Fascial Plane Blocks in Pediatric Surgery – CONS

Maria Vittoria Pesce, MD, PhD
Policlinico Umberto I – Sapienza University of Rome

The European Society of Regional Anaesthesia & Pain Therapy
ESRA ITALIA

ESRA ITALIAN CHAPTER

30° NATIONAL MEETING

13-15 NOV 2025

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MZ EVENTS

•Fascial plane blocks have transformed pediatric multimodal analgesia, with a >230% increase in utilization since 2015

Walker 2024, Anaesthesia

•Their appeal lies in procedural simplicity, ultrasound guidance, and significant opioid-sparing potential. However, pediatric validation remains limited: evidence quality is low-to-moderate *Huang 2023; Tulgar 2025*

•Adult-derived data cannot be linearly extrapolated to the pediatric population.

•*Innovation must not outpace validation.*

Anaesthesia 2024, 79, 63-70 doi:10.1111/anae.16173

Original Article

The analgesic effect of transversalis fascia plane block after caesarean section under spinal anaesthesia with intrathecal morphine: a randomised controlled trial

L. Baghirzada,[1] **A. Walker,**[2] **H. C. Yu**[1] and **R. Endersby**[1]

1 Clinical Assistant Professor, 2 Senior Consultant, Department of Anaesthesiology, Perioperative and Pain Medicine, University of Calgary, Canada

Summary

We aimed to test whether bilateral injection of bupivacaine 0.25% in the transversalis fascia plane reduced 24 h opioid dose after singleton caesarean section, under spinal anaesthesia with intrathecal morphine, compared with saline 0.9% injectate. We allocated randomly 52 women to bilateral injection of 20 ml saline 0.9% on arrival in the post-anaesthesia care unit and 54 women to bilateral injection of 20 ml bupivacaine 0.25% (with adrenaline 2.5 μg.ml^{-1}). Mean (SD) cumulative morphine equivalent opioid dose 24 h after saline injection was 32.3 (28.3) mg and 18.7 (20.2) mg after bupivacaine injection, a mean (95%CI) difference of 13.7 (4.1–23.2) mg

Review Article

Fascial plane blocks as the main anesthetic method: A narrative review

ABSTRACT

This narrative review evaluates the efficacy of fascial plane blocks (FPB) as sole anesthetic method for surgery. Particularly in selected high-risk patients, fascial plane blocks may be a more useful and convenient option than general anesthesia or neuraxial anesthesia. In recent years, with the use of ultrasound, newly defined FPBs have emerged and these techniques have become popular. There are case reports in the literature reporting the use of these blocks for anesthesia, but clinical studies are limited and clinicians may be undecided about which block or combination to apply in which case. In this narrative review, which is the first in this field in the literature, we aimed to discuss the use of FPBs and which combinations can be used in which incisions and which surgeries.

Key words: Anesthesia, fascial plane blocks, review, sole anesthetic method, surgical anesthesia

ORIGINAL ARTICLE

Efficacy and Safety of Serratus Anterior Plane Block and Erector Spinae Plane Block for Rib Fracture Pain

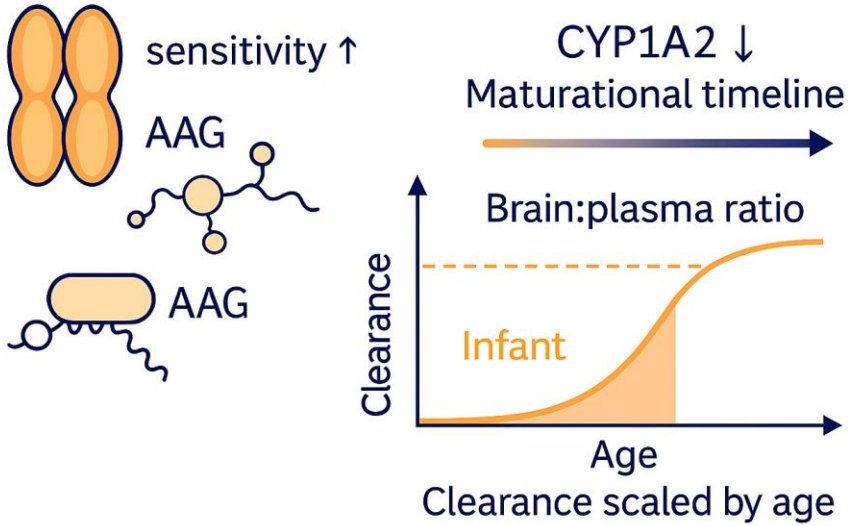
A Systematic Review and meta-analysis

Lin, Bing-Hua MD*; Huang, Hui-Min MD*; Lin, Sheng-Feng MD, PhD†,‡,§,‖,¶

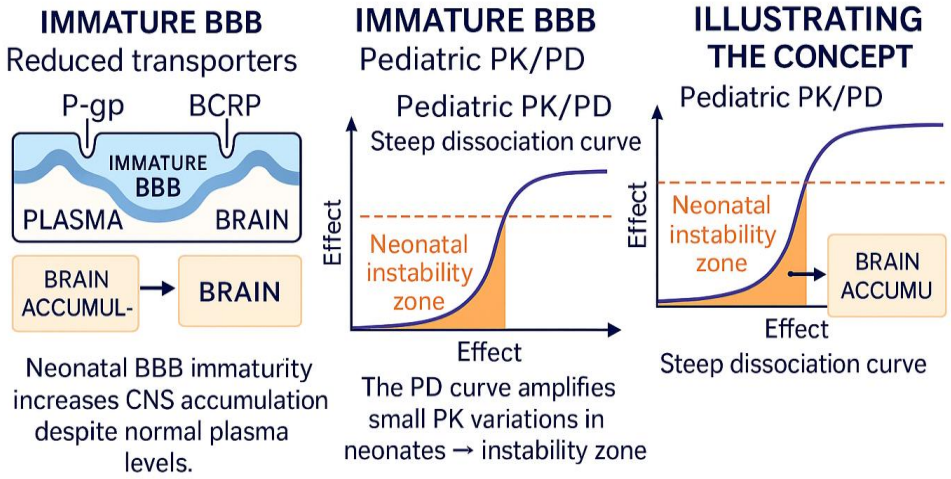
Author Information

The Clinical Journal of Pain ():10.1097/AJP.0000000000001334 IF: 3.1 Q1, October 16, 2025. | *DOI:* 10.1097/AJP.0000000000001334 IF: 3.1 Q1

PEDIATRIC PHARMACOKINETTICS



PHARMACOLOGY CHAPTER
BBB & PK/PD ARCHITECTURE



Neonates show **increased sensitivity of NaV1.5/NaV1.7 channels**, **lower AAG levels** with a higher unbound drug fraction, and **markedly immature CYP1A2 metabolism**. As a result, the **brain-to-plasma ratio is significantly higher**, and the drug persists longer in the CNS, creating a **narrow therapeutic window and a higher vulnerability to toxicity below 15 kg**.

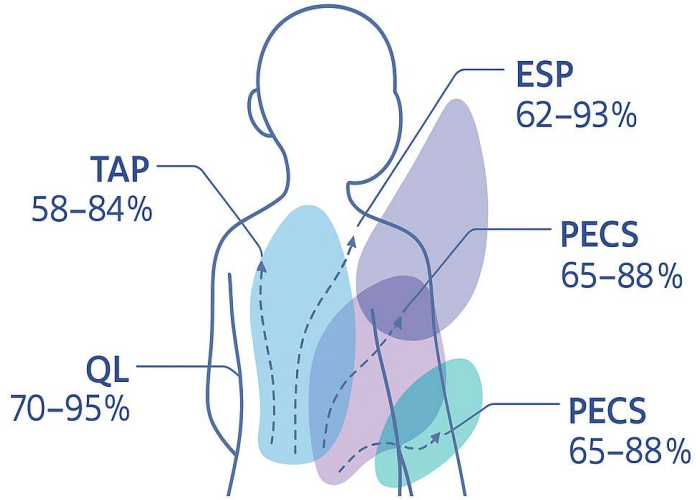
Anatomical Variability

Fascial planes are *potential* rather than fixed anatomical spaces.

Cadaveric dye studies show incomplete or asymmetric spread in ≈30% of pediatric specimens Tulgar 2025)

Diffusion variability ranges from 31–58%, with ESP and QL blocks particularly unpredictable in infants <10 kg Lönnqvist 2024

Where we inject is not always where we act.



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Fascial planes are potential spaces – their diffusion is probabilistic, not deterministic.

Volume Sensitivity & Pharmacokinetics

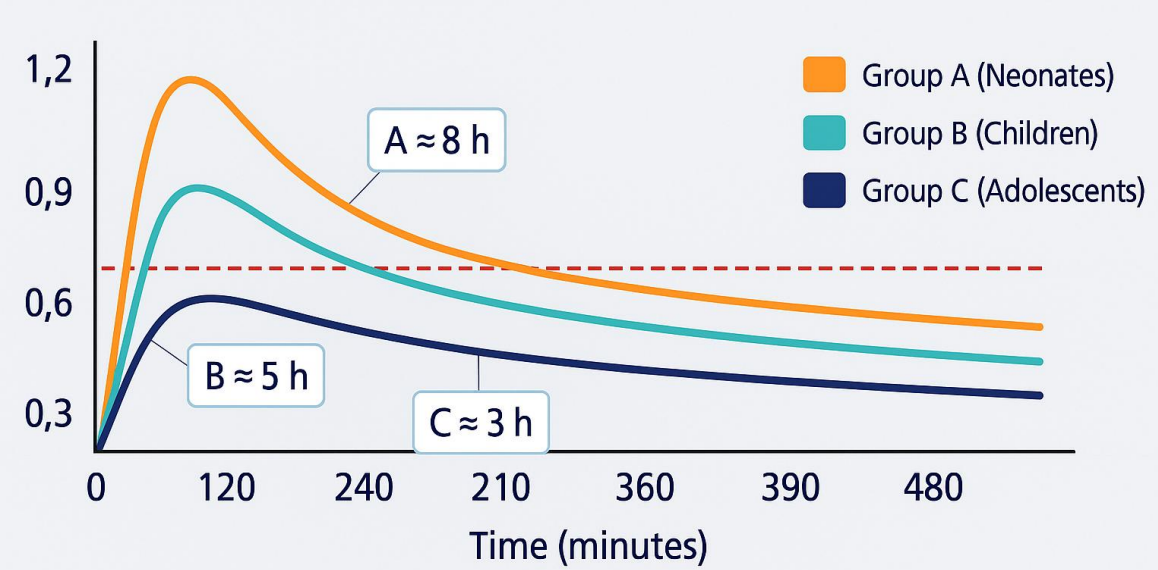
Efficacy is highly volume-dependent, but pediatric pharmacokinetics allow only minimal safety margins.

Local anesthetic absorption is up to 4× faster in infants Mathew 2024

Ropivacaine Cmax ≈ 0.9 µg/mL, approaching toxicity thresholds Yucal 2025

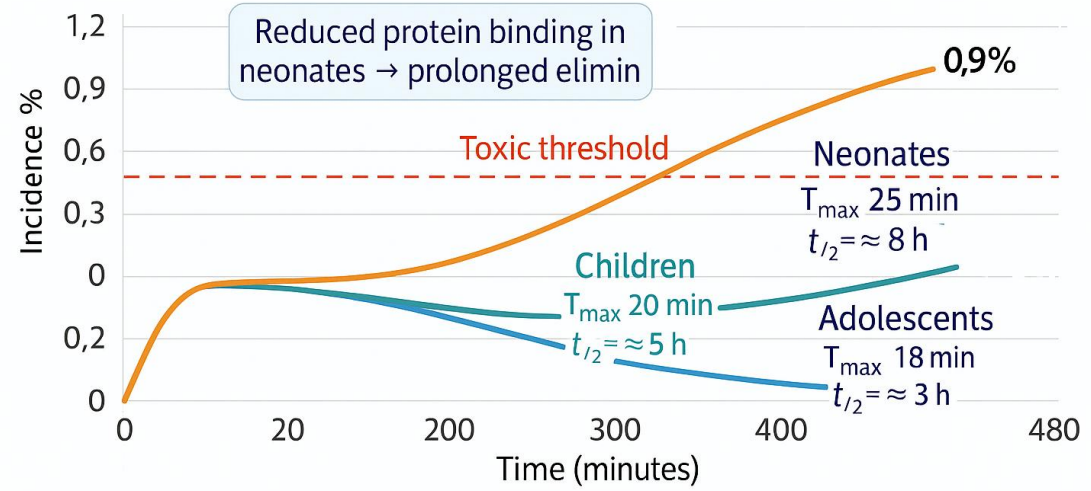
No validated cumulative dosing exists for bilateral or multilevel blocks.

In young children, efficacy and toxicity lie perilously close.



Age-dependent pharmacokininetic drift: faster clearance with metabolic maturation.

Age-dependent pharmacokinetic drift of ropivacaine



Toxic threshold (1.0 µg/mL) marks the upper plasma safety limit, neonates approach this longer due to slower clearance and reduced protein binding.

Mathew P et al. *Paediatr Anaesth.*. 2024:34:112-119, Yucal T et al. *Br J Anaesth*. 2025;125:380-388.
Lönnqvist PA et al. *Curr Opin Anaethesiol.*. 2024;37:410-419.

Ropivacaine in Neonates: Pharmacologic Limitations

Despite its reputation as the "safer" enantiomer, ropivacaine exhibits prolonged half-life and reduced clearance in neonates due to immature CYP1A2 activity.

Low α1-acid glycoprotein markedly increases the unbound (active) fraction.

Neonatal Tmax ≈ 25 min; t½ ≈ 7–8 h vs. 3 h in adults Mathew 2024

These dynamics significantly elevate LAST risk, especially after bilateral QL or TAP blocks.

Evidence Hierarchy and Methodological Concerns

80% of pediatric trials are single-center, include <60 patients, and lack blinding or standardized endpoints.

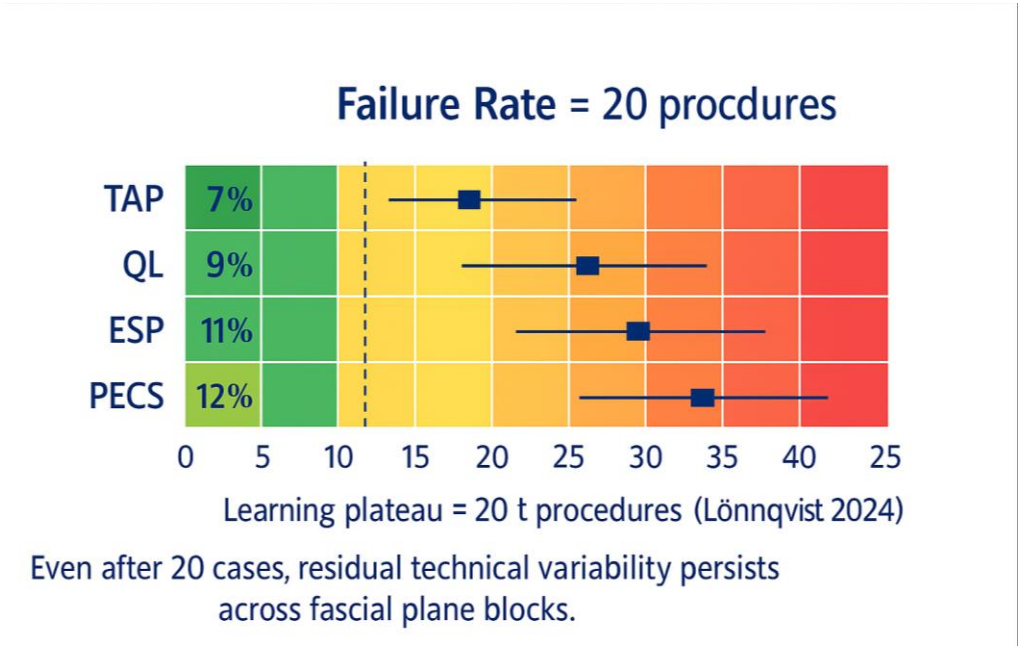
Meta-analyses show high heterogeneity (I^2 = 68%).

Network analyses often pool adult and pediatric data, diluting age-specific insights.

Publication bias remains substantial.

Statistical significance does not equal clinical relevance.

Outcome Variability Across RCTs (forest plot)



Operator Dependency and Learning Curve

Even with ultrasound, fascial plane blocks remain operator-dependent.

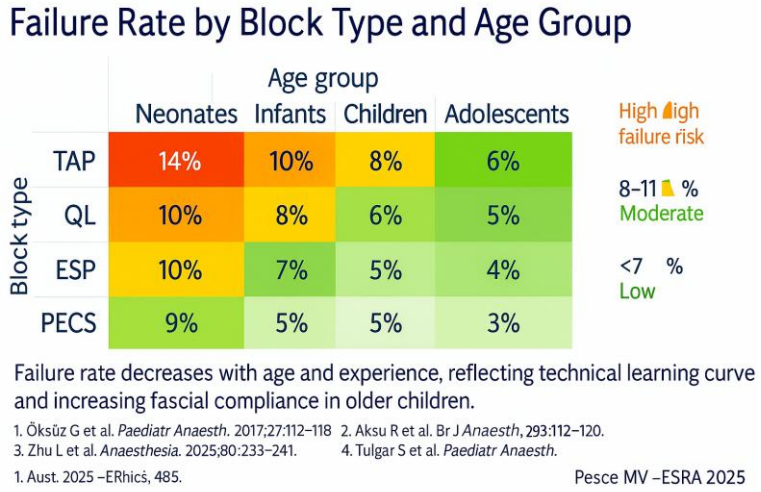
Competency typically requires ≈20–25 supervised procedures (Lönnqvist 2024).

Technical variability persists (CV ≈ 28%).

Failure rates: 7–12%, especially in infants with narrow acoustic windows.

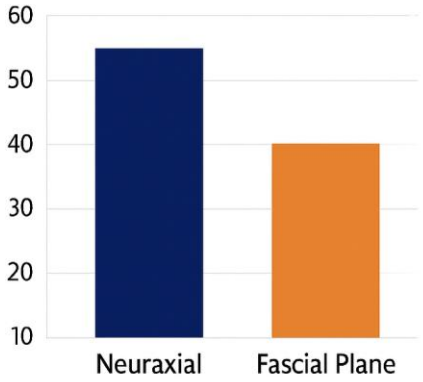
Ultrasound ensures visibility, not reliability.

Block	Neonates	Infants	Children	Adolescents
TAP	14%	10%	8%	6%
QL	12%	8%	6%	5%
ESP	10%	7%	5%	4%
PECS	9%	6%	5%	3%



Neuraxial versus Fascial Plane Approaches

Parameter	Neuraxial (Caudal/Epidural)	Fascial Plane (TAP/QL/ESP/PECS)
Evidence base	>50 pediatric RCTs	<20 pediatric RCTs
Analgesic duration	Predictable, reproducible	Variable, anatomy-dependent
Failure rate	1–2%	7–12%
Complications	Rare, registry-validated	Likely underreported
ERAS validation	Fully integrated	Conceptual, emerging



	Neuraxial	Fascial Plane
Evidence base	50+ RCTs	20 RCTs
Analgesic duration	9–12 h	6–10 h
Failure rate	1–2 %	7–12 %
Complications	Rare	likely underreported
ERAS integration	established	Emerging

Neuraxial blocks remain the gold standard for reproducibility and safety; fascial plane techniques complement but do not replace.

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Safety and Reporting Bias

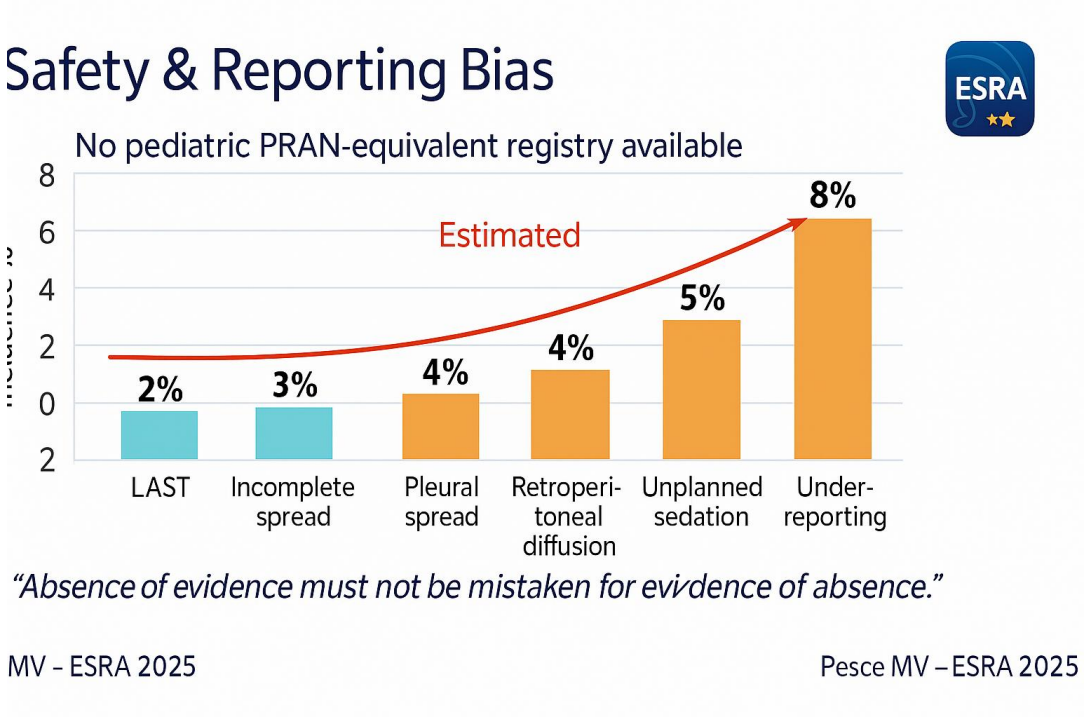
Reported LAST incidence (0.009%) is likely underestimated.

Pharmacovigilance data show plasma levels often exceeding predictions (Yucal 2025).

Ultrasound imaging demonstrates retroperitoneal or near-pleural spread in 2–5% of ESP/QL cases (Mossetti 2025).

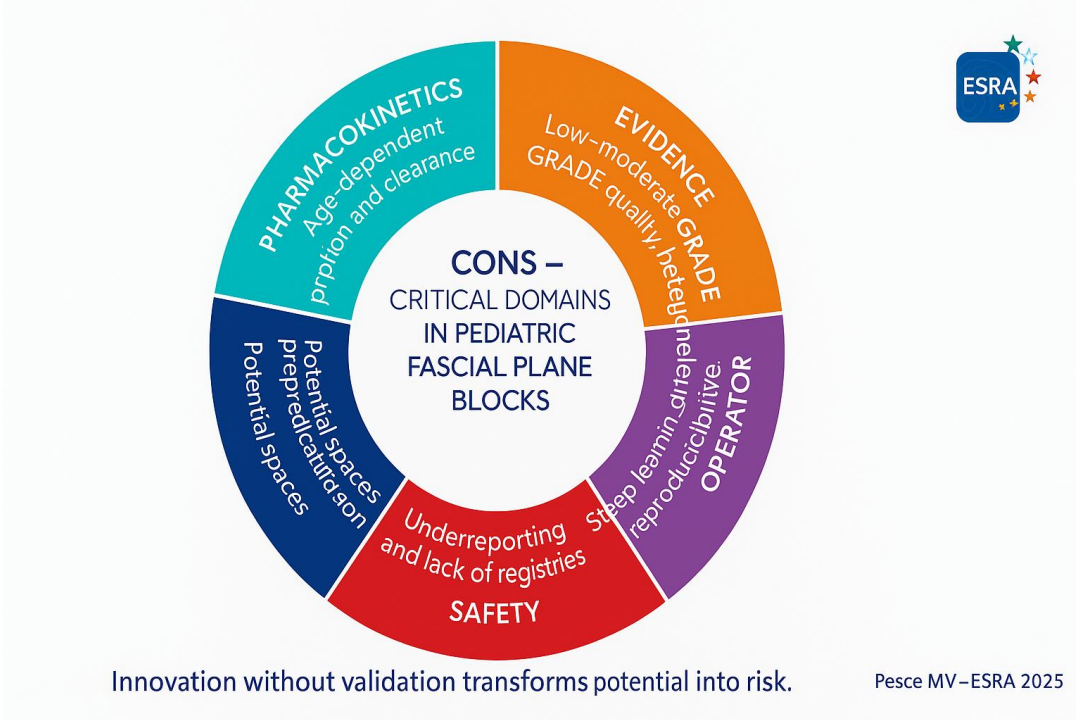
Absence of a dedicated pediatric registry limits safety assessment.

Absence of evidence ≠ evidence of absence.



The CONS Perspective: Critical Domains

- **Anatomical variability:** inconsistent fascial definition and unpredictable diffusion.
- **Pharmacokinetic vulnerability:** altered absorption, distribution, and elimination under 15 kg.
- **Methodologic limitations:** small, heterogeneous, often non-blinded trials.
- **Operator dependency:** reproducibility limited despite ultrasound guidance.
- **Safety oversight:** lack of multicenter registries and standardized toxicity thresholds.
- *Innovation without validation transforms potential into risk.*



Take-Home Message

•Fascial plane blocks embody the **most dynamic frontier in pediatric regional anesthesia**, but evidence maturity lags behind innovation

•Integration into **ERAS and multimodal frameworks** must rely on validated endpoints and pharmacokinetic modeling

•*Promise without proof remains potential—not standard of care.*

Fascial plane blocks in pediatrics: *precision is not yet predictability*

Evidence grows faster than standardization – data ≠ reproducibility

Pharmacokinetics define limits before innovation defines safety

Ultrasound is a guide, not a guarantee – experience remains decisive

"We must learn from what works,
and from what fails – equally."

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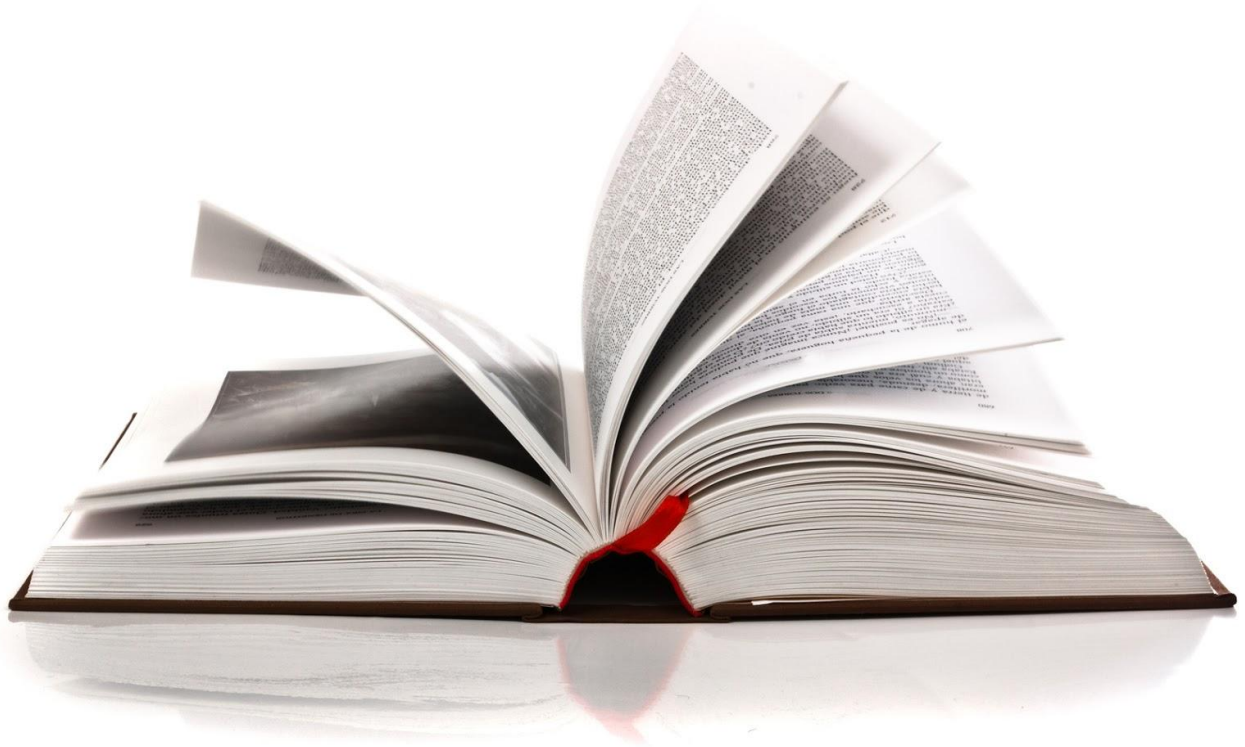

Grazie di

a tutti!