



# A retrospective cohort study of differential attainment, COVID and chaos: taking the difference out of a terrible trinity

Osian P. James, MBBCh, BSc<sup>a,b,\*</sup>, Katie Mellor, MBBCh<sup>a</sup>, Oliver Luton, MBBCh<sup>a</sup>, David B.T. Robinson, MBBCh, PhD<sup>a</sup>, Leona Walsh, BA, LLM<sup>a</sup>, Sarah Hemington-Gorse, MBBCh, MSc<sup>a,c</sup>, Richard J. Egan, MBBCh, MD<sup>a,d,e</sup>, Wyn G. Lewis, MBBCh, MD, DSc<sup>a,d</sup>

**Background:** This study aimed to evaluate core surgical training (CST) differential attainment related to coronavirus disease 2019 (COVID-19), gender and ethnicity. The hypothesis was that COVID-19 adversely influenced CST outcomes.

**Methods:** A retrospective cohort study of 271 anonymised CST records was undertaken at a UK Statutory Education Body. Primary effect measures were Annual Review of Competency Progression Outcome (ARCPO), Membership of the Royal College of Surgeons (MRCS) examination pass and Higher Surgical Training National Training Number (NTN) appointment. Data were collected prospectively at ARCPO and analysed with non-parametric statistical methods in SPSS.

**Results:** CSTs numbering 138 completed training pre-COVID and 133 peri-COVID. ARCPO 1, 2 and 6 were 71.9% pre-COVID versus 74.4% peri-COVID ( $P=0.844$ ). MRCS pass rates were 69.6% pre-COVID versus 71.1% peri-COVID ( $P=0.968$ ), but NTN appointment rates diminished (pre-COVID 47.4% vs. peri-COVID 36.9%,  $P=0.324$ ); none of the above varied by gender or ethnicity. Multivariable analyses by three models revealed: ARCPO was associated with gender [m:f 1:0.87, odds ratio (OR) 0.53,  $P=0.043$ ] and CST theme (Plastics vs. General OR 16.82,  $P=0.007$ ); MRCS pass with theme (Plastics vs. General OR 8.97,  $P=0.004$ ); NTN with the Improving Surgical Training run-through programme (OR 5.00,  $P<0.001$ ). Programme retention improved peri-COVID (OR 0.20,  $P=0.014$ ) with pan University Hospital rotations performing better than Mixed or District General-only rotations (OR 6.63,  $P=0.018$ ).

**Conclusion:** Differential attainment profiles varied 17-fold, yet COVID-19 did not influence ARCPO or MRCS pass rates. NTN appointment fell by one-fifth peri-COVID, but overall training outcome metrics remained robust despite the existential threat.

**Keywords:** core surgical training, COVID-19, differential attainment

## Introduction

Differential attainment is defined as a variation in performance between groups who share a protected characteristic such as ethnicity, gender or disability. Described by Katherine Woolf in 2020, it materialises during medical school assessments and continues beyond early-years postgraduate training. The cause is multifactorial and poorly understood, being driven by a combination of personal and systemic bias and/or prejudice manifesting

## HIGHLIGHTS

- Annual Review of Competency Progression Outcome (ARCPO) and Membership of the Royal College of Surgeons (MRCS) pass were robust irrespective of cancelled examinations.
- Career progression deteriorated by 25% and operative experience fell by a third.
- DA was related to gender with women half as likely to receive satisfactory ARCPO.
- Theme correlated with DA: Plastics received better ARCPO and MRCS than General Surgery.
- Professional Support referral increased five-fold: examination failure to health two-fold.

<sup>a</sup>Health Education and Improvement Wales' School of Surgery, Tŷ Dysgu, Cefn Coed, Nantgarw, <sup>b</sup>School of Medicine, Cardiff University, Heath Park Campus, Cardiff, <sup>c</sup>Department of Burns and Plastic Surgery, <sup>d</sup>Department of Surgery, Morriston Hospital and <sup>e</sup>Swansea University, Singleton Park, Swansea, UK

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\*Corresponding author. Address: Health Education and Improvement Wales' School of Surgery, Tŷ Dysgu, Cefn Coed, Nantgarw, UK, CF15 7QQ. Tel.: +44 02920 743268. E-mail: jamesop1@cardiff.ac.uk (O.P. James).

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as a complex hidden curriculum<sup>[1]</sup>. It is likely linked with chaos theory, an interdisciplinary branch of mathematics focusing on dynamic non-linear systems whose ostensible disorder is influenced by regulations vulnerable to early conditions<sup>[2]</sup>.

Never in modern times have existential events affected surgical training so profoundly as the coronavirus disease 2019 (COVID-19) pandemic. The UK's first national lockdown started on 16 March 2020<sup>[3]</sup>, largely halting the provision of elective surgery. Public fear inhibited emergency hospital attendances, reducing admissions, and most hospital-based specialties became entirely

consultant-led, with a catastrophic effect on surgical training<sup>[4,5]</sup>. As hospitals came to terms with new rules of engagement, professional bodies, and research collaboratives (COVIDSurg and OpCOVID), published guidance to support the secure restoration of services<sup>[6–8]</sup>, including pathways to deliver safe surgery and protect and strengthen training protocols<sup>[9]</sup>.

Core surgical training (CST) is an inherently stressful, intense, yet productive time where trainees must complete an array of mandatory tasks alongside their clinical work to achieve success at National Training Number (NTN) selection. Unsurprisingly, this has resulted in a high prevalence of burnout amongst junior trainees<sup>[10,11]</sup>. Prior to COVID-19, Robinson *et al.*<sup>[12]</sup> reported and quantified differential attainment in a cohort of CSTs. Although outcomes related to differential attainment in UK-trained Black & Minority Ethnic trainees were fair, important differences were clear among International Medical Graduates (IMG), with Membership of the Royal College of Surgeons (MRCS) pass rates 21.4% lower and NTN success six-fold less likely than UK graduates. Yet, to date, other than the adverse impact on operative logbook numbers, there is little evidence relating to the impact of COVID-19 on differential attainment related to other training metrics including Annual Review of Competency Progression Outcome (ARCPO), MRCS pass and NTN appointment rates. This study aimed to assess the quality of training delivered in a single Statutory Education Body (Health Education and Improvement Wales), throughout the COVID-19 pandemic compared with prospectively collected historical metrics and related to gender and ethnicity. The primary hypothesis was that the COVID-19 pandemic had adversely influenced CST experience resulting in poorer ARCPO, MRCS pass rates and NTN appointment.

## Methods

All trainees entering CST in Health Education and Improvement Wales (previously the Wales Deanery) from 2014 to 2021 were included in this retrospective observational cohort study. As part of the ARCP process, all Intercollegiate Surgical Curriculum Programme profiles are scrutinised by the CST Training Programme Director, finding and documenting key performance metrics including MRCS examination success and operative logbook volume for all trainees. In parallel, trainee attrition, demographics, NTN appointment and anonymised data on Professional Support Unit referral reasons were collected as a routine part of the School of Surgery quality improvement programme; thus all data were collected prospectively. Training location was coded as University, District General Hospitals (DGH) or combination. Ethnicity and IMG status was defined in a hybrid measure as three groups: White UK Graduate (WUKG), Black & Minority Ethnic UK Graduate (BMEUKG) and IMG.

Trainees starting CST from 2014 to 2017 formed the control cohort, completing CST before the COVID-19 pandemic. The 2018 cohort had only the latter half of their CST2 year affected (March–August 2020) and therefore formed an intermediate group. The 2019 and 2020 cohorts had their whole CST programme affected and were therefore grouped and analysed together. The 2021 cohort to date has only completed CST1 and was therefore excluded from the analysis.

Following consultation with the Intercollegiate Surgical Curriculum Programme Data Analysis, Audit & Research Group

(16 September 2022), it was concluded that the study did not require formal ethical approval because all data were collected routinely during a rigorous Health Education and Improvement Wales ARCP process and consequently constituted critical metrics of the School of Surgery Quality Assurance and Improvement programme. The study was reported in line with the STROCSS criteria<sup>[13]</sup> and retrospectively registered at ClinicalTrials.gov; ID NCT05599529.

## Primary outcome measures

The three primary outcome measures considered were ARCPO, MRCS examination success and NTN appointment. ARCPO were grouped according to standard and/or targeted training time: Outcome 1 (satisfactory progress), Outcome 2 (development of specific competencies needed – no additional training time) and Outcome 6 (gained all required competencies), versus Outcome 3 (inadequate progress – additional training time) and Outcome 4 (released from training programme). No COVID-specific ARCPO were awarded locally during this time (10.1 or 10.2). MRCS success was defined as passing both Parts A and B (or Diploma in Otolaryngology – Head & Neck Surgery) within 2 years of starting CST. NTN success was defined as ST3 appointment directly from CT2.

## Secondary outcome measures

The two secondary outcome measures considered were trainee attrition and operative logbook volume. Attrition was defined as trainee resignation during the given 24-month CST programme, regardless of any ARCPO. Total operative caseloads were counted during the first 2 years of CST.

## Statistical analysis

Statistical analysis appropriate for non-parametric data (confirmed by Shapiro–Wilks test) was performed using SPSS Statistics version 27 (IBM Corp, Armonk, New York, USA) including  $\chi^2$ , Mann–Whitney *U* and Kruskal–Wallis tests. Statistical significance was set at *P* less than 0.05. The variables associated with ARCPO, MRCS success, NTN appointment and trainee attrition (with statistical significance inferred at the *P* less than 0.100 level) were entered into multivariable analysis models using a binary logistic regression backward conditional approach. These variables consisted of gender, ethnicity, CST theme, hospital status, Improving Surgical Training (IST) status and relation of the cohort to the COVID-19 pandemic.

## Results

Consecutive 303 CSTs were identified, with 66.0% (*n* = 200) male, 56.8% (*n* = 172) White British and Irish, and 85.8% (*n* = 260) UK graduates. IST programme trainees accounted for 12.2% (*n* = 37) starting from 2018 onwards. A hundred and thirty-eight CSTs completed training before the COVID-19 pandemic officially affected the UK in 2020. Forty-three trainees had only their CST2 year disrupted, whilst 90 CSTs completed training during COVID-affected years. Thirty-two trainees starting in 2021 and yet to complete the training programme were excluded from analysis. The median number of years trainees had been qualified before entering CST was 3 (range 2–9), but most (*n* = 146, 48.2%) entered immediately following completion of Foundation Programme training. Earlier cohorts (2014, 2015,

2016; median 2 years in all cases) were more likely to enter CST directly from the Foundation Programme than later cohorts (2017 to 2021; median 3 years in all cases,  $P = 0.001$ ).

**Primary outcome measures**

The overall ARCPO 1, 2 and 6 rate was 72.4%, MRCS pass rate 70.1% and NTN appointment 42.7%. Table 1 outlines the primary and secondary outcome measures related to the COVID-19 pandemic. Achieving ARCPO 1, 2 and 6 was influenced by CST theme (highest Plastic Surgery 96.3% vs. lowest General Surgery/Vascular 59.1%,  $P = 0.001$ ) and Hospital Status (University 82.5% vs. Mixed rotation 73.3% vs. DGH 64.9%,  $P = 0.044$ ). There was a trend towards better ARCP outcomes by males (76.1% vs. females 65.9%,  $P = 0.084$ ), but no significant difference related to ethnicity ( $P = 0.376$ ). There were no significant differences in individual ARCPO (Outcomes 1, 2, 3, 4 and 6) awarded related to the pandemic at CST1 ( $P = 0.275$ ) or CST2 ( $P = 0.684$ ); see Figure 1. MRCS success was influenced by CST theme (highest Plastic Surgery 92.9% vs. lowest Oral & Maxillofacial Surgery 54.5%,  $P < 0.001$ ) and Hospital Status (University 84.0% vs. Mixed 69.1% vs. DGH 63.4%,  $P = 0.010$ ), but not gender (male 72.3% vs. female 66.3%,  $P = 0.306$ ) or ethnicity ( $P = 0.361$ ). IST programme status was associated with significantly better conversion to ST3 NTN (76.0%) than conventional CST (38.8%,  $P < 0.001$ ). No significant difference was clear in relation to gender (male 45.8% vs. female 37.2%,  $P = 0.200$ ) or ethnicity ( $P = 0.360$ ).

**Secondary outcome measures**

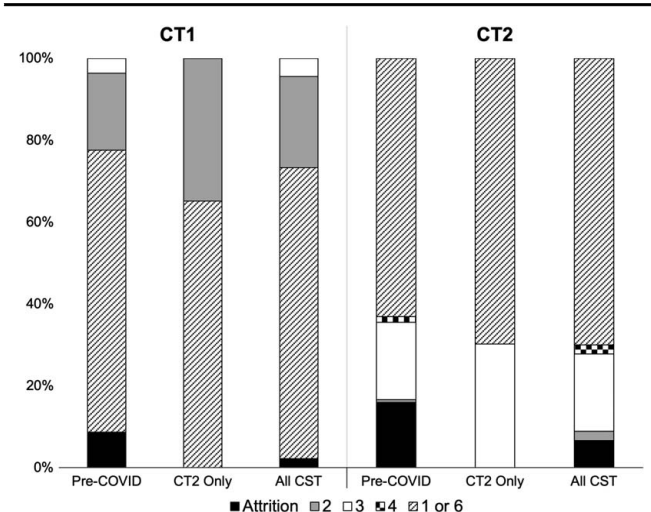
The overall attrition rate was 11.8% ( $n = 32$ ; excluding CSTs released from the programme; ARCPO 4,  $n = 4$ ), and was less often associated with training solely in University Hospitals (2.5%), compared with DGHs (12.2%), or a hybrid mix of both hospital types (14.4%,  $P = 0.022$ ). The median number of operative procedures in CSTs' logbooks was 467 (range 124–1176), with case volume influenced by gender (male 483 vs. female 448,  $P = 0.058$ ), CST theme (highest Oral & Maxillofacial Surgery 593 vs. lowest Trauma & Orthopaedics 438,  $P = 0.001$ ), IST programme (400 vs. CST 480,  $P = 0.004$ ) and Hospital Status (University 520 vs. Mixed 493 vs. DGH only 414,  $P < 0.001$ ). Operative experience and volume related to cohort can be found in Figure 2.

**Professional support unit referral**

One hundred and thirty-four referrals were made to the Professional Support Unit between 2014 and 2022, and the

**Table 1**  
Annual Review of Competency Progression Outcome (ARCPO) 1, 2 and 6 achievement, Membership of the Royal College of Surgeons (MRCS) success, National Training Number (NTN) appointment, attrition rate and median (range) operative caseload during core surgical training (CST) related to the COVID-19 pandemic.

	ARCPO 1, 2 and 6 (%)	MRCS (%)	NTN (%)	Attrition (%)	Logbook
Pre-COVID	71.9	69.6	47.4	15.9	547 (255–1176)
CST2 only	69.8	69.8	41.0	9.3	463 (139–827)
All CST	74.4	71.1	36.9	6.7	358 (124–783)
<i>P</i>	0.844	0.968	0.324	0.090	< 0.001

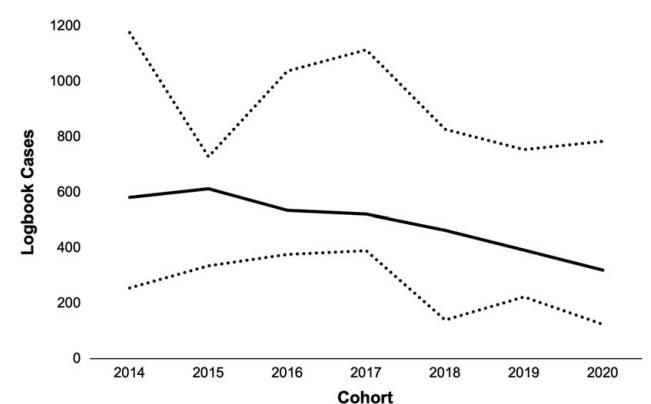


**Figure 1.** Proportion of individual Annual Review of Competency Progression Outcomes at CT1 ( $P = 0.275$ ), CT2 ( $P = 0.684$ ) and attrition rate before ARCP date, related to the COVID-19 pandemic. ARCP, Annual Review of Competency Progression; COVID-19, coronavirus disease 2019.

referral rate increased steadily (2022 referrals remained lower at the time of analysis as the calendar year had not yet ended; see Fig. 3). Health-related referrals were commoner following the onset of COVID-19 (pre-COVID 11.0% vs. peri-COVID 25.0%,  $P = 0.033$ ) and conversely MRCS examination-related referrals less common (52.4% vs. 32.7%,  $P = 0.025$ ). ARCPO-related referrals (29.3% vs. 34.6%,  $P = 0.516$ ) and alternative concerns (7.3% vs. 7.7%,  $P = 0.936$ ) remained similar.

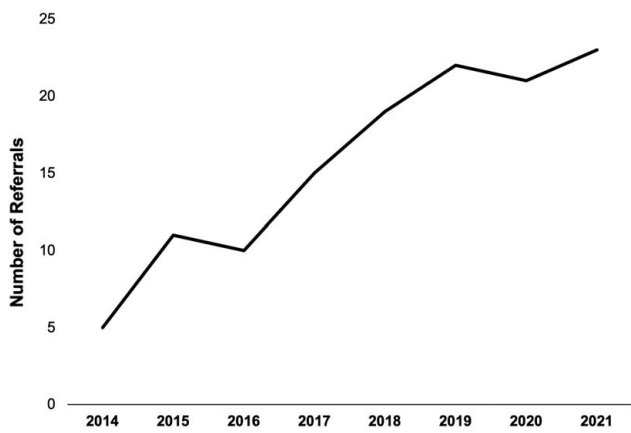
**Univariable and multivariable analyses**

The factors associated with ARCPO 1, 2 and 6, MRCS pass, NTN appointment and attrition on multivariable analysis can be found in Table 2. Ethnicity did not influence any of the primary outcome measures; see Table 3. Attrition or receiving an ARCPO 4 was not associated with gender (male 12.7% vs. female 14.3%,  $P = 0.715$ ) or ethnicity (WUKG 13.2% vs. BMEUKG 13.6% vs. IMG 13.2%,  $P = 0.996$ ). Full CST theme-related outcomes can be found in Table 4.



**Figure 2.** Median (range as dotted lines) operative caseload by cohort entry into CST. CST, core surgical training.

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**Figure 3.** Number of annual core surgical training referrals to the Professional Support Unit, by year. Note the 2022 data are excluded as the calendar year was not complete at the time of analysis.

## Discussion

This is the first study to quantify the temporal effect of the COVID-19 pandemic on CST metrics. Despite frequently declared fears to the contrary, ARCPO and MRCS pass rates

remained robust, notwithstanding cancelled examination diets and adapted participation. In contrast, career progression and Higher Surgical Training NTN promotion deteriorated by 25% and operative experience was reduced by a third. No differential attainment was found related to ethnicity or IMG status, but women were half as likely to achieve ARCPO 1, 2 or 6 than men. University Hospital rotations were associated with three-fold better ARCPO rates, a third better MRCS pass rates, 20% higher operative logbook volume and six-fold less attrition. Differential attainment was associated with CST programme theme; Plastic Surgery CSTs received, on average, better ARCPO (17-fold), MRCS pass rates (nine-fold) and larger logbook volumes (30%) than the largest CST theme of General Surgery. Referral to the Professional Support Unit increased five-fold between 2014 and 2021, and the reasons for referral shifted two-fold from MRCS failure to health-related concerns. The primary hypothesis was supported by fewer NTN appointments but rejected related to ARCPO and MRCS examination pass rates.

Trainee operative logbook volume has been consistently reported to be the most striking and detrimental COVID-19 effect. Indeed, almost a million elective training cases were reported to have been lost in the first year of the pandemic<sup>[14]</sup>. Despite the wider scope of the present study (evaluating 2 years), this fall in operative experience is comparable to the 38%

**Table 2**

**Significant demographic factors associated with Annual Review of Competency Progression Outcomes (ARCPO) 1, 2 and 6, Membership of the Royal College of Surgeons (MRCS) success, National Training Number (NTN) appointment and trainee attrition on multivariable analysis.**

			Univariable analysis		Multivariable analysis	
			OR (95% CI)	P	OR (95% CI)	P
ARCPO 1, 2 and 6	Gender	Male	1		1	
		Female	0.61 (0.35–1.07)	0.085	0.53 (0.28–0.98)	0.043
	Theme	GS	1		1	
		T&O	1.82 (0.93–3.56)	0.081	1.58 (0.78–3.17)	0.201
		ENT	3.73 (1.32–10.56)	0.013	3.59 (1.25–10.34)	0.018
		PS	17.96 (2.34–138.10)	0.006	16.82 (2.17–130.47)	0.007
		Urology	3.92 (1.07–14.30)	0.039	3.44 (0.92–12.82)	0.066
		OMFS	1.38 (0.33–5.87)	0.661	0.94 (0.21–4.25)	0.933
Hospital status	University	1		1		
	Mixed	0.58 (0.28–1.23)	0.155			
	DGH	0.39 (0.19–0.83)	0.014			
MRCS	Hospital status	University	1		1	
		Mixed	0.43 (0.21–0.89)	0.023		
		DGH	0.33 (0.16–0.70)	0.004		
	Theme	GS	1		1	
		T&O	2.57 (1.31–5.08)	0.006	2.48 (1.23–5.00)	0.011
		ENT	2.67 (1.11–6.41)	0.028	2.41 (1.00–5.84)	0.050
		PS	9.92 (2.24–43.98)	0.003	8.97 (2.01–39.92)	0.004
		Urology	3.24 (1.02–10.30)	0.046	3.68 (1.01–13.46)	0.049
OMFS	0.92 (0.26–3.19)	0.889	0.69 (0.19–2.54)	0.576		
NTN	IST	No	1		1	
		Yes	5.00 (1.92–13.03)	< 0.001	5.00 (1.92–13.03)	< 0.001
Attrition	COVID effect	Pre-COVID	1		1	
		CT2 only	0.54 (0.18–1.67)	0.284	0.56 (0.17–1.81)	0.328
		All CST	0.38 (0.15–0.97)	0.043	0.20 (0.06–0.72)	0.014
	Hospital status	University	1		1	
		Mixed	6.66 (1.47–30.26)	0.014	6.27 (1.37–28.72)	0.018
		DGH	5.49 (1.16–25.88)	0.032	6.63 (1.38–31.95)	0.018

DGH, District General Hospital; ENT, otolaryngology; GS, General Surgery; IST, Improving Surgical Training; OMFS, Oral & Maxillofacial Surgery; OR, odds ratio; PS, Plastic Surgery; T&O, Trauma & Orthopaedic Surgery.

**Table 3**

**Annual Review of Competency Progression Outcomes (ARCPO) 1, 2 and 6, Membership of the Royal College of Surgeons (MRCS) success, and National Training Number (NTN) appointment rates (n) related to ethnicity and International Medical Graduate status; pre-COVID (2014–2017) and peri-COVID (2018–2020).**

	Pre-COVID (%)			Peri-COVID (%)		
	WUKG	BMEUKG	IMG	WUKG	BMEUKG	IMG
ARCPO 1, 2 and 6	73.5 (50/68)	76.2 (32/42) <i>P</i> =0.118	45.5 (5/11)	75.7 (56/74)	67.7 (21/31) <i>P</i> =0.685	70.8 (17/24)
MRCS	70.1 (54/77)	76.6 (36/47) <i>P</i> =0.054	42.9 (6/14)	74.7 (56/75)	61.8 (21/34) <i>P</i> =0.391	70.8 (17/24)
NTN	53.1 (34/64)	43.9 (18/41) <i>P</i> =0.243	27.3 (3/11)	40.8 (29/71)	30.0 (9/30) <i>P</i> =0.567	40.9 (9/22)

BMEUKG, Black & Ethnic Minority UK Graduate; IMG, International Medical Graduate; WUKG, White UK Graduate.

reported nearer the centre of the pandemic by Clements *et al.*<sup>[15]</sup> Operative logbooks of over 5000 surgical trainees between April and December of 2020 were compared with a similar period a year before, and the greatest effect was seen in elective (47%) compared with emergency caseloads (15%). In accord with the present study, no change was reported in ARCPO at CST level, though a significant increase in the number of senior trainees prolonging their training was reported (over one in eight). Gaining a critical number of indicative operative procedures may impede the completion of Higher Surgical Training, but neither indicative operation nor total logbook operative volume (suggested number 120 per year) necessarily delays promotion from CST by way of adverse ARCPO. This will, however, undoubtedly affect the procedural competence and confidence of trainees transitioning to phase two of training. The increase in NTN appointments seen in the IST cohort is both contentious and multifactorial. Wales' IST programme was intentionally placed in hospitals with the best evidence-based training experience, with rotational commuting distance minimised, arguably attracting better applicants<sup>[16]</sup>. Moreover, IST, by default, increased NTN competition ratio entry for CSTs on uncoupled programmes because IST progression simply requires demonstration of competence commensurate with being appointable, irrespective of competition ratios.

Robinson *et al.*<sup>[12]</sup> reported differential attainment from the same Statutory Education Body in 2020 and found no variation related to ethnicity or gender for any of the primary outcome measures of ARCPO, MRCS examination pass rate or NTN success. But differential attainment was found related to IMGs compared with UK Graduates – IMGs were two-fold more likely to receive ARCPO 2 or 3, a fifth less likely to pass MRCS and

six-fold less likely to be successful at NTN selection. Multivariable analysis showed that UK Graduate training, higher operative experience and induction bootcamp engagement were the quantitative factors associated with NTN appointment success. Compared with the findings of the present study, it is reassuring that this prior measured difference in IMG attainment appears to be diminishing and may reflect better standardisation and support in undergraduate/early medical training. In contrast, data from the same Statutory Education Body related to Higher Surgical Training, reported by Luton *et al.*<sup>[17]</sup> in 2022, reported a more complex hybrid differential attainment spectrum, showing gender was plainly associated with an achievement gap related to ARCPO, but not Fellowship of the Royal College of Surgeons (FRCS) examination pass or certification of completion of training. Women were twice as likely to receive unsatisfactory ARCPO, with 47.8% of these women having returned from maternity leave prior to appraisal. Ethnicity was not associated with ARCPO, but FRCS pass rates were a third poorer amongst BMEUKGs compared with WUKGs. These negative findings must remain a primary focus for improvement.

This study has inherent limitations. Data are from a single Statutory Education Body with modest cohort numbers. Comparable data from Europe, the Americas and Asia are sparse, and therefore some findings and assumptions may not be extrapolated and applied across divergent international training programmes. Outcomes were recorded related to the intended two-year CST programme and on a binary scale precluding MRCS mark, number of attempts and trainee choice in whether to at once pursue an NTN. Factors including non-training considerations for ARCPO, burnout and 'soft skills' including communication, teamwork and decision making were beyond the

**Table 4**

**Annual Review of Competency Progression Outcomes (ARCPO) 1, 2 and 6, Membership of the Royal College of Surgeons (MRCS) success, National Training Number (NTN) appointment, attrition rate and median (range) operative caseload during core surgical training related to sub-specialty theme.**

	Trainee proportion (%)	ARCPO 1, 2 and 6 (%)	MRCS (%)	NTN (%)	Attrition (%)	Logbook
GS	38.4	59.1	56.7	38.6	15.4	442 (145–822)
T&O	25.8	72.5	77.1	46.9	8.6	438 (124–814)
ENT	13.3	84.4	77.8	53.1	11.1	520 (262–876)
PS	10.3	96.3	92.9	33.3	3.6	586 (242–1176)
Urology	7.7	85.0	81.0	36.8	9.5	480 (265–1131)
OMFS	4.1	66.7	54.5	55.6	18.2	593 (199–829)
<i>P</i>		0.001	<0.001	0.505	0.488	0.001

ENT, Otolaryngology; GS, General Surgery; OMFS, Oral & Maxillofacial Surgery; PS, Plastic Surgery; T&O, Trauma & Orthopaedic Surgery.

scope of this study, whilst future work should include a qualitative component to investigate these factors. Conversely, the study has strengths in comprehensively assessing all critical metrics over 8 years, controlled for geographical bias, COVID effect and devolved government policy. Moreover, the study has statistical power and all data collected were ratified at national ARCP.

## Conclusion

The COVID-19 pandemic had a significant impact on CST, with several likely contributing factors. First, disruption of training decreasing trainees' clinical exposure and skill development. Second, added workload and responsibilities due to staff shortages affecting the ability to focus on training. Third, mental health concerns and increased stress potentially leading to burnout and impaired performance. Fourth, differences in support – trainees from marginalised groups, including those from lower socioeconomic backgrounds or minority ethnic groups, may face more barriers to opportunity. Consequently, to address differential attainment in surgical training, four key areas require focus. First, check and evaluate performance outcomes to find disparities and inform targeted interventions – the driver of this study. Second, provide additional resources and support for mental health, targeted training, and mentorship. Third, address systemic inequities that may contribute to differential attainment such as bias, discrimination, lack of diversity in leadership and management, and unequal access to help. Fourth, adapt training programmes to account for decreased clinical exposure and skill development, which may include more simulation-based training or prioritising certain clinical encounters. Taking the difference out of attainment is an important international concept and must be a prime national health service priority.

## Ethical approval

Not applicable.

## Sources of funding

None.

## Author contribution

All authors made substantial contributions to the drafting, revising and in approving the final version of this manuscript and are accountable for all aspects of the work. In addition, L.W., S.H.G., R.J.E. and W.G.L. were responsible for acquiring the data, with O.P.J., K.M., O.L. and D.R. subsequently responsible for collating, analysing and interpreting.

## Conflicts of interest disclosure

There are no conflicts of interest.

## Research registration unique identifying number (UIN)

1. Name of the registry: ClinicalTrials.gov.

2. Unique identifying number or registration ID: NCT055-99529.
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): <https://clinicaltrials.gov/ct2/show/NCT05599529>.

## Guarantor

Osián P. James and Wyn G. Lewis.

## Data availability statement

The data used to compose this study could be made available upon reasonable request and subject to approval from Health Education and Improvement Wales' School of Surgery.

## Provenance and peer review

Not commissioned, externally peer-reviewed.

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