شیردهی بیهوشی و زایمان بیدرد

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- Well being of the fetus and newborn is a major criterion for evaluating the obstetric and anesthetic management of pregnant women.
- Many tools exist to assist with this determination for the fetus , whereas few are available to evaluate the newborn

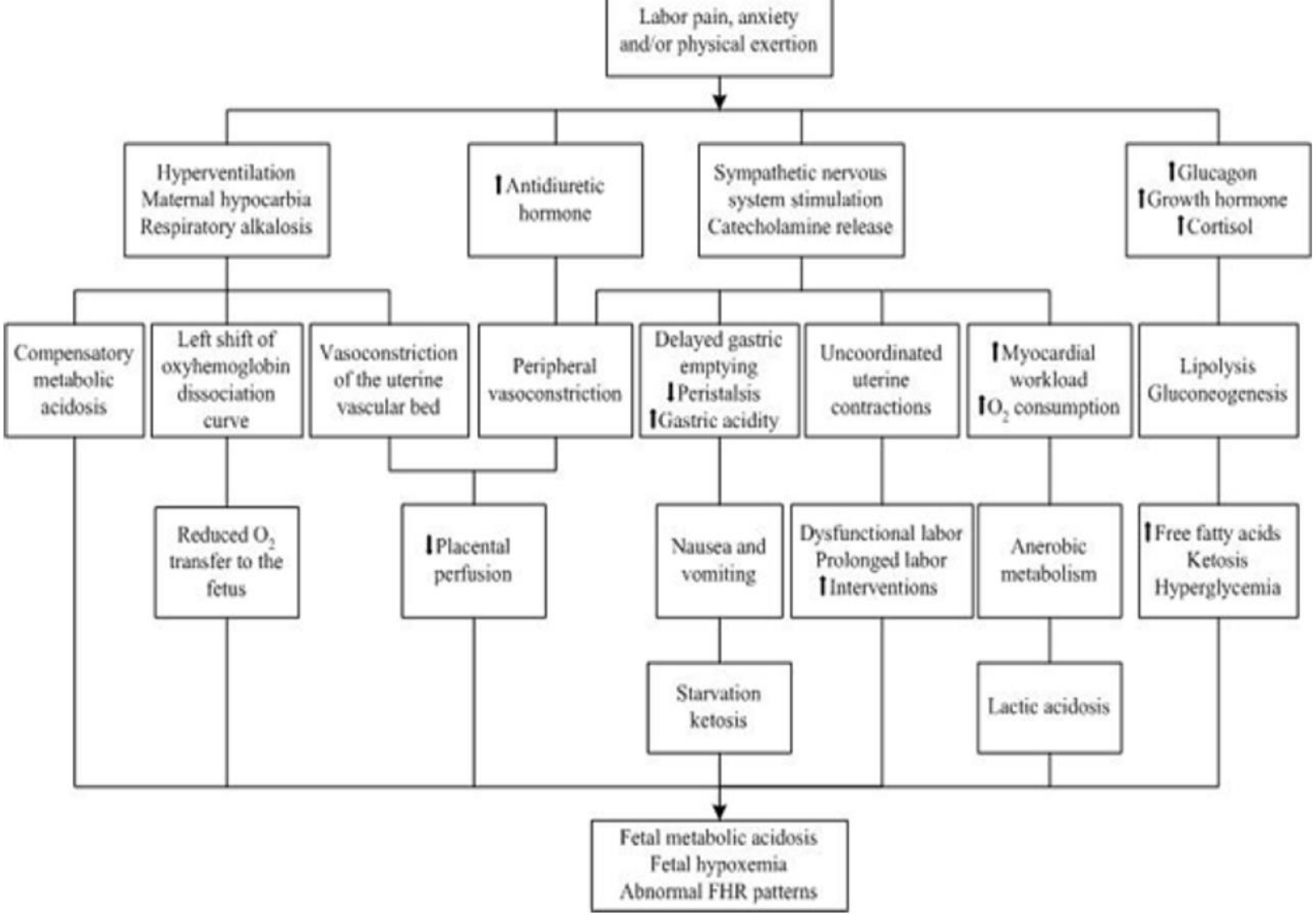

FIGURE 2 Potential adverse effects of untreated maternal pain on the fetus (adapted and modified from: *Brownridge P, Cohen SE, Ward ME.* Neural blockade for obstetrics and gynecologic surgery. *In*: Cousins MJ, Bridenbaugh PO (Eds). Neural Blockade in Clinical Anesthesia and Management of Pain, 3rd ed. Philadelphia: Lippincott, Williams & Wilkins; 1998: 557–604).

Golden Hour of life

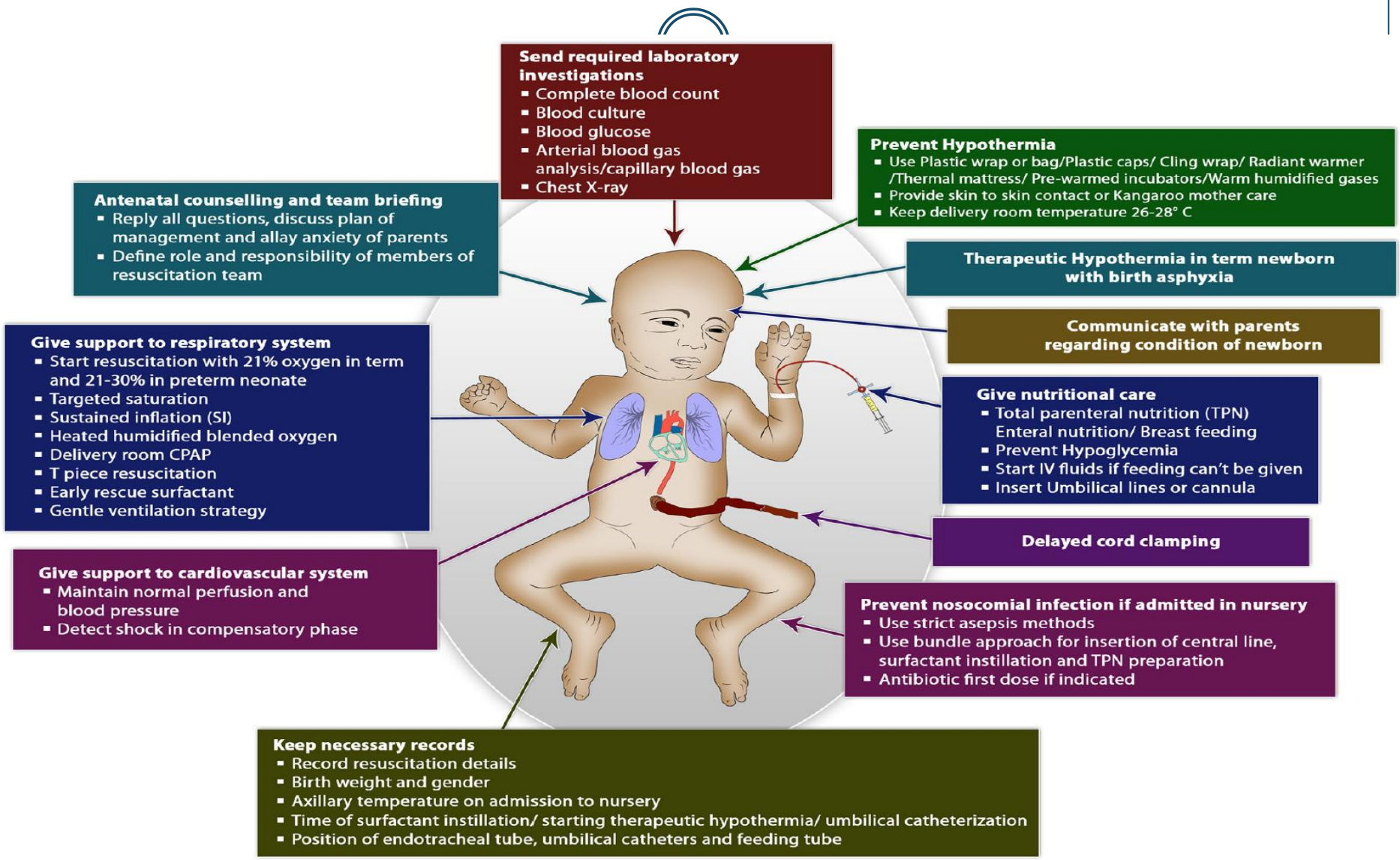

Fig. 1 Figure showing golden hour interventions to be done at the time of preterm and term newborn birth (Figure copyright Dr Deepak Sharma)

Pharmacokinetics and pharmacodynamics and the fetus and neonate

- When considering the effect of any medication on the fetus :
- Whether that medication has produced cerebral effect on the mother
- If yes the drug is lipophilic and has the properties to cross the BBB and likely will cross the placenta to reach the fetus

Pharmacokinetics and pharmacodynamics and the fetus and neonate

- How much of the drug is in the ionized or non ionized form :A medication that is ionized cannot cross a membrane barrier.
- Local anesthetics as a class are weak bases (pKa = 7.6-9.1), so at physiologic pH (7.4) more of the drug is in the ionized state. The ratio by which a local anesthetic is ionized in the circulation depends on how much higher the pKa is from 7.4.

Pharmacokinetics and pharmacodynamics and the fetus and neonate

- If the fetal pH is lower than the maternal pH because of acidosis, more of the drug converts to the ionized form and cannot return to the maternal circulation. If maternal exposure to the medication persists, more of the drug passes from mother to fetus, and increasing amounts accumulate in the fetal circulation. This phenomenon is called *fetal ion trapping* and has been associated with some of the deleterious effects produced by medications in the compromised fetus.

Pharmacokinetics and pharmacodynamics and the fetus and neonate

- drugs that are lipophilic properties are more capable of crossing lipid-rich membranes. Most medications used in obstetrics are lipophilic but to varying degrees. For example, fentanyl and sufentanil are lipophilic opioids, but sufentanil is much more so. As a result, epidural doses of sufentanil more readily leave the epidural space to enter the maternal circulation .

Pharmacokinetics and pharmacodynamics and the fetus and neonate

- Whether drug prefers to bind to protein or be free
- Only the unbound drug is free to cross a membrane and produce an effect. So excluding active transport mechanisms, it is the unbound, nonionized portion of a lipophilic medication that can cross a membrane barrier to produce an effect.

Pharmacokinetics and pharmacodynamics and the fetus and neonate

- The pharmacokinetic effects of metabolism and elimination are yet another regulator of how much a drug will exert an effect on the fetal brain.
- Most medications undergo extensive metabolism into inactive metabolites in the maternal circulation. One example of a rapidly metabolized medication is succinylcholine, a depolarizing muscle relaxant. This medication is metabolized to benign metabolites by pseudocholinesterase in the maternal plasma and has a half-life of about 90 seconds. As a result, nothing reaches the fetus.
- However, if a drug is metabolized into an active metabolite in the maternal system and then crosses into the fetal system, that metabolite can have fetal effects. Such is the case with normeperidine, the active metabolite of meperidine.

Pharmacokinetics and pharmacodynamics and the fetus and neonate

- A useful measurement that helps estimate fetal medication exposure is the ratio of the umbilical vein drug con-centration to the maternal vein (UV:MV). A ratio of 1 (UV:MV = 1) means that the amounts of medication in the umbilical vein equal those in the maternal vein. A low ratio means that a small amount has crossed the placenta to reach the umbilical vein.

Neuraxial analgesia

- **FETAL EFFECTS** — can affect the fetus directly by placental transfer of local anesthetic or opioids, or indirectly via maternal effects (ie, hypotension or uterine hypertonia)

Neuraxial analgesia

- Hypotension caused by neuraxial block can result in decreased fetal oxygenation and a deterioration in the fetal heart rate pattern (eg, bradycardia, repetitive late decelerations).

Neuraxial analgesia

- in the absence of hypotension, epidural local anesthetics have been shown to improve intervillous blood flow , to have minimal effect on uterine or fetal umbilical vasculature as assessed by Doppler velocimetry , and to be associated with improved neonatal acid–base status

Neuraxial analgesia

- Fetal bradycardia after rapid onset of analgesia usually occurs within the first 15 minutes, and when treated with usual measures, does not result in fetal acidemia, low Apgar scores, or the need for cesarean delivery

Neuraxial analgesia

- **EFFECTS ON BREASTFEEDING** — The effects on breastfeeding are controversial and difficult to study, and existing literature is insufficient to make recommendations on this issue. Studies of the effects of labor analgesia on breastfeeding have reported conflicting results, and have included heterogeneous patient populations and labor analgesia techniques, and differing methods for evaluating breastfeeding

- **Local anesthetics** However, it is important to be in mind that the exposure of the baby to the anesthetic drugs through breast milk is insignificant compared to the placental transfer of the drug. Several studies have been published regarding this matter, with conflicting results. A systematic review, regarding the outcomes in breast feeding following labor epidural analgesia, studies demonstrating negative associations between epidurals and breastfeeding success, 10 studies demonstrating no effects, and 1 study with a positive association.

Effects of opoids

- Opioids administered systemically or epidurally rapidly enter the maternal circulation, cross the placenta, and equilibrate with fetal circulation . However, with the low concentrations of lipophilic opioids (eg, fentanyl and sufentanil) used for labor analgesia, even prolonged epidural opioid infusion rarely causes fetal accumulation, neonatal respiratory depression, or reduced neonatal behavioral scores

- Neurobehavioral studies in neonates whose mothers received epidural analgesia or systemic opioids have shown either no difference or improved scores in neonates of mothers receiving epidurals .
- A meta-analysis of 10 randomized trials reported that neonates of mothers who received epidural analgesia had fewer Apgar scores below seven and required naloxone less often than those whose mothers received systemic opioids .

The effects of opoids

- The doses of opioid used for intrathecal administration are considerably lower than epidural doses, and maternal systemic uptake is negligible, such that direct fetal or neonatal effects are unlikely

- **EPIDURAL ANALGESIA AND CHILDHOOD AUTISM** — After review of available data, there is no convincing evidence that labor epidurals cause autism spectrum disorder (ASD) or other types of behavioral or learning disabilities in the parturient's infant, and no evidence that choosing another form of pain relief for labor, or no pain relief, reduces the risk of autism or other disabilities.
- Relevant evidence consists of retrospective observational or database studies, and results are mixed. In studies that have shown an association between epidural analgesia and offspring risk of ASD, that association usually disappears when adjusting for confounders .

Maternal fever and epidural anesthesia

- EA is associated with a significantly higher incidence of maternal intrapartum fever
- Maternal fever during labor increases the risk of neonatal morbidity.
- Some studies have shown that neonates born to mothers with epidural associated fever have a higher likelihood of being investigated and treated for neonatal sepsis. However, many other studies failed to show any significant effects of
- epidural analgesia on neonatal outcomes

. Short-term neonatal outcomes of the mothers who received EA in Qatar

- This was a retrospective cohort study involving 2360 low-risk nulliparous women
- who delivered at AWH, Qatar, during the two years between January 2016 December and 2017. Short-term neonatal outcomes of the mothers who received EA in active labor werecompared with a similar population who did not receive EA. As secondary objectives, labor
- parameters like maternal temperature elevation, duration of the second stage of labor, and
- instrumental delivery were compared

- Conclusion : this study suggests that labor EA adversely affects the

short-term neonatal outcome. It increases the NICU admission rate, antibiotic exposure, neonatal birth injuries , respiratory distress, and need for oxygen in the first 24 hours of life. But no effects were observed on the

- Apgar score, need for resuscitation, mechanical ventilation

rate, and neonatal lab parameters.

Mothers on epidural analgesia had a prolonged second stage of labor, a higher

- percentage of instrumental delivery, meconium-stained amniotic fluid and fever. The need for Caesarian delivery remains unaffected.

- Although essential for meticulous care of sick neonates, the NICU stay separates the baby from the mother, causes parental anxiety, breastfeeding failure, and puts the baby at risk for medical errors and healthcare-associated infections. This is in addition to the cost factors.

JAMA Network Open. 2021;4(10):e2131683. doi:10.1001/jamanetworkopen.2021.31683 (

- This study included a total of 435 281 live births with cephalic presentation in labor
- (median gestational age at delivery, 40 weeks [IQR, 39-41 weeks]; 221 153 male infants [50.8%]), of
- which 94 323 (21.7%) had labor epidural

JAMANetwork Open | Anesthesiology Association of Epidural Analgesia With Neonatal and Childhood Outcomes

- To account for confounding by indication, a propensity score–matched sensitivity analysis was performed that found no difference between groups for neonatal resuscitation (RR,0.99; 95%CI, 0.95-1.04) but an increased risk of neonatal unit admission with epidural use (RR, 1.10;95%CI, 1.06-1.14). Epidural use was associated with a decreased risk of an Apgar score less than 7 at 5 minutes in Cadj analysis (Cadj RR, 0.92; 95%CI, 0.86-0.99), mediation analysis (CMadj RR, 0.74;
- 95%CI, 0.69-0.79), and in propensity score–matched analysis (Cadj RR, 0.84; 95%CI, 0.78-0.91),
- with similar findings for the more severe outcome of an Apgar score less than 4 at 5 min

- Studies of associations between labor epidural analgesia and longer-term childhood outcomes are scarce.
- A study of 4684 children born vaginally between 1976 and 1982 indicated that maternal epidural use was not associated with an increased risk of learning difficulties by age 19 years.
- More recently, a retrospective cohort study of 147 895 children showed a 37%relative increase in the risk of autism in babies whose mothers had epidural analgesia in labor. This report stimulated debate
- and statements from professional societies regarding the

- A subsequent Canadian population-based study of 123 175 offspring found
- no association between labor epidural and autism, although the study did not examine other more
- general markers of childhood development. In this study, they focused on a routine, standardized national program of childhood surveillance assessments in 4 developmental domains, providing an over view of childhood developmental attainment at 2 years of age, and found no detrimental association with epidural use.

Effects on breast feeding

- Lactogenesis is a two-stage process: stage I (secretory initiation) — during the second half of pregnancy, and stage II (secretory activation) — after delivery. Stage II lactogenesis occurs between day

2 and 4 postpartum, and is marked by the swelling of the mother's breasts and the onset of copious milk production. If failure to lactate occurs during that stage, breastfeeding can be delayed up to 7–10 days postpartum

Effects on breast feeding

- During the postpartum period, physical contact between the mother and the infant, as well as contact between the infant's lips and the nipple, are associated with increased initiation and duration of breastfeeding

Effects on breast feeding

- There is evidence to suggest that the initiation rates of breastfeeding are lower in infants born by cesarean section (CS), as compared to vaginal delivery (VD). However, there is no difference in breastfeeding rates between infants born by VD and those delivered via CS at 6 months of age

Effects on breast feeding

- General anesthesia used for CS may decrease alertness of the infant and interfere with initiation of nursing. However, this is an infrequent problem as most cesarean deliveries are performed under local anesthesia

Effects on breast feeding

- Breastfeeding is affected by many factors, like the mother's feeding demands, regional traditions, the relationship between the mother and the newborn, education, social factors, type of delivery, and duration of delivery. Because of these factors, the type of anesthesia can play a role on onset time of breast feeding

Effects of different anesthesia protocols on lactation in the postpartum period

- J Turk Ger Gynecol Assoc 2014; 15: 233-8

- they consider that the onset time of lactation is delayed in patients undergoing cesarean section with general anesthesia when compared with patients who undergo cesarean section with spinal and epidural anesthesia and with patients who undergo normal vaginal birth. Because of the delay of awakening and recovery of cognitive functions in general anesthesia, communication between the mother and the newborn is delayed and so is the lactation

- Delayed awakening, delayed recovery of cognitive functions and delayed communication between mother and infant in general anaesthesia may prolong the first breastfeeding interval
- Medications used in general anaesthesia may be an effective factor in inducing and initiating breastfeeding

Pain control and anesthesia in lactating mother

- **Benzodiazepines**Diazepam should be avoided even in single doses in breast-feeding mothers due to its adverse effects in the neonate .Midazolam, on the other hand, seems to be safe when given as a single dose.

hypnotics

- The main induction agents (propofol, thiopental, and etomidate) seem to be safe for lactating mothers whenadministered as a single dose at the induction of anesthsia

- Halothane and xenon gas seem to be safe because their concentration in milk were considered negligible. As for isoflurane, enflurane, sevoflurane, and desflurane, the theoretical risk for the suckling infant is considered low because of their pharmacokinetic profile. Also, regarding nitrous oxide, we have not found clinical trials of its intrapartum use with breast-feeding as the primary outcome. But there is some evidence that it has the potential to cause positive effects on both women's psychoemotional experience of labor and breast-feeding success.

- **Opioids** Meperidine should be avoided even in single doses in breast-feeding mothers due to its adverse effects in the neonate . The other opioids seem to be safe when administered as a single dose.