

Assessing the Impact of a Regional Anesthesia Workshop on Anesthesiology Residents' Perceived Comfort in Performing Peripheral Nerve Blocks

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Original Article

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Abstract

Background: Different methods of regional anesthesia education have been described in the literature, but none have proven to be superior. The objective of this study was to evaluate the educational value as perceived by the anesthesia resident of a regional anesthesia workshop.

Methods: Twenty-eight anesthesia residents participated in a workshop, which reviewed nerve blocks of the upper and lower extremities. Prior to the workshop, each resident completed a survey assessing their confidence in their ability to perform 13 nerve blocks. At the conclusion of the workshop and at 3 months post-workshop, the residents completed similar surveys. Paired sample t-test was used to compare pre- and post-workshop confidence levels.

Results: Twenty-eight residents completed the pre-, post-, and 3-month follow-up questionnaires. There was a statistically significant increase in residents' confidence level post-workshop for 11 blocks evaluated. This was sustained in 5 blocks at the 3 month follow-up survey. Senior residents had higher baseline confidence scores when compared to junior residents. When all blocks were considered, junior residents demonstrated a statistically significant increase in confidence level in independently performing nerve blocks immediately post workshop and at 3 month follow-up. Senior residents had a statistically significant increase in confidence level immediately post workshop, but not at the 3 month follow-up. 100% of participants found the workshop to be beneficial. Participants with less prior experience showed sustained increase in comfort levels at 3 months post-workshop (p=0.007).

Conclusions: Based on self-reported trainee comfort level, the workshop was an effective teaching tool. Future workshops might be most effective when targeted at learners with less baseline regional anesthesia experience. Peripheral nerve block workshops can provide an important adjunct in the regional anesthesia education of resident anesthesiologists.

Key words: Regional anesthesia, education, workshop, survey.

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Manuscript

Background

The popularity of regional anesthesia has increased significantly over the past few years, especially with the incorporation of ultrasound guided techniques. It is imperative that anesthesia residents leave their training programs with the necessary skills to incorporate regional anesthesia into their everyday practice. Experts in the field have repeatedly stressed the importance of adequate education in the use of regional block techniques¹⁻³. The best way to obtain these skills has yet to be determined.

Historically, regional anesthesia has been taught through an apprenticeship style. Residents learned through the “see one, do one, teach one” pathway. This method, however, has significant limitations. One primary concern is patient safety, which could be improved if residents acquired some basic regional skills before attempting nerve blocks in the clinical setting. Another problem with the apprenticeship model is that residents may have very disparate learning experiences, based on what and how many clinical opportunities arise⁴. The ACGME requires 40 peripheral nerve blocks (PNBs) prior to graduation from residency, but studies have indicated that this number may be insufficient to obtain clinical competence⁵. One study showed that residents’ success rate in placement of epidurals improved with increased number of attempts⁶. This finding can be extrapolated to peripheral nerve blocks as well. To this end, some programs have implemented dedicated regional rotations, which increase the quantity of blocks residents perform during their training⁷.

Increased quantity is clearly an important factor in obtaining competence and confidence in regional anesthesia techniques. However, the time constraint of the 80 hour work week has

impacted the way in which regional anesthesia can be taught. Residents no longer have the luxury of acquiring skills as opportunities arise in the course of patient care. Teachers of regional anesthesia must be able to create meaningful learning opportunities. The quality of educational interactions should be stressed, rather than just relying on quantity to eventually lead to competence.

In an attempt to provide some guidelines for these educational interactions, the American Society of Regional Anesthesia and Pain Medicine and the European Society of Regional Anesthesia and Pain Therapy have recently published “joint committee recommendations for education and training in ultrasound-guided regional anesthesia”⁸. The Joint Committee recommends a residency-based training pathway that incorporates the six core competencies as defined by the ACGME⁹. Included in the recommendations is a didactic component addressing basic ultrasound skills and/or an introductory ultrasound-guided regional anesthesia workshop. The recommendations presented by ASRA/ESRA are based on opinion and clinical experience. The current literature on education in regional anesthesia is far from definitive.

Many different methods of supplemental training in regional anesthesia have been described in the literature. Animal or other lo-fidelity training models have been advocated to practice ultrasound guided regional anesthesia skills¹⁰⁻¹². Multi-media teaching tools have been employed⁴. One article describes residents being subjected to regional anesthesia themselves¹³! Another group studied the value of cadaver dissection workshops¹⁴. Simulators have been used to recreate regional anesthesia emergencies such as local anesthetic toxicity or a high spinal⁴.

Although a number of different methods have been used to teach regional anesthesia, the efficacy of these tools has not been thoroughly investigated.

The day-long workshop is a teaching format that has proven beneficial in other areas of anesthesia training¹⁵. The primary outcome measure was residents' subjective comfort level in independently performing PNBs. We hypothesized that the skills and knowledge obtained during the workshop would lead to a significant and sustained increase in resident confidence across all block types and resident training levels. The secondary outcome measure was resident feedback about the perceived educational value of the workshop. We expected that residents would endorse the workshop as a worthwhile experience. The goal of the workshop was to create a meaningful educational opportunity. The goal of the study was to determine the effect of a day-long regional anesthesia workshop on residents' perceived comfort level with PNB placement. .

Materials and Methods:

As part of resident education, a regional anesthesia workshop was organized. This one-day workshop lasted four hours and was open to post graduate year 1 (PGY-1) residents and clinical anesthesia (CA) 1-3 residents. A series of questionnaires designed to evaluate the educational value of the workshop was administered to the participating residents after approval was obtained by the Institutional Review Board. The study group brainstormed possible questions designed to assess the study outcomes. A subset of these questions was chosen for the surveys. Selected questions were pilot studied by presenting them to peers and receiving feedback.

Upon arrival, the residents were given a brief introduction to the structure of the workshop. The questionnaires were explained, and the pre-workshop questionnaire was completed. Residents then rotated in groups through three 1-hour sessions, with 5-6 residents per group. Each session was led by a faculty member trained in regional anesthesia. One session was devoted to upper extremity blocks and another devoted to lower extremity blocks. Anatomy and landmarks were reviewed for each type of relevant block. Paid volunteers served as models to obtain ultrasound images of the nerves at the site of each block. The optimal images were first demonstrated by the faculty group leader, and then attempted by the residents.

The third session was divided between paravertebral blocks, lumbar plexus blocks, and hands-on practice with ultrasound guided needle localization using pig shoulders. The anatomy and landmarks for paravertebral and lumbar plexus blocks were identified on skeleton models and human volunteers. During the practice session with pig models, residents used 22 gauge 2 inch Stimuplex A insulated needles and 21 gauge 4 inch Stimuplex A insulated needles (B

Braun; Bethlehem, PA) and the SonoSite M-Turbo ultrasound machines (SonoSite Inc.; Bothell, WA).

At the end of the morning, all of the small groups came back together for a brief wrap-up session. At this time, the post-workshop questionnaire (Appendix 1) was completed. Three months from the time of the workshop, a follow-up questionnaire was distributed to all participating residents. The pre- and post-workshop questionnaires were on paper, and the three month follow-up was an online version. Participating residents were compensated with a \$5 coffee gift card.

The residents completed the questionnaires anonymously. However, an identification number for each resident allowed comparison of the same resident's answers across the three questionnaires. In the pre-workshop questionnaire; demographics, level of training and previous regional anesthesia experience were assessed. Our primary outcome data revolved around the questionnaire query "please list your comfort level with the following peripheral nerve blocks," followed by a list of 13 PNBs (interscalene, supraclavicular, infraclavicular, axillary, nerve blocks at elbow, lumbar plexus, femoral, saphenous, classic Labat sciatic, subgluteal sciatic, popliteal, ankle, and thoracic paravertebral.) For the purposes of data analysis, answers from all three questionnaires were scored 1 through 4, correlating with answers of not comfortable/would not attempt (1), limited experience but would attempt (2), reasonably comfortable (3), and very comfortable (4).

In the post-workshop questionnaire, residents again rated their comfort level with the same thirteen blocks. They also expressed their opinions about the educational value of the workshop and gave feedback about potential areas for improvement. In the three month follow-

up questionnaire, residents for the third time rated their comfort level independently performing the same thirteen blocks.

Paired sample t-test was used to compare pre- and post-workshop confidence levels (immediately post-workshop and at 3 month follow-up). Spearman correlation was used to test the association between pre-workshop knowledge base and confidence level. The Bonferroni correction was applied to keep the overall alpha = 0.05. Assuming a sample size of 28, a standard deviation of 1, the Bonferroni-corrected alpha of 0.0038 (0.05/13), and a power of 0.8, a difference of 0.7 between baseline and follow-up scores could be detected in this study.

Results:

Twenty-eight residents participated in the workshop, 17 (61%) senior residents (CA-2 and CA-3) and 11 (39%) junior residents (PGY-1 and CA-1). All participants (28/28, 100%) completed the pre- and post- questionnaires. With the exception of one junior resident (27/28, 96%), all residents completed the 3-month follow-up questionnaire. In the pre-workshop questionnaire, baseline block confidence levels were established. Residents overall were most confident performing femoral blocks and ankle blocks, with an average comfort score of 2.89 +/- 1.13 (SD) and 2.68 +/- 1.09 respectively. They were least confident performing lumbar plexus blocks (1.38 +/- 0.70) and thoracic paravertebral blocks (1.43 +/- 0.84). (Figure 1) At both the immediate post-workshop time point and the 3-month follow-up time point, residents continued to give highest comfort scores to femoral and ankle blocks and lowest scores to lumbar plexus and thoracic paravertebral blocks.

In data analysis from immediate post-workshop questionnaire and the 3-month follow-up questionnaire, the comfort scores were again established, and then compared to the pre-workshop baseline to assess for improvement. There was a statistically significant ($p < 0.05$) increase in residents' confidence level immediately post-workshop for 11 out of 13 blocks evaluated. (Figure 1) The only two blocks for which there was not a significant increase in comfort score were popliteal and saphenous. A statistically significant increase in confidence level was sustained in only 5 of these blocks at the 3 month follow-up survey. A significant sustained increase in comfort score was seen for the following blocks: interscalene, supraclavicular, axillary, femoral and ankle.

Senior residents had higher baseline confidence scores when compared to junior residents (2.53 +/- 0.74 versus 1.44 +/- 0.38). When all blocks were considered together, both junior and

senior residents demonstrated a statistically significant increase in confidence level in independently performing nerve blocks immediately post workshop. (Figure 2). Junior residents had a greater increase in comfort level after the workshop than senior residents. Peak confidence for both groups was immediately following the workshop. At the three month follow-up the comfort level of both groups had decreased somewhat, but not returned to baseline. The increase in comfort level for juniors at 3 month follow-up remained statistically significant, but for seniors did not.

Prior to the regional workshop, 8 of the 17 senior residents had each spent 4 weeks on the regional anesthesia service. None of the junior residents had rotated through this service. In the year prior to the workshop, the 9 senior residents who did not have a regional rotation did perform some nerve blocks. (Residents not rotating on the regional service have the opportunity to perform occasional PNBs when they are on call. In addition, they may spend a random day on the regional service if the assigned regional resident is post call or on vacation.) Their experience was as follows: 2 performed 0-4 blocks, 2 performed 5-10 blocks, 2 performed 11-25 blocks, and 3 performed 26+ blocks. During the year prior to the workshop, the 11 junior residents block experience was as follows: 4 performed 0-4 blocks, 2 performed 5-10 blocks, and 5 performed 11-25 blocks. (Table 1) Experienced (defined as performing 11 or more blocks in the year preceding the workshop) and non-experienced (defined as performing less than 11 blocks in the year preceding the workshop) residents both demonstrated a statistically significant increase ($p \leq 0.05$) in block comfort level immediately following the workshop. (Figure 3)

During the 3 months immediately following the regional workshop, the 10 junior residents who completed the study all had limited opportunity to practice what they had learned. All 10 responded that they performed 0-4 blocks during this 3 month period. Three senior

residents rotated on the regional service during the 3 months immediately following the workshop. The block experience for all 17 senior residents during this period was as follows: 10 performed 0-4 blocks, 2 performed 5-10 blocks, 3 performed 11-25 blocks and 2 performed 26+ blocks. (Table 2) Among seniors, those who had completed 11 or more blocks after the workshop (n=5) appeared to retain increased comfort levels (2.62 vs 2.98 vs 3.17), as opposed to those who had completed fewer or no blocks post-workshop (n=12) and whose comfort levels lowered at 3 months (2.48 vs 2.76 vs 2.53).

A secondary outcome measure was residents' perceptions about the educational value of the workshop. These opinions were gathered on the immediate post-workshop questionnaire. 100% of residents answered in the affirmative when asked "did you find the workshop beneficial." (Figure 4). When questioned about specific aspects of the workshop program, 100% of residents felt that the workshop had improved their anatomical and landmark knowledge, 60.7% noted subjectively improved comfort level with ultrasound and 50.0% related subjectively improved dexterity with blocks. Residents were asked about whether they would like to see various additions to the workshop in the future. 96.3% of residents would add nerve catheter placement techniques. Only 50% or fewer of the residents believed that other potential additions, such as additional lectures, anatomic dissection, and video demonstration, would be beneficial to the educational value of the workshop. (Figure 5).

Discussion:

The purpose of this study was to examine the change in resident confidence level performing PNB following a one day regional workshop. Immediately following the workshop, the residents felt more confident with all but 2 (popliteal and saphenous) of the studied blocks. The

residents maintained a significant increase in comfort level with only 5 (interscalene, supraclavicular, axillary, femoral and ankle) of the studied blocks 3 months after the workshop. The junior residents appeared to have a greater benefit from this intervention, as their comfort level improved more than that of their senior colleagues. All residents involved in this endeavor indicated that it was a beneficial learning experience.

The primary outcome measure used was the ability of the workshop to increase residents' perceived comfort level in performing peripheral nerve blocks. Increased comfort level implies more familiarity with the various blocks, and more willingness to incorporate regional techniques into future practice.¹⁶ The regional workshop was intended as an adjunct educational opportunity, used to supplement the existing regional curriculum. It is not necessary or expected that residents emerge from the four hour workshop with the skills to be considered competent for independent practice. In our opinion, the workshop need only provide a lasting impact (defined as 3 months time) on residents comfort levels with peripheral nerve block techniques in order to be considered valuable. Our secondary outcome explored residents' perceptions about the value of the workshop and its various components.

This workshop was not the sole source of regional anesthesia education for our residents. CA-3 residents spend 4 weeks on a dedicated regional anesthesia rotation. During this rotation, they select appropriate patients for regional anesthesia techniques, perform PNB with ultrasound guidance and nerve stimulation, place peripheral nerve catheters, and follow up on these patients. The same faculty members involved in the workshop also attend on the regional rotation. In addition to supervising PNB, they also spend time providing informal didactics. The residents also receive a formal regional and ambulatory care didactic block consisting of two months of morning lectures pertaining to these topics. According to our results, experience level

prior to the workshop did not affect comfort level immediately following the workshop. The workshop was beneficial to all. However, residents who did more PNBs in the 3 month period following the workshop seemed to maintain a higher comfort level in comparison to those residents who had minimal block experience after the workshop. Perhaps, this type of educational intervention would most benefit those residents who will be given the opportunity to use the skills they have learned soon after the workshop.

By the measures employed in this study, the regional workshop was an overall moderate success. The immediate post-workshop questionnaire revealed that the workshop had had a major influence. Eleven of 13 blocks had a statistically significant increase in comfort level immediately after the workshop. Femoral, ankle, popliteal, supraclavicular, interscalene, and saphenous blocks had relatively high baseline scores where as the axillary, classic sciatic, blocks at the elbow, subgluteal sciatic, infraclavicular, lumbar plexus, and thoracic paravertebral had relatively low baseline scores. Popliteal and saphenous blocks were the only two for which there was not a significant increase in comfort level immediately post-workshop. These two were covered during the one hour session on lower extremity blocks, along with sciatic, femoral and ankle blocks. The authors postulate that perhaps instructors spent more time on these latter three, as they are more commonly employed techniques. The 3 month follow-up questionnaire showed that the workshop had a more modest long term impact. Only 5 of the original 13 blocks had sustained increases in comfort levels at the three month follow-up: interscalene, supraclavicular, axillary, femoral and ankle blocks. No clear unifying theory easily explains these results. In general, these five blocks are performed relatively frequently. Perhaps residents had more opportunities to apply the lessons of the workshop to these particular blocks during the interim 3 months, thus retaining a higher confidence level. We initially hypothesized that the

skills and knowledge obtained during the workshop would lead to a significant and sustained increase in resident confidence across all block types. This was not the case.

The initial hypothesis also stated that increase in resident comfort would be significant and sustained across all resident training levels. To this end, junior versus senior residents were compared. Both groups had a statistically significant increase in overall comfort level (when all blocks were considered as a whole) immediately post-workshop, but only the junior residents retained a significant elevation over baseline comfort level at the 3 month follow-up. Junior residents had a lower initial comfort score. With less baseline exposure to regional anesthesia, the junior residents had more to gain from participation in the regional workshop. The hypothesis that all residents would demonstrate a significant and sustained increase in comfort level was proven incorrect. Perhaps in the future, this workshop could be tailored towards less experienced residents, as they seemed to benefit the most from this educational intervention.

The secondary outcome explored in this study was resident feedback about the perceived educational value of the study. We hypothesized that residents would subjectively find the workshop to be valuable, and indeed they did. 100% of residents believed the workshop to be beneficial when asked in the immediate post-workshop survey, especially with regard to anatomic/landmark knowledge. Unfortunately, these questions were not repeated in the 3 month follow-up survey. It would have been interesting to see whether senior residents still felt that workshop was beneficial, even though their increased comfort with nerve blocks was no longer statistically significant. Almost all residents (96.3%) would have liked to learn more about nerve catheter placement techniques during the workshop. Educational opportunities such as this workshop provide the perfect venue for residents to explore a new technique, in a low stress environment.

The study has several limitations. With only 28 participants, the sample size was small. Resident experience (or lack thereof) with regional techniques during the 3 month follow-up period was not taken into account when evaluating comfort levels at the 3 month mark. Multiple regional faculty members taught the small group sessions, so variations in teaching style and material covered could have influenced the results. Finally, there is the consideration of outcome measures. Some might argue that demonstrating an increase in clinical competence would have been more meaningful. In the future, resident block placement could be assessed through resident case logs documenting block success rates. Alternatively, a practical exam could be given either at the conclusion of the workshop or at the conclusion of residency. The objective structured clinical examination is being used to demonstrate regional anesthesia competence in Israel¹⁷. Although beyond the scope of this study, evaluation of whether the regional workshop improved resident competence could be a target of future research projects.

The results of this study demonstrate that the regional anesthesia workshop, while a promising educational tool, has definite room for improvement. In the future, interventions should be made to try to retain increased resident confidence levels at 3 month follow-up. Such interventions might include more time spent on less common blocks, or take-home educational materials. It would also be advisable to gear future workshops towards less experienced residents, as they have the most to gain. Brief educational encounters such as this workshop cannot take the place of patient care over the course of an entire residency. The initial hypothesis was that the skills and knowledge obtained during the workshop would lead to a significant and sustained increase in resident confidence across all block types and resident training levels. This was not found to be true. However, residents overall did sustain an increased comfort level in some blocks, and junior residents in particular derived a long term

overall value from the workshop. We conclude that the workshop was a valuable adjunct, to be best used within the larger curriculum of regional anesthesia education.

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Table 1: Pre-workshop Block Experience

	Junior (n=11)	Senior (n=17)	Total (n=28)
Have you had a 4week rotation on the regional anesthesia service?-yes	0	8	8
If yes, how long ago?			
≤1 year	0	8	8
1-2 years ago	0	0	0
≥2 years ago	0	0	0
In no, how many days have you had on the regional service in the last year?			
0 days	1	6	7
1-4 days	8	1	9
5-8 days	2	1	3
9+ days	0	1	1
Approximately how many peripheral nerve blocks have you performed in the last year?			
0-4 blocks	4	2	6
5-10 blocks	2	2	4
11-25 blocks	5	2	7
26+ blocks	0	11	11

Table 2: 3 Months Post-Workshop Block Experience

	Junior (n=10)	Senior (n=17)	Total (n=27)
Have you had a 4 week rotation on the regional anesthesia service since the regional workshop? --Yes	0	3	3
If no, how many days have you had on the regional service in the 3 months?			
0 days	6	8	14
1-4 days	4	4	8
5-8 days	0	1	1
9+ days	0	4	4
Approximately how many peripheral nerve blocks have you performed in the last 3 months?			
0-4 blocks	10	10	20
5-10 blocks	0	2	2
11-25 blocks	0	3	3
26+ blocks	0	2	2

Figure 1

Comfort level, by block type, for all residents who completed the regional workshop. 1) Change in block comfort level immediately following the workshop is statistically significant. ($p \leq 0.05$). 2) Change in block comfort level three months following the workshop is statistically significant. ($p \leq 0.05$).

Figure 2

Comfort level of all blocks, by resident training level, for all residents who completed the regional workshop. 1) Change in block comfort level immediately following the workshop is statistically significant. ($p \leq 0.05$). 2) Change in block comfort level three months following the workshop is statistically significant. ($p \leq 0.05$).

Figure 3

Comfort levels of all blocks, by block experience, for all residents who completed the regional workshop. 1) Change in block comfort level immediately following the workshop is statistically significant ($p \leq 0.05$). 2) Change in block comfort level three months following the workshop is statistically significant ($p \leq 0.05$).

Figure 4

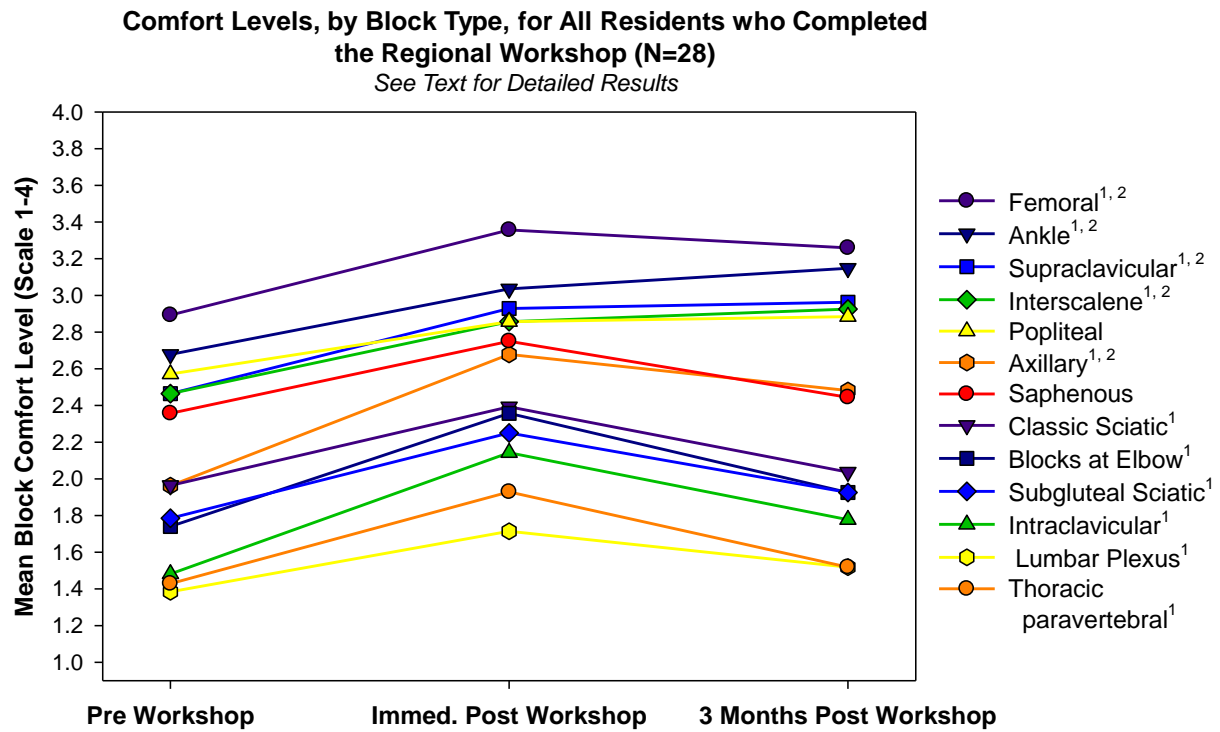
Beneficial aspects of the workshop. In the post-workshop questionnaire, the residents were asked what knowledge realms (anatomical/landmark knowledge, comfort with

ultrasound, and dexterity with blocks) improved based on the workshop and about the overall benefit of the workshop.

Figure 5

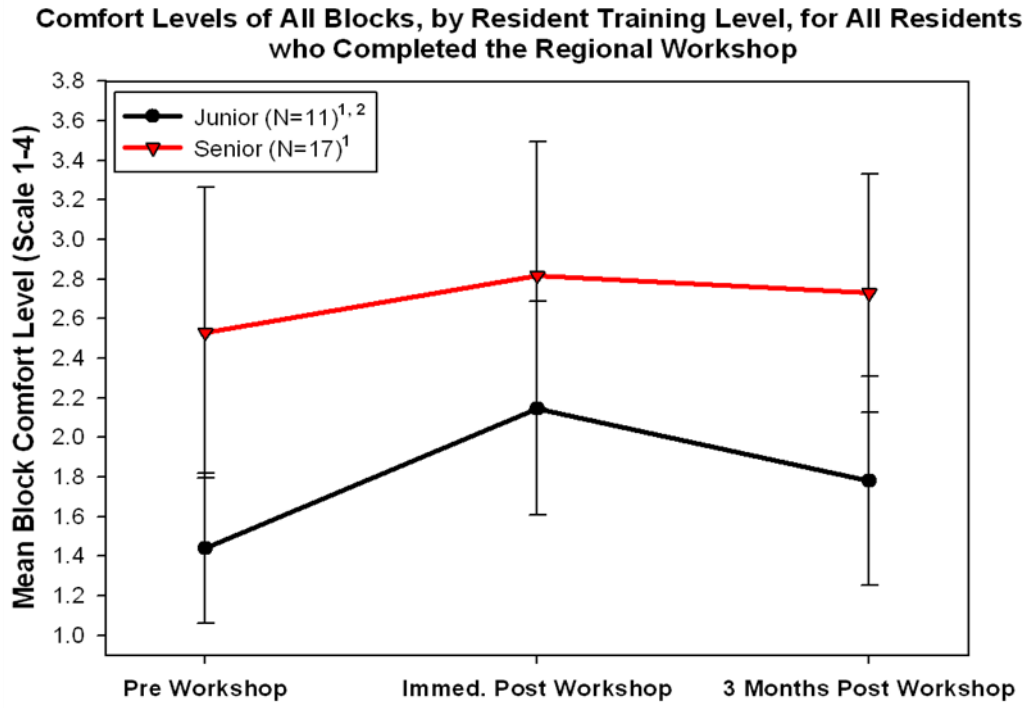
Further Additional Topics. In the post-workshop questionnaire, the residents were asked if additional topics (nerve catheter placement technique, video demonstration, anatomical dissection, and additional lectures) should be added to future workshops.

Figure 1



¹Change in block comfort level *immediately* following workshop is statistically significant (p≤0.05)
²Change in block comfort level *three months* following workshop is statistically significant (p≤0.05)

Figure 2



¹Change in block comfort level *immediately* following workshop is statistically significant ($p \leq 0.05$)

²Change in block comfort level *three months* following workshop is statistically significant ($p \leq 0.05$)

Figure 3

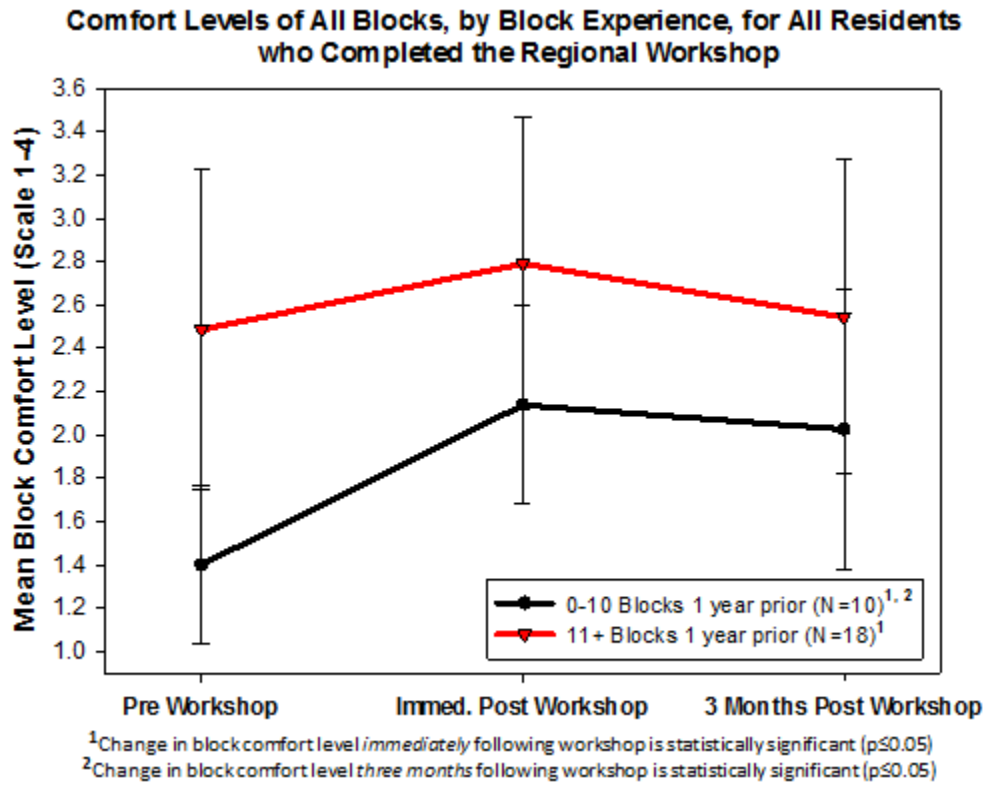


Figure 4

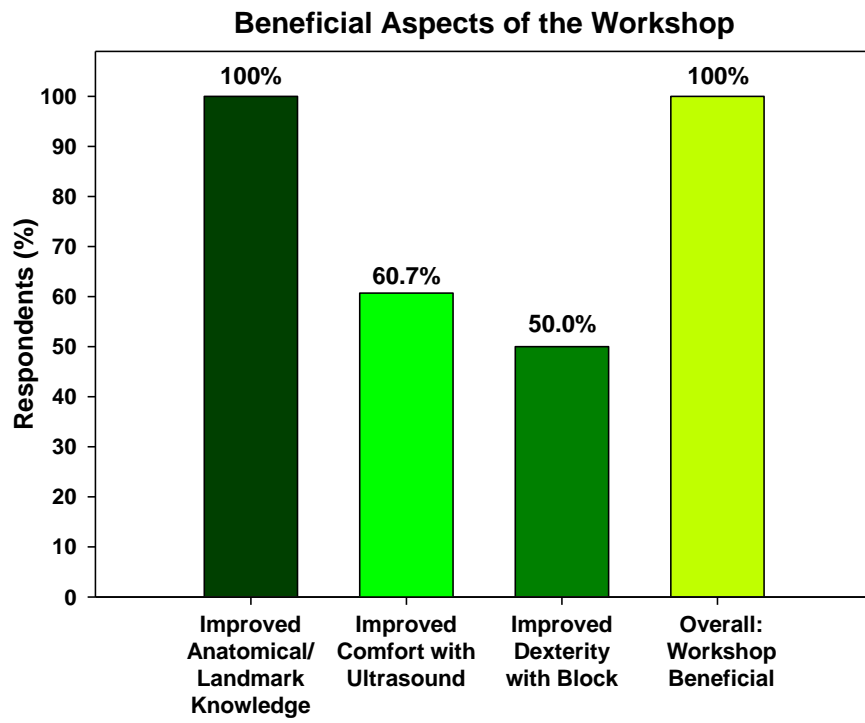


Figure 5

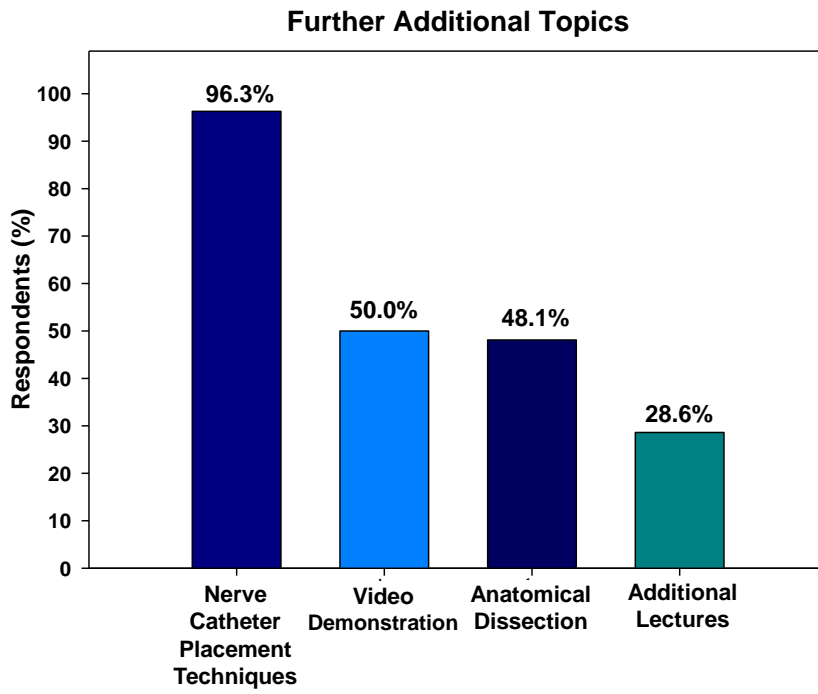


Figure 3

Appendix 1

Post-Workshop Questionnaire

	Waste of Time	Not Valuable	Neutral	Valuable	Extremely Valuable
Did you find this workshop to be:					

Would you have wanted to add the following to the regional workshop?

	Definitely leave out	Probably leave out	Neutral	Consider adding	Definitely add
Anatomic Dissection					
Additional Lectures					
Video demonstration					
Nerve catheter placement techniques					

Did any of the following improve with the regional workshop?

	More confused	No Improvement	Neutral	Improvement	Major Improvement
Anatomic/landmark knowledge					
Dexterity with block					
Comfort level with ultrasound					

After attending the Regional Retreat, please list your comfort level with the following peripheral nerve blocks.

Block Type	1= Not Comfortable (would not attempt)	2= Limited Experience (but would attempt)	3= Reasonably Comfortable	4= Very Comfortable
Interscalene				
Supraclavicular				
Intraclavicular				
Axillary				
Nerve Blocks at Elbow				
Lumbar Plexus				
Femoral				
Saphenous				
Classic (Labot) Sciatic				
Subgluteal Sciatic				
Popliteal				
Ankle Block				
Thoracic Paravertebral				
Transversus Abdominis Plane Block				