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Core training and surgical opportunities: A UK-based analysis

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ABSTRACT

Background and Aim: The COVID-19 pandemic, the new Intercollegiate Surgical Curriculum Programme curriculum and the European Work Time Directive significantly reduced surgical exposure for trainees. This study analyzed the operative experience of Phase 1 trainees (CT1/ST1 vs. CT2/ST2) against the Annual Review of Competence Progression (ARCP) criterion of 120 procedures yearly.

Methods: National survey research in October 2021. Study end-point was the completion of >4 weekly procedures, equivalent to 120 cases per year. Chi-square test and multivariate regression analysis were performed.

Results: 205 participants from 5 Deaneries were included, 48.3% were CT1/ST1 and 51.7% were CT2/ST2. About 54.5% of year-1 and 50% of year-2 trainees were 28-30 years old, 55.6% and 50.9% were male, and 39.4% and 38.7% were White British. About 39.4% of CT1/ST1 and 22.6% of CT2/ST2 performed <4 weekly procedures ($P = 0.01$), with no difference in the "Observed" ($P = 0.6$) or "Assisted" ($P = 0.3$) number of cases. CT2/ST2 recorded more "ST-S" ($p = 0.04$), "S-TU" ($P = 0.03$), and "Performed" ($P = 0.02$) operations. For CT1/ST1, older age (HR 2.4, 95% CI [1.1; 5.3], $P = 0.02$) and southern deaneries (HR 1.7, 95% CI [1.2; 2.4], $P = 0.004$) were independent factors for <4 weekly procedures. For CT2/ST2, northern regions were associated with more favorable training (HR 1.4, 95% CI [1.1; 1.7], $P = 0.01$).

Conclusion: Over one third of Phase 1 trainees do not meet the ARCP requirement of >120 procedures annually. Age and region of training are independent factors in the number of logbook cases.

Relevance for Patients: This research focuses on training opportunities for junior surgical residents across the United Kingdom. The degree and type of exposure to the operating theatre have a significant impact on the development of surgical competencies. These are undoubtedly related to patient outcomes, as the quality of care delivered to patients and relatives greatly relies on the training background of future consultant surgeons.

1. Introduction

In August 2021, the Intercollegiate Surgical Curriculum Programme (ISCP) introduced the new outcomes-based curriculum for surgical training. The updated core trainees' syllabus recommends an eLogbook evidence of >120 operative procedures per year to obtain a satisfactory outcome (Outcome 1) at the Annual Review of Competence Progression (ARCP) [1].

The COVID-19 pandemic has had an unprecedented impact on global healthcare systems since [2]. The surgical workforce has had to adapt and the global emphasis has moved to service provision, affecting quality and quantity of surgical training. Services have been centralized, elective operations postponed and emergency surgical practice on such higher-risk patients carried out by consultants or senior trainees only [3,4]. Furthermore, the Joint Committee on Surgical Training agreed that doctors in their early

year of surgical training would be redeployed to other sectors and frontlines, and training rotations suspended, in an effort to reduce a potential burden on healthcare systems [5]. Such changes, alongside the reduction in study budgets and stricter working hour control, in line with the European Working Time Directive, have led to a significant concern about the adequacy of surgical exposure for trainees in their formative years of surgical training [6,7].

A recent study analyzed the impact of COVID-19 on operative experience of core trainees across the Irish surgical program. In comparison with previous years, the mean number of procedures performed by individual trainees decreased by 64% for ST1s and by 63.4% for ST2s [8]. Similarly, a survey conducted in Western Scotland showed that 71.4% of trainees had less opportunity to operate as the primary surgeon, and 64.3% found it difficult to progress, as a result of the pandemic [9].

This study aims to analyze the current operative experience of Phase 1 surgical trainees across the United Kingdom. This survey research focuses on the eLogbook evidence core trainees are able to record prior to their ARCP, in relation to the new ISCP syllabus of >120 mandatory procedures per year.

2. Methods

2.1. Ethical statement

This study was registered at the Audit and Quality Improvement Department of Addenbrooke's Hospital. Formal approval was obtained.

2.2. Study design

This report represents a survey research across the United Kingdom, analyzing the operative experience of surgical trainees in their current job role.

The survey was created on Google Forms and was available for completion during the month of October 2021. It included 17 questions in the format of multiple-choice questionnaire (Appendix) and comprised three domains:

- Demographics: Age, gender, ethnicity, deanery, and specialty
- Operative experience: Number of procedures per supervision code (O, A, S-TS, S-TU, P), type of procedure (CEPOD definition), and variety of exposure
- Educational and Professional background: MRCS status, medical school, previous staff grade or locum job, and previous research job.

A previous Staff grade or Locum Job and a previous Research job were intended after completion of Foundation Training and before commencement of CST.

Study end-point was the analysis of Phase 1 surgical trainees' operative experience in relation to the eLogbook supervision coding and ARCP criteria. Potential determinant factors were also studied in a regression analysis.

The minimum requirement of 120 eLogbook procedures to achieve the ARCP Outcome 1 was transformed into a weekly number of four procedures. This resulted from the following

considerations: 11 months of training, 27 days of annual leave per year, 7 days of study leave per year, and 8 days off work monthly (BMA, 2022).

$$(11 \times 30) - [27 + 7 + (8 \times 11)] / 7 = 29.6 \text{ weeks}$$

$$120 / 29.6 = 4.05 \text{ procedures}$$

2.3. Participant selection

All Phase 1 surgical trainees were included in the study.

Inclusion criteria were Core Surgical Trainees 1 and 2 (CT1 and CT2) and Specialty Trainees 1 and 2 (ST1 and ST2) in current UK training posts.

Exclusion criteria were trust appointed doctors in core training-equivalent posts, staff grade doctors, junior clinical or research fellows, and doctors employed with a locum contract.

2.4. Data analysis

The survey was anonymous; hence, participants were not identifiable at any stage. Data were kept confidential in a password-protected file at all times.

For a confidence interval of 95%, 0.5 standard deviation and a margin of error of 5%, the calculated sample size was 292, 20 trainees each Deanery. This includes both CT1/ST1s and CT2/ST2s.

Categorical data are expressed as percentages and counts, and compared with the Pearson Chi-square test.

A multivariate Cox regression analysis for the degree of surgical exposure was performed including age, gender, ethnicity, deanery, specialty, type of operation, MRCS status, medical school, previous locum job, and previous research job as covariates.

Statistical significance was defined at $P < 0.05$.

The SPSS system for statistics was used for the analysis [10].

3. Results

3.1. Demographics

There are 14 Deaneries providing surgical training across the UK. Of these, 5 responded to the survey, indicated as South or North Deaneries in relation to their geographical location. Participants' demographics are shown on Table 1.

The number of participants was 205, 48.3% (n 99) CT1/ST1 and 51.7% (n 106) CT2/ST2. Both groups, CT1/ST1 and CT2/ST2, reported similar characteristics. Participants appeared to be young, male White British doctors in a General Surgery rotation.

The professional background of trainees only differed for the Intercollegiate MRCS status ($P < 0.001$). A greater proportion of CT2/ST2 passed both Parts A and B (58.5% vs. 16.2%), whilst over one third of CT1/ST1 had not attempted any part yet (17.2% vs. 0).

3.2. Operative experience: CT1/ST1 versus CT2/ST2

The ARCP requirement of >120 eLogbook procedures, translated into >4 weekly operations, is not met by 39.4%

Table 1. Demographics CT1/ST1 and CT2/ST2.

	CT1/ST1 (n=99)	CT2/ST2 (n=106)	P-value
Gender, % (n)			0.5
Female	44.4 (44)	49.1 (52)	
Male	55.6 (55)	50.9 (54)	
Other	-	-	
Prefer not to say	-	-	
Age, % (n)			0.1
25–27	23.2 (23)	13.2 (14)	
28–30	54.5 (54)	50 (53)	
31–33	21.2 (21)	34 (36)	
34–35	-	0.9 (1)	
>35	1 (1)	1.9 (2)	
Ethnicity, % (n)			0.7
Asian/Asian British/Arab	23.2 (23)	23.6 (25)	
Black/Black British/African/Caribbean	14.1 (14)	17 (18)	
White British	39.4 (39)	38.7 (41)	
White (Other)	21.2 (21)	16 (17)	
Other	2 (2)	4.7 (5)	
Deanery, % (n)			0.7
South Deanery 1	28.3 (28)	21.7 (23)	
South Deanery 2	15.2 (15)	14.2 (15)	
South Deanery 3	17.2 (17)	21.7 (23)	
North Deanery 1	21.2 (21)	26.4 (28)	
North Deanery 2	18.2 (18)	16 (17)	
Specialty, % (n)			0.9
General surgery	26.3 (26)	28.3 (30)	
Cardiothoracic surgery	5.1 (5)	2.8 (3)	
Neurosurgery	3 (3)	1.9 (2)	
Orthopedics surgery	14.1 (14)	18.9 (20)	
ENT	13.1 (13)	9.4 (10)	
Pediatric surgery	8.1 (8)	5.7 (6)	
Plastic surgery	7.1 (7)	9.4 (10)	
Urology	13.1 (13)	15.1 (16)	
Vascular surgery	10.1 (10)	8.5 (9)	
Type of procedures, % (n)			0.09
Emergency	15.2 (15)	17 (18)	
Elective	20.2 (20)	9.4 (10)	
Both	64.6 (64)	73.6 (78)	
MRCS status, % (n)			<0.001
Passed Part A	46.5 (46)	36.8 (39)	
Passed Part A and B	16.2 (16)	58.5 (62)	
Failed Part A	20.2 (20)	2.8 (3)	
Failed Part B	-	1.9 (2)	
Not attempted yet	17.2 (17)	-	
Variety of exposure, % (n)			0.6
Strongly agree	31.3 (31)	30.2 (32)	
Agree	45.4 (45)	47.2 (50)	
Neutral	14.1 (14)	8.5 (9)	
Disagree	7.1 (7)	10.4 (11)	
Strongly disagree	2 (2)	3.8 (4)	

(Contd...)

Table 1. (Continued).

	CT1/ST1 (n=99)	CT2/ST2 (n=106)	P-value
Medical school, % (n)			0.5
East Midlands	8.1 (8)	3.8 (4)	
East of England	6.1 (6)	6.6 (7)	
Kent, Surrey, Sussex	4 (4)	4.7 (5)	
London	14.1 (14)	13.2 (14)	
North West	6.1 (6)	7.5 (8)	
Northern	5.1 (5)	2.8 (3)	
Scotland	9.1 (9)	16 (17)	
South West	10.1 (10)	6.6 (7)	
Thames Valley	1 (1)	7.5 (8)	
Wales	2 (2)	2.8 (3)	
West Midlands	5.1 (5)	7.5 (8)	
Yorkshire and Humber	7.1 (7)	6.6 (7)	
Europe	12.1 (12)	7.5 (8)	
Overseas	7.1 (7)	4.7 (5)	
Staff grade/Locum job, % (n)	44.4 (44)	45.3 (48)	0.9
Research job, % (n)	11.1 (11)	12.3 (13)	0.8

of CT1/ST1 and 22.6% of CT2/ST2, p 0.01. The breakdown according to the supervision coding system is shown on [Table 2](#).

Very few trainees recorded any observed procedure and over 78% of both groups did not observe any case, $P = 0.6$.

All participants assisted their senior colleagues to a various degree on a weekly basis. Similar numbers were recorded by CT1/ST1 and CT2/ST2 (p 0.3), with the majority being an assistant 2–3 times a week (45.4% vs. 52.9%).

Conversely, the recorded S-TS operations differed significantly between 1st and 2nd year trainees, $P = 0.04$. While over 80% of CT1/ST1s do not perform any or perform 1–2 operations weekly, almost one fourth of CT2/ST2s record more than 2 ST-S cases. Similarly, a greater number of year-2 participants were able to operate under indirect supervision in comparison with their year-1 colleagues ($P = 0.03$).

Finally, 16% of the CT2/ST2 Group recorded 1–2 independently performed cases versus 5.1% of the CT1/ST1 Group, $P = 0.02$. However, <1% of participants were given the opportunity to perform more than 2 operations independently per week. These trainees were in a general surgery (31%), plastic surgery (52%), and orthopedics surgery (17%) rotation.

Concerning the variety of surgical procedures trainees felt to be exposed to, the majority of our participants were satisfied and a similar range of opinions was expressed for year-1 and year-2 ($P = 0.6$). About 31.3% of CT1/ST1 and 30.2% of CT2/ST2 strongly agreed with the heterogeneity of operations, while 45.5% and 47.2% agreed, respectively. The remaining few trainees were neutral, disagreed, or strongly disagreed.

The type of operations participants were involved in, expressed according to the CEPOD classification, did not differ between 1st and 2nd year surgeons ($P = 0.09$). A combination of both elective and emergency theatre lists was recorded by 64.6% of the former group and 73.6% of the latter. Emergency cases were 15.2% and

Table 2. Operative experience of CT1/ST1 and CT2/ST2.

	CT1/ST1 (n=99)	CT2/ST2 (n=106)	P-value
Weekly procedures, % (n)			0.01
<4	39.4 (39)	22.6 (24)	
>4	60.6 (60)	77.4 (82)	
Observing, % (n)			0.6
0	78.8 (78)	78.3 (83)	
1-2	17.2 (17)	17 (18)	
2-3	1 (1)	2.8 (3)	
3-4	-	0.9 (1)	
4-5	1 (1)	-	
>5	2 (2)	0.9 (1)	
Assisting, % (n)			0.3
0	3 (3)	0.9 (1)	
1-2	27.2 (27)	29.2 (31)	
2-3	45.5 (45)	52.9 (56)	
3-4	13.1 (13)	9.4 (10)	
4-5	4 (4)	5.7 (6)	
>5	7.1 (7)	1.9 (2)	
ST-S, % (n)			0.04
0	40.4 (40)	22.6 (24)	
1-2	43.4 (43)	53.8 (57)	
2-3	9.1 (9)	14.2 (15)	
3-4	7.1 (7)	6.6 (7)	
4-5	-	-	
>5	-	2.8 (3)	
ST-U, % (n)			0.03
0	87.9 (87)	72.6 (77)	
1-2	21.1 (12)	17.9 (19)	
2-3	-	6.6 (7)	
3-4	-	0.9 (1)	
4-5	-	0.9 (1)	
>5	-	0.9 (1)	
Performed, % (n)			0.02
0	93.9 (93)	82.1 (87)	
1-2	5.1 (5)	16 (17)	
2-3	1 (1)	-	
3-4	-	-	
4-5	-	-	
>5	-	1.9 (2)	

ST-S, supervised trainer-scrubbed; ST-U, supervised trainer-unscrubbed

17%, whilst elective surgeries accounted for 20.2% and 9.4%, respectively.

3.3. Multivariate regression analysis CT1/ST1

A multivariate adjusted Cox regression analysis of factors affecting the weekly number (n = 4) of procedures required to achieve a satisfactory ARCP outcome was performed for CT1/ST1. Demographics, educational, and professional factors were used as covariates (Table 3).

Table 3. Multivariate regression analysis for weekly number of procedures (n <4) for CT1/ST1.

	Standard error	Hazard ratio	95% CI: Lower bound	95% CI: Upper bound	P-value
Age	0.4	2.4	1.1	5.3	0.02
Gender	0.5	0.5	0.2	1.4	0.2
Ethnicity	0.2	0.8	0.5	1.3	0.5
Deanery	0.2	1.7	1.2	2.4	0.004
Specialty	0.08	1.02	0.9	1.2	0.8
CEPOD	0.3	0.8	0.4	1.6	0.6
Exposure	0.2	1.3	0.8	2.2	0.3
MRCS status	0.2	1.04	0.7	1.5	0.8
Medical School	0.06	1	0.9	1.1	0.9
Locum job	0.6	0.4	0.1	1.3	0.1
Research job	0.8	0.9	0.2	4.3	0.9

Based on the multivariate model, there was no difference in weekly procedures in relation to gender (HR: 0.5, 95% CI [0.2; 1.4], $P = 0.2$), ethnicity (HR: 0.8, 95% CI [0.5; 1.3], $P = 0.5$), specialty (HR: 1.02, 95% CI [0.9; 1.2], $P = 0.8$), CEPOD (HR: 0.8, 95% CI [0.4; 1.6], $P = 0.6$), variety of exposure (HR: 1.3, 95% CI [0.8; 2.2], $P = 0.3$), medical school (HR: 1, 95% CI [0.9; 1.1], $P = 0.9$), Locum job (HR: 0.4, 95% CI [0.1; 1.3], $P = 0.1$), and Research job (HR: 0.9, 95% CI [0.2; 4.3], $P = 0.9$).

Only age and deanery resulted significant. A further detailed regression analysis was conducted including each category for both these variables. Older trainees performed less weekly procedures (HR: 7, 95% CI [1.9; 4.7], $P = 0.003$). Northern trainees recorded a higher number of weekly procedures (HR: 0.03, 95% CI [0.002; 0.4], $P = 0.009$).

3.4. Multivariate regression analysis CT2/ST2

Likewise, a multivariate adjusted Cox regression analysis of covariates limiting the weekly number (n = 4) of procedures to obtain an ARCP Outcome 1 was completed for CT2/ST2. Again, demographics, educational, and professional factors were considered (Table 4).

According to the multivariate results, there was no difference in weekly procedures in relation to age (HR: 1.5, 95% CI [0.9; 2.3], $P = 0.07$), gender (HR 0.7, 95% CI [0.4; 1.4], $P = 0.4$), ethnicity (HR: 0.9, 95% CI [0.7; 1.2], $P = 0.5$), specialty (HR 1.01, 95% CI [0.9; 1.1], $P = 0.8$), CEPOD (HR: 0.8, 95% CI [0.5; 1.3], $P = 0.4$), variety of exposure (HR 0.9, 95% CI [0.7; 1.3], $P = 0.9$), MRCS status (HR: 1.2, 95% CI [0.9; 1.5], $P = 0.2$), medical school (HR 0.9, 95% CI [0.9; 1.04], $P = 0.3$), Locum job (HR: 0.9, 95% CI [0.4; 1.8], $P = 0.7$), and research job (HR: 1.4, 95% CI [0.5; 3.6], $P = 0.5$).

The same detailed regression analysis was completed for each category of the significant variable, Deanery. Year-2 trainees from northern regions performed more procedures than their colleagues living in the south (HR: 0.3, 95% CI [0.1; 1], $P = 0.04$).

Table 4. Multivariate regression analysis for weekly number of procedures (n <4) for CT2/ST2.

	Standard error	Hazard ratio	95% CI: Lower bound	95% CI: Upper bound	P-value
Age	0.2	1.5	0.9	2.3	0.07
Gender	0.3	0.7	0.4	1.4	0.4
Ethnicity	0.1	0.9	0.7	1.2	0.5
Deanery	0.1	1.4	1.1	1.7	0.01
Specialty	0.06	1.01	0.9	1.1	0.8
CEPOD	0.2	0.8	0.5	1.3	0.4
Exposure	0.2	0.9	0.7	1.3	0.9
MRCs status	0.1	1.2	0.9	1.5	0.2
Medical School	0.04	0.9	0.9	1.04	0.3
Locum job	0.4	0.9	0.4	1.8	0.7
Research job	0.5	1.4	0.5	3.6	0.5

4. Discussion

This survey research demonstrated that over one third of core surgical trainees is expected to fail their ARCP due to inadequate surgical experience. The new ISCP curriculum, introduced in August 2021, imposes adjusted WBAs criteria and eLogbook requirements. The latter include a minimum of 120 procedures recorded by trainees and validated by trainers. As of October 2021, these are not met in 5 of the 14 deaneries providing surgical training across the UK, mirroring the challenges introduced by the COVID-19 pandemic, European Work Time Directive and the new ISCP syllabus. In the remaining nine deaneries, the quality of training was not assessed; this represents a limitation of the study. Finally, this analysis raised a significant concern about the quality of early surgical training.

A satisfactory ARCP outcome is essential for both CT1/ST1 and CT2/ST2 trainees, particularly for the latter group. Year-2 surgeons will have to undergo a national selection process to enter Phase 2 training (ST3 and above), which requires specific operative competencies. In 2010, doctors with additional operative experience gained from extra non-training posts were preferentially recruited at ST3, displacing those applying straight from core surgical training [11,12]. Only one in four of CT2 doctors was appointed an ST3 job. In other words, the surgical experience collected over the 2 years of CST is often deemed inadequate and trainees have to take time out of training to gather further exposure. This is particularly true in some specialties, such as cardiothoracic surgery, neurosurgery, and vascular surgery; in our analysis, those trainees able to confidently perform cases were in a general, plastic or orthopedic rotation only.

The JCST acknowledged the quality of CST as a real concern and is working to address the underlying educational factors. The JCST's current plan is to explore whether or not it would be feasible and appropriate to extend CST to an indicative period of 3 years, adding a 12-month period to the current framework [11]. Our study demonstrated a significant difference in the number of weekly procedures performed by year-1 and year-2 trainees,

showing a degree of progression, which would be expected to continue if a 3rd year was to be added.

Surgical training in the United Kingdom is regulated by national committees and advisory bodies, such as the JCST, the Royal Colleges of Surgeons and the ISCP. The purpose of such complex framework is to ensure standardization of the quality of training across the different regions. Several studies have shown a similar operative experience of core trainees in relation to their deanery. Robinson analyzed WBAs, surgical cases, and academic productivity of CT1 and CT2 doctors in relation to location, type of hospital, and length of rotation. Concerning the operative caseload, this was significantly greater for trainees completing longer rotations (6- and 12-month), but did not differ for geographical area and type of hospital (rural or university teaching center's) [13]. Similarly, a comparative study of Wales and East Midlands deaneries failed to demonstrate the influence of the region in the total number of operations recorded by trainees [14]. Our results appear to be, however, in contrast with literature. The survey confirmed trainees from northern deaneries carried out a greater number of surgical procedures in both their 1st and 2nd years.

Age displayed a significant association with surgical opportunities in our analysis for year-1 trainees only. Literature reports very little evidence concerning the impact of age on CST. Nevertheless, doctors of a more mature age tend to opt for less than full time training (LTFT) on the ground of personal and academic reasons, including childrearing, caring for a dependent, academia, ill health, leadership roles and sporting commitments. It was estimated that 6.25% of LTFT trainees are at core level, while the remaining 92.5% in higher surgical training. Such category of surgeons has often experienced undermining behavior by consultants and other team members, less operative exposure, and more unfavorable rotations [15]. These factors, alongside the reduced amount of working hours a LFTF job entitles to, could have some detrimental effects on surgical training. Another likely explanation could be the challenges of returning to work following a career break. Whether it is for academic or personal reasons, doctors pausing their training at this stage often tend to deskill, making it more difficult to train in comparison with their colleagues. Moreover, a recent analysis showed that how mature trainees were less likely to achieve a satisfactory ARCP outcome and more likely to be awarded an unsatisfactory outcome than younger graduates ($P = 0.01$) [16].

In conclusion, the operative experience of current trainees in core surgical training has been negatively influenced by the European Working Time Directive of the past two decades, the COVID-19 pandemic, and the new ISCP curriculum introduced in August 2021. This study illustrates relevant independent factors in the number of weekly procedures Phase 1 trainees are involved in, highlighting their impact on the ARCP outcome. Future implications of the quality of current surgical training include a non-standardized operative exposure across the country with significant variations among deaneries, as well as a discrepancy in volume of operations older trainees are allowed to perform.

5. Limitations

This survey research is associated with some limitations, which merit discussion.

The original study design included a national portrait of core trainees' surgical exposure. However, this was not entirely achieved due to a limited response to our survey. Out of the 14 deaneries accountable for training across the UK, only five participated. Hence, the power calculation conducted prior to the commencement of the study could not be entirely fulfilled (292 anticipated participants vs. 205 responses).

Moreover, the dissemination of the survey was provided by the single deanery administration offices. A trust email was sent to trainees with the survey link and an invitation to participate. Consequently, those with limited access to their mail account, doctors on annual leave or sick absence might not have responded. Yet, the response was significantly higher than anticipated.

Surveys also carry an intrinsic bias. Respondents may not provide accurate and honest answers, or not feel entirely comfortable. In addition, data may be unclear and participants might interpret some questions differently. To this purpose, it was made clear that the survey was entirely anonymous.

Finally, a survey collects data at a single point in time, without taking into account trends.

6. Conclusion

Over one third of Phase 1 trainees (CT1/ST1 and CT2/ST2) do not meet the ARCP requirement of >120 procedures annually. Age and deanery are independent factors in the number of logbook cases.

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Conflicts of Interest

Nothing to declare.

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