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Original Research Article

ORIGINAL RESEARCH ARTICLE

Regional anaesthesia training in the UK – a national survey

Boyne Bellew[1,2], David Burkett St-Laurent[3], Martin Shaw[4,5], Toby Ashken[6], Jonathan Womack[7], Jonathan Debenham[3], Michael Getty[3], Shveta Kajal[8], Neil Verma[8], Katie Samuel[9], Alan J. R. Macfarlane[5,10,†], Rachel J. Kearns[5,10,*,†] and on behalf of the Regional Anaesthesia UK Research Network[‡]

[1]Department of Anaesthesia, Royal National Orthopaedic Hospital, Stanmore, UK, [2]Imperial College Healthcare NHS Trust, London, UK, [3]Department of Anaesthesia, Royal Cornwall Hospitals NHS Trust, Truro, UK, [4]Department of Medical Physics, NHS Greater Glasgow and Clyde, UK, [5]School of Medicine, University of Glasgow, UK, [6]Department of Anaesthesia, University College London, London, UK, [7]Department of Anaesthesia, Royal Victoria Infirmary, Newcastle upon Tyne, UK, [8]The Hillingdon Hospitals NHS Foundation Trust, UK, [9]Department of Anaesthesia, North Bristol NHS Trust, Bristol, UK and [10]Department of Anaesthesia, Glasgow Royal Infirmary, Glasgow, UK

*Corresponding author. Department of Anaesthesia, Glasgow Royal Infirmary, Glasgow, UK. E-mail: Rachel.kearns@glasgow.ac.uk
[†]Denotes joint last author.
[‡]See supplementary material for a list of collaborators.

Abstract

Background: Adequate training of anaesthetists in regional anaesthesia is important to ensure optimal patient access to regional anaesthesia.
Methods: We undertook a national survey of UK trainee anaesthetists and Royal College of Anaesthetists (RCoA) tutors to assess experiences of training in regional anaesthesia. We performed descriptive statistics for baseline characteristics, and logistic regression of training indices and tutor confidence that their hospital could provide regional anaesthesia training at all three stages of the RCoA 2021 curriculum.
Results: A total of 492 trainees (19.2%) and 114 tutors (45.2%) completed the survey. Trainees were less likely to have received training in chest/abdominal wall compared with upper/lower limb blocks {erector spinae *vs* femoral block (odds ratio [OR] 0.25, 95% confidence interval [CI] 0.16–0.39), $P<0.001$}, or achieved >20 chest/abdominal wall blocks by Stage 3 of training (chest *vs* lower limb block [OR 0.09, 95% CI 0.05–0.15, $P<0.001$]. There was a strong association between training received, number of blocks performed (>20 *vs* 0–5 blocks), and self-reported ability to perform blocks independently, OR 20.9 (95% CI 9.38–53.2). 24/182 (13%) and 10/182 (5.5%) of trainees had performed ≥50 non-obstetric lumbar and thoracic epidurals, respectively, by Stage 3 training. There was a positive association between having a lead clinician for regional anaesthesia, particularly those with paid sessions, and reported confidence to provide regional anaesthesia training at all stages of the curriculum (Stage 3 OR 7.27 [95% CI 2.64–22.0]).
Conclusion: Our results confirm the importance of clinical experience and access to training in regional anaesthesia, and support the introduction of departmental regional anaesthesia leads to improve equity and quality in training opportunities.

Keywords: curriculum; education; regional anaesthesia; Royal College of Anaesthetists; training

Many studies suggest that regional anaesthesia is underutilised.[1] In order to offer patients a choice of anaesthetic technique, and to ensure optimal access to regional anaesthesia, anaesthetists must be trained with the requisite skills. In the United Kingdom, training in anaesthesia is governed by the General Medical Council in conjunction with

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the Royal College of Anaesthetists (RCoA), and takes a minimum of 7 yr after completion of a 2-yr foundation programme where doctors achieve generic competencies.[2] In 2021, the RCoA published a new curriculum for anaesthesia training incorporating three distinct training stages before completion and eligibility to apply for a consultant post.[3] Regional anaesthesia is now a core competency domain in each stage of the RCoA curriculum, and by the end of Stage 3 (the final 2 yr of training), the trainee must be able to independently perform 'upper limb', 'lower limb', 'chest', and 'abdominal wall' peripheral nerve blocks in addition to central neuraxial techniques.[3] The curriculum is not prescriptive, and allows flexibility by not specifying particular blocks in each anatomical category. This may also reflect a lack of consensus across worldwide training programmes, guidelines, and recommendations as to which are the most important blocks to learn during non-fellowship regional anaesthesia training.[4–6]

Whilst not specified in the RCoA curriculum, the 'Plan A' blocks concept proposed by Regional Anaesthesia UK recommends becoming competent in seven high value, safe, effective, and simple peripheral blocks, namely the interscalene, axillary, rectus sheath, erector spinae plane (ESP), femoral, adductor canal, and popliteal blocks.[7] With the expansion of interest in ultrasound-guided regional anaesthesia, Plan A blocks are now being taught across many UK anaesthetic departments (personal communication, AJRM). However, despite the potential paradigm shift in training accompanying the introduction of new technologies such as artificial intelligence-assisted nerve recognition and noninvasive simulation and assessment equipment, there is currently little information on the delivery of regional anaesthesia training in the UK and the nature and number of blocks being undertaken by trainees.[8–11] Whether the 2021 RCoA curriculum objectives are being met, or are likely to be met in the future, is unknown.

In the UK, RCoA tutors act as educational leads for anaesthetic training, ensuring that the educational and pastoral needs of each trainee, and all curriculum requirements, are met. We surveyed both anaesthesia trainees and tutors in the UK with the intention of informing relevant stakeholders including NHS hospitals and the RCoA on current experiences of training in regional anaesthesia and to identify areas where further adaptations may be required. We chose to incorporate the recognised concept of Plan A blocks given these could be correlated with the anatomical areas specified in the RCoA curriculum.

Methods

Ethical approval was not required for this survey. We conducted two cross-sectional surveys using the Google Forms survey tool (Google Inc., Mountain View, CA, USA). Results are reported in accordance with the CROSS checklist (Supplementary material, Appendix 2).[12,13] The trainee survey was conducted in collaboration with the Research and Audit Federation of Trainees (RAFT) and the tutor survey performed in conjunction with the RCoA and Health Services Research Committee (HSRC). Since the launch of this survey, HSRC has merged with the Perioperative Medicine Clinical Trials Network to form the Centre for Research and Improvement. Each survey was constructed using an iterative process with questions drafted based on recommendations in the RCoA curriculum for trainees and previous Delphi consensus work from international experts focusing on non-fellowship regional anaesthesia training.[3,6] Pilot surveys were tested on a working group of five members of the RA-UK research network (round 1), with feedback from this round used to refine questions before further peer review by 10 members of the RA-UK board and one representative from RAFT (round 2). Depending on the question asked, answers were obtained in one of the following formats: pre-populated drop-down menu; 'YES/NO'; using a 4-point Likert scale; using a numeric scale from 1 to 10; via a free text response. The final surveys were approved by the RAFT and RCoA/HSRC internal governance processes (Supplementary material, Appendices 3 and 4). The trainee survey (49 questions) was disseminated via RAFT and RA-UK electronic mailing lists, by emails to local training leads, and via Twitter (now 'X'). All UK trainees between CT3 and ST7 (i.e. year 3–7 of anaesthetic training) in RCoA approved training posts were eligible. The tutor survey with 38 questions was distributed via the RCoA's electronic tutor mailing list and reminder emails were sent out 1 month and 1 week before survey closure via the above channels. To determine the denominator for the number of training sites, we used the RCoA database of college tutors, and information from Health Education England (now NHS England Workforce Training and Education Directorate), Health Education Scotland, Department of Health Northern Ireland, and Health Education Improvement Wales to identify 252 UK NHS training hospitals with 352 tutors. All UK RCoA college tutors were eligible, but only one tutor from each hospital was required to complete the survey. The stages of training were split in to CT3, ST4/5, and ST6/7 reflecting the training grades encompassed within the three stages of training outlined in the 2021 RCoA curriculum.

Statistical analysis

We anonymised responses and removed duplicate submissions before analysis. We performed descriptive statistics for response rates, respondent characteristics, and experience in regional anaesthesia. Numerical data were assessed for normality using the Shapiro–Wilk test, and parametric or non-parametric testing performed as appropriate. We used logistic regression to provide odds ratios (ORs) with 95% confidence intervals (CIs) for the outcomes of: (i) achieved performance of $\geq$20 (peripheral nerve block) in body locations correlating with the 2021 RCoA curriculum; (ii) achieved $\geq$50 neuraxial blocks; (iii) receipt of training in each of the Plan A blocks, and (iv) self-reported ability to perform each of the Plan A blocks independently. We built further adjusted logistic regression models for (i) strata of number of peripheral blocks performed (0–5, 6–10, 11–15, 16–20, >20), and trainee self-reported ability to perform each Plan A block type (adjusting for stage of training and receipt of specific training for each block type), and (ii) tutor self-reported confidence that their hospital could provide regional anaesthesia training at Stages 1–3 of the RCoA 2021 curriculum (adjusted for having a regional anaesthesia lead with or without allocated programmed activity time), as we considered these the most clinically relevant endpoints. Data are described using count (%), and median (inter-quartile range [IQR]) as appropriate. Statistical significance was accepted at $P<0.05$. Survey data on Google Forms were migrated to Microsoft Excel for Mac (Microsoft Corp., Redmond, WA, USA) and analyses performed using R (version 4.2.2, R Foundation for Statistical Computing, Vienna, Austria).

Results

The trainee survey was open from 24 February 2022 to 1 June 2022, and the tutor survey from 28 July 2022 to 28 February 2023.

Anaesthesia trainee survey

A total of 492 trainees completed the survey. There were 2562 trainees at CT3-ST7 reported in the RCoA medical workforce census 2020, giving an estimated response rate of 19.2%.[14] Of these, 359/492 (73%) were from England, 74 (15%) from Scotland, 45 (9.1%) from Wales, and 14 (2.8%) from Northern Ireland. One hundred and twenty-five (25.4%) trainees were in Stage 1 (CT3), 185 (37.6%) in Stage 2 (ST4/5), and 182 (37%) in Stage 3 (ST6/7), (Table 1). General anaesthesia was the most common area of primary sub-specialty interest (111, 23%), followed by regional anaesthesia (93, 19%), and obstetric anaesthesia (82, 17%). Three hundred (61%) respondents stated that they had a lead clinician for regional anaesthesia in their hospital. One hundred and twenty-five (26%) trainees had undergone the optional 'higher' regional anaesthesia training as outlined in the prior RCoA 2010 curriculum, with 21 (4.5%) having done 'advanced' training. Further details of higher qualifications in regional anaesthesia and fellowship level training are detailed in Table 1. One hundred and seventy-two (35%) respondents said that they hoped to have a consultant job with a fixed regional anaesthesia component after completion of training.

Exposure to regional anaesthesia varied by stage of training and block type (Table 2). The performance of ≥50 neuraxial blocks by Stage 3 training was achieved in 178/182 (92%) for obstetric spinals, 175/182 (96%) for obstetric epidurals, and in 132/182 (74%) for non-obstetric spinals. Some 24/182 (13%) and 10/182 (5.5%) of trainees had performed ≥50 non-obstetric lumbar and thoracic epidurals, respectively, by Stage 3 training. By Stage 3 (n=182), training in femoral (138/182, 76%)

Table 1 Characteristics of anaesthetist in training (AiT) survey respondents. HPB, Hepatobiliary; ICM, Intensive care medicine; PHEM, Pre-hospital Emergency Medicine. *n (%), †Fisher's exact test; Fisher's exact test for count data with simulated P-value (based on 2000 replicates); Pearson's $\chi 2$ test.

Characteristic	Overall, N=492*	Stage 1, N=125*	Stage 2, N=185*	Stage 3, N=182*	P-value†
Region					0.029
England	359 (73)	87 (70)	135 (73)	137 (75)	
Scotland	74 (15)	23 (18)	31 (17)	20 (11)	
Wales	45 (9.1)	14 (11)	17 (9.2)	14 (7.7)	
Northern Ireland	14 (2.8)	1 (0.8)	2 (1.1)	11 (6.0)	
Primary sub-speciality interest					0.017
General anaesthesia	111 (23)	42 (34)	39 (21)	30 (17)	
Regional anaesthesia	93 (19)	21 (17)	30 (16)	42 (23)	
Obstetric anaesthesia	82 (17)	20 (16)	33 (18)	29 (16)	
Paediatric anaesthesia	49 (10)	16 (13)	17 (9.2)	16 (8.8)	
Head and neck/airway	42 (8.6)	6 (4.9)	24 (13)	12 (6.6)	
Pain	20 (4.1)	5 (4.1)	10 (5.4)	5 (2.8)	
Vascular	20 (4.1)	1 (0.8)	6 (3.3)	13 (7.2)	
Cardiothoracics	16 (3.3)	4 (3.3)	6 (3.3)	6 (3.3)	
Dual/ICM	17 (3.5)	3 (2.4)	7 (3.8)	7 (3.9)	
Neuroanaesthesia	11 (2.3)	1 (0.8)	2 (1.1)	8 (4.4)	
Perioperative medicine	13 (2.7)	2 (1.6)	6 (3.3)	5 (2.8)	
PHEM/emergency	5 (1.0)	1 (0.8)	2 (1.1)	2 (1.1)	
Trauma	5 (1.0)	1 (0.8)	0 (0)	4 (2.2)	
Burns	1 (0.2)	0 (0)	0 (0)	1 (0.6)	
Day case surgery	1 (0.2)	0 (0)	1 (0.5)	0 (0)	
HPB	1 (0.2)	0 (0)	0 (0)	1 (0.6)	
Not yet known	1 (0.2)	0 (0)	1 (0.5)	0 (0)	
Other	4	2	1	1	
Sub-speciality interest in regional anaesthesia					0.011
Yes	208 (42)	47 (38)	84 (45)	77 (42)	
No	137 (28)	27 (22)	48 (26)	62 (34)	
Maybe	147 (30)	51 (41)	53 (29)	43 (24)	
Named regional anaesthesia lead					0.2
Yes	300 (61)	78 (62)	101 (55)	121 (66)	
No	33 (6.7)	9 (7.2)	14 (7.6)	10 (5.5)	
Do not know	159 (32)	38 (30)	70 (38)	51 (28)	
Attended regional anaesthesia-UK conference	83 (17)	14 (11)	22 (12)	47 (26)	<0.001
Completed higher training in regional anaesthesia (2010 curriculum)	125 (26)	0 (0)	18 (9.9)	107 (59)	<0.001
Completed advanced training in regional anaesthesia (2010 curriculum)	21 (4.5)	0 (0)	0 (0)	21 (12)	<0.001
Completed regional anaesthesia fellowship (6 months)	9 (2.0)	1 (0.8)	2 (1.2)	6 (3.6)	0.2
Completed regional anaesthesia training (1 yr)	6 (1.3)	0 (0)	1 (0.6)	5 (3.1)	0.064
Completed regional anaesthesia MSc	0 (0)	0 (0)	0 (0)	0 (0)	—
Completed European Diploma in Regional Anaesthesia (EDRA)	6 (1.3)	0 (0)	1 (0.6)	5 (3.0)	0.063
Hope for regional anaesthesia component in consultant job					0.003
Yes	172 (35)	44 (35)	61 (33)	67 (37)	
No	148 (30)	31 (25)	47 (25)	70 (38)	
Maybe	172 (35)	50 (40)	77 (42)	45 (25)	

Table 2 Anaesthetist in training (AiT) self-reported experience of performing regional anaesthesia procedures. CSE, combined spinal epidural; ESP, erector spinae plane; IQR, inter-quartile range; TAP, transversus abdominis plane; USG, ultrasound-guided. *n (%), †Pearson's χ^2 test; Fisher's exact test, ‡Kruskall–Wallis rank sum test

Characteristic	Overall, N=492*	Stage 1, N=125*	Stage 2, N=185*	Stage 3, N=182*	P-value†
Received training in Plan A blocks: interscalene	333 (68)	75 (60)	123 (66)	135 (74)	0.030
Axillary brachial plexus	344 (70)	79 (63)	128 (69)	137 (75)	0.074
Femoral	359 (73)	91 (73)	130 (70)	138 (76)	0.5
Adductor canal	297 (60)	73 (58)	106 (57)	118 (65)	0.3
Popliteal	325 (66)	72 (58)	119 (64)	134 (74)	0.012
ESP	178 (36)	46 (37)	52 (28)	80 (44)	0.007
Rectus sheath	178 (36)	47 (38)	62 (34)	69 (38)	0.6
Can perform Plan A blocks independently for analgesia: interscalene	165 (34)	15 (12)	55 (30)	95 (52)	<0.001
Axillary brachial plexus	228 (46)	35 (28)	77 (42)	116 (64)	<0.001
Femoral	373 (76)	89 (71)	136 (74)	148 (81)	0.082
Adductor canal	240 (49)	39 (31)	87 (47)	114 (63)	<0.001
Popliteal	271 (55)	40 (32)	96 (52)	135 (74)	<0.001
ESP	114 (23)	16 (13)	35 (19)	63 (35)	<0.001
Rectus sheath	153 (31)	24 (19)	54 (29)	75 (41)	<0.001
Expects to achieve ≥20 blocks: upper limb (e.g. interscalene or axillary)	252 (51)	66 (53)	80 (43)	106 (58)	0.015
Lower limb (e.g. femoral, adductor or popliteal)	339 (69)	94 (75)	117 (63)	128 (70)	0.072
Chest wall (e.g. ESP block)	68 (14)	14 (11)	22 (12)	32 (18)	0.2
Abdominal wall (e.g. rectus sheath, TAP block)	152 (31)	35 (28)	53 (29)	64 (35)	0.3
Has performed ≥ 20 blocks: upper limb (e.g. interscalene or axillary brachial plexus)	151 (31)	15 (12)	39 (21)	97 (53)	<0.001
Lower limb (e.g. femoral, adductor canal or popliteal)	222 (45)	39 (31)	77 (42)	106 (58)	<0.001
Chest wall (e.g. ESP block)	26 (5.3)	3 (2.4)	3 (1.6)	20 (11)	<0.001
Abdominal wall (e.g. rectus sheath, TAP block)	81 (16)	8 (6.4)	20 (11)	53 (29)	<0.001
Has performed ≥50 blocks: obstetric spinal	456 (93)	102 (82)	176 (96)	178 (98)	<0.001
Obstetric epidural	413 (84)	72 (58)	166 (90)	175 (96)	<0.001
Non-obstetric spinals	319 (65)	63 (50)	124 (67)	132 (74)	<0.001
Non-obstetric thoracic epidural	36 (7.3)	2 (1.6)	10 (5.4)	24 (13)	<0.001
Non-obstetric thoracic epidural	11 (2.2)	0 (0)	1 (0.5)	10 (5.5)	<0.001
Self-reported confidence to manage complications of regional anaesthesia (e.g. local anaesthetic systemic toxicity, postoperative neurological symptoms)	323 (66)	77 (62)	125 (68)	121 (67)	0.5
Self-reported confidence to teach an USG Plan A block	149 (30)	30 (24)	52 (28)	67 (37)	0.036
Self-reported confidence to perform awake wrist or hand surgery	129 (26)	22 (18)	37 (20)	70 (38)	<0.001
Self-reported confidence to integrate USG regional anaesthesia into consultant practice	217 (44)	52 (42)	73 (40)	92 (51)	0.089
Median level of confidence that regional anaesthesia training will meet RCoA 2021 curriculum requirements (1–10), median (IQR)	7 (6–8)	7 (6–8)	7 (5–8)	8 (6–9)	0.002‡

and axillary brachial plexus blocks (137/182, 75%) were most commonly received, and training in ESP (80/182, 44%) and rectus sheath blocks (69/182, 38%) least common (ESP *vs* femoral [OR 0.25, 95% CI 0.16–0.39, P<0.001]; rectus sheath *vs* femoral [OR 0.19, 95% CI 0.12–0.30, P<0.001]) (Table 2, Fig 1, Supplementary Table S1). Correspondingly, numbers of trainees achieving ≥20 blocks by Stage 3 training in body locations correlating with the 2021 RCoA curriculum was highest for lower limb (106/182, 58%) and upper limb techniques (97/182, 53%), and lowest for chest wall (20/182, 11%) and abdominal wall blocks (53/182, 29%); (lower limb *vs* chest wall [OR 0.09, 95% CI 0.05–0.15, P<0.001], and lower limb *vs* abdominal wall blocks [OR 0.29, 95% CI 0.19–0.45, P<0.001])—Table 2, Fig 1, Supplementary Table S2.

A total of 70/182 (38%) Stage 3 trainees stated that they felt able to perform a hand surgery list under regional anaesthesia alone without direct supervision. Self-reported ability to perform Plan A blocks independently by Stage 3 training followed a similar trend with lowest levels reported for ESP (63/182, 35%) and rectus sheath blocks (75/182, 41%) compared with femoral 148/182 (81%) and axillary brachial plexus block (116/182, 64%) (Table 2). We found a strong, positive association between number of blocks performed during training, and self-reported ability to perform regional anaesthesia techniques after adjustment for stage of training and receipt of specific training for each block type (upper limb: OR 20.9 [95% CI 9.38–53.2] for ≥20 blocks *vs* 0–5 blocks) (Fig 1, Supplementary Table S3).

College tutor survey

A total of 114 tutors from 252 training hospitals (45.2%) responded to the survey (Table 3). Respondents were mainly from England (71, 62%) with the remainder from Scotland (23, 20%), Wales (13, 11%), and Northern Ireland (7, 6.1%). Four tutors (5.6%) stated that they had a block bay in their hospital. Seventy-four (64.9%) tutors replied that their hospital had a departmental lead for regional anaesthesia, with 43 of these (37.7% of overall 114 respondents) having paid sessional time for this role. One hundred (100/114, 88%) tutors replied that they had a departmental lead for acute pain, 92 (80%)) of whom had paid sessional time. Whilst self-reported ability to provide Stage 1 training was high (105/114, 92%), this decreased at Stage 2 (91/114, 80%) and Stage 3 (72/114, 63%); Stage 1 *vs* Stage

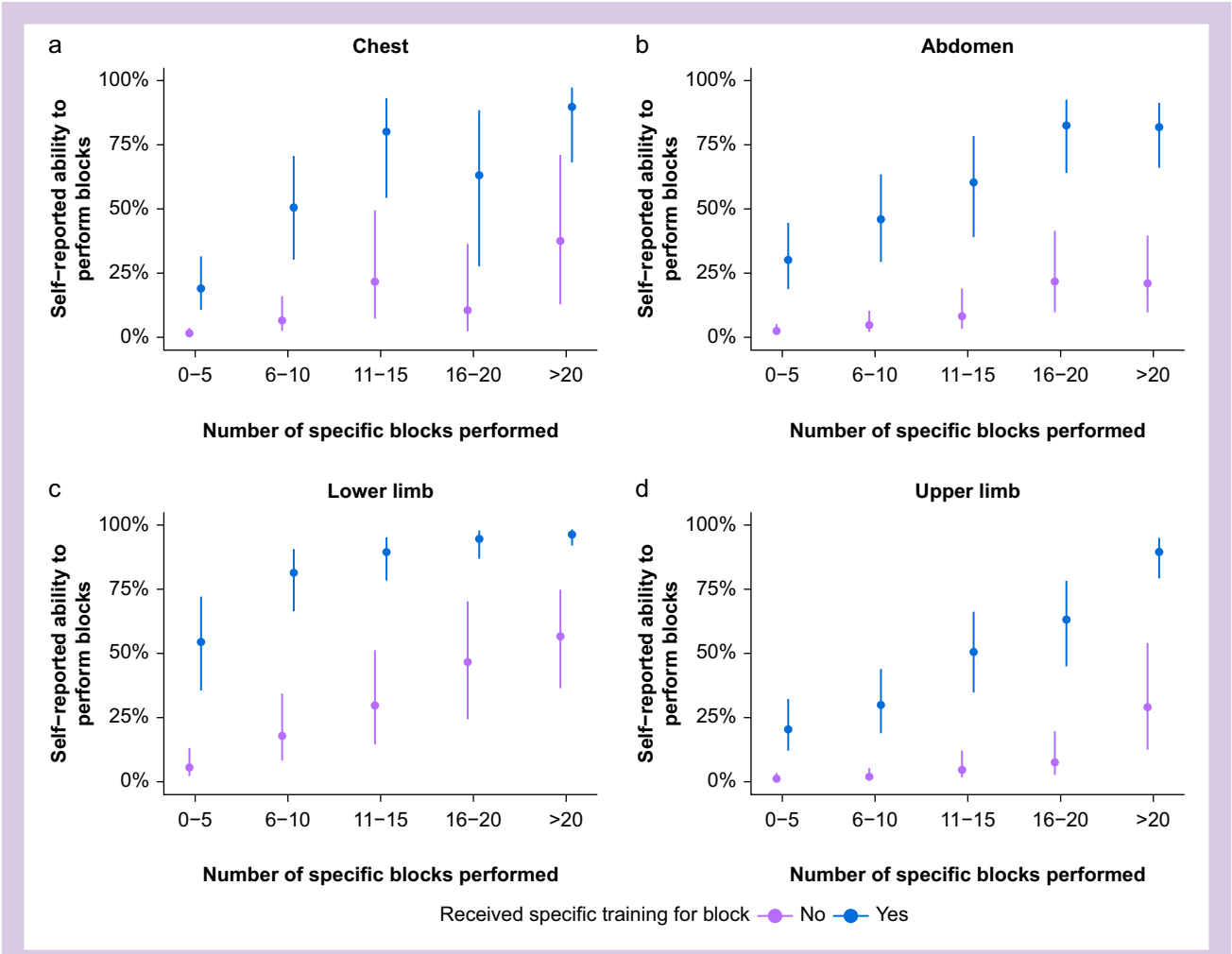

Fig 1. Anaesthetist in training (AiT) self-reported ability to independently perform (a) chest wall, (b) abdominal wall, (c) lower limb, and (d) upper limb blocks adjusted for receipt of training in each block type and number of blocks performed during training.

3, X^2 0.29, 95% CI 0.18–0.40, $P<0.001$. We found a positive association between the presence of a lead clinician for regional anaesthesia (particularly if this was supported with paid sessional support), and self-reported confidence to provide regional anaesthesia training at all stages of the RCoA 2021 curriculum compared with having no regional anaesthesia lead (OR 7.27 [95% CI 2.64–22.0]) (Fig 2, Supplementary Table S4).

Discussion

This is the largest survey of UK anaesthetic trainees and RCoA tutors exploring experiences of regional anaesthesia training in the context of meeting RCoA 2021 curriculum requirements. Our results suggest that trainees are more likely to have received specific training in, have performed greater numbers of blocks, and be able to independently perform upper and lower limb nerve block techniques compared with abdominal and chest wall blocks. Experience in performing neuraxial procedures was most common in the obstetric domain with ≥50 non-obstetric lumbar or thoracic epidurals achieved in only a small minority of anaesthetists in training. Ability to perform peripheral nerve blocks independently is significantly associated with both the number of blocks performed and having received specific training. Furthermore, we demonstrate that departments with a lead clinician for regional anaesthesia, particularly those who have allocated time for these activities, are more likely to be able to deliver training.

Our study has a number of strengths: it provides a novel overview of training from both trainee and trainer perspectives from a wide spread of geographical areas throughout the UK, delivers valuable information to inform future training needs, and is the largest study of UK practice to date. Whereas the response rate for the tutor survey was 45%, our trainee survey response rate (19%) was low, and this in conjunction with the fact we used mailing lists and social media accounts from RA-UK and RAFT to help disseminate the survey, raises the issue of responder bias.[13] The spread of trainee respondents from each nation within the UK (England 73%, Scotland 15%, Wales 9.1%, and Northern Ireland (2.8%) reflects data from the 2020 RCoA census (England 80.5%, Scotland 9.5%, Wales 6.5%, and Northern Ireland 3.3%).[14] In the tutor survey, respondents from Wales, Scotland, and Northern

Table 3 Characteristics of college tutor (CT) survey respondents. IQR, inter-quartile range; PA, Programmed Activity; RCoA, Royal College of Anaesthetists, US, ultrasound. *n (%)

Characteristic	N=114*
Region	
England	71 (62)
Scotland	23 (20)
Wales	13 (11)
Northern Ireland	7 (6.1)
Does your hospital provide the following?	
Dedicated block bay	4 (5.6)
Ultrasound machine available in main theatre suite	114 (100)
Peripheral nerve stimulator available in main theatre suite	105 (92)
Peripheral nerve block needles available in main theatre suite	111 (97)
Nerve pressure monitor available in main theatre suite	10 (8.8)
Nerve catheter set available in main theatre suite	87 (76)
Ultrasound machine available in day-case theatre suite	80 (70)
Peripheral nerve stimulator available in day-case theatre suite	71 (62)
Peripheral nerve block needles available in day-case theatre suite	75 (66)
Nerve pressure monitor available in day-case theatre suite	8 (7.0)
Nerve catheter set available in day-case theatre suite	48 (42)
Does your hospital have a regional anaesthesia lead clinician?	
Yes, with PAs allocated	43 (38)
Yes, but no PAs allocated	31 (27)
No	33 (29)
Do not know	7 (6.1)
Does your hospital have an acute pain service lead clinician?	
Yes, with PAs allocated	92 (81)
Yes, but no PAs allocated	8 (7.0)
No	12 (11)
Do not know	2 (1.8)
Have any members of the consultant body completed the following?	
Regional anaesthesia fellowship	79 (69)
European Diploma of Regional Anaesthesia (EDRA)	66 (58)
MSc regional anaesthesia	15 (13)
Other higher degree (regional anaesthesia)	8 (7.0)
None of the above	24 (21)
Which of the following does your hospital provide?	
Regional anaesthesia teaching as part of the regular dedicated teaching offered at your hospital	94 (82)
Regional anaesthesia training days? (e.g. regional anaesthesia-US course)	32 (28)
Regional anaesthesia advanced module training (≤6 months)	53 (46)
Regional anaesthesia fellowship training (≥1 yr)	21 (18)
None of the above	19 (17)
Yes	105 (92)
No	6 (5.3)
Maybe	3 (2.6)
Does your hospital offer regional anaesthesia teaching at RCoA 2021 curriculum Stage 1?	
Yes	105 (92)
No	6 (5.3)
Maybe	3 (2.6)
Does your hospital offer regional anaesthesia teaching at RCoA 2021 curriculum Stage 2?	
Yes	91 (80)
No	8 (7.0)
Maybe	15 (13)
Does your hospital offer regional anaesthesia teaching at RCoA 2021 curriculum Stage 3?	
Yes	72 (63)
No	19 (17)
Maybe	23 (20)
Self-reported confidence to deliver adequate regional anaesthesia training (1–10)- median (IQR)†	8 (7–9)

Ireland appeared overrepresented when compared with National data (i.e. English tutors account for 80% of the total number of tutors in the UK but had a response rate of 62% in our survey). Reported primary sub-specialty interests were similar to those reported in the census special interests of consultants (e.g. general 23% *vs* 23.6%, paediatric anaesthesia 10% *vs* 8.5%, pain medicine 4.1% *vs* 4%, cardiothoracics 3.3% *vs* 3%, neuroanaesthesia 2.3% *vs* 2.7%), except for intensive care medicine where the proportion was significantly lower (3.5% *vs* 12.3%).[14] An interest in obstetric anaesthesia was represented proportionally more in the trainee survey (17% *vs* 10.5%). There was also concordance between our tutor and trainee surveys (despite the significantly higher response rate in the tutor survey) which reported that 65% and 61% of

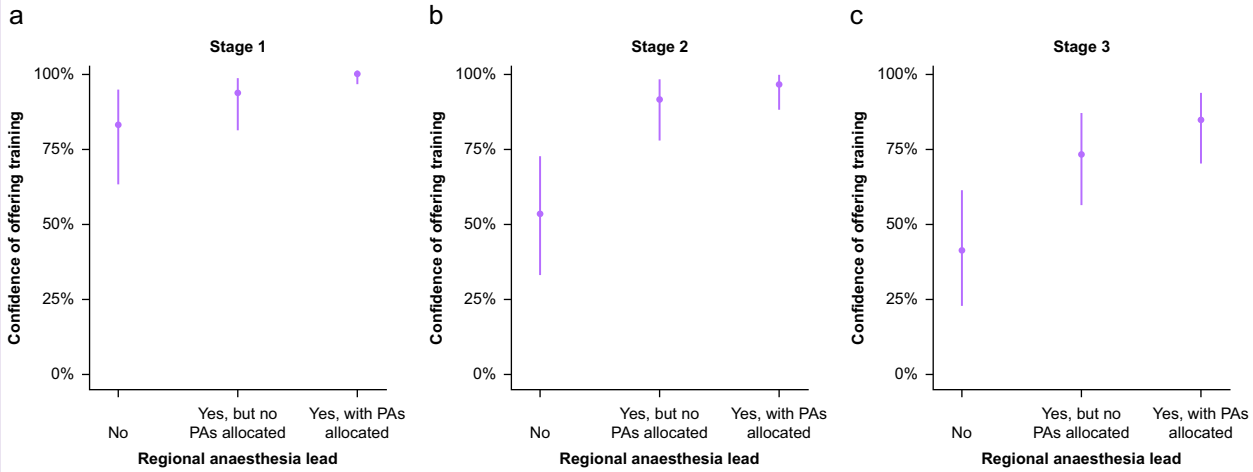

Fig 2. College tutor (CT) self-reported confidence to provide (a) Stage 1, (b) Stage 2, (c) Stage 3 training in relation to the presence of a lead clinician for regional anaesthesia, with or without allocated sessional support. PA, Programmed Activity.

hospitals had a lead clinician for regional anaesthesia, respectively. Whilst responder bias in the trainee survey cannot be eliminated, we believe with the large number of respondents, the two surveys together provide useful and novel information about regional anaesthesia training in the UK, and what influences both trainee and trainer competence and confidence in meeting RCoA requirements. This information may be relevant in informing anaesthetic training providers in other countries.

We acknowledge some limitations including potential responder bias, low response rate particularly for trainees, and lack of data on gender and other protected characteristics. The UK General Medical Council National Training Survey (2023) suggests gender may be a barrier to training opportunities, but we were unable to explore this further in our survey.[15] Irrespective of potential responder bias, the absolute numbers of trainee respondents suggest significant demand for advanced regional anaesthesia training. The interest in regional anaesthesia was high across all grades, with half of Stage 2 and a quarter of Stage 3 trainee respondents wishing to complete advanced (now special interest area) regional anaesthesia training, and a further 12% of Stage 3 trainees having completed this at the time of completing the survey. More than two-thirds of all trainees aimed to incorporate regional anaesthesia in their consultant job plan. This popularity is consistent with international studies demonstrating that regional anaesthesia is a popular fellowship choice.[16]

International guidelines, including those of the European Society of Anaesthesiology, endorse the general principles of competency-based medical education and training with regional anaesthesia one of the core domains of training.[17] Similarly, the 2010 and 2021 RCoA curricula are competency- and not numbers-based.[3] Our data suggest trainees' self-reported ability to perform upper limb, lower limb, abdominal wall, and chest wall blocks independently are significantly associated both with having received teaching, and with the number of blocks performed in those anatomical regions. Undertaking >20 blocks in each area was associated with the highest levels of self-reported ability to perform these blocks independently. Although perhaps not surprising that ability is linked to numbers of procedures performed, there are few data examining volume of blocks and competency in ultrasound-guided regional anaesthesia compared with traditional landmark techniques. Before the era of ultrasound-guided anaesthesia, American anaesthesiology residents reported reduced confidence in performing peripheral nerve blocks which they had undertaken fewer than 10 times during residency.[18] Subsequent studies and mathematical models of training in ultrasound-guided regional anaesthesia suggest a range of 28 to >100 blocks may be required to become competent.[19,20] Non-fellowship anaesthesia training programmes vary around the world in overall duration, and in specific regional anaesthesia training requirements. In an international Delphi exercise examining non-fellowship regional anaesthesia training, 16–20 blocks were chosen by experts as the target number of blocks for each specific body area.[6] Our results suggest that slightly higher numbers may be beneficial given the increased self-reported ability to perform blocks independently noted moving from 16–20 to >20 for chest wall and upper limb blocks in particular. Concerningly, if the performance of >20 blocks for each technique is important, a significant proportion of Stage 3 trainees had not achieved this target, particularly for abdominal wall or chest wall blocks. Unless access to training in chest and abdominal wall blocks increases, achieving competence in these Stage 3 key capabilities is likely to be challenging.

Trainees were significantly less likely to have received training in chest and abdominal wall blocks compared with upper and lower limb blocks. That numbers of chest and abdominal wall blocks were low is perhaps surprising given the lack of exposure to non-obstetric lumbar and thoracic epidurals. Given that these neuraxial techniques are now less commonly used, the importance of chest and abdominal wall blocks in providing analgesia is increasingly important. The ESP block was first described in 2016,[21] and although it continues to grow in popularity, and is increasingly studied,[22] our finding of reduced exposure and training in chest wall blocks is concerning and may reflect its novelty amongst a

significant proportion of consultant trainers. Surgeons performing rectus sheath blocks may also reduce training opportunities. In our trainee survey, completion of Higher Training in the 2010 RCoA curriculum was predictive of achieving adequate numbers of blocks, and mandatory 'regional rotations', to high-volume centres if necessary, may be required to ensure adequate training in regional anaesthesia. It is not possible to ascertain from our survey whether such capacity exists, and it was not possible to meaningfully compare the training delivered between UK schools of anaesthesia. Only 63% of hospitals stated that they could 'definitely' offer Stage 3 regional anaesthesia teaching, whilst confidence in delivering Stage 3 training was also significantly lower compared with earlier stages of training. Although more than two-thirds of hospitals had colleagues who had undertaken a regional anaesthesia fellowship, we did not explore if the reported lack of confidence in offering training was because of lack of appropriate cases, either in nature or in volume, a lack of teachers, or a lack of non-clinical time to teach outside of the operating room, and further work is required to investigate this. Using simulation and part-task trainers may help develop skills and reduce the numbers of blocks required to be performed in patients, and in the future more widespread availability of artificial intelligence or other new technologies may further improve confidence.[23]

Receiving teaching correlated with trainees' self-reported ability to independently perform peripheral blocks, and the ability to provide teaching was associated with having a departmental regional anaesthesia lead. This was even more strongly associated when the regional anaesthesia lead had allocated programmed activities to support these teaching activities. There were significantly fewer regional anaesthesia leads with allocated sessional time compared with departmental acute pain leads. There are currently no national standards that state a department should have a regional anaesthesia lead. This is in contrast to other sub-specialties including acute pain, where RCoA Guidelines for the Provision of Anaesthesia Services (GPAS) state that there should be a clinician with allocated time.[24] Our study supports a need for departmental regional anaesthesia leads with allocated time to improve training opportunities in regional anaesthesia and to meet the educational responsibilities inherent in the RCoA 2021 curriculum.[3,25]

Conclusion

This survey finds important gaps in the provision of regional anaesthesia training in the UK with around one-third of UK college tutors not confident of being able to deliver Stage 3 training in keeping with the RCoA 2021 curriculum. We observed a strong association between training received, number of blocks performed, and trainee self-reported ability to perform blocks independently, underpinning the importance of clinical experience and access to regional anaesthesia training opportunities. Our results support the introduction of a regional anaesthesia educational lead in each department to improve equity of access and quality of training opportunities.

Author's contributions

Responsible for data interpretation and drafting of the final manuscript: all authors.

Oversaw project conception and acts as overall guarantor: RJK, AJRM.

Responsible for statistical analysis and modelling: MS, AJRM, RJK.

Responsible for project level steering, national coordination, and data collection: all authors and all collaborators (see Supplementary appendix).

Read and approved the final manuscript, offering critical feedback: all authors.

Declarations of interest

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.bjao.2023.100241.

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