

# BRACHIAL PLEXUS BLOCK TECHNIQUES FOR UPPER LIMB SURGERY DISTAL TO THE SHOULDER: A BAYESIAN NETWORK META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS

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## BACKGROUND

- Ultrasound-guided brachial plexus block techniques are routinely used for upper limb surgery distal to the shoulder.
- However, existing evidence is largely limited to pairwise comparisons, preventing simultaneous evaluation of all available approaches. Consequently, the comparative effectiveness, efficiency, and safety of these techniques remain unclear.

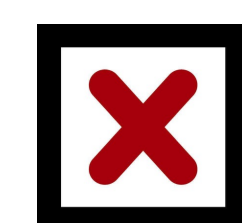
## METHODS



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Upper Limb Surgery



Interscalene  
Terminal Nerves  
Combined Block  
Strategies

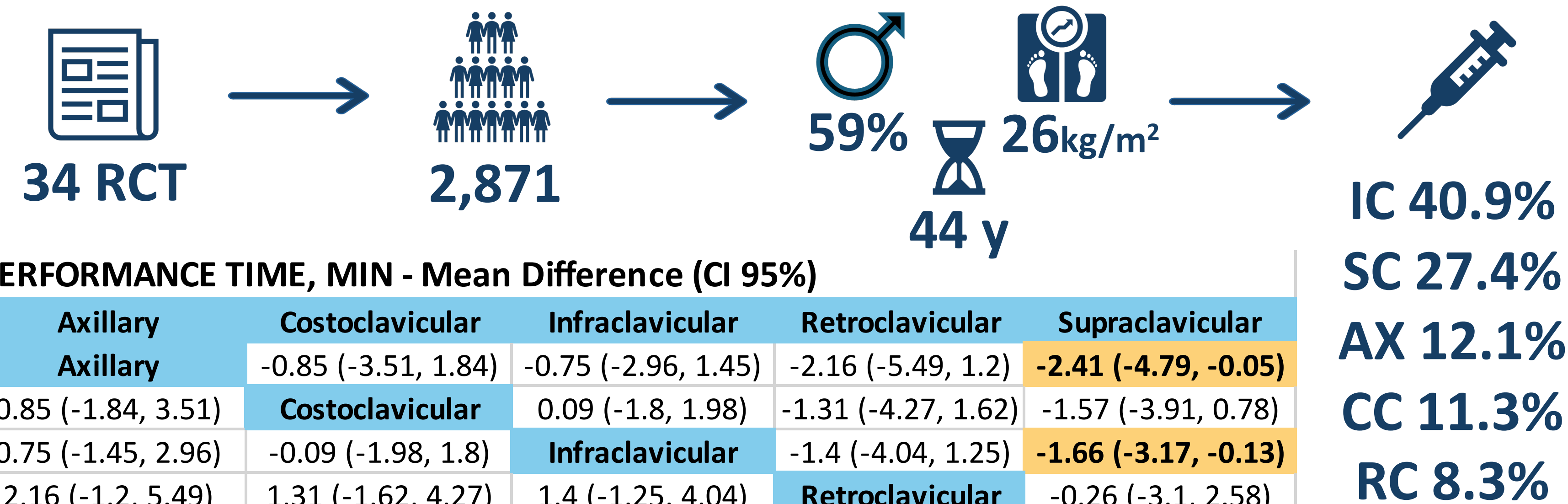


Shoulder Surgery

### Primary Endpoints:

- Performance time
- Sensory block onset
- Motor block onset
- Adverse event rates

## RESULTS



### PERFORMANCE TIME, MIN - Mean Difference (CI 95%)

| Axillary           | Costoclavicular        | Infraclavicular        | Retroclavicular        | Supraclavicular             |
|--------------------|------------------------|------------------------|------------------------|-----------------------------|
| Axillary           | -0.85 (-3.51, 1.84)    | -0.75 (-2.96, 1.45)    | -2.16 (-5.49, 1.2)     | <b>-2.41 (-4.79, -0.05)</b> |
| 0.85 (-1.84, 3.51) | <b>Costoclavicular</b> | 0.09 (-1.8, 1.98)      | -1.31 (-4.27, 1.62)    | -1.57 (-3.91, 0.78)         |
| 0.75 (-1.45, 2.96) | -0.09 (-1.98, 1.8)     | <b>Infraclavicular</b> | -1.4 (-4.04, 1.25)     | <b>-1.66 (-3.17, -0.13)</b> |
| 2.16 (-1.2, 5.49)  | 1.31 (-1.62, 4.27)     | 1.4 (-1.25, 4.04)      | <b>Retroclavicular</b> | -0.26 (-3.1, 2.58)          |
| 2.41 (0.05, 4.79)  | 1.57 (-0.78, 3.91)     | 1.66 (0.13, 3.17)      | 0.26 (-2.58, 3.1)      | <b>Supraclavicular</b>      |

### SENSORY BLOCK ONSET, MIN - Mean Difference (CI 95%)

| Axillary                     | Costoclavicular        | Infraclavicular        | Retroclavicular        | Supraclavicular        |
|------------------------------|------------------------|------------------------|------------------------|------------------------|
| Axillary                     | 10.18 (-2.14, 22.37)   | 12.76 (1.32, 24)       | 11.93 (-7.99, 31.62)   | 14.52 (1.1, 27.84)     |
| -10.18 (-22.37, 2.14)        | <b>Costoclavicular</b> | 2.58 (-5.55, 10.71)    | 1.74 (-15.2, 18.78)    | 4.34 (-6.47, 15.13)    |
| <b>-12.76 (-24, -1.32)</b>   | -2.58 (-10.71, 5.55)   | <b>Infraclavicular</b> | 0.83 (-17.72, 16.29)   | 1.76 (-5.39, 8.94)     |
| -11.93 (-31.62, 7.99)        | -1.74 (-18.78, 15.2)   | 0.83 (-16.29, 17.72)   | <b>Retroclavicular</b> | 2.58 (-15.98, 20.93)   |
| <b>-14.52 (-27.84, -1.1)</b> | -4.34 (-15.13, 6.47)   | -1.76 (-8.94, 5.39)    | 2.58 (-20.93, 15.98)   | <b>Supraclavicular</b> |

### MOTOR BLOCK ONSET, MIN - Mean Difference (CI 95%)

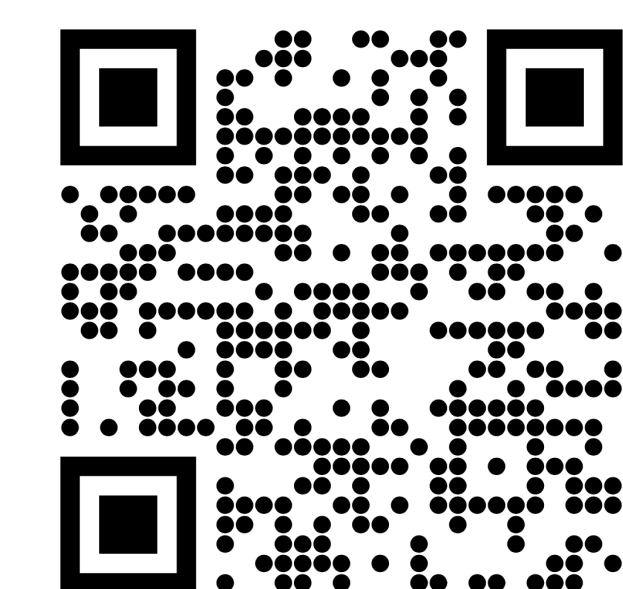
| Axillary           | Costoclavicular        | Infraclavicular        | Retroclavicular        | Supraclavicular        |
|--------------------|------------------------|------------------------|------------------------|------------------------|
| Axillary           | -0.2 (-2.69, 2.43)     | -0.1 (-2.31, 2.08)     | -1.38 (-4.54, 1.92)    | 0.29 (-2.3, 3.01)      |
| 0.2 (-2.43, 2.69)  | <b>Costoclavicular</b> | 0.09 (-1.28, 1.33)     | -1.2 (-3.57, 1.18)     | 0.48 (-1.49, 2.43)     |
| 0.1 (-2.08, 2.31)  | -0.09 (-1.33, 1.28)    | <b>Infraclavicular</b> | -1.27 (-3.6, 1.17)     | 0.4 (-1, 1.9)          |
| 1.38 (-1.92, 4.54) | 1.2 (-1.18, 3.57)      | 1.27 (-1.17, 3.6)      | <b>Retroclavicular</b> | 1.66 (-1.14, 4.45)     |
| -0.29 (-3.01, 2.3) | -0.48 (-2.43, 1.49)    | -0.4 (-1.9, 1)         | -1.66 (-4.45, 1.14)    | <b>Supraclavicular</b> |

### ADVERSE EVENTS RATE - Odds Ratio (CI 95%)

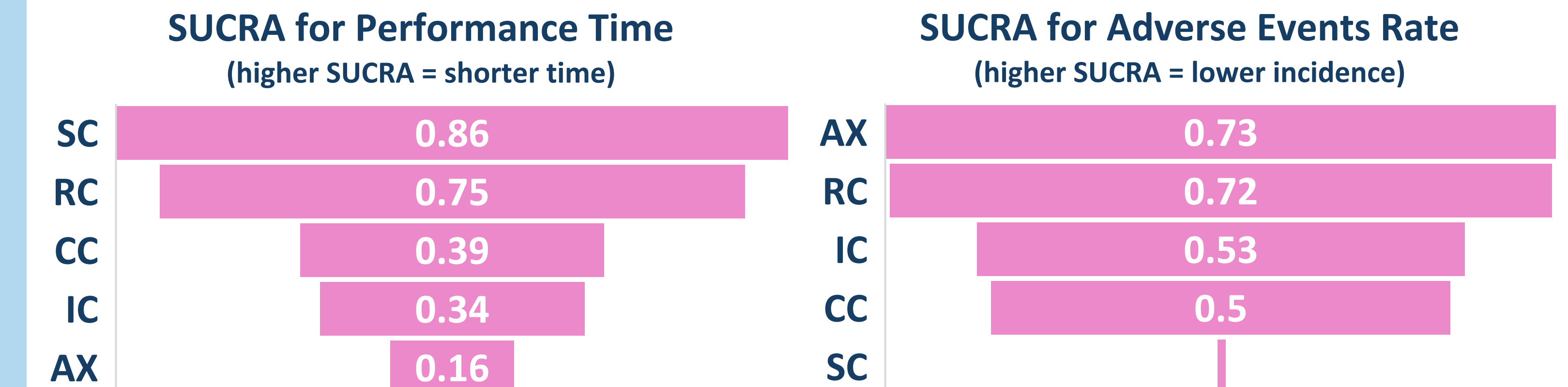
| Axillary          | Costoclavicular        | Infraclavicular        | Retroclavicular        | Supraclavicular            |
|-------------------|------------------------|------------------------|------------------------|----------------------------|
| Axillary          | 1.76 (0.21, 16.89)     | 1.6 (0.31, 8.99)       | 0.91 (0.05, 19.98)     | <b>10.46 (1.89, 63.84)</b> |
| 0.57 (0.06, 4.83) | <b>Costoclavicular</b> | 0.91 (0.19, 4.13)      | 0.52 (0.04, 7.53)      | <b>5.94 (1.14, 30.69)</b>  |
| 0.63 (0.11, 3.23) | 1.1 (0.24, 5.2)        | <b>Infraclavicular</b> | 0.57 (0.05, 7.51)      | <b>6.55 (2.24, 19.6)</b>   |
| 1.1 (0.05, 19.27) | 1.91 (0.13, 27.56)     | 1.74 (0.13, 21.07)     | <b>Retroclavicular</b> | <b>11.33 (0.84, 14.56)</b> |
| 0.1 (0.02, 0.53)  | 0.17 (0.03, 0.88)      | 0.15 (0.05, 0.45)      | 0.09 (0.01, 1.19)      | <b>Supraclavicular</b>     |

BETTER  
RESULTS

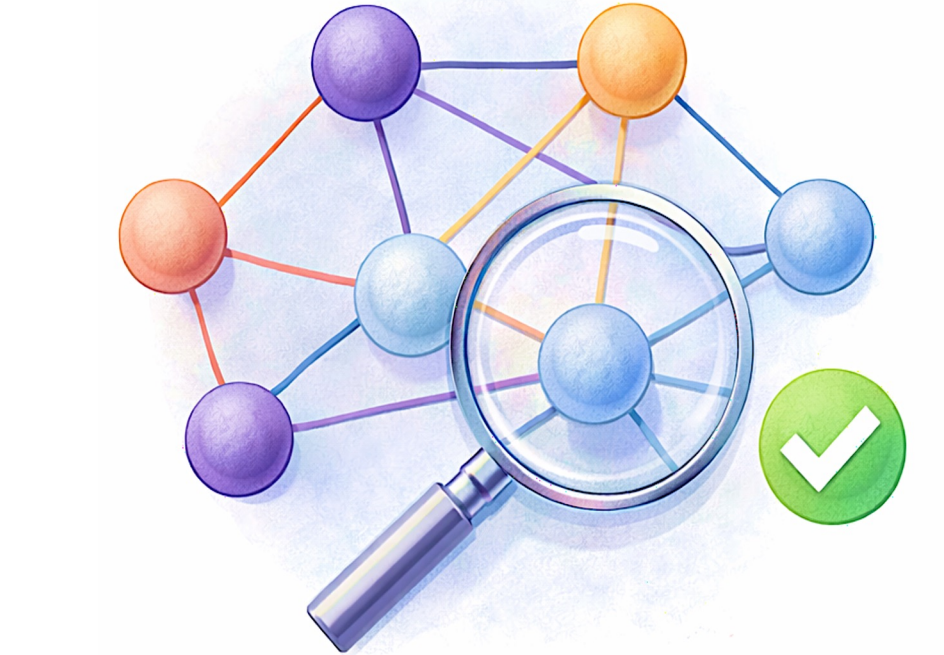
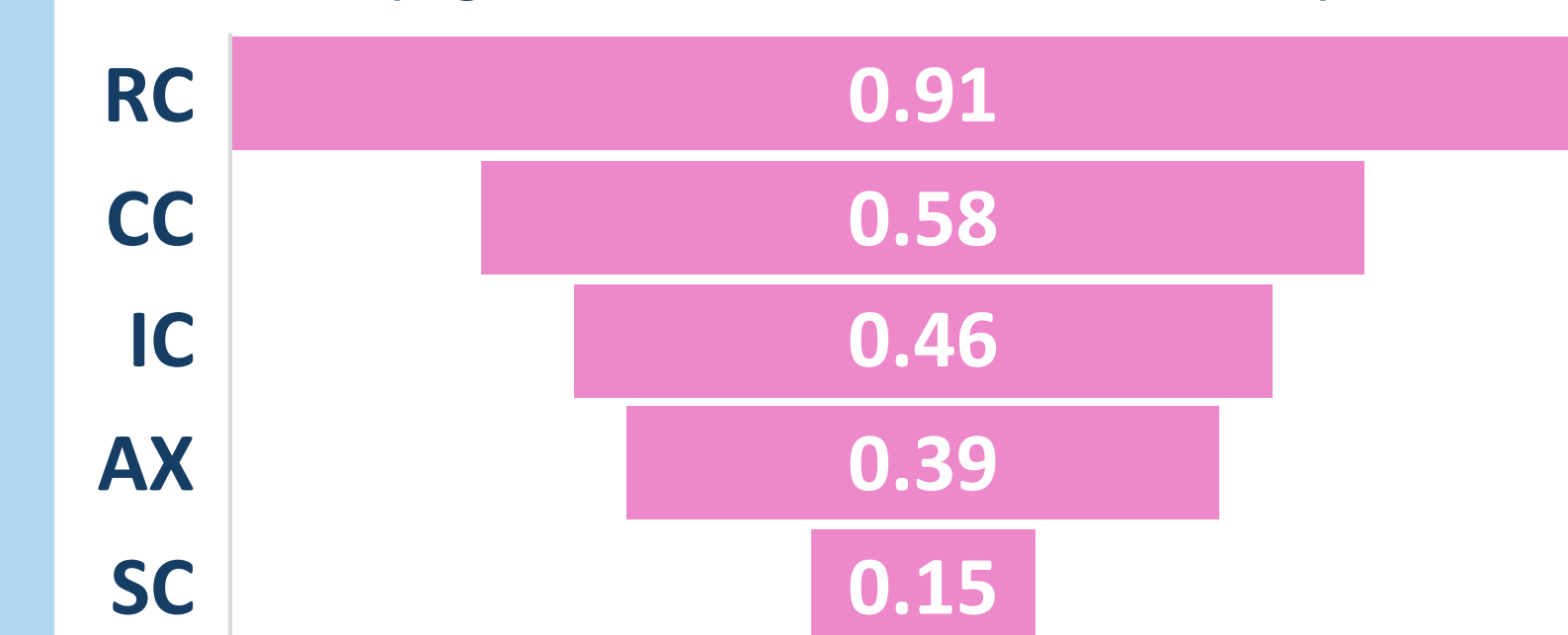
WORSE  
RESULTS



## DISCUSSION



### SUCRA for Motor Block Onset Time (higher SUCRA = faster motor onset)



No relevant inconsistency was  
identified across outcomes based  
on node-splitting analyses

- Supraclavicular approach was associated with greater procedural efficiency but higher adverse event rate, whereas axillary blocks demonstrated faster sensory onset and a more favorable safety profile.
- Retroclavicular blocks showed a high probability of ranking among the most favorable techniques for motor block onset, performance time, and adverse event outcomes.
- These findings highlight trade-offs between procedural efficiency, block dynamics, and safety that may help clinicians tailor block selection according to procedural priorities and patient-specific considerations.