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LABOR ANALGESIA

The source of these differences in labor pain is not completely known but may be in part genetic.

In one study, Asian women reported more pain in labor than women of other ethnic backgrounds. This association was also found with a single nucleotide-polymorphism in the β 2-adrenergic gene.

Other factors may include

pelvic size

and shape, fetal presentation,
and

whether the contractions are
augmented.

The background of the slide is a light blue, slightly blurred image of an aquarium. In the bottom right corner, a goldfish is visible, swimming towards the left. Above it, several white bubbles are rising. The overall scene is calm and aquatic.

NONPHARMACOLOGIC LABOR PAIN MANAGEMENT



Acupuncture

Acupuncture
can be effective in
treating
postoperative pain
after
cesarean section, but
it is not as effective
for analgesia during
labor.



massage

Several trials have found a reduction in pain and anxiety during the first stage of labor with the use of massage.

Hypnosis

Hypnosis has been used both as a relaxation technique and for management of pain during labor. When hypnosis was compared with standard care, no evidence was found that pain was less after hypnosis, nor was evidence found for a difference in satisfaction with pain relief.

Other nonpharmacologic techniques include the

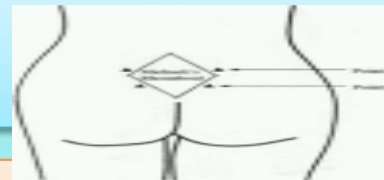
Breathing techniques described by Lamaze (rhythmic **breathing exercises** that reduce heart rate, anxiety, and pain perception during labor), the LeBoyer technique (gentle **birthing** techniques, in particular, the practice of immersing newborn **infants** in a small tub of warm water — known as a "LeBoyer bath") and biofeedback **technique** (mind-body **technique** that involves using visual or auditory feedback to gain control over involuntary bodily functions such as blood flow, blood pressure, and heart rate)

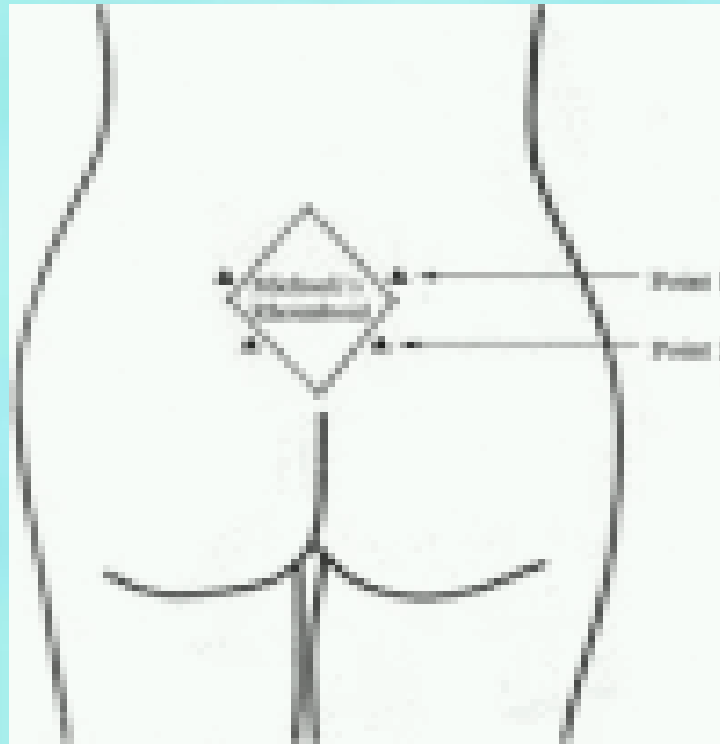
Transcutaneous nerve stimulation,

Hydrotherapy


Presence of a support person,

Intradermal water
injections over the sacrum





The Michaelis' rhomboid and points for injection (From: Martensson L, Wallin. G. Labour pain treated with cutaneous injections of sterile water: a randomized controlled trial)

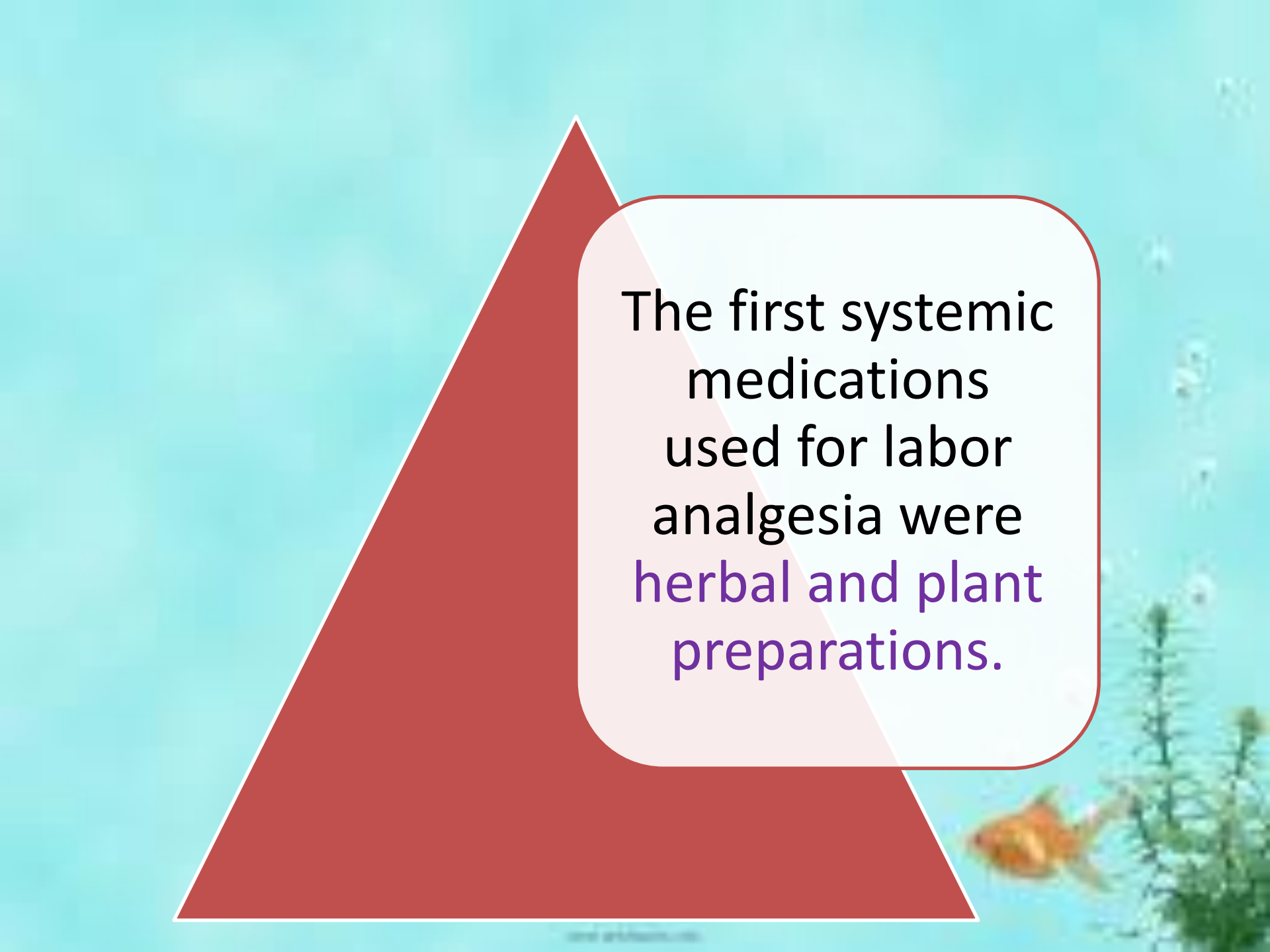
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PHARMACOLOGIC TREATMENT OF PAIN IN LABOR

Although any laboring woman has the potential to require cesarean section, labor takes many hours and requires adequate nutrition and hydration. While balancing these two considerations, the ASA has recommended that moderate amounts of clear liquids be allowed during the administration of neuraxial analgesia and throughout labor and, furthermore, a period of abstention from solids before the placement of neuraxial analgesia is not required. However, the ASA does recommend the ingestion of solid foods be avoided in laboring patients.

SYSTEMIC MEDICATIONS



The background is a light blue image of a goldfish tank. A large, solid red triangle is positioned on the left side, pointing towards the top. Overlapping the right side of this triangle is a white rounded rectangle with a thin red border. Inside this rectangle, text is displayed. The text reads: "The first systemic medications used for labor analgesia were herbal and plant preparations." The words "herbal and plant preparations." are in a purple color, while the rest of the text is black.

The first systemic medications used for labor analgesia were herbal and plant preparations.


Extracts of the poppy plant that contain opium have analgesic properties that are clearly a result of their activation of the μ -opioid receptor.

Opioids are used commonly for labor analgesia because they are mostly inexpensive and widely available

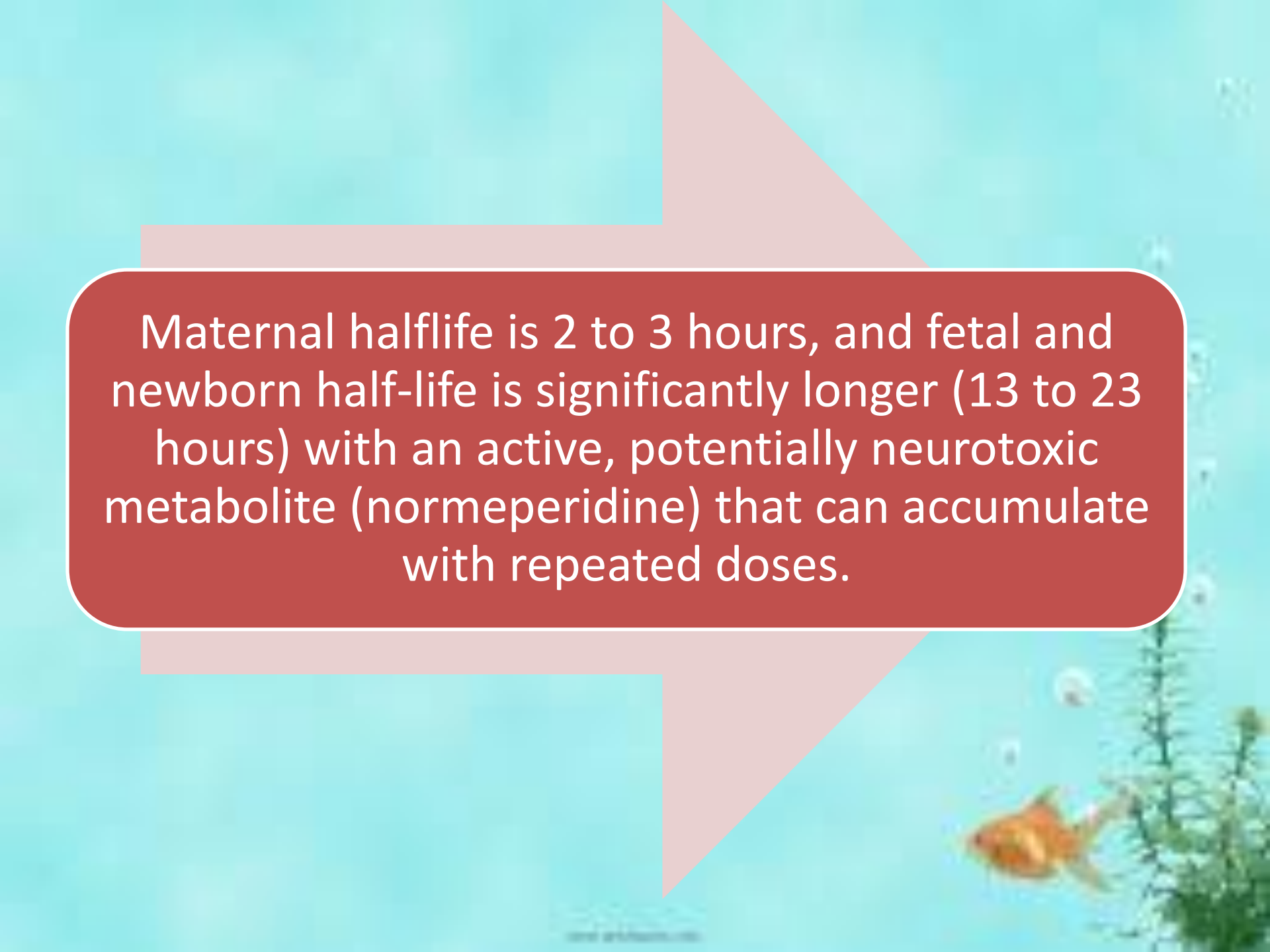
Worldwide, meperidine is the most commonly used long-acting opioid in obstetric practice



but, unfortunately, the most likely to result in side effects



It is typically administered intravenously in doses of up to 25 mg or intramuscularly in doses up to 50 mg.

A goldfish is swimming in an aquarium. In the background, there is a large, semi-transparent red arrow pointing to the right. The text is overlaid on the arrow.

Maternal half-life is 2 to 3 hours, and fetal and newborn half-life is significantly longer (13 to 23 hours) with an active, potentially neurotoxic metabolite (normeperidine) that can accumulate with repeated doses.



Morphine is rarely used for labor pain.

Like meperidine it has an active metabolite (morphine-6-glucuronide) with a half-life that is longer in neonates than in adults, and it produces significant maternal sedation

Obstetricians may use intramuscular morphine combined with phenergan for analgesia, sedation, and rest termed “morphine sleep.” This combination produces analgesia and sedation for approximately 2.5 to 4 hours, with an onset of 10 to 20 minutes and is used most commonly in latent labor.

Nalbuphine

Nalbuphine has similar analgesic potency as morphine. It is given either intravenously, intramuscularly, or by subcutaneous injection at doses of 10 to 20 mg every 4 to 6 hours.

Butorphanol

Butorphanol is five times as potent as morphine and 40 times more potent than meperidine.

A dose of 1 to 2 mg intravenously or intramuscularly is commonly used for labor analgesia. Both medications are often well tolerated by the parturient.

Fentanyl has a short duration and no active metabolites. When given in small IV doses of 50 to 100 $\mu\text{g/hr}$, no significant differences are seen compared with those in newborns of mothers not receiving fentanyl in neonatal Apgar scores and respiratory effort

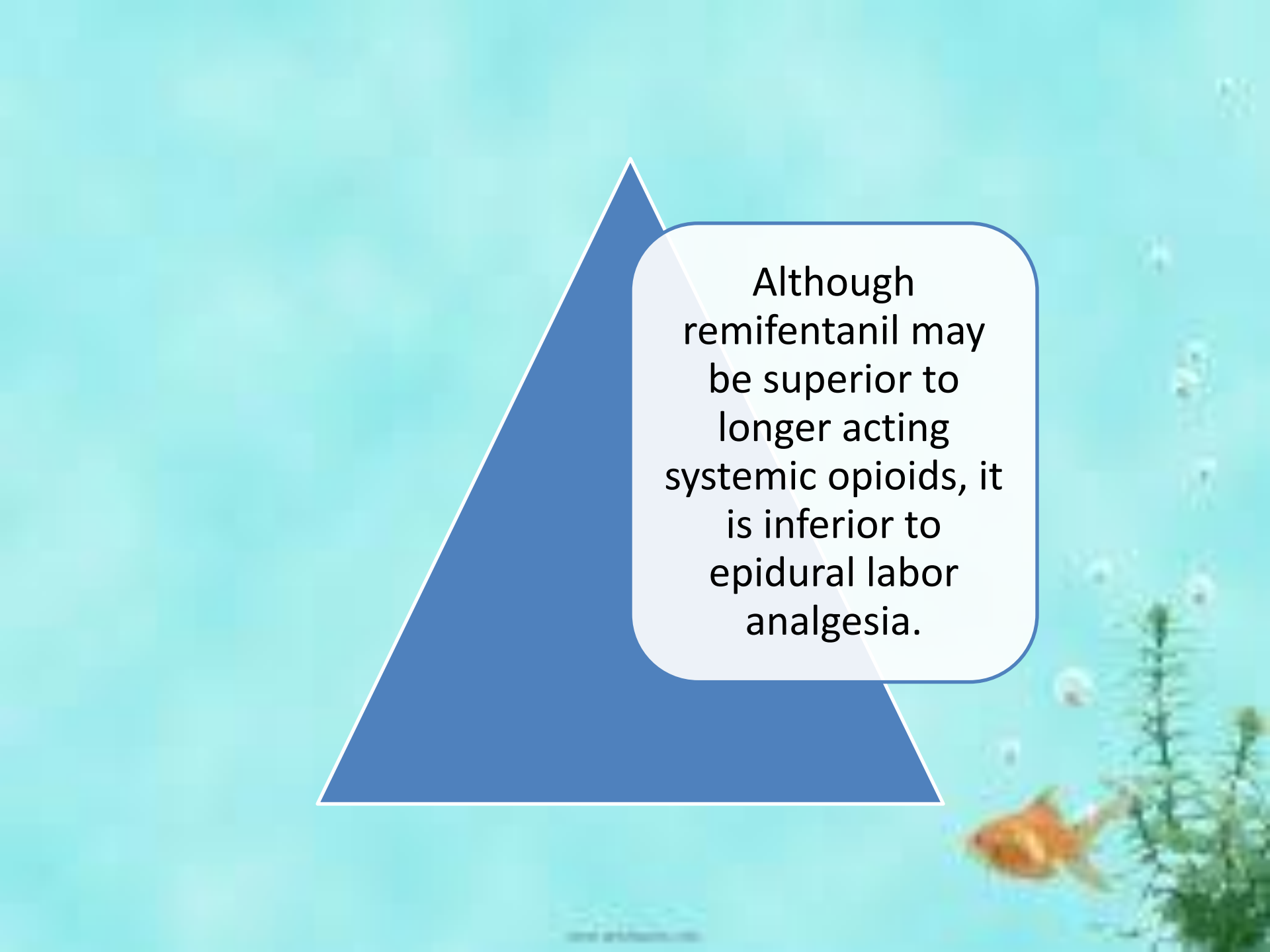
Fentanyl is also commonly used inpatient-controlled analgesia (PCA) during labor. Common doses utilized for fentanyl PCA include a bolus dose of 10 to 25 μg with a lockout interval of 5 to 12 minutes. High doses of systemic fentanyl, especially immediately prior to birth, could result in neonatal depression.

Remifentanyl

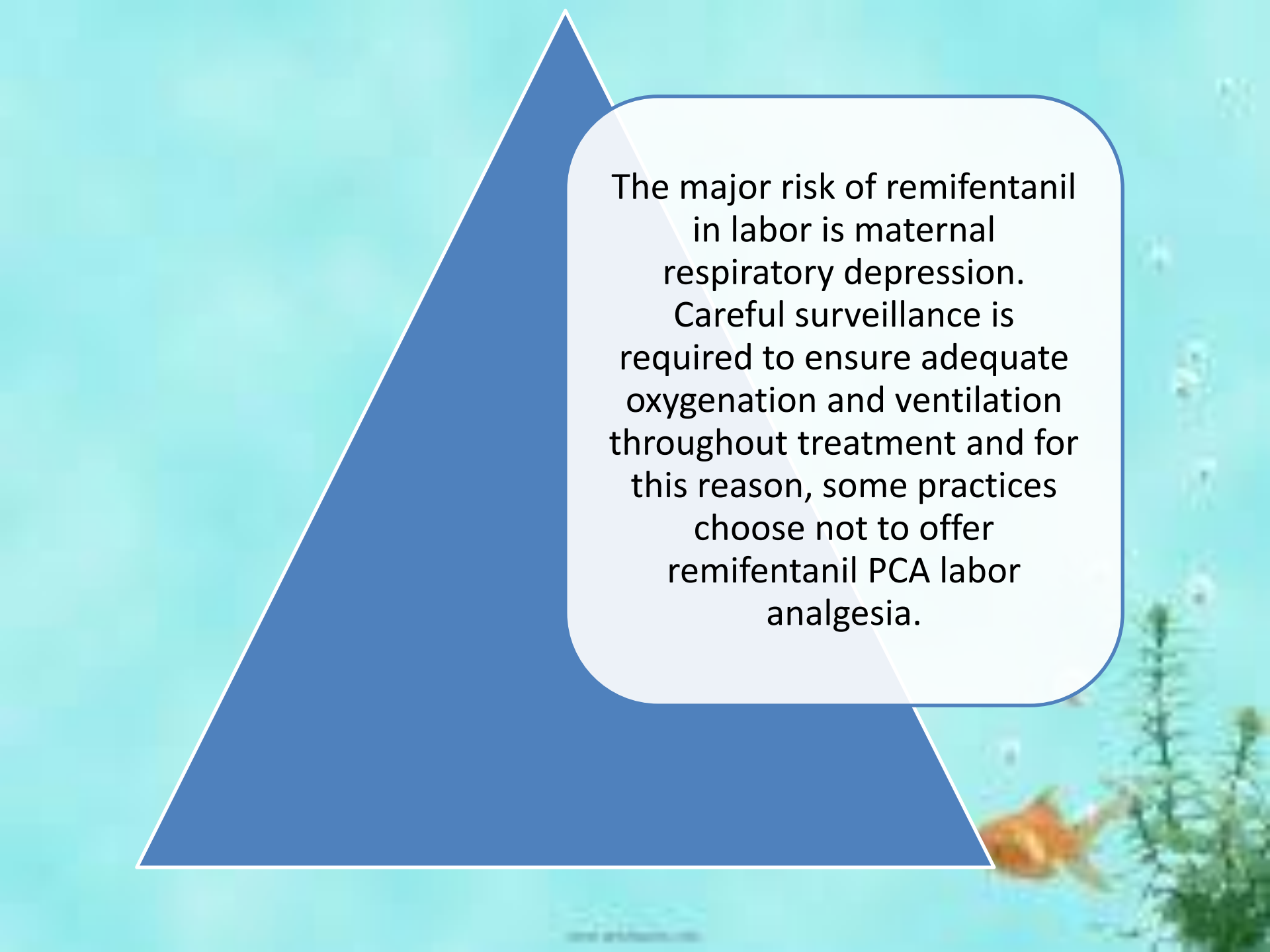
Remifentanyl has entered clinical practice as an alternative to neuraxial analgesia for patients with contraindications and in some settings as an alternative for patients who simply do not desire neuraxial anesthesia.

In addition, remifentanyl offers an important safety advantage when used in active labor in that it is an ultra short acting opioid highly metabolized by placental esterase and thus the fetal-to-maternal ratio is small.

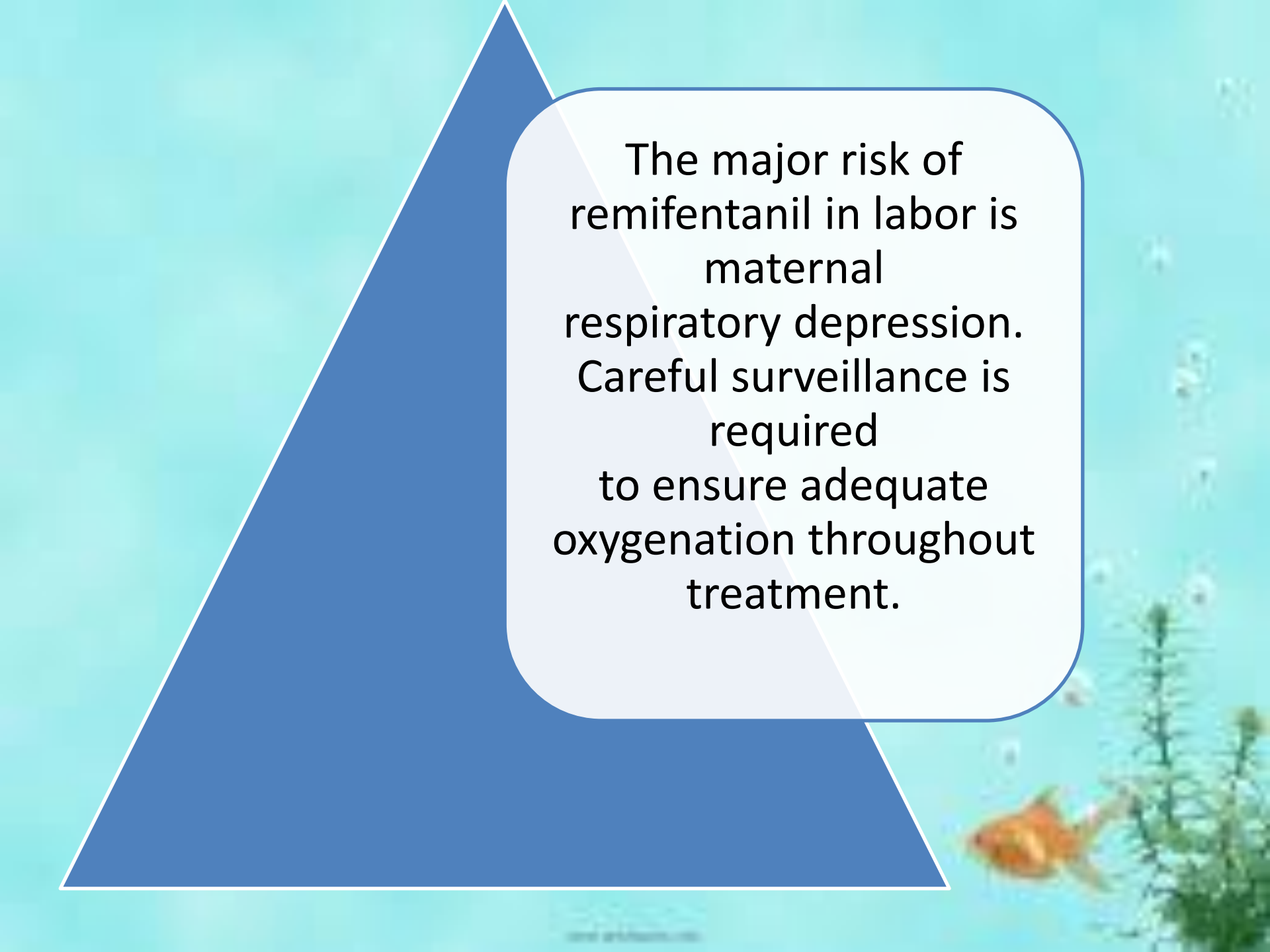
Thus, remifentanyl does not depend on the maturity of any organ for its degradation and is more rapidly metabolized in the fetoplacental unit than in the maternal

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Although remifentanyl may be superior to longer acting systemic opioids, it is inferior to epidural labor analgesia.



The major risk of remifentanyl in labor is maternal respiratory depression. Careful surveillance is required to ensure adequate oxygenation and ventilation throughout treatment and for this reason, some practices choose not to offer remifentanyl PCA labor analgesia.

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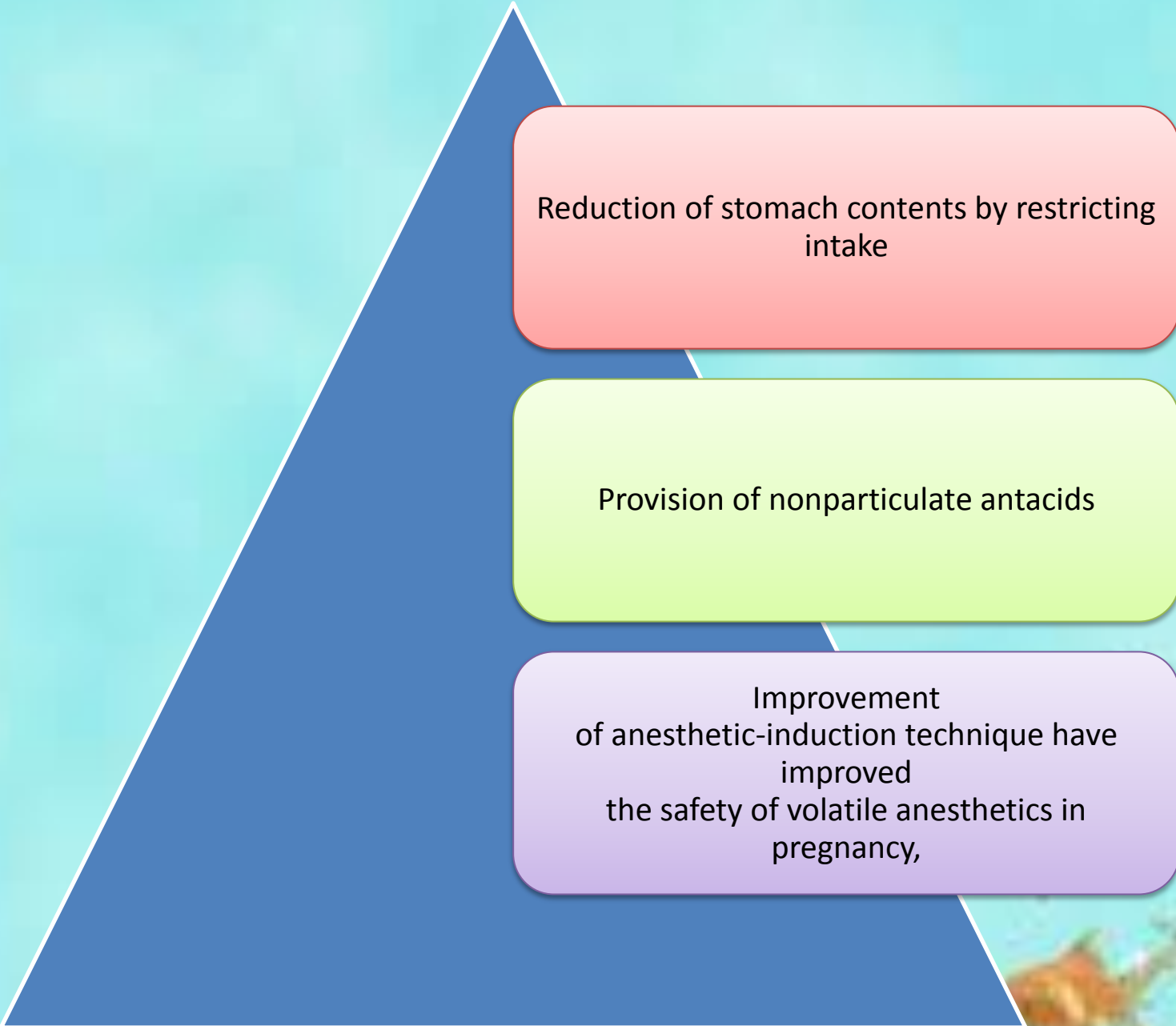
The major risk of
remifentanyl in labor is
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INHALED ANALGESIA

The background of the slide is a photograph of a goldfish swimming in a clear blue tank. A large, solid blue triangle is superimposed on the left side of the image, pointing towards the top right. Two white, rounded rectangular boxes with blue borders are positioned on the right side of the slide, overlapping the blue triangle and the background image.

Neonatal depression

and maternal gastric aspiration were reported as volatile techniques became more commonly used for operative delivery.



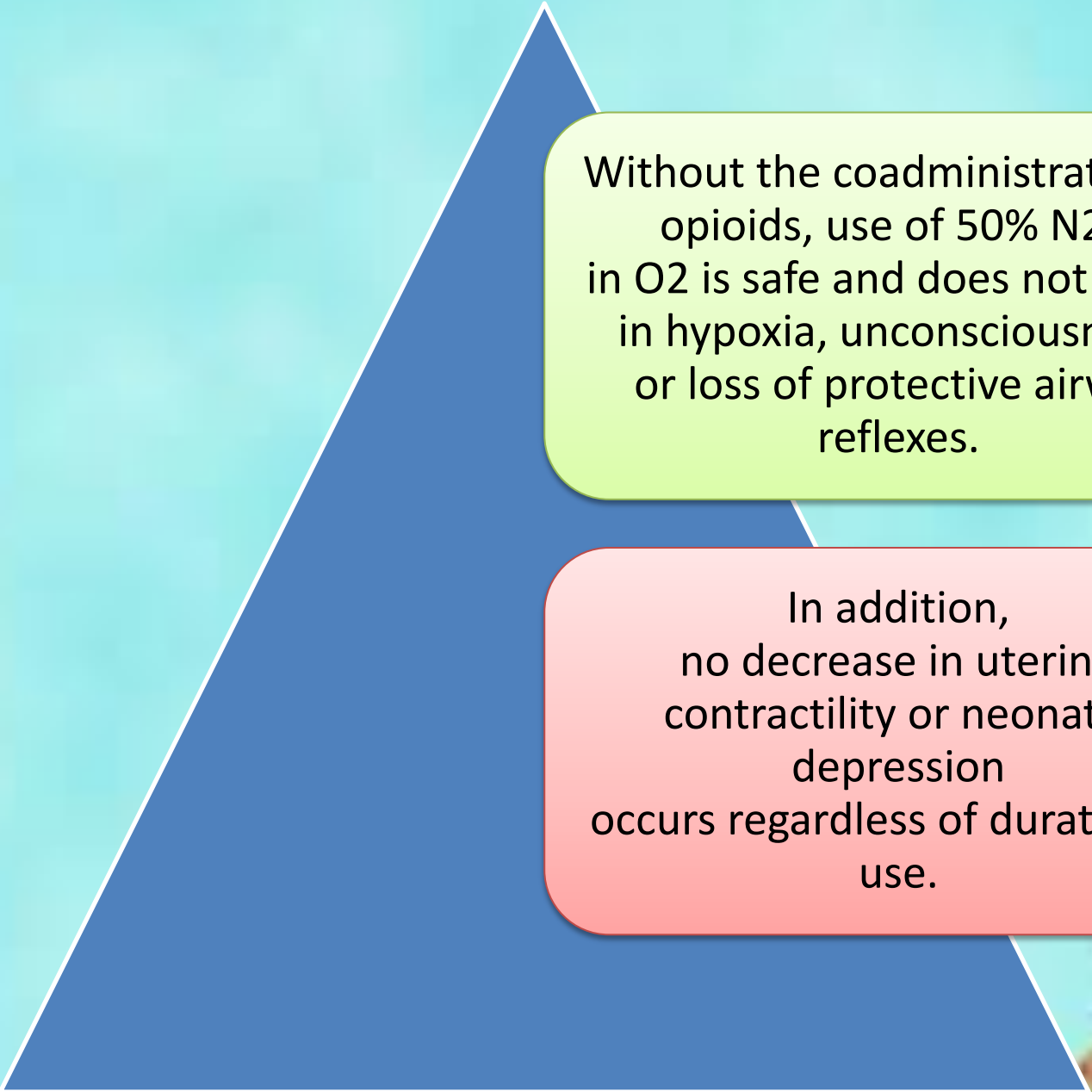
Reduction of stomach contents by restricting intake

Provision of nonparticulate antacids

Improvement
of anesthetic-induction technique have
improved
the safety of volatile anesthetics in
pregnancy,

Nitrous oxide

Nitrous oxide, however, is still commonly used worldwide and is welcomed by many parturients as a less invasive approach to pain relief in labor.



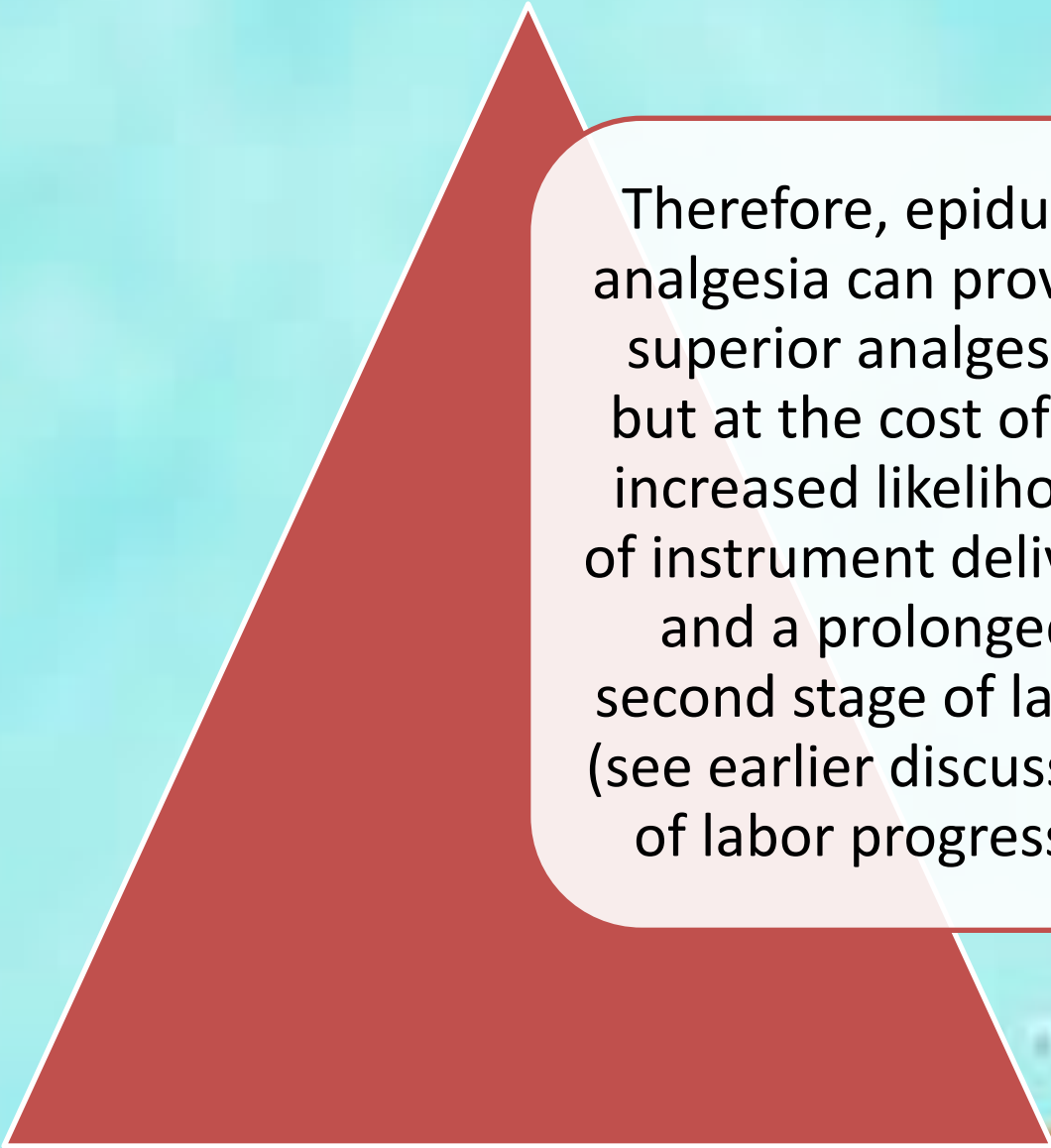
Without the coadministration of opioids, use of 50% N₂O in O₂ is safe and does not result in hypoxia, unconsciousness, or loss of protective airway reflexes.

In addition, no decrease in uterine contractility or neonatal depression occurs regardless of duration of use.

NEURAXIAL ANALGESIA

Neuraxial analgesia is the most reliable and effective method of reducing pain during labor. However, it is encumbered by small but real and predictable risks.

However, the rate of cesarean section and neonatal Apgar scores were not different.

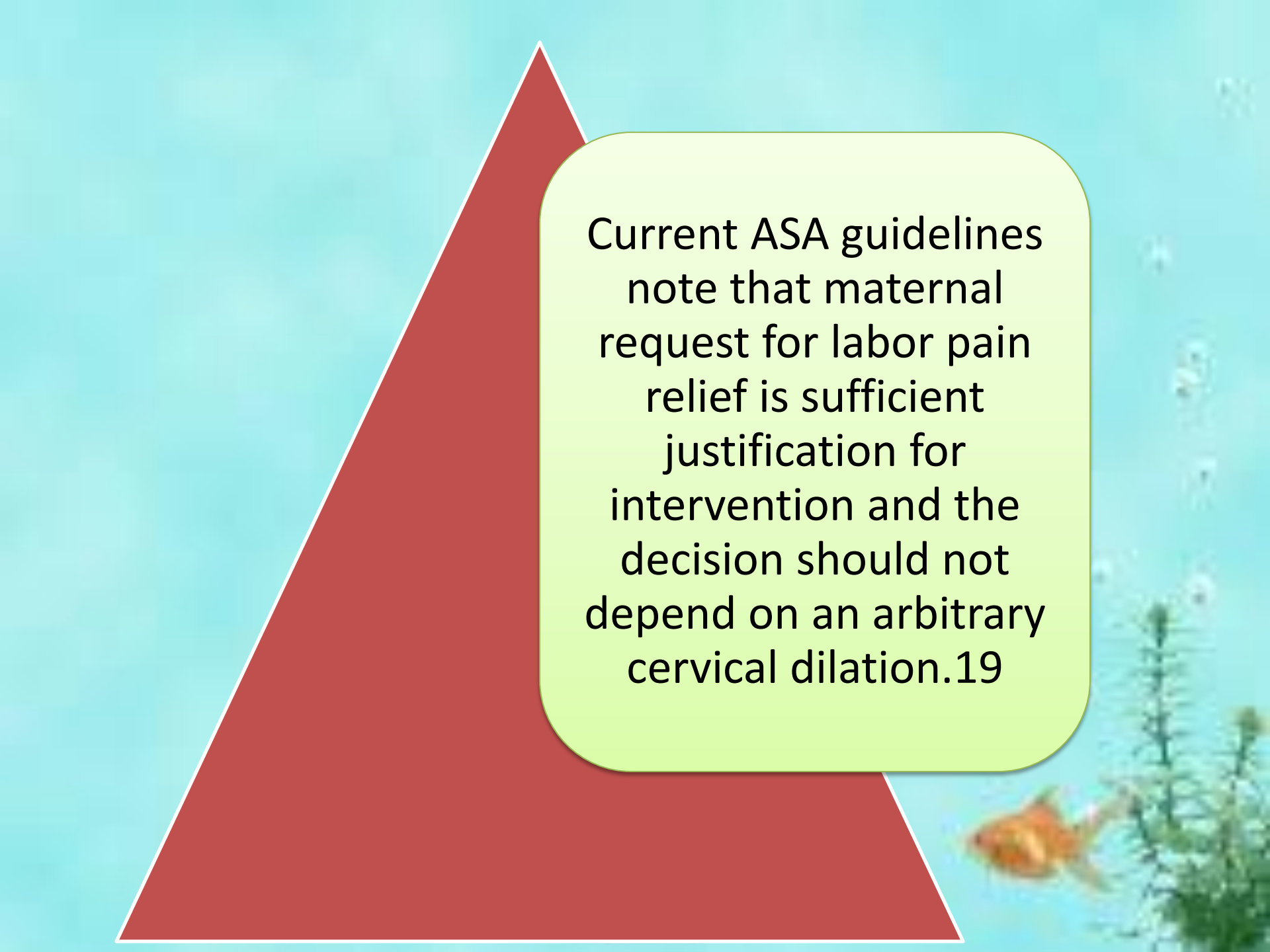


Therefore, epidural analgesia can provide superior analgesia, but at the cost of an increased likelihood of instrument delivery and a prolonged second stage of labor (see earlier discussion of labor progress).

Does the stage of labor at which the neuraxial analgesic was placed influence the ensuing time course of labor?

Timing of
Placement??





Current ASA guidelines
note that maternal
request for labor pain
relief is sufficient
justification for
intervention and the
decision should not
depend on an arbitrary
cervical dilation.¹⁹

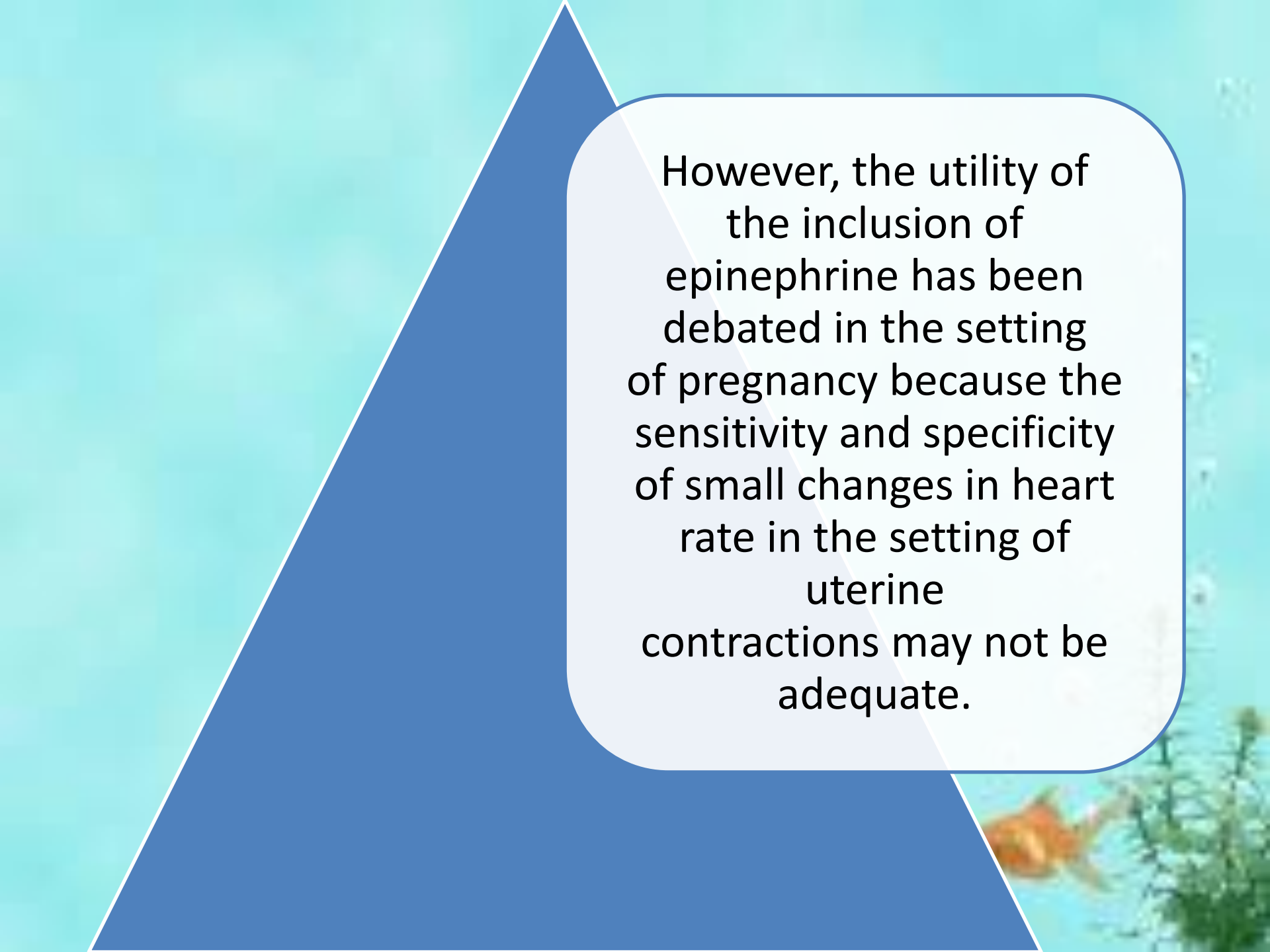
Epidural Analgesia



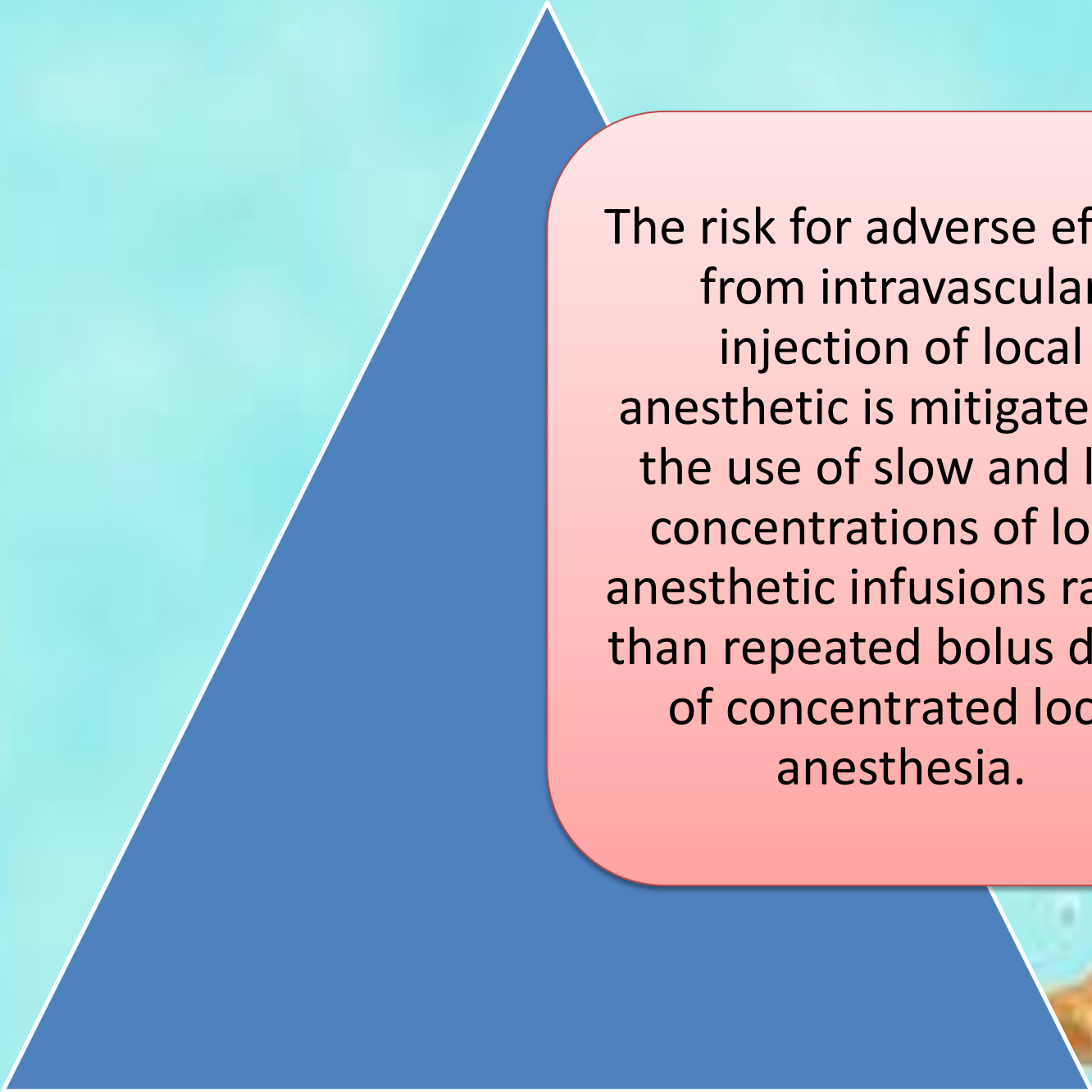
Initial dosing of local anesthetic through the needle within the epidural space is not recommended because of potential unintended intravascular placement and rapid onset of local anesthetic toxicity, including seizures, arrhythmias, and cardiovascular collapse.

Analgesia should be initiated with a test dose consisting of a dose of local anesthetic that would not be harmful if injected intravascularly but that would induce an altered sensorium, most commonly described as dizziness or a sensation of buzzing in the ears or numbness in the lips.

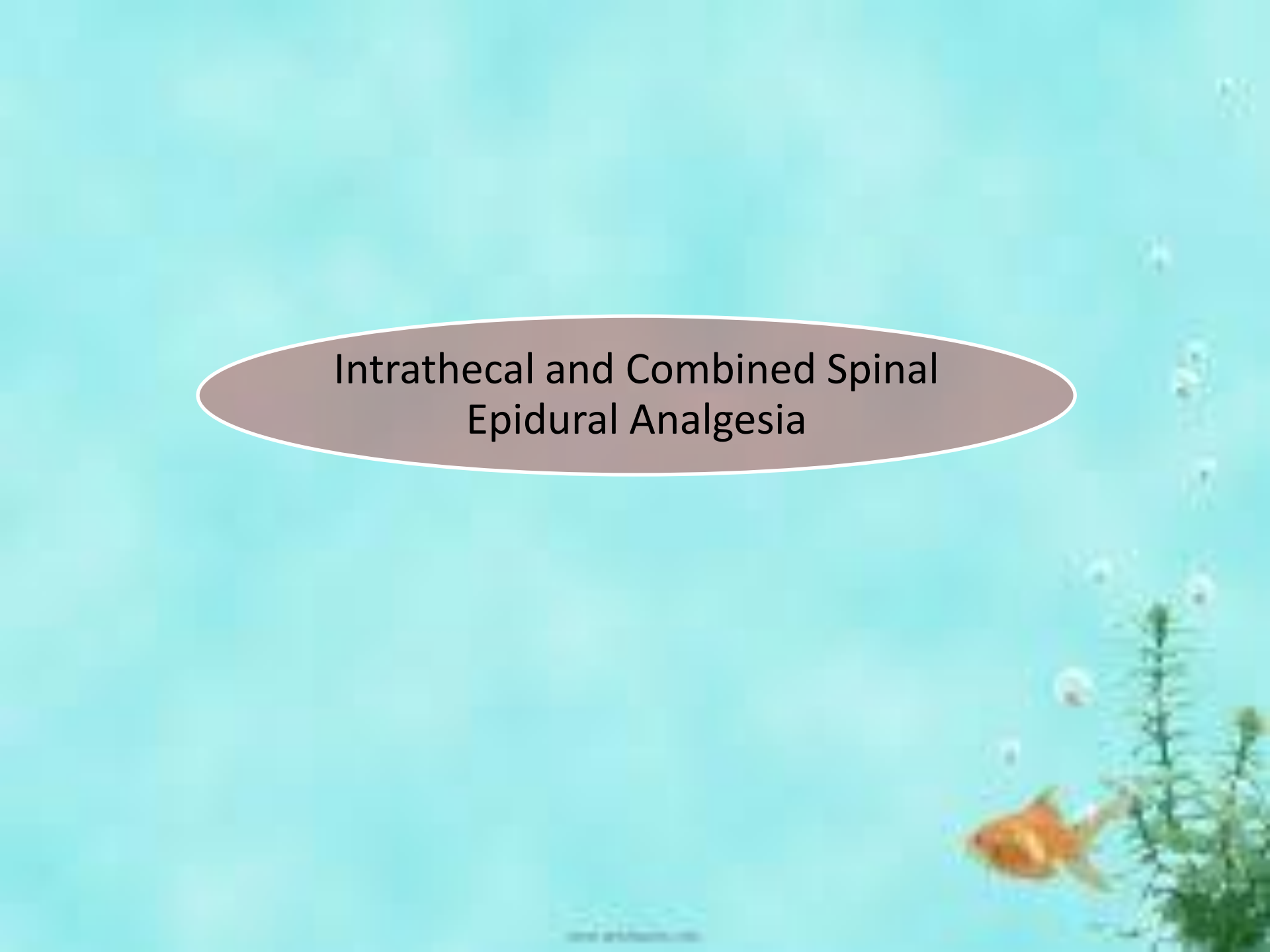




However, the utility of the inclusion of epinephrine has been debated in the setting of pregnancy because the sensitivity and specificity of small changes in heart rate in the setting of uterine contractions may not be adequate.

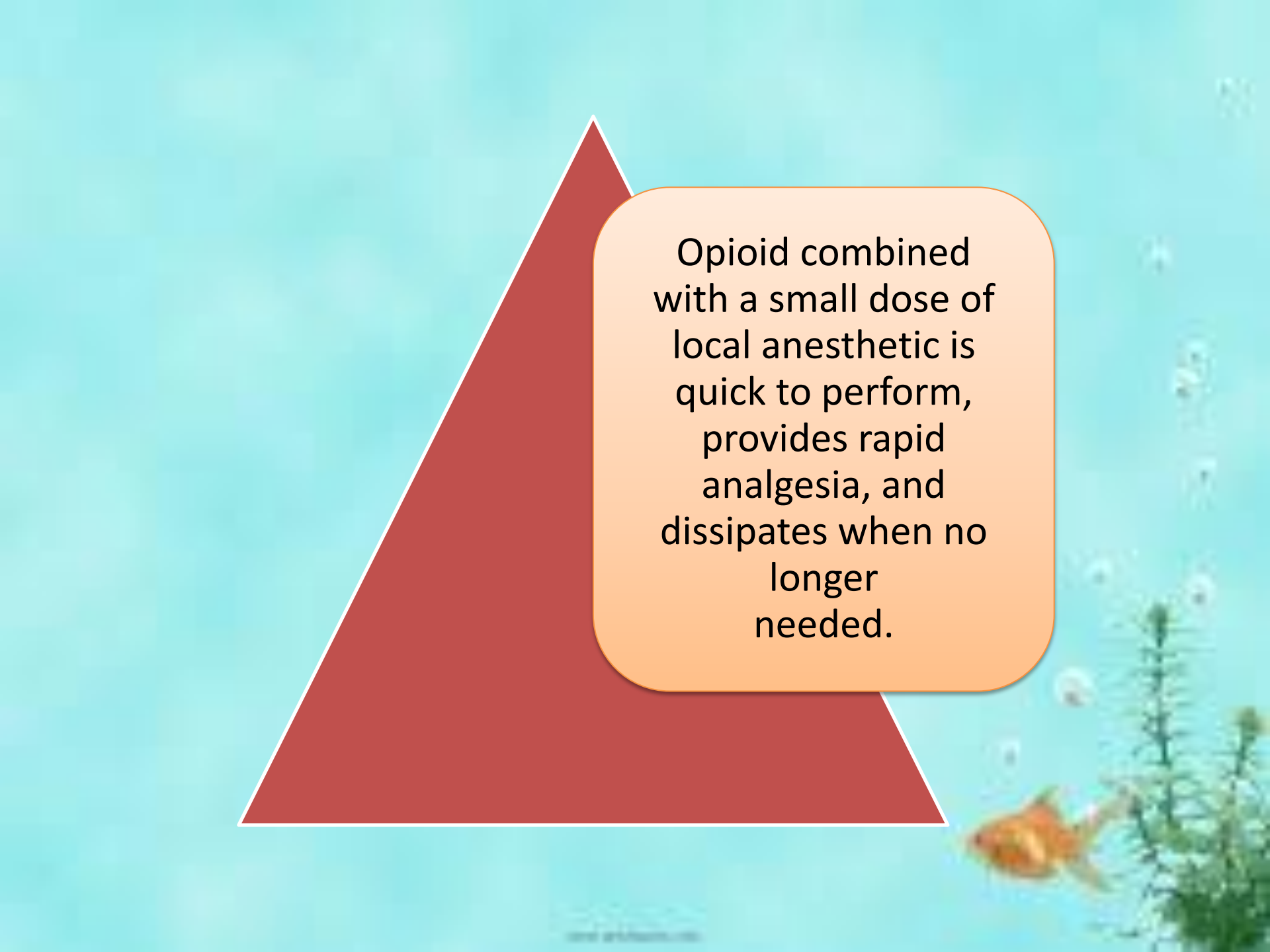


The risk for adverse effects from intravascular injection of local anesthetic is mitigated by the use of slow and low concentrations of local anesthetic infusions rather than repeated bolus doses of concentrated local anesthesia.

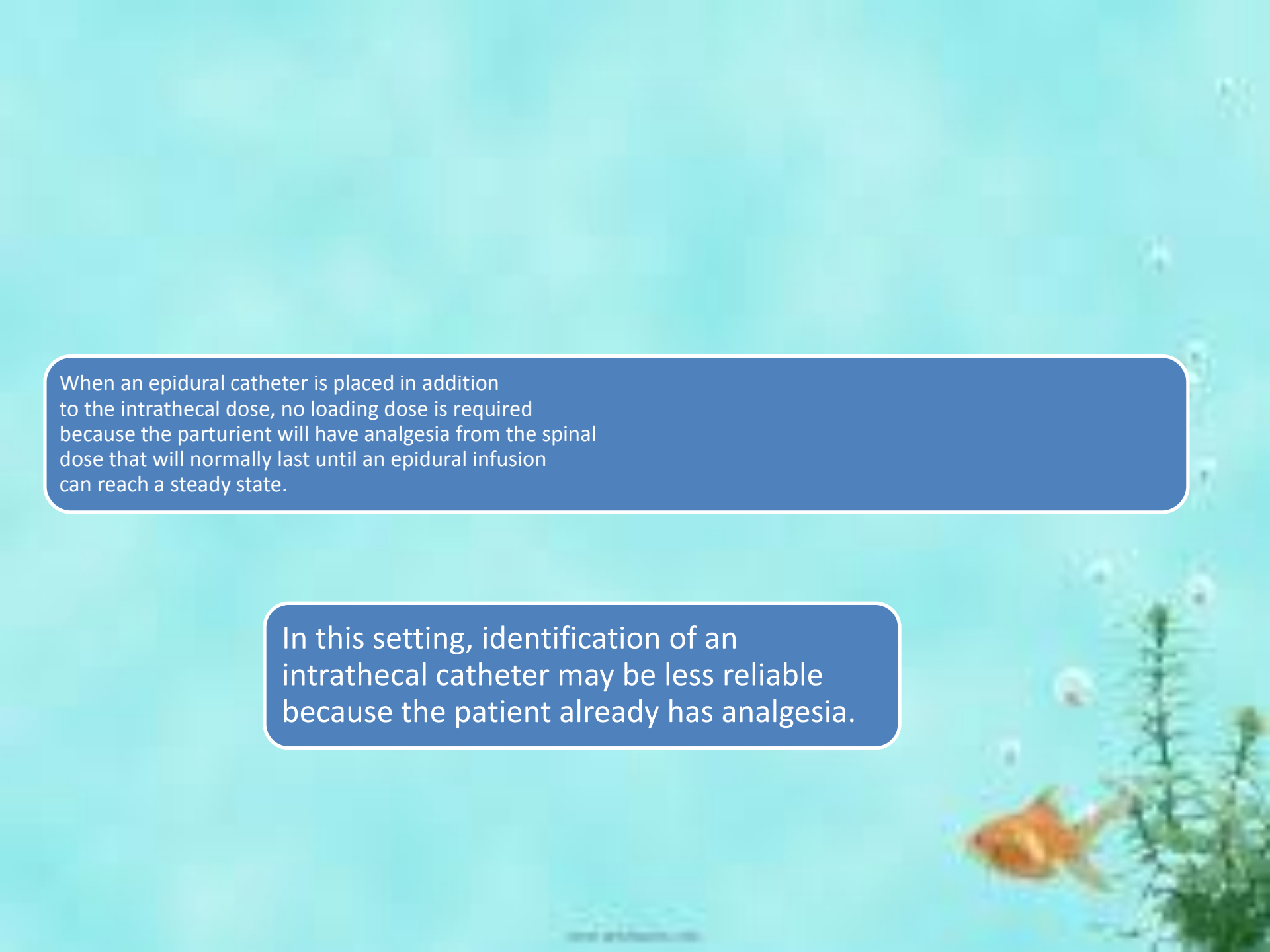
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Intrathecal and Combined Spinal Epidural Analgesia

What should be done if a multiparous parturient in the second stage of labor requests analgesia?

The background is a light blue gradient with a faint image of an aquarium. A large, solid red triangle is positioned on the left side of the slide. In the bottom right corner, there is a small, out-of-focus image of a goldfish swimming near some green artificial plants.

Opioid combined
with a small dose of
local anesthetic is
quick to perform,
provides rapid
analgesia, and
dissipates when no
longer
needed.



When an epidural catheter is placed in addition to the intrathecal dose, no loading dose is required because the parturient will have analgesia from the spinal dose that will normally last until an epidural infusion can reach a steady state.

In this setting, identification of an intrathecal catheter may be less reliable because the patient already has analgesia.

In this setting, identification of an intrathecal catheter may be less reliable because the patient already has analgesia.

However, typical doses of local anesthetic in combined spinal epidural placements provide analgesia without motor block, and the detection of an intravascular catheter as discussed previously may have value.

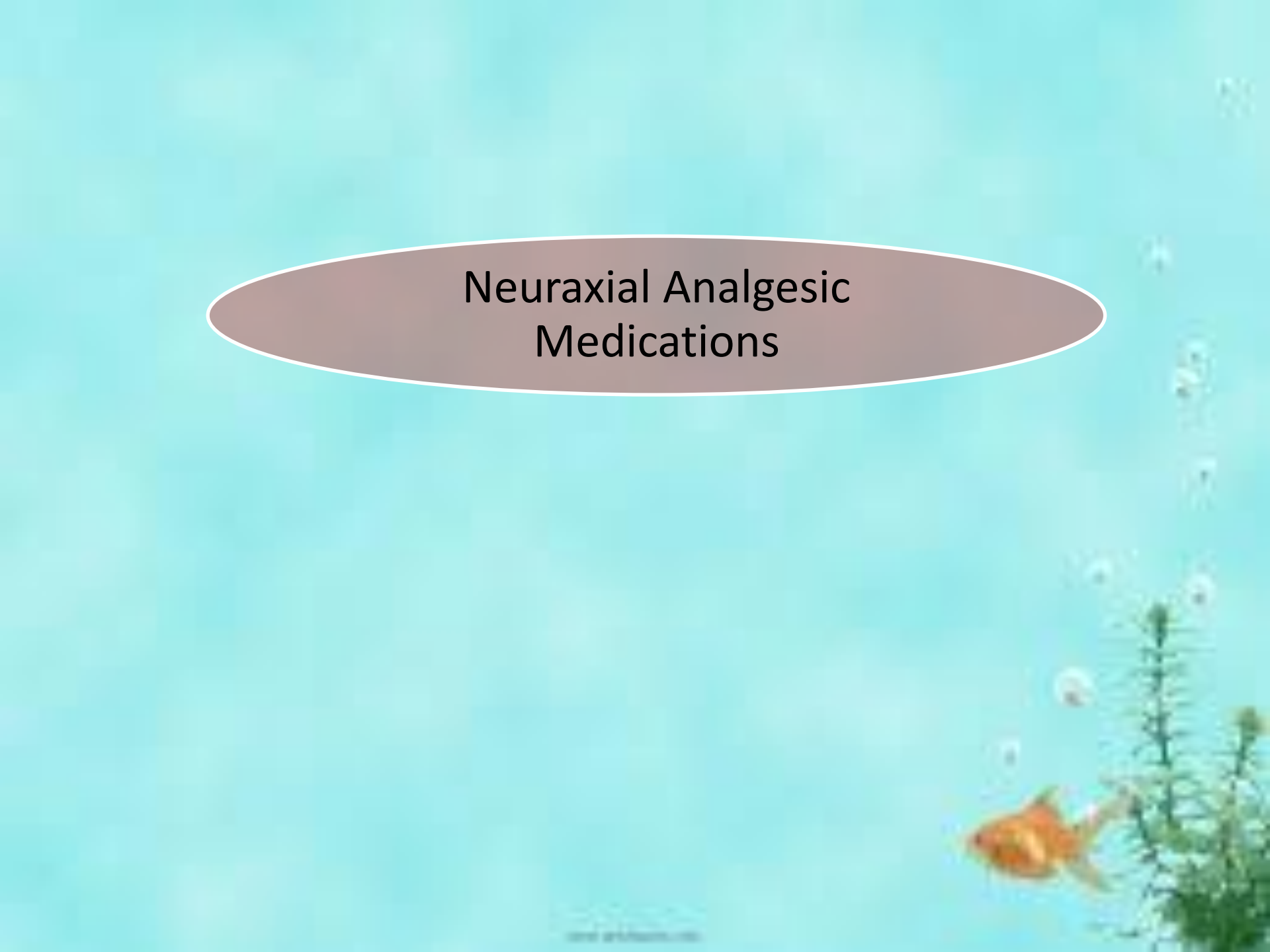
Dural Puncture Epidural

An emerging technique in labor analgesia is the DPE. After the epidural space is located with the epidural needle, a pencil-point spinal needle is inserted utilizing the “needle-through-needle” technique and the dura is punctured.

A 25- or 26-gauge spinal needle is usually used because a DPE placed by a 27-gauge needle was shown to offer no benefit in a single study.

No medication is directly introduced into the intrathecal space but the dural puncture may facilitate the intrathecal migration of medication administered into the epidural space.

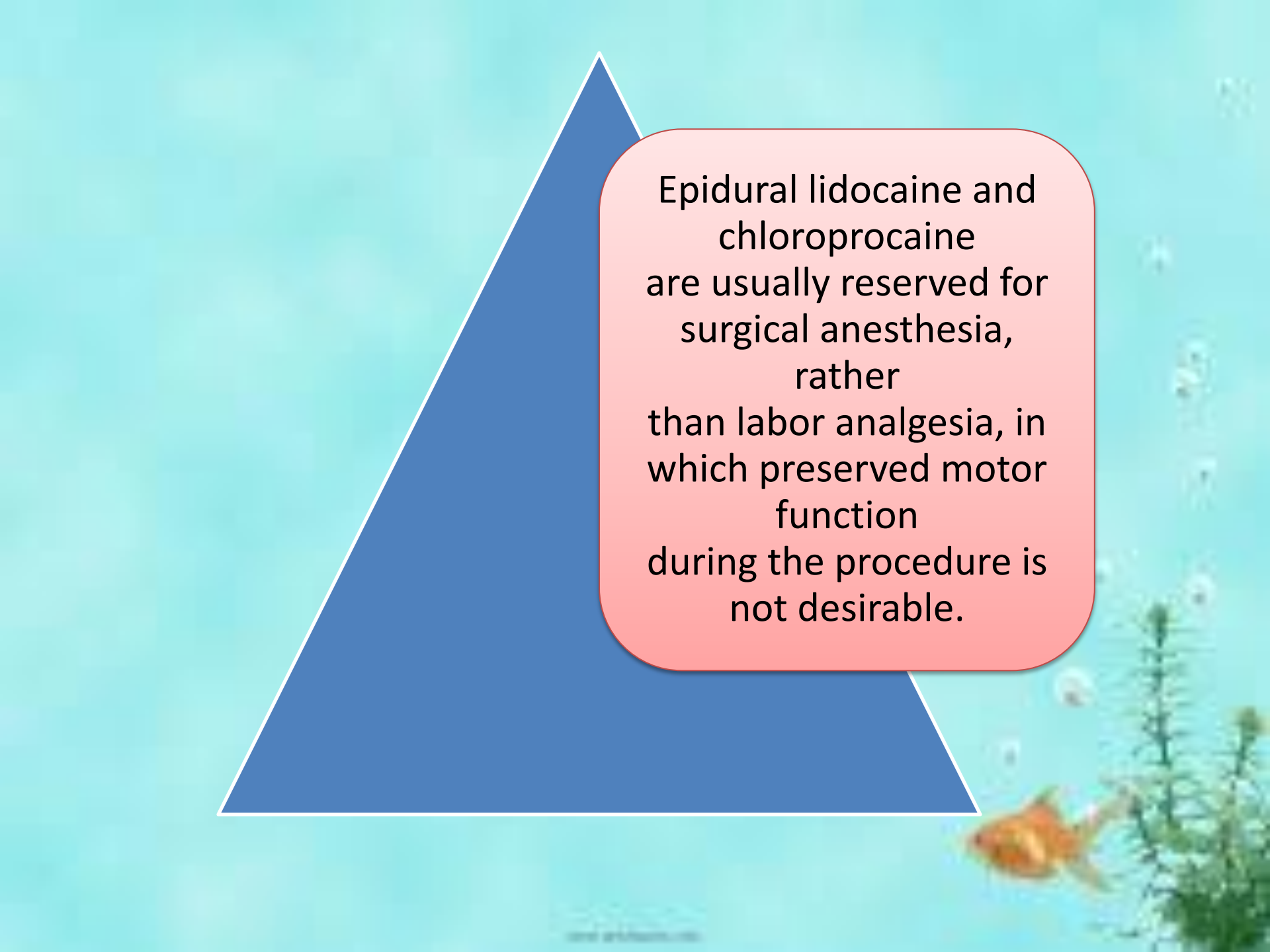
More studies are needed to fully understand the role of the DPE in the neuraxial labor analgesia armamentarium.

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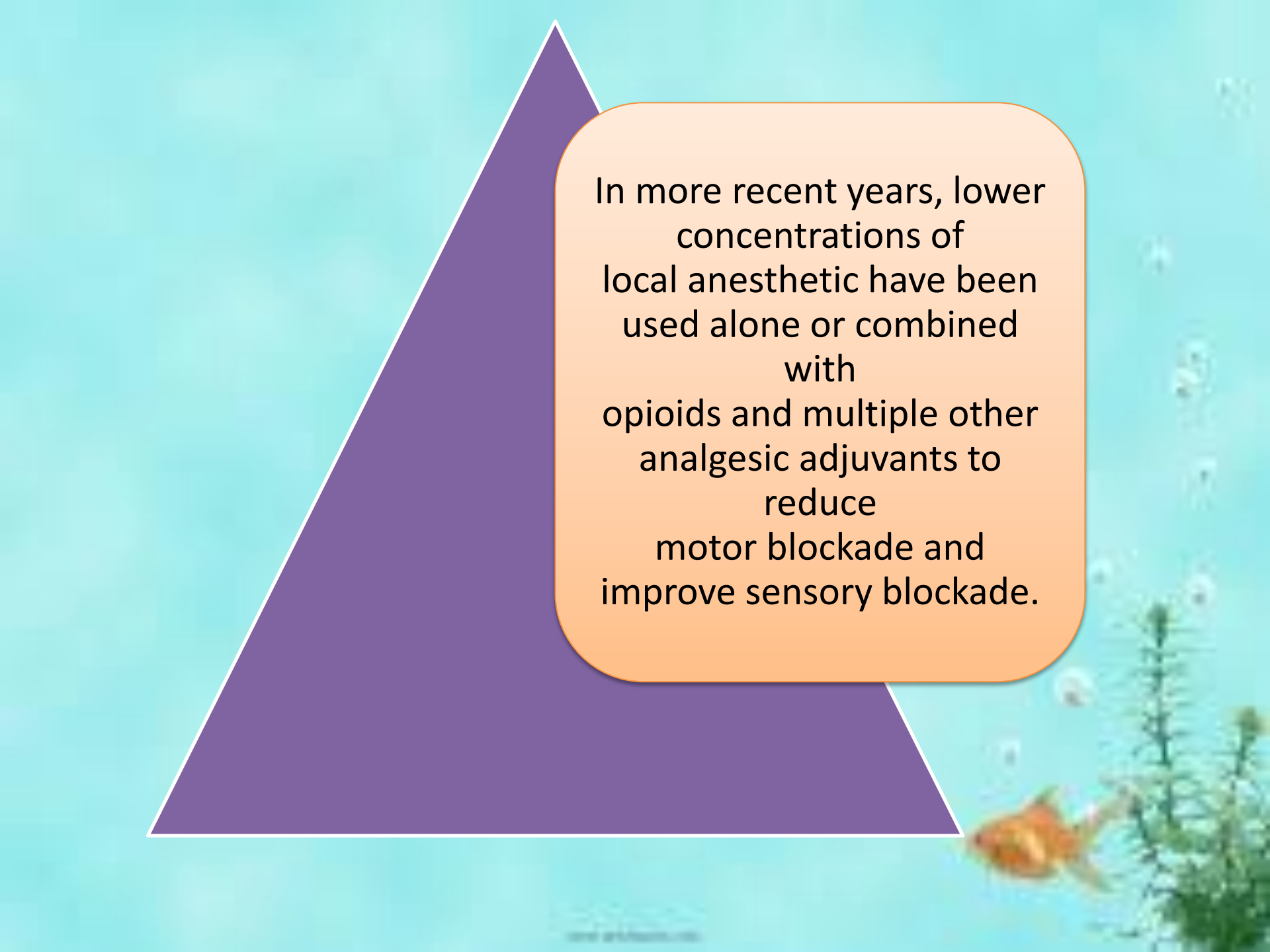
Neuraxial Analgesic Medications

Any preservative-free local anesthetic can be used in an epidural catheter.

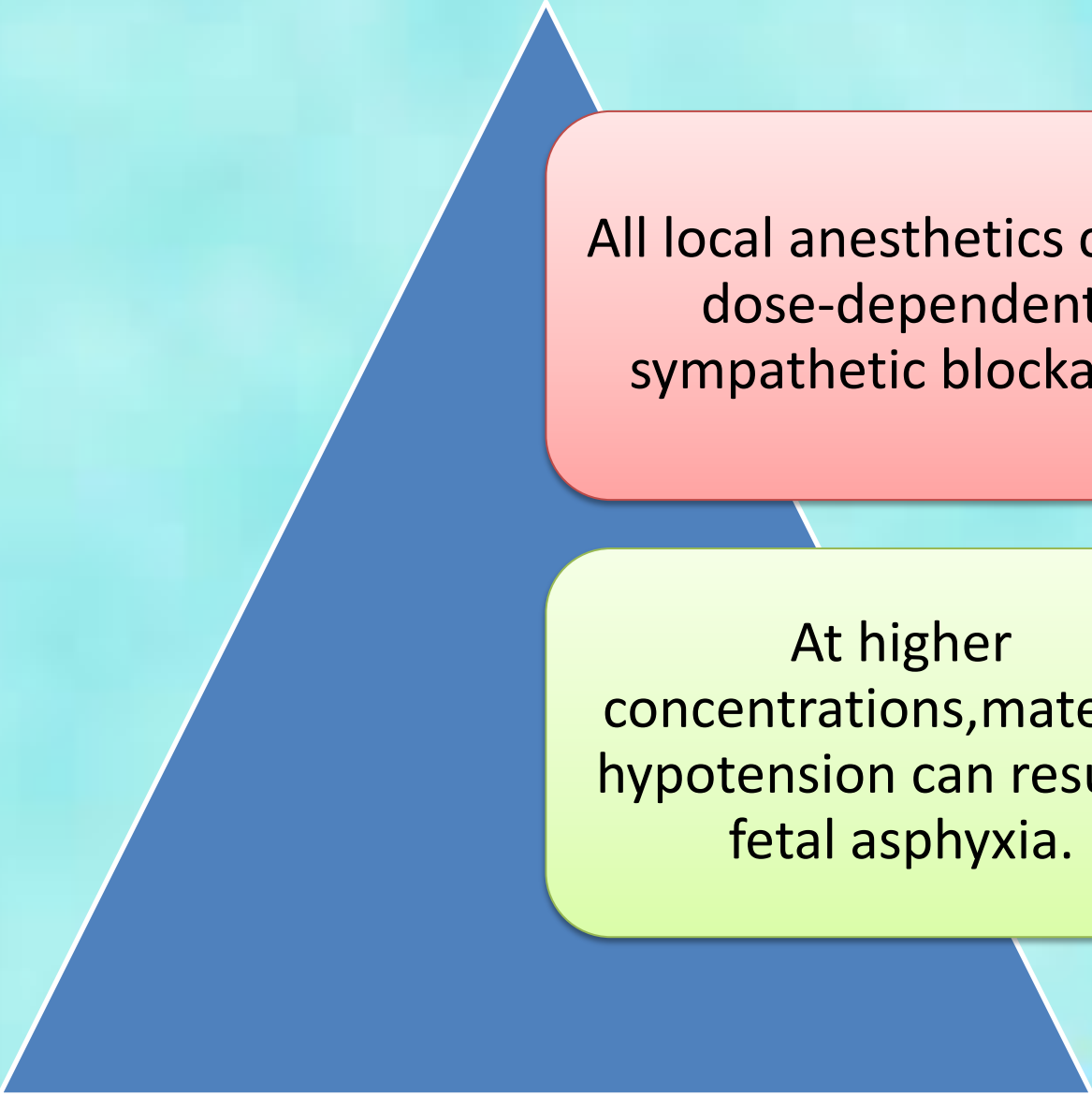
Most commonly,
bupivacaine (0.0625%-0.125%) and ropivacaine (0.0625%-0.2%) because the ratio of sensory to motor blockade is greater than that for lidocaine or 2-chloroprocaine.

The background is a light blue gradient with a faint image of an aquarium. A large blue pyramid is on the left side. A pink rounded rectangle with a thin red border is on the right, containing text. In the bottom right corner, there is a small image of a goldfish and some green plants.

Epidural lidocaine and chloroprocaine are usually reserved for surgical anesthesia, rather than labor analgesia, in which preserved motor function during the procedure is not desirable.

The background is a light blue aquarium scene. On the left, a large purple triangle is partially visible. On the right, there is a green artificial plant and a goldfish swimming. In the center, there is a light orange rounded rectangle containing text.

In more recent years, lower concentrations of local anesthetic have been used alone or combined with opioids and multiple other analgesic adjuvants to reduce motor blockade and improve sensory blockade.



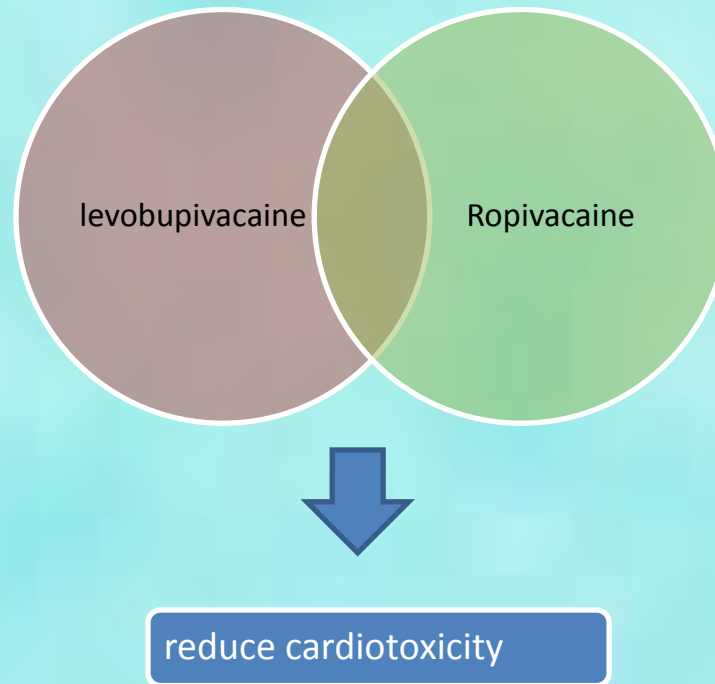
All local anesthetics cause
dose-dependent
sympathetic blockade.

At higher
concentrations, maternal
hypotension can result in
fetal asphyxia.


Epidural bupivacaine (0.625% to 0.125%) or ropivacaine (0.625% to 0.2%) are most commonly used for obstetric analgesia because of the reduced motor block.

The addition of lipid-soluble opioids, fentanyl 1 to 3 $\mu\text{g/mL}$ or sufentanil 0.1 to 0.5 $\mu\text{g/mL}$ allowed the reduction of local anesthetic dose with associated decreased motor blockade, preserved analgesia, and enhanced maternal satisfaction.

The search for the perfect labor epidural drug combination has led to the use of other adjuvant drugs that can reduce the dose of local anesthetic that is required. Most of these drugs act through activation of adrenergic receptors. Epinephrine is a nonselective adrenergic agonist activating α_1 -, α_2 -, β_1 -, and β_2 -adrenergic receptors.



Ropivacaine and levobupivacaine were synthesized to reduce cardiotoxicity that occurs with inadvertent intravascular bolus doses of bupivacaine. However, with the small doses of local anesthetic currently used for labor analgesia, cardiotoxicity is uncommon.



Unfortunately, no
epidural opioid only
regimen provides
adequate analgesia
without
unacceptable
side effects.

The most troublesome
complication that limits the dose
of epidural fentanyl is itching.

Patient-controlled epidural analgesia allows the patient to dose the epidural catheter with the use of a pump that has a maximum amount of drug per hour to prevent toxicity. In one study, patients who self-administered local anesthetic as needed in labor used less drug and had similar pain relief.

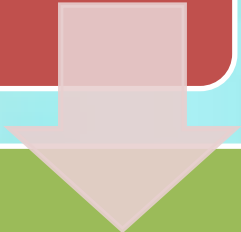


epinephrine

.



Activation of α_1 -receptors in the epidural vasculature causes vasoconstriction that delays the vascular uptake of local anesthetic and opioid.



Additional analgesia is likely provided by epinephrine through activation of α_2 -adrenergic receptors.



The dose of epidural epinephrine is typically dilute (1:400,000 to 1:800,000) secondary to concern for uterine artery vasoconstriction by systemic effects of higher doses.

Neostigmine

Neostigmine reduces the degradation of synaptic epinephrine and has effects similar to those of low-dose epinephrine.

Intrathecal neostigmine causes an unacceptable incidence of nausea and vomiting and epidural neostigmine does not seem to offer any advantage over epinephrine

Clonidine

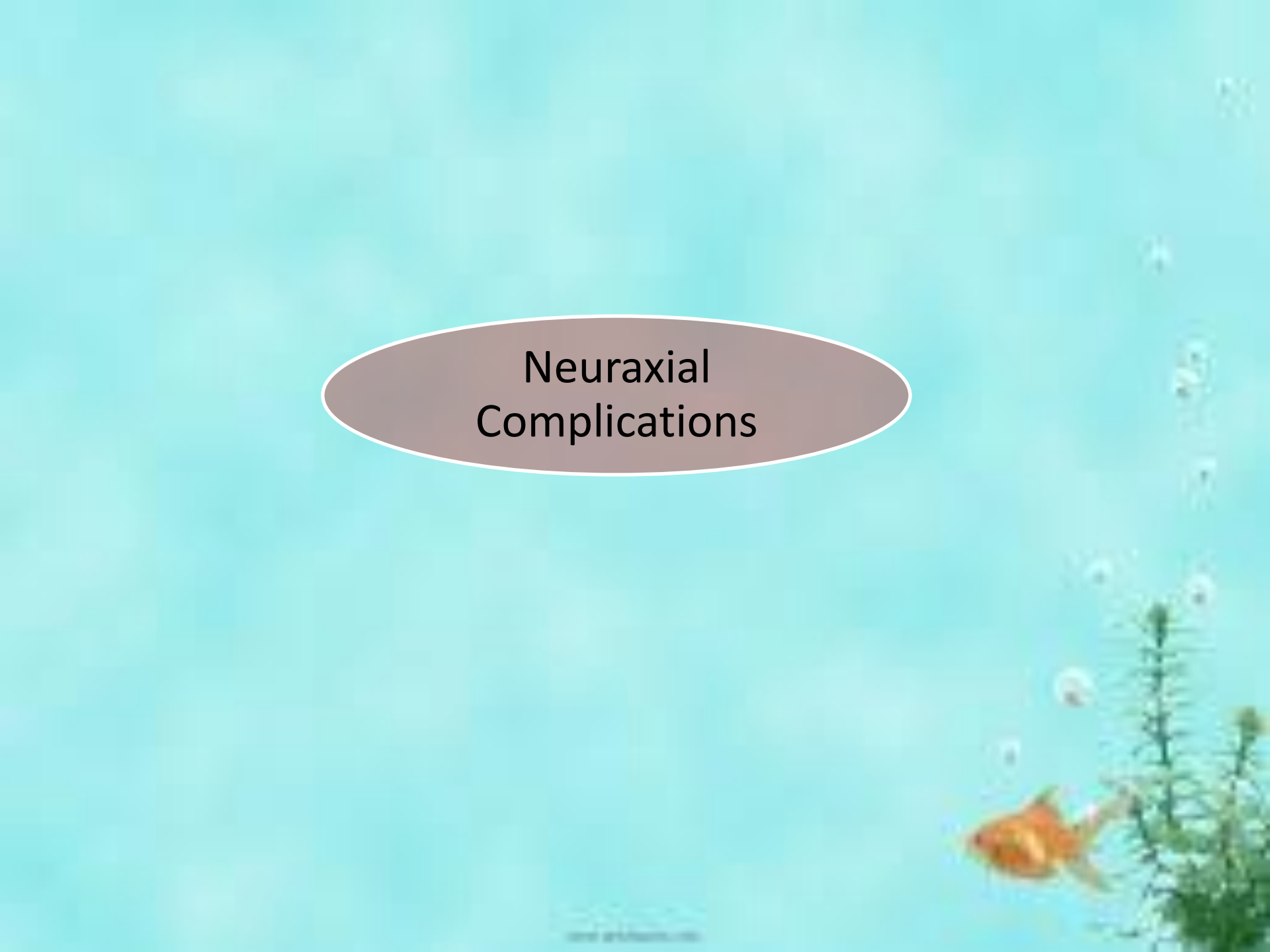
Clonidine is a relatively selective α_2 -adrenergic agonist that when added to dilute local anesthetic solution provides adjuvant analgesia. Although clearly effective for labor analgesia, within the United States epidural clonidine carries a U.S.

Food and Drug Administration (FDA) warning that states it is “not recommended for obstetrical, postpartum or perioperative pain management as the risk of hemodynamic instability (e.g., hypotension, bradycardia) may be unacceptable in this population.

Dexmedetomidine

Dexmedetomidine is a significantly more selective α_2 -adrenergic receptor agonist that is not approved for epidural use in the United States.

However, one randomized controlled trial found that it was efficacious combined with epidural bupivacaine.

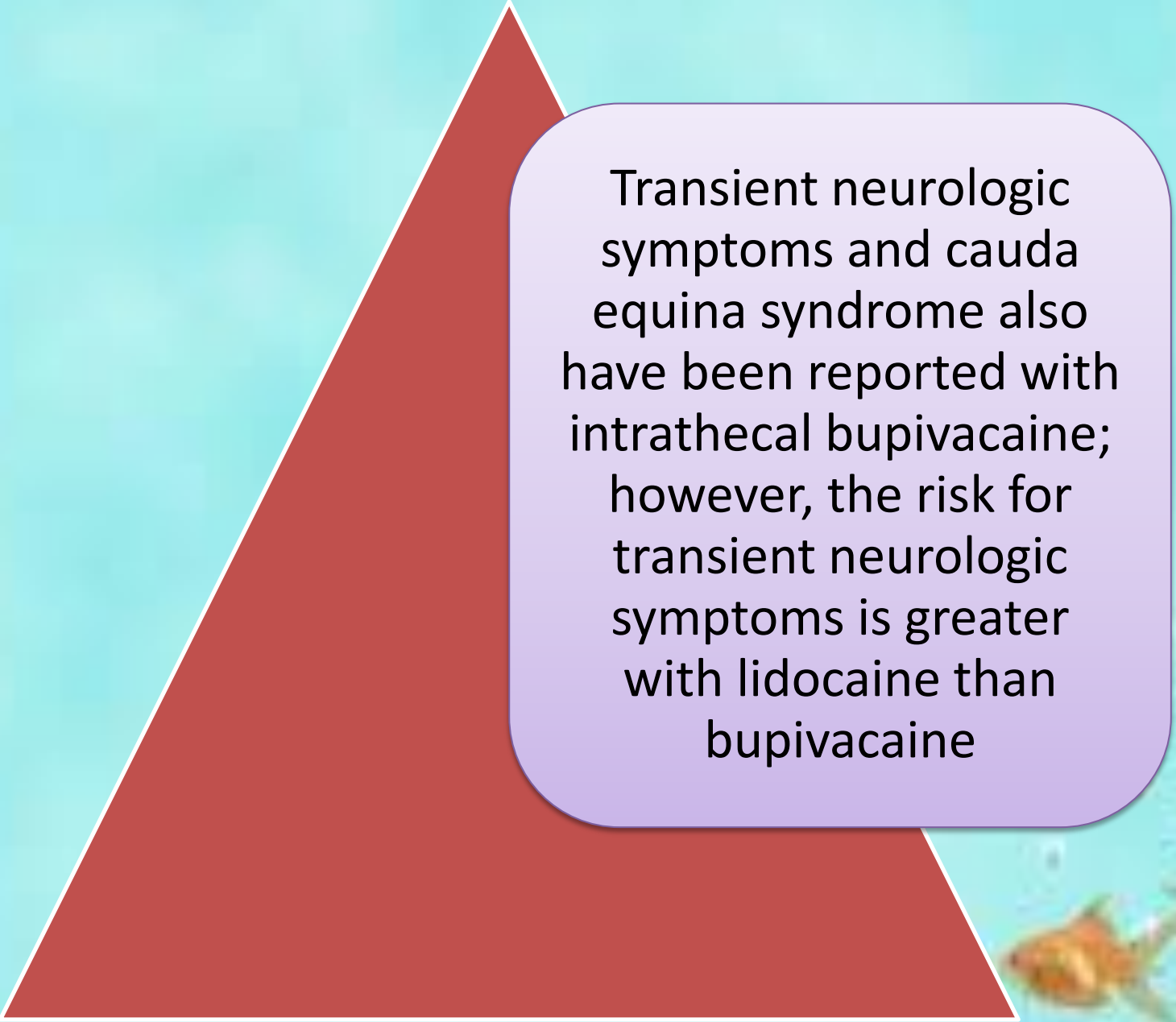
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Neuraxial Complications

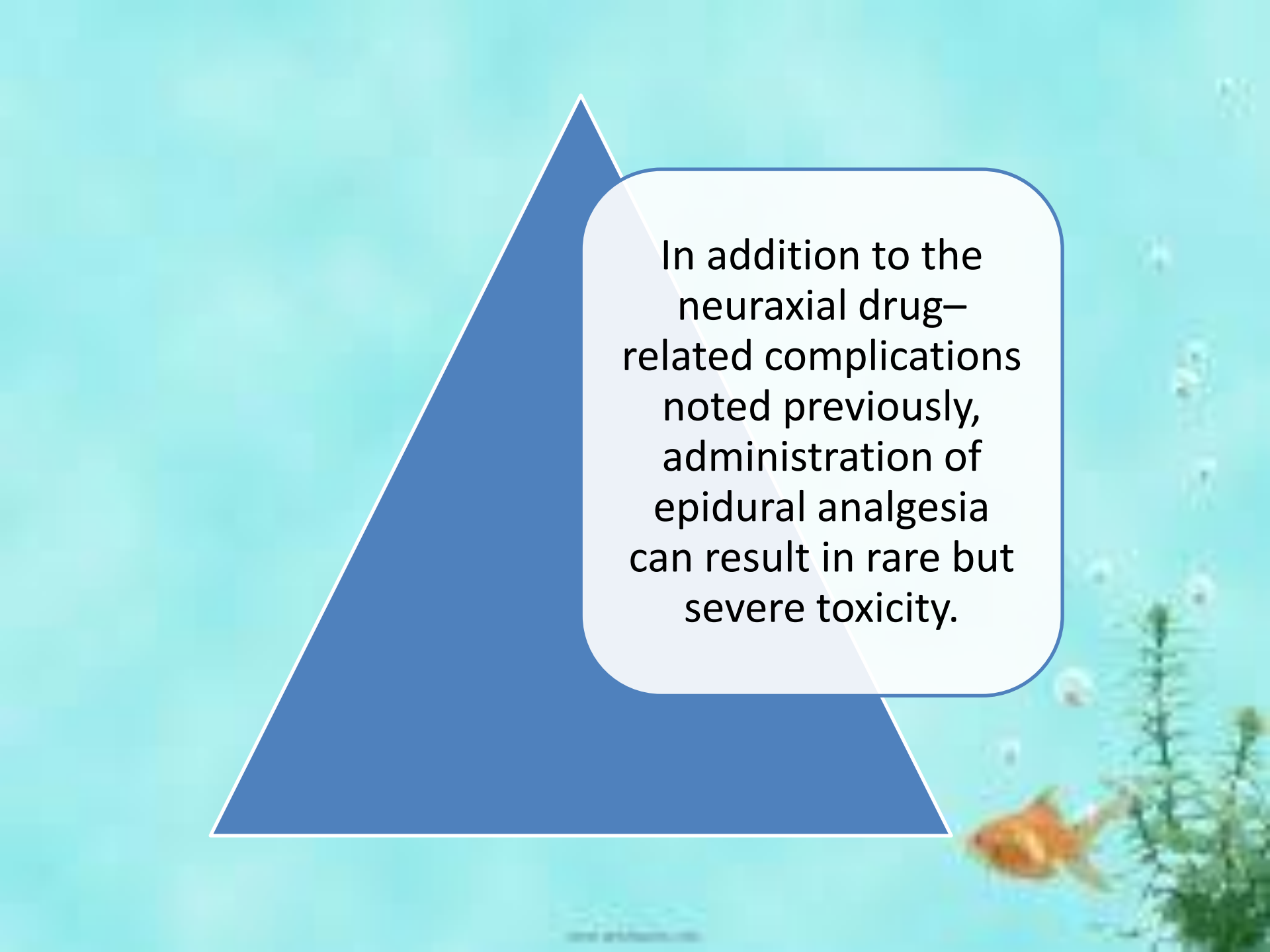
Transient neurologic symptoms and longer lasting cauda equine syndrome

During the 1990s, intrathecal lidocaine and 2-chloroprocaine were associated with multiple case reports of transient neurologic symptoms and longer lasting cauda equine syndrome.

Notably, most but not all cases were associated with high concentration—that is, hyperbaric preparations.




Transient neurologic symptoms and cauda equina syndrome also have been reported with intrathecal bupivacaine; however, the risk for transient neurologic symptoms is greater with lidocaine than bupivacaine

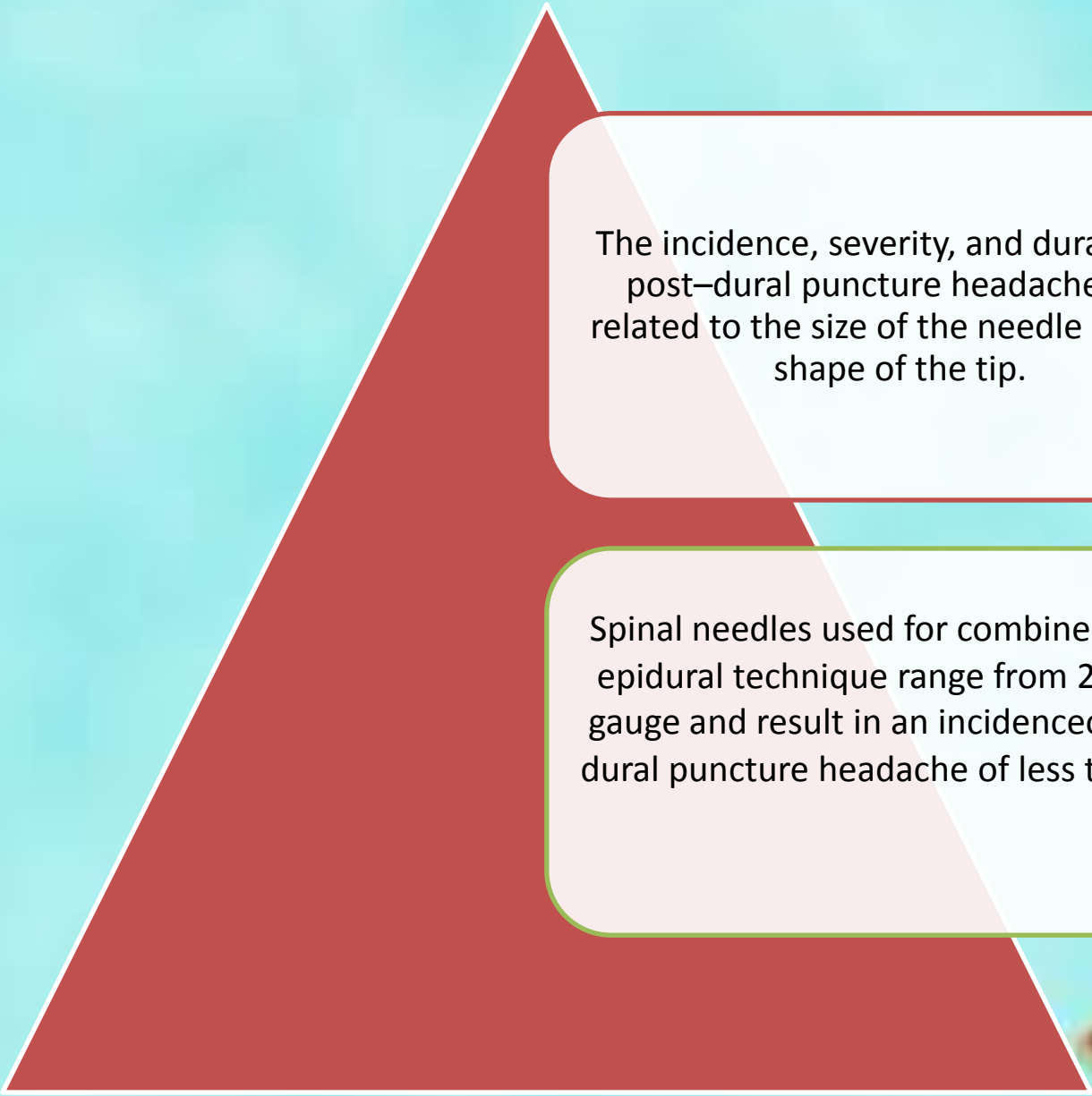
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In addition to the neuraxial drug-related complications noted previously, administration of epidural analgesia can result in rare but severe toxicity.

The earliest experiments with spinal cocaine resulted in severe post-dural puncture headache.



Leakage of spinal fluid is thought to result in vascular hyperemia, migraine physiology and traction on pain-sensitive fibers may contribute.



The incidence, severity, and duration of post-dural puncture headaches are related to the size of the needle and the shape of the tip.

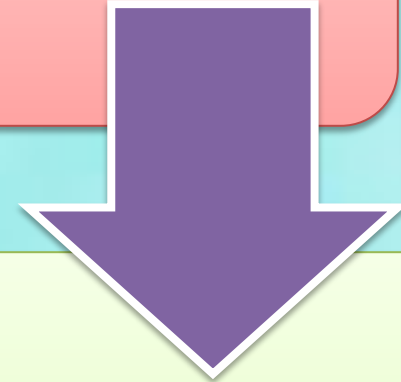
Spinal needles used for combined spinal epidural technique range from 25 to 29 gauge and result in an incidence of post-dural puncture headache of less than 1%.

Epidural catheters are most commonly placed through a 17- or 18-gauge blunt-tipped needle, and thus the incidence of post-dural puncture headache is reported at 30% to 80%.

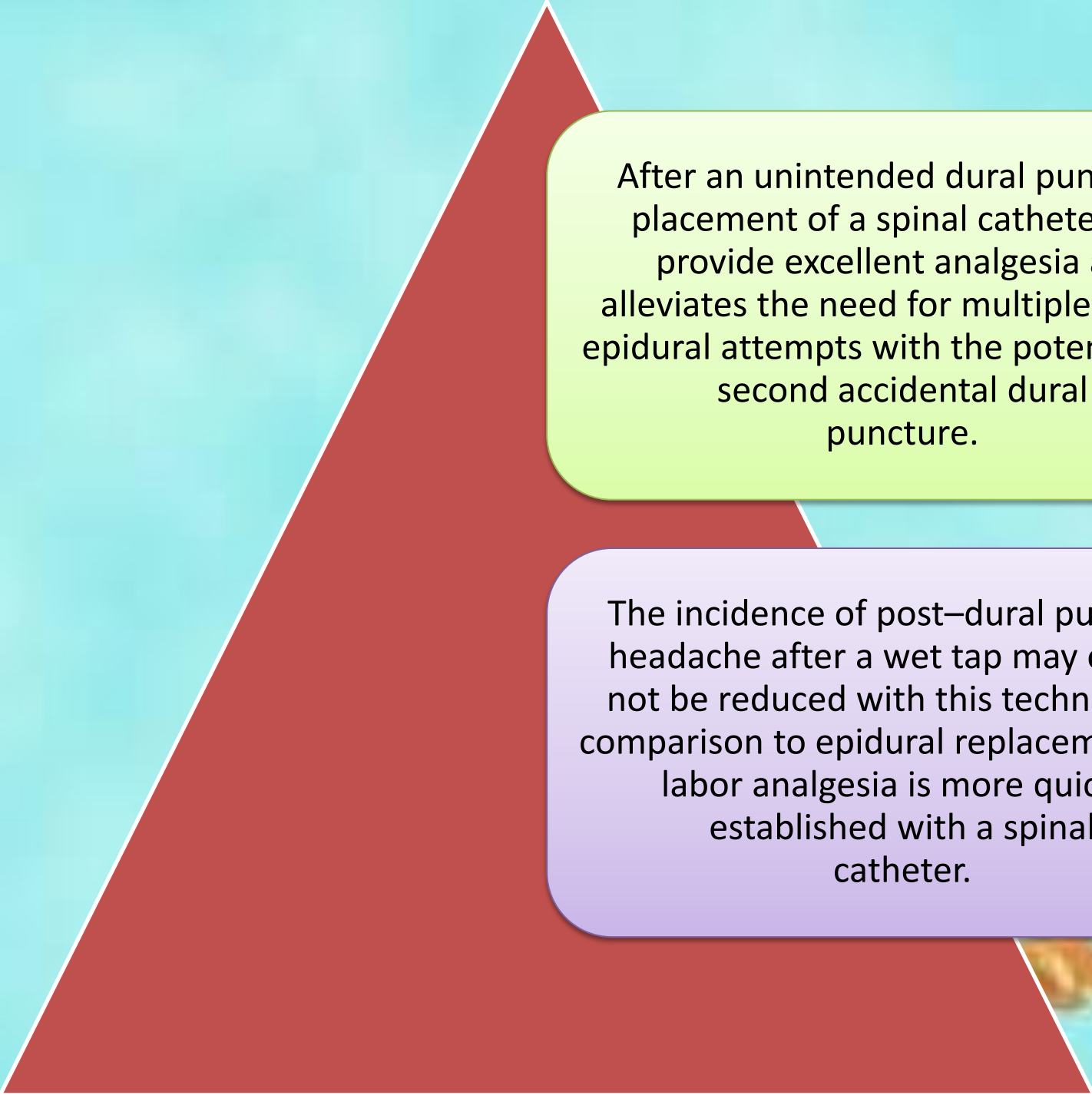
Caffeine

Caffeine is effective to treat the pain of a post-dural puncture headache in the short term likely because of its vasoconstrictive effects, but the duration of the headache is likely related to healing of the rent in the dura.

In the setting of dural puncture with an epidural needle, the needle may be replaced at a different interspace or an intrathecal catheter may be placed.



If an intrathecal catheter is placed, unintentional injection of an epidural anesthetic dose must be carefully avoided.



After an unintended dural puncture, placement of a spinal catheter can provide excellent analgesia and alleviates the need for multiple repeat epidural attempts with the potential of a second accidental dural puncture.

The incidence of post-dural puncture headache after a wet tap may or may not be reduced with this technique in comparison to epidural replacement, but labor analgesia is more quickly established with a spinal catheter.

Infection

When strict aseptic technique is used, infection is uncommon with spinal and epidural anesthesia

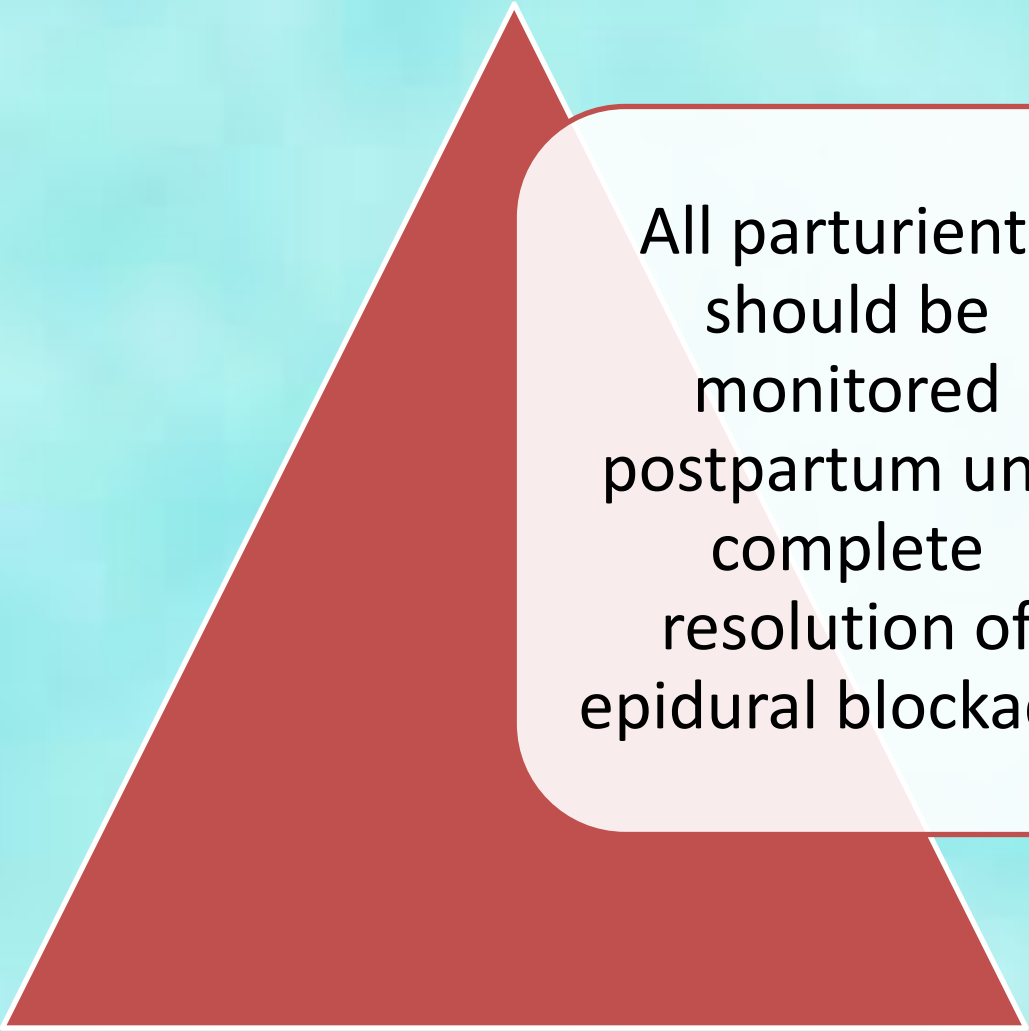
Epidural hematoma

The epidural space is highly vascular, and vessels are likely punctured, often in epidural needle placement.

However, with normal platelets and coagulation factors, epidural hematoma is extremely uncommon, with an estimated upper limit of 4.6×10^{-5} in the obstetric population.

Back pain

Persistent
motor
blockade



All parturients
should be
monitored
postpartum until
complete
resolution of
epidural blockade.


Direct nerve damage

Direct nerve damage from an epidural or spinal needle placed for labor is exceedingly rare because they are placed below the level of the conus medularis.

Damage attributed to direct neurologic injury has been estimated at 0.6 in 100,000 with epidural and 3 in 100,00 with spinal analgesia

Postpartum back pain

Postpartum back pain is common regardless of whether neuraxial analgesia has been used after childbirth.



However, no evidence indicates that it is more common when neuraxial analgesia is used for labor

increased maternal temperature

Several trials have identified an association between increased maternal temperature and epidural use as a secondary outcome.

Attribution of causality is difficult in this setting because temperature increases with advancing labor likely as a result thermogenic

Epidurals are also more likely to be placed later in labor and thus may be associated with higher temperature that results from the intense metabolic activity of labor

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OTHER REGIONAL NERVE BLOCKS

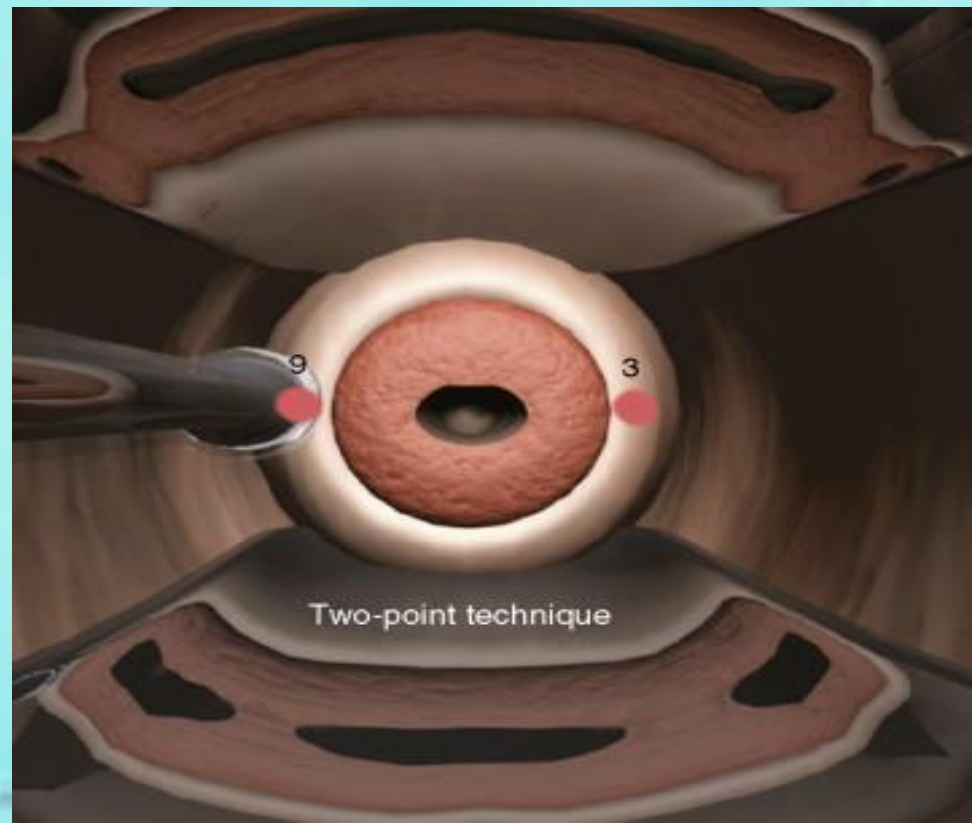
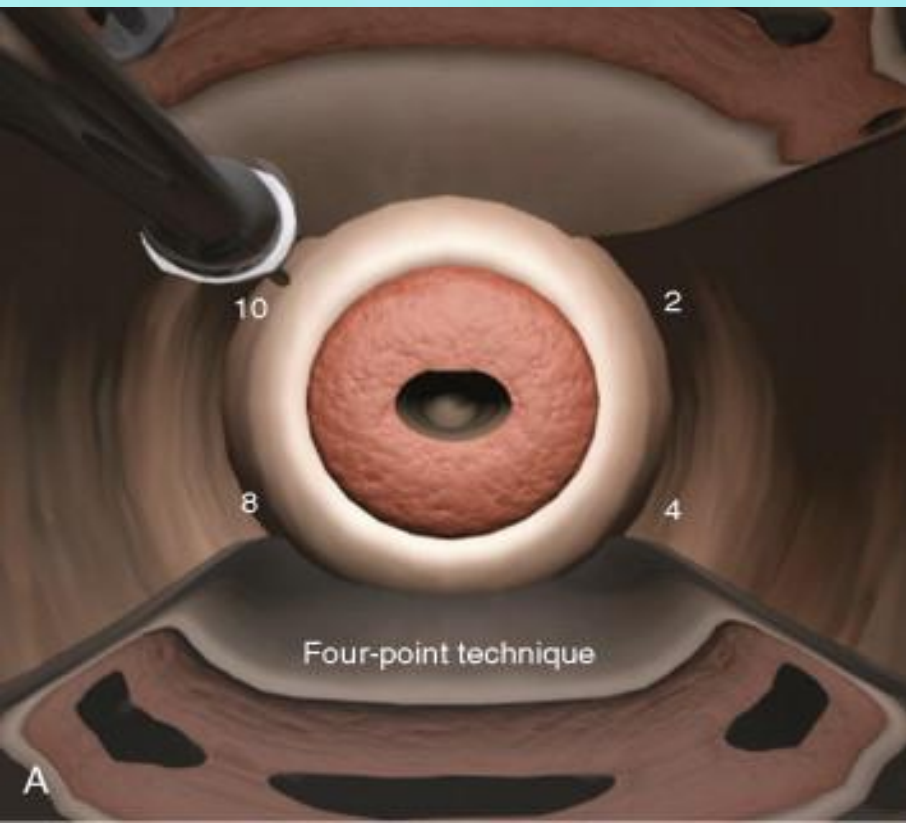
Paracervical block

paracervical block, local anesthetic is injected lateral to the cervix at 4 o'clock and 10 o'clock, taking care to avoid vascular structures

The paracervical block is effective to relieve pain of cervical dilation but does not affect cramping pain from contraction of the uterine corpus.

Paracervical block can be complicated by injection of local anesthetic into the presenting fetal head, which can have devastating consequences.


Paracervical Block



Paracervical block is more effective for relief of labor pain in contrast to placebo or intramuscular meperidine.



No difference was found in pain relief comparing paracervical block to patient controlled analgesia with IV fentanyl.



More commonly, side effects of transient fetal bradycardia and maternal local anesthetic toxicity have been reported.

The technique of paracervical block has become safer with more superficial injection ensured by a needle guide and more dilute solutions of local anesthetic.

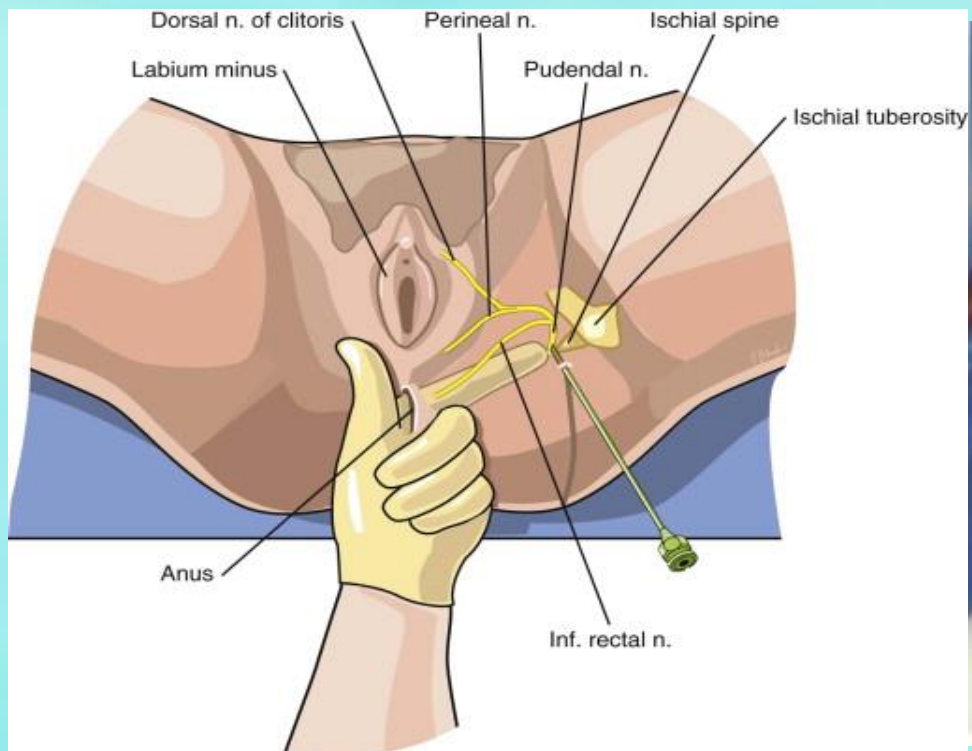
Pudendal nerve block

A pudendal nerve block can be helpful but is not as effective as a subarachnoid block with fentanyl and bupivacaine

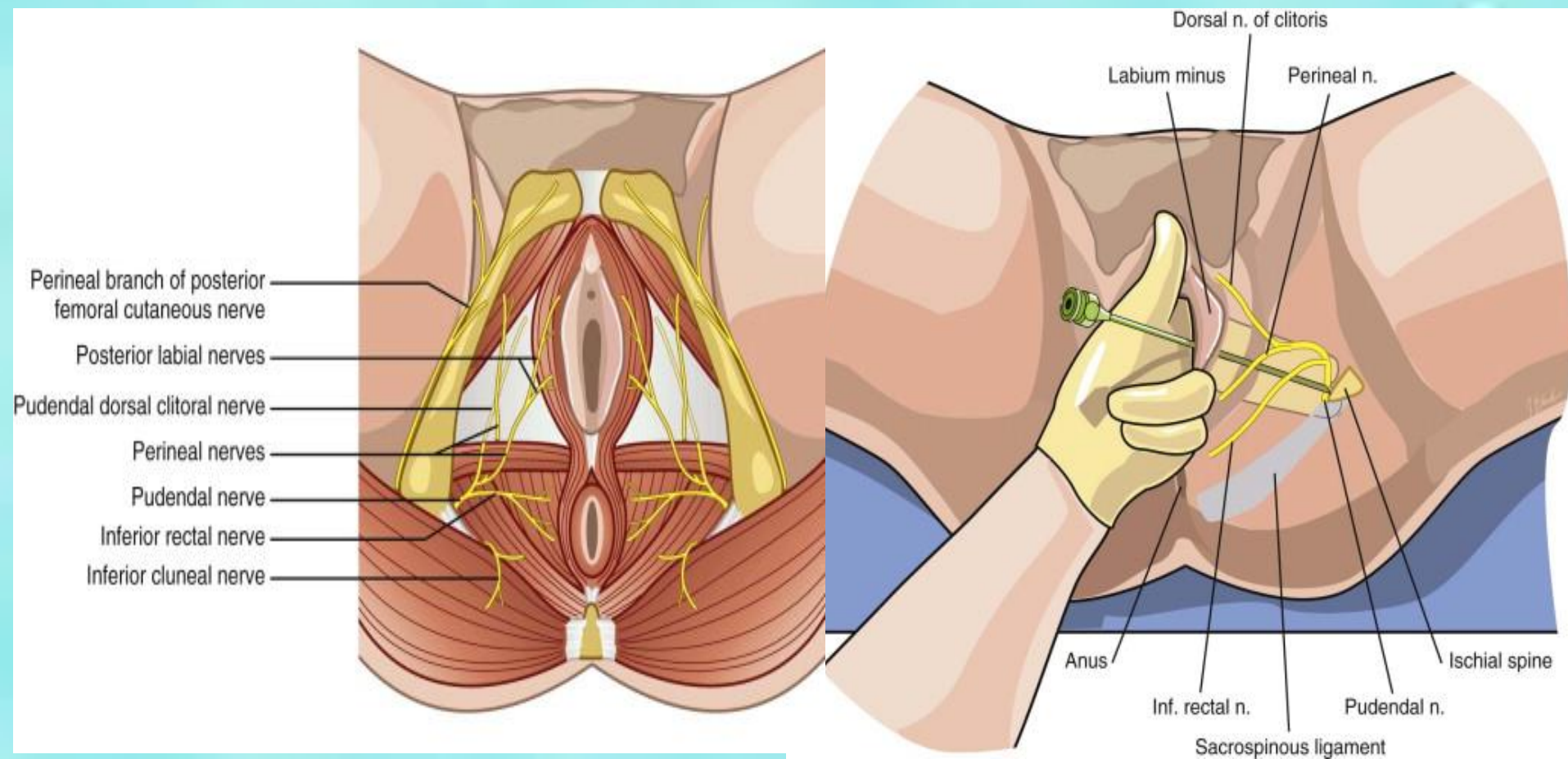
The pudendal nerve is derived from sacral nerve roots

It can be blocked with local anesthetic using a transvaginal or transperineal approach to treat pain during the second stage of labor and for episiotomy repair.

Pudendal Nerve Block : Transperineal Approach



Pudendal Nerve Block : Transvaginal Approach



Pearls of pudendal nerve block

High rate of block failure;

Systemic local anesthetic toxicity;

Ischiorectal vaginal hematoma;

fetal
injection of local anesthetic

Pudendal block can impede the urge to push
during the
second stage of labor

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

وصل الله على سيدنا محمد وآله وسلم تسليما



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ