

Block duration as a novel patient outcome measure for regional anesthesia education

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Introduction

- **Ultrasound-guided regional anesthesia** is a tested skill during the applied anesthesia board exam (1)
- Near-real-time feedback may be helpful in resident training (2)
- Reported regional anesthesia training assessments are primarily observational tools and, for patient outcomes, only immediate block failure (3) has been used for education
- More objective training measurements are needed to optimize regional anesthesia learning for general anesthesiology training

This study evaluates **patient follow-up** and **block duration outcomes** to **identify residents needing additional training interventions** for single bolus regional procedures at Massachusetts General Hospital (MGH) ambulatory surgical center, in Waltham, MA.

Methods

MGH IRB approved this study

Population

- 13 attendings, 33 senior residents on a 4-to-6-week regional anesthesia elective
- Study period: April 2022 to April 2024
- Rotation experience tailored to focus on mostly lower extremity procedures in the 1st half of rotation to mostly upper extremity procedures in the 2nd half

Data collection (4)

- Platform: MGB RedCap with Twilio for sending text message links to follow-up surveys to patients at 27 hours after block placement
- **Included data: overall patient follow-up rate, survey-only response rate, block resolution and block duration follow-up rates, block procedure, block duration**
- Block inclusion: blocks with ropivacaine or bupivacaine
- Block exclusion: blocks using mepivacaine
- Block duration: reported by patients either by automated text-based survey or phone call by anesthesia provider if no response to survey
- **Block duration**: the number of hours the block lasted as reported by patients
- **Underperforming blocks**: block durations <10th percentile of attending-only procedures

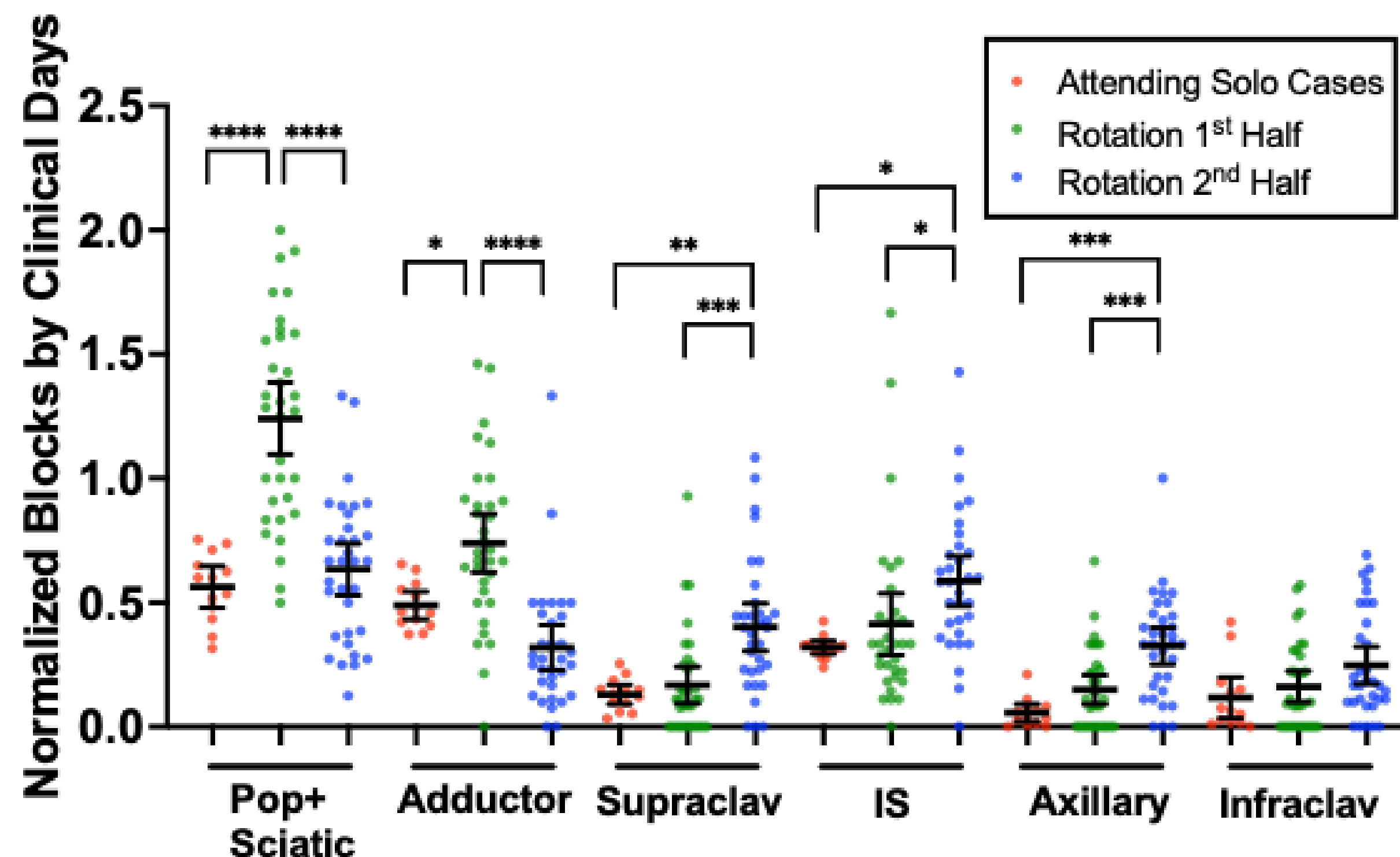
Analysis tools & statistical methods

- RStudio (v2024.09.0), GraphPad Prism (v10.4.1)
- Statistical analysis: one-way ANOVA, t-tests; significance at <0.05

Table 1. Patient follow-up and patient automated survey response rates for blocks performed by residents and/or attendings.

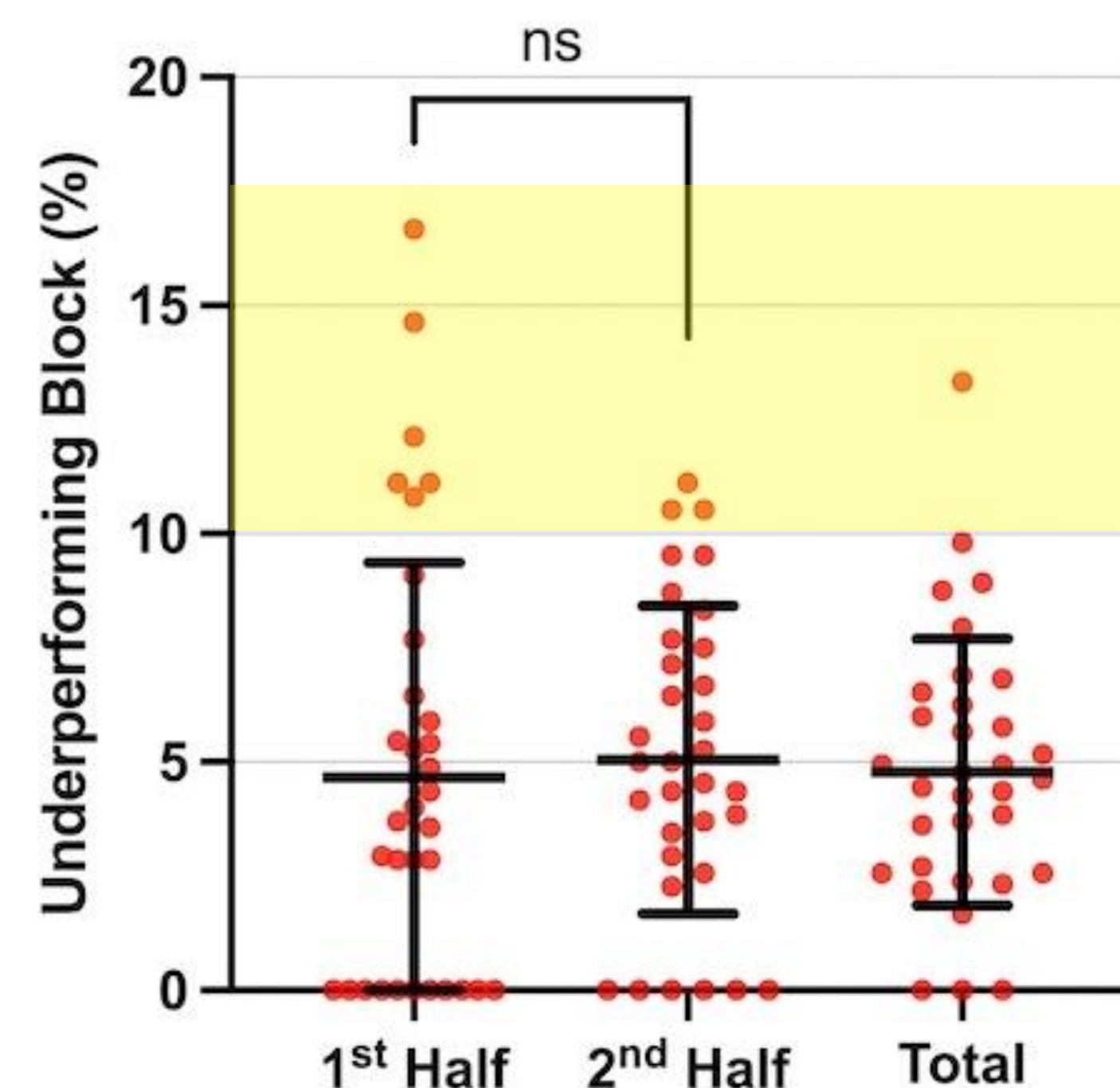
	Follow-up or Response Rate Mean $\pm$ SD			Multiple Comparison of Means (p-value)			Resident # < Attending Mean	
	Attending (N=13)	Resident 1st Half (N=33)	Resident 2nd Half (N=33)	Attd. vs. Res. 1st Half	Attd. vs. Res. 2nd Half	Res. 1st Half vs. Res. 2nd Half	Rotation 1st Half (%)	Rotation 2nd Half (%)
Overall follow-up rate	87.2% $\pm$ 4.6	95.1% $\pm$ 6.8	92.9% $\pm$ 7.3	0.003	0.037	0.302	5 (15.2%)	4 (12.1%)
Patient survey response rate	82.1% $\pm$ 2.6	79.0% $\pm$ 12.3	76.0% $\pm$ 13.0	0.683	0.245	0.316	19 (57.6%)	22 (66.7%)
Worn-off follow-up rate	87.0% $\pm$ 4.7	95.1% $\pm$ 6.8	92.9% $\pm$ 7.3	0.003	0.032	0.303	5 (15.2%)	3 (9.1%)
Block duration follow-up rate	57.4% $\pm$ 9.7	71.7% $\pm$ 14.1	78.7% $\pm$ 11.0	0.002	<0.0001	0.056	6 (18.2%)	1 (3.0%)

Figure 1. Residents' normalized block counts over rotation compared to attendings' normalized counts.



The number of single bolus regional anesthesia block procedures are normalized (divided) by the number of unique clinical days for procedures performed by attendings only (red dots) and residents with attending supervision during the residents' 1st (green dots) and 2nd halves of their rotation (blue dots). Means $\pm$ 95% CIs plotted.
Pop+sciatic = popliteal + sciatic; Adductor = adductor canal; Supraclav = supraclavicular; IS = interscalene; Infraclav = infraclavicular
* = p-value <0.05; ** = p-value <0.01; *** = p-value <0.001; **** = p-value <0.0001

Figure 2. Underperforming resident blocks during regional anesthesia rotation.



Percent of each resident's underperforming blocks is shown by those in the 1st half (4.7% $\pm$ 4.7%) and 2nd half (5.0% $\pm$ 3.4%) of their rotations (p=0.70, t=0.387, df=64), and the total (4.8% $\pm$ 2.9%). Yellow highlighted area signifies trainees with failure rates above 10% cutoff. Mean $\pm$ -SD plotted.

Results

- **Follow-up rates** (Table 1)
 - Overall response, block resolution, block duration follow-up rates: **higher in residents** than attendings
 - Not significantly different for survey response rate
- **Block counts** (Figure 1)
 - 1st rotation half (compared to attending)
 - Residents perform significantly **more normalized popliteal-saphenous** (1.2 $\pm$ 0.4 vs. 0.6 $\pm$ 0.3, p<0.0001) and **adductor canal blocks** (0.7 $\pm$ 0.3 vs. 0.3 $\pm$ 0.3, p<0.0001)
 - 2nd rotation half (compared to 1st rotation half)
 - Residents perform **more normalized supraclavicular, interscalene, and axillary blocks**
 - Numbers exceed that of attending
- **Underperforming blocks** (Figure 2)
 - **>10% underperforming: 18.2%** of residents in 1st rotation half $\rightarrow$ **9.1%** in the 2nd rotation half
 - Most trainees had underperforming blocks

Discussion

- Number of residents with >10% rate of underperforming blocks reduced by half by the 2nd rotation half (from 6 to 3 residents)
- Residents with underperforming blocks may benefit from **reviewing saved procedure images** and **targeted educational interventions**
- **Patient-reported block duration** as a **novel** metric for evaluating **resident performance on single bolus blocks**

Limitations

- Incomplete block duration data $\rightarrow$ impact block performance results
- Block duration data $\rightarrow$ patient-reported due to same-day discharges

Future direction

- Identify modifiable factors contributing to underperforming blocks, such as block exposure frequency and attending instruction $\rightarrow$ help develop quality improvement interventions

References

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Summary

- **Patient-reported block duration** as a **novel** metric for evaluating **resident performance on single bolus blocks**
- Number of **residents with >10% underperforming blocks reduced** by half in 2nd half of the rotation (18.2% $\rightarrow$ 9.1%)
- **Reviewing procedure images** and **targeted interventions** may help improve performance