



# A patient-centered, algorithm-based management of epidural analgesia for labour and delivery: A prospective observational cohort study

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## Introduction

Despite many advances in epidural analgesia for childbirth, including the use of drug delivery systems capable of administering both programmed intermittent and on demand epidural boluses (PIEB and PCEA), a significant number of parturients receiving epidural analgesia still experience pain during labour<sup>1</sup>.

**Primary objective:** to assess the efficacy of a patient-centered algorithm-based management of labour epidural analgesia.

## Methods

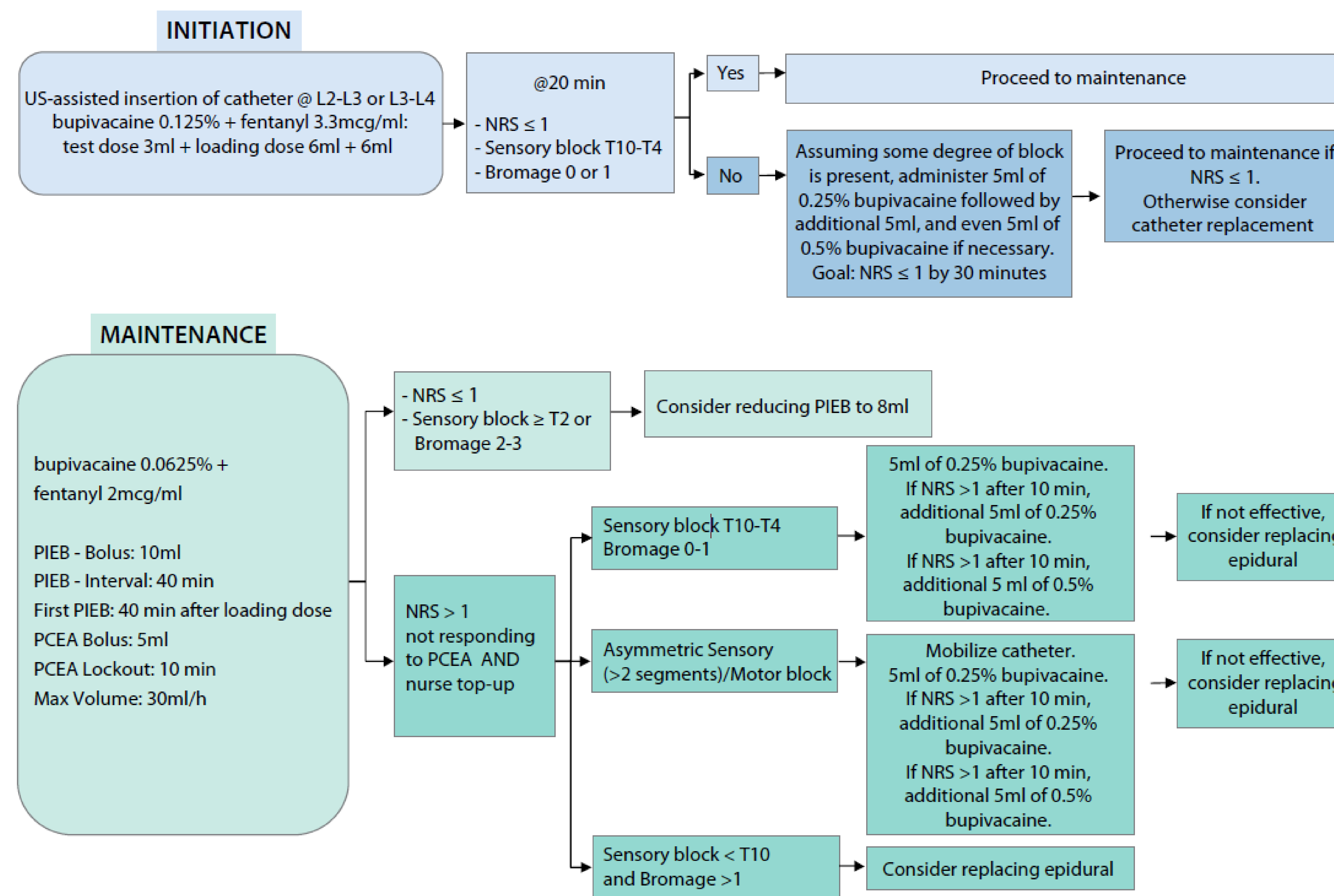
Research Ethics Board approval and patient's written informed consent

**Study design:** Prospective observational study

**Population:** Patients requesting epidural analgesia during active labor, ASA II-III, and able to consent and understand their expected role in the algorithm.

- All technical interventions including epidural catheter placement, test dose, loading dose, maintenance regimen, and plan for trouble-shooting insufficient analgesia and excessive motor block followed pre-defined algorithms provided to the patient, the nurse/midwife and the anesthesiologist (see figures).
- Primary outcome: presence of pain >3 (NRS 0–10) at any time during the first or second stage of labour as documented by hourly nursing assessment.
- Secondary outcomes: pain and satisfaction with analgesia throughout labour (assessed by a satisfaction questionnaire completed by the patient after delivery), total consumption of local anesthetic, need for supplementation of loading dose and top-up, mobilization of the catheter, maximum height of sensory block and presence of motor block.
- Results were presented descriptively. Frequency (percentage), mean (standard deviation) or median (inter quartile range) were reported as appropriate.

## Management of Labour Epidural Analgesia: Algorithm for the Anesthesiologist



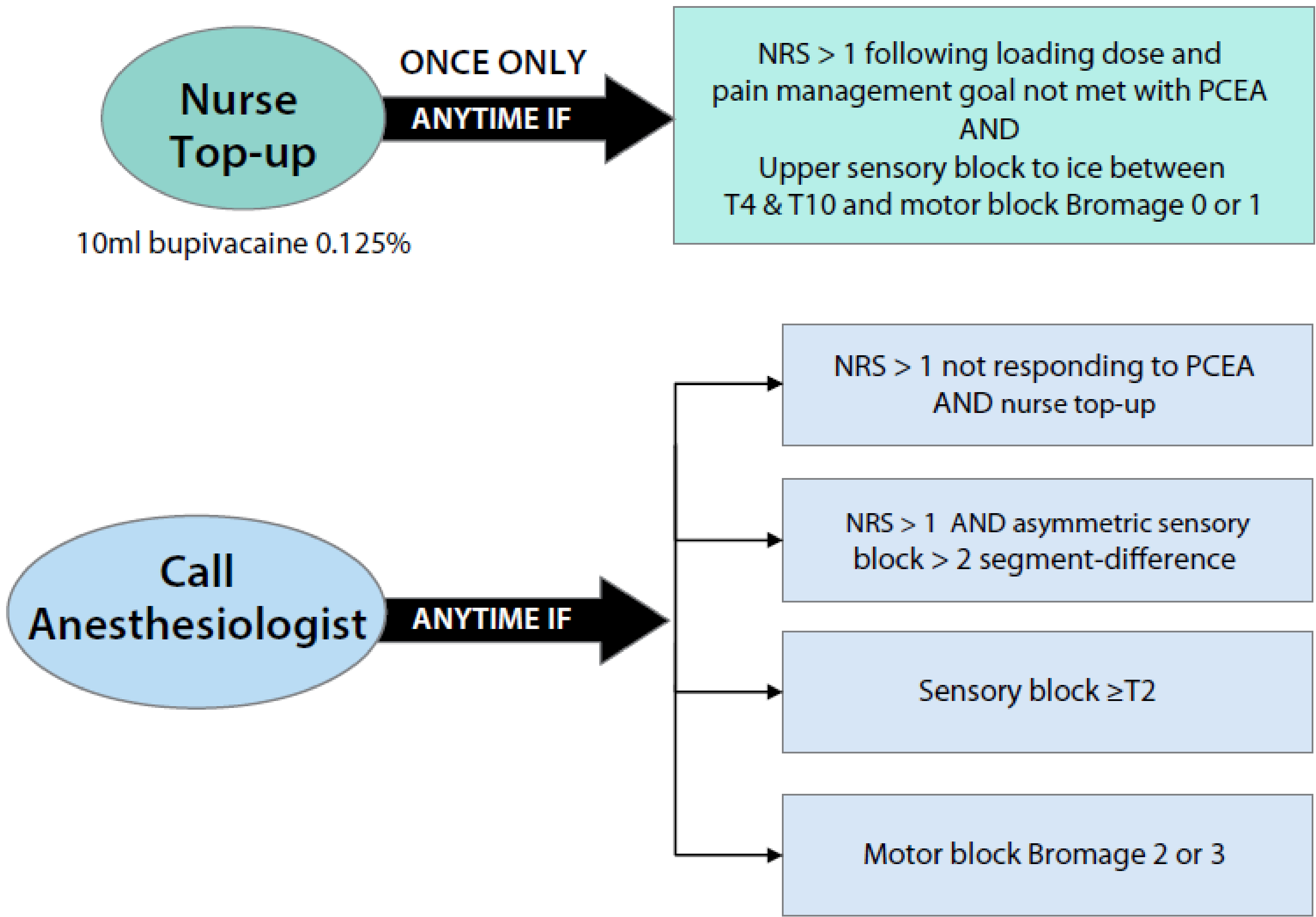


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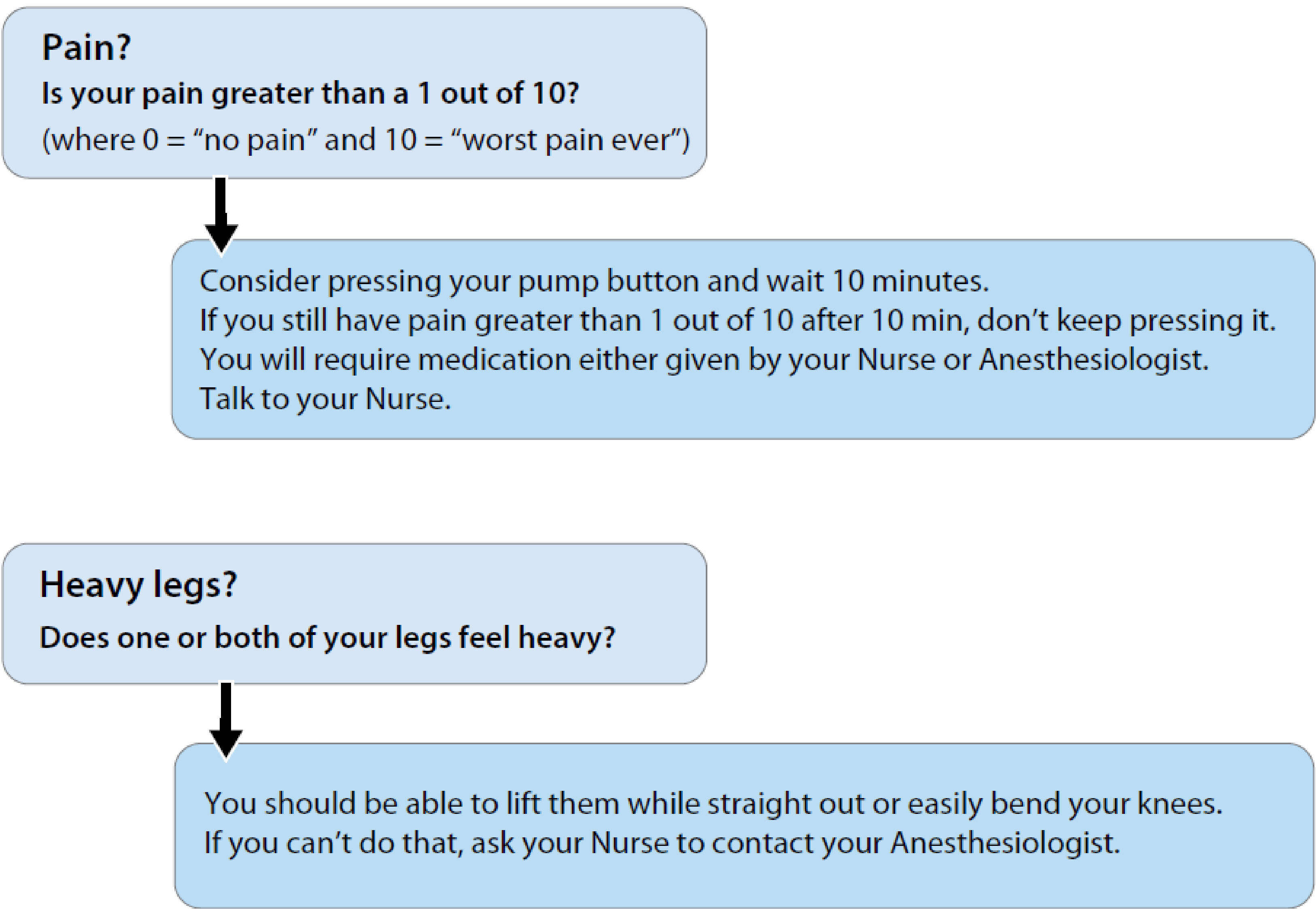
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## Management of Labour Epidural Analgesia: Algorithm for the Nurse



## Management of Labour Epidural Analgesia: Instructions for Patients



## Results

- 50 patients consented and 48 were included in the analysis.
- Primary and secondary outcomes are presented in Tables 1 and 2.
- The percentage of patients reporting pain NRS>3 during first or second stage of labor was 20.8%.
- The median (IQR) peak upper sensory block level to ice was T5 (T4-T6).
- The percentage of patients that developed motor block >1 (Bromage scale 0-3) was 4.2%.
- Four patients needed supplementation of the loading dose, one needed mobilization of the catheter and one had the catheter replaced.
- Two and four patients required nurse and physician top ups, respectively.
- Twenty-six patients used PCEA; median (IQR) number of attempts and deliveries was 1 (0,3) and 1 (0,2.5), respectively.
- The percentage of women reporting insufficient analgesia during the first and second stage of labour as assessed by the questionnaire was 25% and 28.6%, respectively.
- The median (IQR) patient satisfaction (NRS 0-10) with their active involvement with their pain management was 10 (9,10).



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**Table 1.** Pain scores, anesthetic management, and sensory/motor block. NRS, numerical rating scale; PCEA, patient controlled epidural analgesia, SD, standard deviation; IQR, interquartile change.

|                                                                       |            |
|-----------------------------------------------------------------------|------------|
| Maximum pain score (NRS 0-10) max (0-10), median (IQR)                | 0 (0,3)    |
| Number of patients with pain NRS >3 (NRS 0-10) (Y/N), N (%)           | 10 (20.8)  |
| Number of patients requiring nurse top-ups, N (%)                     | 2 (4.2)    |
| Number of patients requiring MD top-up, N (%)                         | 8 (16.7)   |
| PCEA attempts, median (IQR)                                           | 1 (0,3)    |
| PCEA deliveries, median (IQR)                                         | 1 (0,2.5)  |
| Consumption of bupivacaine (mg/h) excluding manual top ups, mean (SD) | 10.2 (5.3) |
| Patients requiring supplementation of loading dose (Y/N), N (%)       | 4 (8.3)    |
| Patients requiring mobilization of epidural catheter (Y/N), N (%)     | 1 (2.1)    |
| Patients requiring replacement of epidural catheter (Y/N), N (%)      | 1 (2.1)    |
| Highest upper sensory level, median (IQR)                             | T5 (T4-T6) |
| Number of patients with Bromage >1 (Y/N), N (%)                       | 2 (4.2)    |

**Table 2.** Parturients that agreed or strongly agreed with the statements about satisfaction with the epidural.

|                                         |              |
|-----------------------------------------|--------------|
|                                         | n/N (%)      |
| Comfortable epidural insertion          | 32/36 (88.9) |
| Effective analgesia in the first stage  | 27/36 (75.0) |
| Effective analgesia in the second stage | 25/35 (71.4) |
| Sufficient pain medication              | 35/36 (97.2) |
| Bothered by numbness                    | 4/36 (11.1)  |
| Bothered by itchiness                   | 11/36 (30.6) |
| Bothered by shivering                   | 8/36 (22.2)  |
| Difficulty in pushing                   | 6/35 (17.1)  |
| Overall satisfaction with epidural      | 35/36 (97.2) |
| Would want same analgesia again         | 36/36 (100)  |

## Discussion

- Our pilot study suggests that the use of a standardized algorithm for the management of labor epidural analgesia may improve the quality of epidural analgesia. Although our current study does not allow a direct comparison with our previous studies,<sup>1,2</sup> the observed outcome trends suggest that the quality of analgesia may have been overall improved.

|                                                   |                           |               |
|---------------------------------------------------|---------------------------|---------------|
|                                                   | Easter et al <sup>1</sup> | Current study |
| Overall incidence of pain > 3                     | 30.4%                     | 20.8%         |
| Effective analgesia first stage                   | 62.4%                     | 75%           |
| Effective analgesia second stage                  | 67.2%                     | 71.5%         |
| Overall patient satisfaction with labor analgesia | 87.2%                     | 97.2%         |

- Possible explanation for improved quality of epidural analgesia
  - standardized epidural catheter placement
  - inclusion of fentanyl in the loading dose
  - validated PIEB maintenance regimen<sup>2</sup>
  - clear algorithms
  - clear endpoint for the loading dose: NRS ≤ 1 at 20 minutes, before starting maintenance
  - education of health care providers and patients, with clear expectations and target outcomes

## References

1) Easter RG et al. Reg Anesth Pain Med 2021; 46:157-163; 2) Clivatti J et al. Can J Anesth 2013;60:787–95.