of local anaesthetics through epidural catheters, and indicate in which situations they are required to call for the anaesthesiologist.[39] Despite the lack of anaesthesiologists in some centres/countries, we still recommend that obstetric units are provided with appropriate staffing of attending anaesthesiologists to allow a constant direct supervision of LEA. We acknowledge that the organisation of each centre/country does not always allow this optimal situation. In this case, other healthcare providers (such as midwives, nurses, or trainees) can be delegated to the management of LEA, provided that they receive adequate training and supervision and there are adequate written protocols to allow

for the detection of anaesthesia complications and failing analgesia.

Allowing other healthcare providers to supervise epidural analgesia without direct oversight from an anaesthesiologist may lead to several issues. These problems could include inappropriate evaluation and management of LEA, potentially resulting in a higher incidence of failing LEA, delayed detection of failing LEA, postponed administration of higher concentrations of local anaesthetic, or deferred performance of a rescue technique such as replacing the epidural or CSE, or DPE blocks. In addition to potential safety concerns, a delayed diagnosis of a failed epidural block can lead to unnecessary and prolonged discomfort for parturients, as they may experience pain for an extended period before the issue is identified and addressed.

Consequently, we recommend that an anaesthesiologist should manage failing epidurals, to ensure a rapid and optimal resolution, and thus facilitating the delivery of the highest standard of care.

More comparative studies on strategies of LEA supervision would be necessary to assess their impact on relevant clinical outcomes such as the rate of failing epidural among others, but also the safety and the cost/benefit balance of delegating to non-anaesthesiologist professionals the supervision of LEA.

PICO 5: in a parturient with initially adequate Labour Epidural Analgesia, is an institutional protocol and training for the management of pain during labour beneficial to improve the management of failing epidural?

Clinical practice statements

CPS 9. We recommend that each centre has a local multidisciplinary protocol regarding the detection and treatment of failing epidural after initially adequate Labour Epidural Analgesia has been achieved.

CPS 10. We recommend that multidisciplinary education and simulation training is organised on a periodic basis to increase adherence to the protocol and awareness and communication with other healthcare providers and parturients.

Rationale

Intrapartum pain may occur despite LEA initially appearing effective. Intrapartum pain may occur after the anaesthesiologist has handed over the direct care of a parturient to a trainee, a nurse, or a midwife. Therefore, a multidisciplinary approach is warranted to facilitate early detection and treatment of failed epidural block.

In our literature search, we did not identify any studies that investigated the occurrence or management of failed blocks in centres with vs. without an institutional protocol for managing breakthrough labour pain after initially adequate LEA.

Despite a lack of evidence on this specific topic, we believe a multidisciplinary approach is warranted. Several different professionals are involved in failed LEA management. In general, multidisciplinary instructions and hands-on training can improve communication, collaboration and improve the institutional climate and quality/safety culture.[40] Adherence to such protocols improve parturient outcomes as well as perceptions of patient safety with regard to teamwork and communication.[41]

Multidisciplinary simulation training has demonstrated benefits to improve outcomes in various obstetric emergencies including postpartum haemorrhage[42] and maternal cardiac arrest.[43] The experts of this taskforce are aware that failing epidurals and critical emergencies in obstetrics are completely different scenarios. However, given the evidence showing the usefulness of team training and simulation-based training in obstetric anaesthesiology for critical situations, we recommend that local standardised protocols for failing epidural are developed and that teams are trained in a multidisciplinary environment to improve patient care in the context of failing epidural.

Future studies are warranted to specifically address the optimal approach to multidisciplinary education on failing epidurals. Multidisciplinary didactic meetings, case-based discussions and simulation sessions may improve adherence to the local protocols and based upon other experience, it can be expected this may contribute to improved patient outcomes.

PICO 6: In parturients with Labour Epidural Analgesia, what is the best management for a failing conversion to anaesthesia for intrapartum caesarean delivery?

Recommendations

R2. We suggest that each instance of failed augmentation of Labour Epidural Analgesia for labour for intrapartum caesarean delivery be addressed on an individual basis. Depending on the circumstances, both neuraxial anaesthesia (such as epidural top-up, new spinal, or combined spinal-epidural techniques) and general anaesthesia may be appropriate choices. (Conditional recommendation, very low quality of evidence)

Clinical practice statement

CPS 11. We recommend pro-active early management of a failing epidural as the preferred technique to facilitate successful conversion to anaesthesia for intrapartum caesarean delivery.

Rationale for recommendations

Various risk factors have been described for failed LEA conversion for intrapartum caesarean delivery in a

Table 4 Factors influencing the technique used and its success in the failing conversion of labour epidural analgesia to anaesthesia for intrapartum caesarean delivery (inspired by Yoon *et al.*[47])

1. Urgency of delivery (Lucas' classifications[56]).
2. Has the labour epidural provided sufficient (bilateral) analgesia? [VAPS < 3 (Severity of labour pain evaluated with a numerical rating scale (VAPS: 0 to 10), or less than 2 additional epidural boluses]
3. Timing of the last epidural bolus administration (increased risk of high block).
4. Maternal consideration:[56–58]
a. Complicated pregnancy (such as multiple gestation, placenta previa, previous uterine surgery and pregnancy-induced hypertension), antepartum haemorrhage
b. Cardiac disease
c. Contraindication to spinal anaesthesia
d. Risk of difficult airway or aspiration (including maternal obesity with body mass index $\geq$30 kg m^{-2}, symptoms of gastroesophageal reflux, intestinal obstruction, ileus, elevated intracranial pressure, neuromuscular disease, mouth opening less than 4 cm, history of difficult intubation, or Mallampati classification Class III or Class IV)
e. Parturient's lack of co-operation or her refusal of new neuraxial anaesthesia

VAPS, visual analogue pain score.

prospective observational study: the requirement for more than two extra boluses to supplement the labour analgesia was the most frequently described.[44] Other risk factors for failed conversion were described in another observational study and in a systematic review including observational studies.[45,46] These found that younger age, higher BMI, long gestational age, and a non-obstetric anaesthesiologist in charge of anaesthetic management were associated with a higher risk of failing epidural[45,46] (Tables 4 and 5).

The rate of failing conversion for intrapartum CD requiring general anaesthesia was between 3.5 and 38% in the available series (2 observational studies, 1 systematic review and 1 RCT).[44–47]

From a total of 7 articles in our literature search, we included 6 studies (Table 6): two prospective observational studies,[44,46] two retrospective cohort studies,[48,49] one systematic review with meta-analysis,[45] and one randomised controlled trial[47] addressing the topic on the management of how to rescue a failing conversion for intrapartum CD, since no solid evidence exists on the optimal approach for this clinical situation. There is substantial heterogeneity between the included studies in terms of population and interventions and most of them have major methodological limitations (high risk of bias).

Table 5 Definitions of failing conversion to anaesthesia for intrapartum caesarean delivery

a. Failed Top-Up: After negative aspiration from the epidural catheter, the top-up solution is injected epidurally and successively the block level is assessed using a cotton swab doused with alcohol (absence of cold sensation or absence of touch sensation of the swab) to determine if a bilateral block along the mid-clavicular line up to T5 is achieved. If the sensory block for coldness is absent at the T5 level 30 min after the supplemental dose, the top-up was considered a failure.
Failed Top-Up includes: Failed sensory block, the upper level of sensory block to coldness below T5, or patchy block or pain from forceps pinching at the surgical site in parturients whose upper level of sensory block to coldness was equal or above T5.
b. Failure of pain-free surgery: Successful Top-Up, but when evaluating intra-operative pain using 100-mm visual analogue scales (VAS) and a VAS $\geq$ 30 mm is recorded, 100 µg fentanyl is injected intravenously as a rescue analgesic. If pain is not managed with intravenous fentanyl, the anaesthesia is of poor quality, and conversion is considered a failure.

According to two ''observational/RCTs studies'', the most tested strategy to prevent the failing conversion for intrapartum CD consists of an early recognition of parturients at risk of failing epidural analgesia for labour and who are also at risk of intrapartum CD, to ensure that these failing epidurals are detected/rescued/replaced promptly so that they provide good labour analgesia (defined as satisfactory pain relief and maternal satisfaction).[44,46]

If epidural anaesthesia conversion fails, spinal anaesthesia rather than epidural anaesthesia provides a shorter time to obtain optimal sensory and motor block. However, compared with a spinal in a parturient with no existing block, a spinal used to complement an insufficient epidural block can increase the risk of a high block.[47]

Alternatively, a CSE can be considered. The CSE technique increases the probability of a correct midline position of the spinal needle and the epidural catheter decreasing rate of unilateral block compared with epidural (RR = 0.48), although the rate of resited catheter was not lower.[50] A reduced spinal dose can then be used if a high block is a risk. If necessary, the epidural catheter can be used for top-up as required (intra-operative pain or insufficient level of block).[10] Saline epidural volume extension has also been used to increase the level of the spinal block when a CSE is used.[18,51] This technique could be useful when an intrapartum caesarean section is indicated with a failing epidural analgesia. This rescue measure would allow the administration of a lower dose of intradural local anaesthetics and may increase patient safety while decreasing the risk of high spinal block (**conditional recommendation, very low quality of evidence**).

There is very low-quality evidence (retrospective cohort study) on the risk of high blocks when a new spinal is performed after epidural labour analgesia: Einhorn *et al.*[48] did not find high blocks with spinal bupivacaine doses under 7.5 mg. Visser *et al.*[49] found no difference on the incidence of total spinal anaesthesia or high blocks between epidural or spinal anaesthesia conversion for intrapartum CD after a well functioning epidural analgesia for labour (0.8% with spinal anaesthesia following epidural labour analgesia and 0.2% with spinal anaesthesia only, $P = 0.36$, retrospective cohort study). (Recommendation 2D)

In parturients with increased risk of complications under general anaesthesia, rapid sequence spinal anaesthesia has been suggested as an alternative. This technique consists of a ''no-touch technique'' with sterile gloves only, antiseptic application of chlorhexidine 0.5% in alcohol, consider increased dose of hyperbaric bupivacaine 0.5% (up to 2.5 to 3 ml), add fentanyl 25 µg if preparing it does not introduce delay and limit the

Table 6 Evidence on epidural conversion failure for intrapartum caesarean delivery:

Reference	Study design	Intervention	Findings	Risk of bias
Gago *et al.*, 2009[44]	Prospective Observational Study	Compare adequate epidural anaesthesia for intrapartum CD ($n=115$) vs. failed epidural anaesthesia ($n=18$).	Failed epidural for intrapartum CD 13.4%. The need for top-ups during labour as risk factor for failed epidural anaesthesia (OR = 2.890 (CI95% 1.25 to 6.683) $P=0.021$).	High
Orbach-Zinger *et al.*, 2006[46]	Prospective Observational Study	Compare adequate epidural anaesthesia for intrapartum CD ($n=81$) vs. failed epidural anaesthesia ($n=20$).	Failed epidural for intrapartum CD 19.8%. Risks factors for failed epidural anaesthesia: younger women ($P=0.01$), higher BMI ($P=0.0004$), prolonged gestational age ($P=0.008$) and number of top-ups ($P=0.0004$).	High
Bauer *et al.*, 2012[45]	Systematic review with meta-analysis	13 studies included ($n=8628$). Risk factors for failed conversion of labour epidural analgesia to anaesthesia for intrapartum CD.	Risk Factors: 1. Greater number of top-ups during labour (OR = 3.2, 95% CI, 1.8 to 5.5). 2. Non-obstetric anaesthesiologist management (7.2% vs. 1.6%, OR = 4.56 95% CI, 1.8 to 11.5). 3. CSE vs. Epidural only – insufficient evidence.	High
Yoon *et al.*, 2017[47]	RCT, single centre, non-blinded, (Category 3 caesarean delivery only)	Epidural vs. spinal anaesthesia for conversion of epidural labour analgesia to anaesthesia for intrapartum CD. Epidural catheter was removed regardless of how it worked before performing the new technique. (Epidural $n=163$ / Spinal $n=160$)	- Failure rate of pain-free surgery higher in epidural (epidural 15.3% vs. Spinal 2.5%, $P<0.001$). - Interval between injection and skin incision and time for sensory block were shorter in spinal anaesthesia group ($P<0.001$). - Motor block higher in spinal anaesthesia group ($P<0.001$). - No difference in the rate of conversion to GA.	Some concerns
Visser *et al.*, 2009[49]	Retrospective Cohort Study	Compares the rate of conversion of spinal anaesthesia ($n=128$) vs. epidural anaesthesia ($n=19$) to GA. Both groups had epidural analgesia for labour prior to the indication for CD.	No difference was found in the conversion rate to GA between the groups, nor on the incidence of total or high spinal block.	High
Einhorn *et al.*, 2016[48]	Retrospective Cohort Study	Analyses the factors associated with failed and high spinal blocks after spinal anaesthesia following a labour epidural that was inadequate for surgical anaesthesia ($n=263$).	High blocks were described with spinal hyperbaric bupivacaine in doses > 7.5 mg (3% high blocks), and all occurred in spinal anaesthesia conversion.	High

CD, caesarean delivery; GA, general anaesthesia.

permitted time available for insertion attempts. But, to date, there is no solid evidence supporting a strong recommendation for this technique (**Recommendation 2D**, one systematic review and one case series).[52,53]

Figure 3 summarised with an algorithm the recommendations for failing epidural during intrapartum CD.

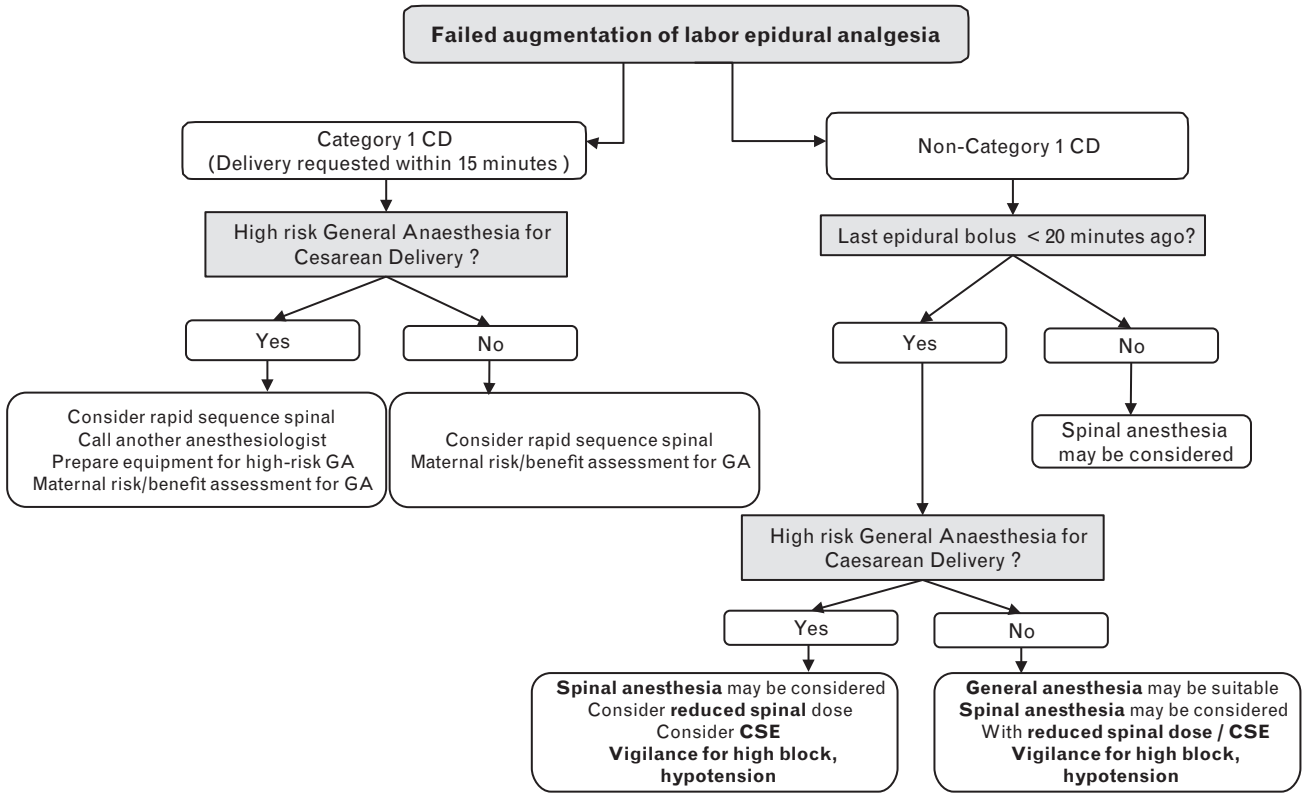
Final remarks and discussion

The bibliographic search performed for this guideline highlighted the overall lack of high-quality studies that generated evidence related to the best strategy for managing failing epidural.

Until now, despite a large number of publications concerning the different types of neuraxial techniques and strategies for maintaining neuraxial analgesia, most studies have primarily focused on the incidence and causes of epidural block failure. Numerous RCTs have investigated the impact of different neuraxial techniques and methods on the incidence of epidural failure and breakthrough pain during labour.[12] However, there is a scarcity of information on how to effectively manage a failing epidural to minimise patient discomfort and pain during labour, which is ultimately a crucial patient-centred outcome.

Optimising the modifiable factors which contribute to the failure of LEA will significantly decrease its incidence and contribute to improved quality and safety of obstetric anaesthesiology care. A recent publication by

Fig. 3 Failed augmentation of labour epidural analgesia.



CD, caesarean delivery; CSE, combined spinal epidural; GA, general anaesthesia.

Bamber *et al.*,[54] highlighted the importance of achieving an efficient epidural block within 45 min after the placement of the epidural catheter as one of the top five indicators of quality to improve maternal care. Although this indicator only applied to the onset of the initial epidural analgesia, it is an important factor which contributes to decreasing the incidence of a later failing epidural.

In spite of all the efforts to decrease the incidence of failing epidural, 12 to 14% of parturients still develop incomplete analgesia during labour.[12] This appears to be an unusually high number compared with the 1 to 2% reported incidence of failure in spinal blocks reported by Horlocker *et al.*[55] This significant incidence of failing epidurals during labour suggests that further improvements of quality of care will require other measures in addition to preventive measures. Since failing epidural appears to be unavoidable, rescue techniques and strategies should focus on enhancing our ability to promptly identify affected parturients, minimising the duration of inadequate analgesia, and swiftly addressing the consequences of a failing block. By implementing these measures, we can efficiently rescue the neuraxial block and optimise pain management for patients.

The first stage of the management of a failing epidural is its diagnosis. For this, indicators and objective scales seem essential. Our bibliographic search only allowed the identification of existing scales to measure pain intensity, motor and sensory block, e.g. VAPS, Bromage score and Obstetric Warning scores,[29,34,35] which are probably useful but, to date have never validated been in the context of failing epidural.

The existing recommendations[18] concerning failing epidural analgesia have so far been based on experts' opinions and studies analysing failed onset of epidural analgesia.

Our extensive bibliographic search, spanning from 1946 to the present, surprisingly failed to yield any robust evidence to support recommendations in the six predefined domains of knowledge, concerning the strategies and best techniques of rescue of the epidural analgesia (PICOs 1 and 2), the monitoring scales and indicators for a failing epidural analgesia (PICO 3), the optimum healthcare provider to manage parturients with LEA failure (PICO 4), and the best training to detect and early treat this failing epidural analgesia (PICO 5), and finally the best strategy for managing a failed conversion in case of intrapartum caesarean delivery (PICO 6).

The need to bring answers to those important questions that increase parturients' safety, satisfaction, and overall labour experience, led us to propose eleven clinical practice statements and two very low evidence recommendations. Those two recommendations were formulated, considering that the experts participating in the guideline judged them important enough to justify their presentation as recommendations and not clinical practice statements, despite the very low level of evidence. They were related to the initial management of a failing epidural analgesia and the choice between regional and general anaesthesia in the case of intrapartum caesarean delivery in a parturient with failing epidural analgesia.

All the CPSs and recommendations were validated by the experts, indicating a global consensus among obstetric anaesthesiologists on the management of failing epidural analgesia despite the lack of scientific evidence to support these clinical practices.

The production of algorithms for the management of a failing epidural will probably help clinicians to optimise their management these, even though these algorithms will need to be validated and improved in future guidelines and recommendations.

The lack of evidence found in the bibliographic search should encourage our community of obstetric anaesthesiologists to develop more investigation projects in this field. This could validate the CPS proposed by this group and develop strategies for treating failing epidural analgesia more efficiently and rapidly.

Limitations and further research

The main limitation of this guideline relates to the fact that all the recommendations and CPSs are mainly based on the expertise and opinions of the members of the task force, due to the lack of evidence in the different domains explored by the experts. This limitation is partially balanced by the overall agreement of the members of the task force through the DELPHI process to validate the CPS and recommendations. The composition of the task force which was balanced in terms of geographic distribution and expertise in the different domains assessed in the guideline strengthens the validity of the consensus and conclusions. Obviously, more evidence is required to support/refute the conclusions of this guideline in all its aspects and the new lines of investigation suggested will help clinicians to improve the quality of care of parturients asking for LEA and provide a more patient-centred care.

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