Research Square

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The Role of University Diplomas in the Training of Young French Orthopaedic Surgeons: A Complement to Training or a Reflection of the Limitations of Theoretical Education? Results of a National Survey

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Abstract

Background:

The training of young orthopaedic surgeons relies on university hospital theoretical education, complemented by clinical training. University and Inter-University Diplomas (UD and IUD) play an increasing role in this training pathway, but their role, enrollment motivations, and educational impact have never been evaluated on a national scale in orthopaedic surgery and traumatology.

Objective:

To assess the role of UD/IUDs in the training pathway of young French orthopaedic surgeons and to determine if they meet educational needs that are insufficiently covered by initial training.

Materials and methods:

A cross-sectional observational study was conducted using a national survey distributed between October 2024 and June 2025 among residents, junior doctors, fellows, and young practitioners in orthopaedic surgery and traumatology. The questionnaire explored perceptions of theoretical training, experience with UD/IUDs, reasons for enrolling, fundings, and barriers encountered. Data were analyzed using descriptive and comparative statistics.

Results:

Among the 326 respondents analyzed, 87.7% had already completed at least one UD/IUD. Only 39% reported being satisfied with the theoretical education received at their workplace, and this satisfaction was significantly associated with the time dedicated to theoretical training ($p<0.001$). The main reason for enrolling in UD/IUDs was to acquire knowledge considered insufficiently covered during residency (74.5%), followed by learning specific surgical techniques (43.3%) and improving career prospects (38.3%). Overall, UD/IUDs matched participants' expectations regarding theoretical knowledge (7.3/10), but their perceived impact on daily practice was more moderate (6.7/10). The main barriers identified were global costs (66.6%), geographical distance (53.1%), and administrative constraints (39.6%). Half of the participants preferred a blended educational model combining in-person and online learning.

Conclusion:
UD/IUDs currently represent a major complement to the training of young French orthopaedic surgeons. Their success seems to reflect a desire to compensate for perceived gaps in hospital-based theoretical education rather than a simple interest of sub-specialization. Improving their financial and organizational accessibility, combined with the development of hybrid formats integrating more practical training, could better satisfy the needs of future generations of orthopaedic surgeons.

Level of evidence: IV

Introduction

The training of orthopaedic and trauma surgery residents is based on a balance between clinical learning, progressive acquisition of surgical skills, and theoretical education. In France, the residency, also called the specialized studies diploma (SSD), lasts twelve semesters. It is divided into three phases – foundation, advanced, and consolidation – whose content is defined by regulatory texts and the College of the specialty [1, 2]. Beyond daily clinical activity, residents must benefit from regular theoretical teaching covering fundamental knowledge, surgical techniques, traumatology, and the different subspecialties of orthopaedics.

Despite this regulatory framework, several French studies have shown that the quality and organization of this teaching remain heterogeneous across university subdivisions [3, 4]. The time dedicated to theoretical education is often difficult to preserve due to hospital activity constraints, leading many residents to continue their learning during their personal time. Internationally, orthopaedic education increasingly relies on digital resources, online learning platforms, and hybrid teaching methods [5–7]. In France, while university networks, surgical simulation, and digital tools are progressively developing, their dissemination remains uneven and their impact on the training of young surgeons is still limited [3, 4, 8, 9].

In this context, University Diplomas (UD) and Inter-University Diplomas (IUD) play a growing role in the training pathway of young orthopaedic surgeons. These programs offer targeted education in many areas of the specialty, ranging from arthroscopic techniques to various osteoarticular conditions. Although they were initially designed as complementary or subspecialty training, their use appears much more widespread today. This evolution raises questions about the ability of initial training to meet the educational needs of young surgeons and highlights the role that UD/IUDs now play in their training program.

Do UD/IUDs mainly serve to acquire complementary expertise, or do they address needs that are insufficiently covered by the theoretical teaching provided during residency? The motivations driving young surgeons to enroll, as well as the obstacles they encounter, might shed light on current expectations regarding orthopaedic and trauma education. While several studies have evaluated these programs in other medical specialties [10–12], to our knowledge, no study has analyzed their place within the training of French orthopaedic surgeons.

The primary objective of this study was to evaluate the place of UD/IUDs in the training pathway of young French orthopaedic surgeons. More specifically, we sought to determine to what extent these programs addressed educational needs perceived as insufficiently covered by initial training. The secondary objectives were to identify motivations for enrollment, evaluate their perceived educational impact, describe the main barriers to access, and gather participants' expectations regarding the evolution of these programs.

Materials and methods

Study design and population

This is a cross-sectional observational study based on a national questionnaire sent to young French orthopedic surgeons. The target population included orthopedic and trauma surgery residents (foundation, advanced, and consolidation training phases), specialist assistants, clinical fellows, and young orthopedic surgeons working in public hospitals or private practice. Senior hospital surgeons were not included because they were expected to use UD/IUD courses less frequently, and the main objective of the study was to assess training during residency and the early post-residency period.

Participation was voluntary and anonymous. Before starting the questionnaire, participants were informed about the objectives of the study, and electronic informed consent was obtained. The only exclusion criterion was refusal to participate. The study received approval from the institutional ethics committee of Tours University Hospital (IRB 2024-098) and was declared to the French Data Protection Authority (CNIL) in accordance with current regulations.

Questionnaire development

The questionnaire was developed specifically for this study by the study investigators after a review of the literature on surgical training and the use of UD/IUD across different medical specialties [10–16]. The Scale Content Validity Index (S-CVI) demonstrated excellent validity (S-CVI = 0.90). Items receiving lower ratings were revised according to the experts' recommendations. Face validity was subsequently evaluated through a pilot study involving 20 orthopedic surgery residents. This sample size was selected in accordance with Hertzog's recommendation that 10–30 participants are generally sufficient for pilot studies[17]. Participants assessed the clarity, readability, and relevance of the questionnaire items. Based on their feedback, minor modifications were made to improve wording and comprehensibility before the final questionnaire was distributed nationwide. The final version, available in English in the supplementary files, included 21 questions divided into five domains:

- Demographic characteristics.
- Methods used to acquire theoretical and practical skills outside UD/IUD programs.
- Experience of participants who had completed one or more UD/IUD programs.
- Reasons for enrollment and barriers encountered.
- Open-ended questions about possible improvements and the overall experience with University Diploma (UD/IUD) programs.

Participants were required to answer all questions, except for the sections reserved for participants who had attended one or more UD/IUD programs and the open-ended questions, which were optional.

Recruitment

The questionnaire was distributed between October 2024 and June 2025 using a Microsoft Forms® questionnaire (Microsoft Corporation, Redmond, WA, USA), accessible through a web link or a QR code. It was distributed through several national orthopedic surgery training networks, including the Hospital-University Orthopedic Network of Western France (HUGOrtho), the French Arthroscopy Society (SFA), and several academic coordinators of UD/IUD programs. Several reminders were sent during the inclusion period to improve the response rate. The minimum sample size was estimated at 323 participants using Raosoft® software [18], assuming a target population of 2,000 young orthopedic surgeons, with a 5% margin of error, and a 95% confidence level.

Outcomes assessed

The primary endpoint was the perception of the place of UD/IUD in the training pathway of young orthopedic surgeons.

Secondary endpoints included:

- The satisfaction with the theoretical teaching received at the training site;
- The use of UD/IUD.
- The motivations for registration.
- The perceived educational impact of UD/IUD.
- The funding methods.
- The obstacles encountered.
- The expectations regarding the evolution of teaching methods.

Open-ended questions were independently reviewed by the authors, then grouped by themes after consensus, to allow a descriptive analysis of the main suggestions made by the participants.

Statistical analysis

Descriptive analyses are presented as numbers and percentages for qualitative variables, and as means with standard deviations or medians with interquartile ranges when appropriate for quantitative variables. Comparisons between groups were performed using the Chi-squared test for qualitative variables, and Mann–Whitney or Wilcoxon non-parametric tests for quantitative variables, depending on the nature of the comparisons. A multivariate logistic regression was used when relevant to identify factors independently associated with the variables of interest. All statistical analyses were performed using RStudio® version 2025.05 (Posit Software, Boston, MA, USA). Descriptive statistics were performed using Microsoft Excel® (Microsoft Corporation, Redmond, WA, USA). The threshold for statistical significance was set at $p < 0.05$.

Results

Study population

A total of 331 questionnaires were collected. After exclusion of five participants who did not give their consent, 326 questionnaires were analyzed. The population was mainly male (sex-ratio = 2.84), with a mean age of 32.1 years (median: 31 years). The respondents came from all French subdivisions, with a larger representation from the University Hospital Center (CHU) of Tours (13.2%), the Assistance Publique–Hôpitaux de Paris (9.2%), practitioners working abroad (8.6%), the CHU of Toulouse (5.5%) and the CHU of Brest (4.6%). The different levels of practice were balanced: 23.9% of residents in foundation or advanced phase, 29.8% of junior doctors (consolidation phase), 16.6% of university hospital practitioners, 15.0% of hospital practitioners and 14.7% of private practice surgeons (Table 1).

Table 1: Participant demographics

Total responses		***331***
Refusal of consent		**5**
Analyzed responses		**326**
Sex-ratio	Males	241 (73,93 %)
	Females	85 (26,07 %)
Age (years)		32,08 ±6,54
Workplace	CHU Tours	43 (13,2 %)
	APHP	30 (9,2 %)
	Abroad	28 (8,6 %)
	CHU Toulouse	18 (5,5 %)
	CHU Brest	15 (4,6 %)
	CHU Montpellier	14 (4,3 %)
	CHU Angers	13 (4,0 %)
	CHU Rennes	13 (4,0 %)
	CHU Nantes	13 (4,0 %)
	CHU Lille	13 (4,0 %)
	CHU Nancy	11 (3,4 %)
	Hospices Civils de Lyon	11 (3,4 %)
	CHU Caen	10 (3,1 %)
	Other CHU (<10 responses)	64 (19,6 %)
Practice level	Residency (foundation and advanced phase)	78 (23,9 %)
	Residency (consolidation phase), called junior doctor.	97 (29,8 %)
	Private practice	48 (14,7 %)
	CHU	54 (16,6 %)
	CH	49 (15,0 %)

Legend: Assistance Publique des Hôpitaux de Paris (APHP), University Hospital Center (CHU), Hospital Center (CH)

Theoretical training in orthopaedic surgery

Most participants (52.5%) dedicated one to two hours per week to theoretical training at their workplace, while 19.3% dedicated three to four hours. In contrast, 18.1% reported having no dedicated time. Only 39% of respondents said they were satisfied with the theoretical training received at their workplace. This proportion was lower among foundation and advanced phase residents (25.6%) and junior doctors (34%).

The time dedicated to this training was significantly associated with satisfaction ($p < 0.001$). Satisfaction increased progressively, reaching 71.4% among participants dedicating seven to eight hours per week to their training, and then decreased beyond this threshold (Figure 1). However, the number of UD/IUD completed was not associated with the level of satisfaction ($p = 0.95$).

Theoretical learning also relied heavily on personal time. In total, 70.6% of respondents dedicated one to four hours per week to their training outside of work hours, compared to only 6.4% who reported never working during their free time. Early-phase residents more frequently reported three to four hours per week, while a duration of one to two hours became predominant among junior doctors and private practice surgeons.

Use and perception of UD/IUD

Among the 326 respondents, 286 (87.7%) had already completed at least one UD or IUD, with an average number of 2.69 diplomas per participant (median: 3).

The most frequently completed courses were the IUD in arthroscopy (44.8%), the UD in knee surgical pathologies (40.2%), the UD in microsurgery (35.3%), the UD in hand surgery (32.2%), and the UD in shoulder and elbow surgical pathologies (27.3%) (Figure 2).

Among participants who had completed a UD/IUD, the agreement between acquired knowledge and expectations was rated 7.3/10 (median: 8), while the perceived impact on daily practice obtained an average score of 6.66/10 (median: 7).

Regarding pedagogical formats, hybrid learning combining in-person and distance learning was the preferred format for half of the respondents (50.0%), ahead of exclusively in-person teaching (35.7%) and exclusively distance learning (10.5%).

Motivations, funding and barriers

The main motivation for enrolling in a UD/IUD was to acquire knowledge that was insufficiently covered during residency (74.5%), followed by learning specific surgical techniques (43.3%) and improving career prospects (38.3%). No association was found between enrollment motivations and satisfaction with the UD/IUD. However, respondents who reported enrolling to compensate a training deficit during residency

reported a significantly lower satisfaction regarding the theoretical training received during residency ($p < 0.001$).

Among participants who had completed a UD/IUD, 38 (13.3%) received financial aid. On average, this aid covered 56.6% of the total cost of the training (IQR: 30–90%) and came mainly from a hospital institution, whether with academic responsibility or not (63.2%), or a private company (34.2%).

The main barriers to enrollment were the cost of training (66.6%), geographical distance to teaching locations (53.1%), and administrative constraints (39.6%). The lack of national recognition for the diploma was also frequently reported (38.7%), while difficulties related to being absent from the workplace to attend classes concerned 14.7% of respondents.

Analysis of open-ended questions

The response rate for open-ended questions was 41.7% for suggestions for improvement and 26.4% for general comments. The main ideas for improvement concerned reducing training costs and geographical constraints. Developing recorded lectures or a hybrid in-person and distance learning format was among the most frequent suggestions (48 mentions). Respondents also emphasized the need to strengthen practical training, exposure to clinical cases, and the opportunity to be released from clinical duties to attend classes. General comments mostly highlighted the value of UD/IUD in the training of young orthopedic surgeons, while noting the financial and organizational constraints associated with these courses. Only a few respondents felt that UD/IUD had limited value.

Discussion

To our knowledge, this study provides the first national assessment of the role of UD/IUD in the training pathway of young French orthopedic surgeons. Beyond describing the use of these courses, our results suggest a deeper evolution in surgical training. Today, UD and IUD seem less like subspecialty training and more like a response to a perceived gap in hospital-based theoretical teaching. This trend raises questions about the current organization of training for young orthopedic surgeons and the role that these additional degrees should play in the future.

The primary finding of this study is the low level of satisfaction with the theoretical teaching provided during residency. Less than four out of ten respondents reported being satisfied, with even higher dissatisfaction among residents at the beginning of their training. These results are consistent with several French studies that have highlighted the significant variations in teaching across university subdivisions, as well as the difficulty of preserving time genuinely dedicated to theoretical training [3, 4, 13, 19]. Our results also show that satisfaction depends more on "protected time" dedicated to training than on the overall workload. The observed relationship between time dedicated to teaching and satisfaction, with an optimal level around seven to eight hours per week, highlights the importance of a balance between clinical work and educational activities. This observation suggests that the perceived quality of training depends less on the intensity of hospital activity than on the ability to integrate

structured teaching. This interpretation is supported by the heavy reliance on personal study. Almost all respondents continued learning outside of hospital hours, showing a strong investment in their training. This finding is consistent with the work of Faivre et al. and several international studies showing that residents' well-being depends more on the quality of the educational environment, autonomy, and the meaning given to work, rather than just the number of hours worked [13, 20–24]. The progressive increase of administrative and organizational constraints in hospitals could thus reduce the time spent on the most valuable educational activities (mentorship, surgical practice, and theoretical teaching) without reducing the overall workload. From this perspective, the dissatisfaction expressed by respondents might reflect a decrease in the perceived educational value of time spent in the hospital, rather than a simple lack of hours.

In this context, the high reliance on UD/IUD appears less as a desire for subspecialization than as an adaptive strategy by young surgeons to their training environment. Nearly nine out of ten respondents had completed at least one UD/IUD, and three-quarters reported that their main motivation was to acquire knowledge that was insufficiently covered during residency. Motivations related to academic recognition, meeting experts, or subspecialization were significantly less common. This interpretation is supported by the association found between this motivation and a low level of satisfaction with the theoretical teaching received during residency. Conversely, the number of UD/IUD completed was not associated with any improvement in this satisfaction. Therefore, UD/IUD do not seem to replace initial training but rather address specific needs. They have become an essential complement rather than an indicator of academic excellence. These results also raise questions about the role that UD/IUD now play in the national educational curriculum. Initially designed as complementary or subspecialty training, they seem to gradually address more fundamental needs of initial training. This evolution raises the issue of whether certain skills currently acquired through UD/IUD should be better integrated into the orthopaedic residency (DES) curriculum or the national teaching of the College.

The good alignment between the lessons provided and participants' expectations contrasts with a more moderate impact on daily practice. This difference could be explained by the largely theoretical nature of many courses. The answers to the open-ended questions support this interpretation: respondents mainly expressed a need for greater exposure to clinical cases, teaching focused more on technical skills, and a greater emphasis on hands-on practice. These expectations align with the current evolution of surgical education. Simulation, dissection labs, 3D printing, and virtual reality have shown their value in acquiring technical skills in orthopedic surgery [8, 9, 25]. Their greater integration into UD/IUD could improve the transfer of knowledge into clinical practice while meeting the expectations of young surgeons. Similarly, the majority preference for blended learning confirms the benefit of combining digital resources with in-person teaching. This trend was already anticipated in the SOFCOT White Paper published in 2018 [4]. However, the limited support for exclusively remote learning highlights that mentorship, discussions with instructors, and peer interactions remain essential elements of surgical training.

The main obstacles identified (overall costs, geographical distance, and organizational constraints) go beyond just the organization of UD/IUD. They raise wider concerns about equal access to courses that

have become almost essential. This issue is particularly clear among residents and junior doctors, who have the most limited financial resources even though they are the primary users of these courses. The main point is probably no longer to determine whether UD/IUD are useful: their success shows that they meet a clear need identified by young surgeons. Instead, the challenge now is to define their place in a rapidly evolving surgical training model. This model is shaped by a decrease in time available for teaching, the development of digital tools, the rise of simulation, and the need to ensure equal access to additional degrees. This reflection goes beyond UD/IUD alone and broadly concerns the future of French orthopedic surgery training.

This study has several limitations. Its cross-sectional and self-reported nature exposes it to the typical biases of survey research, particularly selection and memory bias. Distribution through university networks probably explains the overrepresentation of certain subdivisions, especially Tours and the HUGOrtho network. Practitioners working exclusively in private practice or non-academic hospitals are likely underrepresented. Finally, the high heterogeneity of UD/IUD, in terms of content, teaching or assessment methods, organization, and cost, limits our ability to generalize the results to all these courses. Future studies focusing on specific UD/IUD will help better identify the features linked to their educational effectiveness.

Despite these limitations, this study highlights an important evolution in the training of young French orthopedic surgeons. Furthermore, the participation of more than 300 respondents from all French subdivisions is a major strength of this study and reinforces the representativeness of the findings. Today, UD/IUD appear more as a marker of the transformations in surgical education than as a simple tool for subspecialization. Their future development should probably be part of a broader discussion on the organization of theoretical training, the role of simulation, "protected time" for teaching, and the accessibility of additional degrees.

Conclusion

Today, UD/IUD play an essential role in the training curriculum of young French orthopedic surgeons. More than a simple tool for subspecialization, they serve as a response to educational needs that many participants feel are insufficiently covered by hospital-based theoretical training. Their success thus reflects profound changes in surgical training, marked by the need to balance clinical demands, knowledge acquisition, and technical skills development. Improving financial and organizational access to UD/IUD, combined with hybrid learning methods that include more simulation and hands-on practice, provides an initial response to the expectations of young surgeons. More broadly, these findings invite reflection on the future role of UD/IUD and also highlight the opportunity to integrate certain skills currently acquired through these degrees into the DES curriculum.

Declarations

- *Ethics approval and consent to participate:* The study received approval from the institutional ethics committee (IRB 2024-098) and was declared to the French Data Protection Authority (CNIL) in accordance with current regulations.
- *Consent for publication:* Participation was voluntary and anonymous. Before starting the questionnaire, participants were informed about the objectives of the study, and electronic informed consent was obtained.
- *Availability of data and materials:* The data supporting the findings of this study are stored on a secure server at the CHU de Tours and are available from the corresponding author upon reasonable request.
- *Competing interests:* The authors declare no competing interests.
- *Funding:* The authors received no financial support for the research, authorship, and/or publication of this article.
- *Authors' contributions:* Tugdual Pichon, Rayane Benhenneda, and Ramy Samargandi contributed to the study conception. Tugdual Pichon and Rayane Benhenneda performed data collection, and Tugdual Pichon conducted the statistical analysis. Tugdual Pichon and Julien Berhouet wrote the original manuscript. All authors participated in the review and editing of the manuscript, read, and approved the final manuscript.
- *Acknowledgement:* none

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Figures

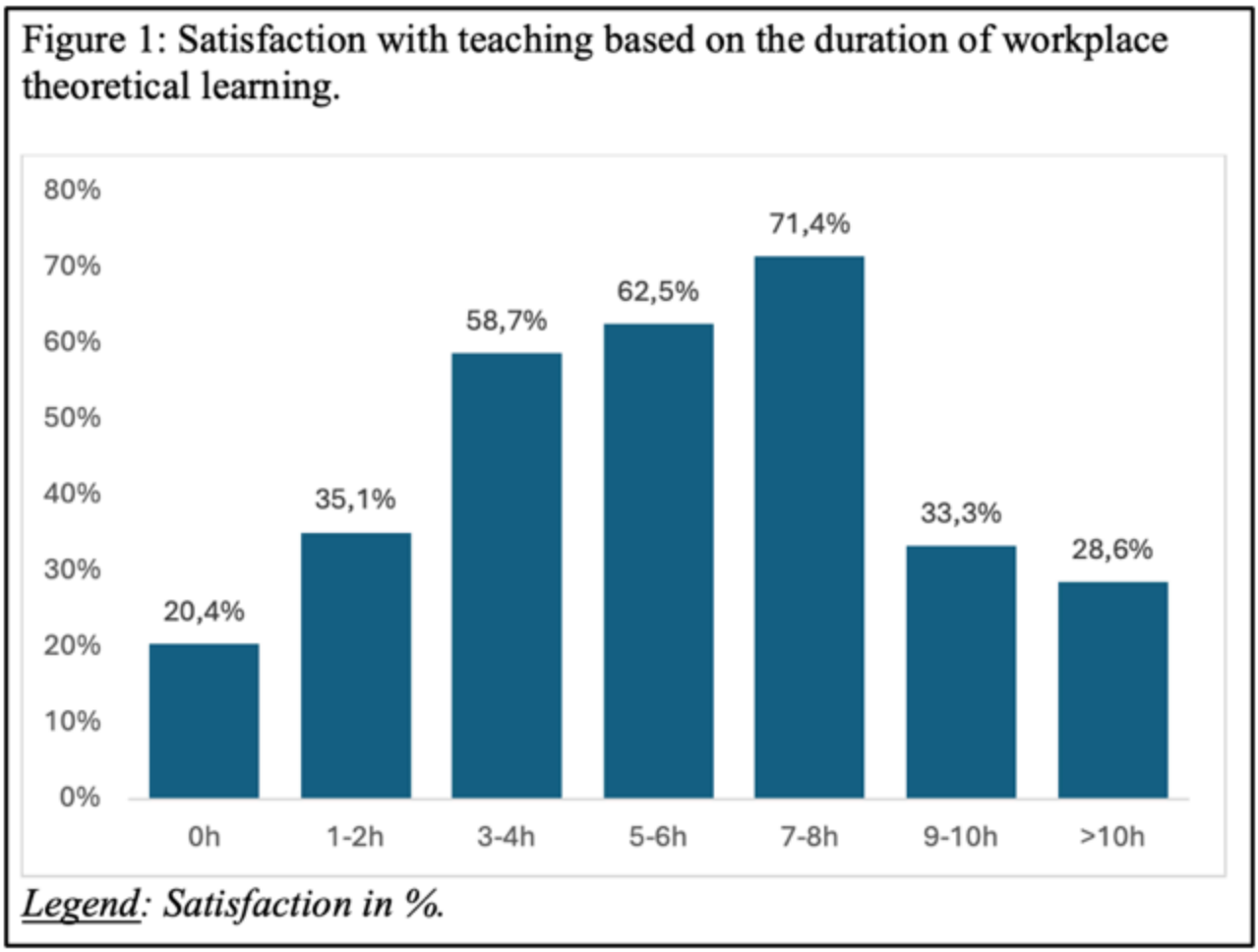


Figure 1

See image above for figure legend.

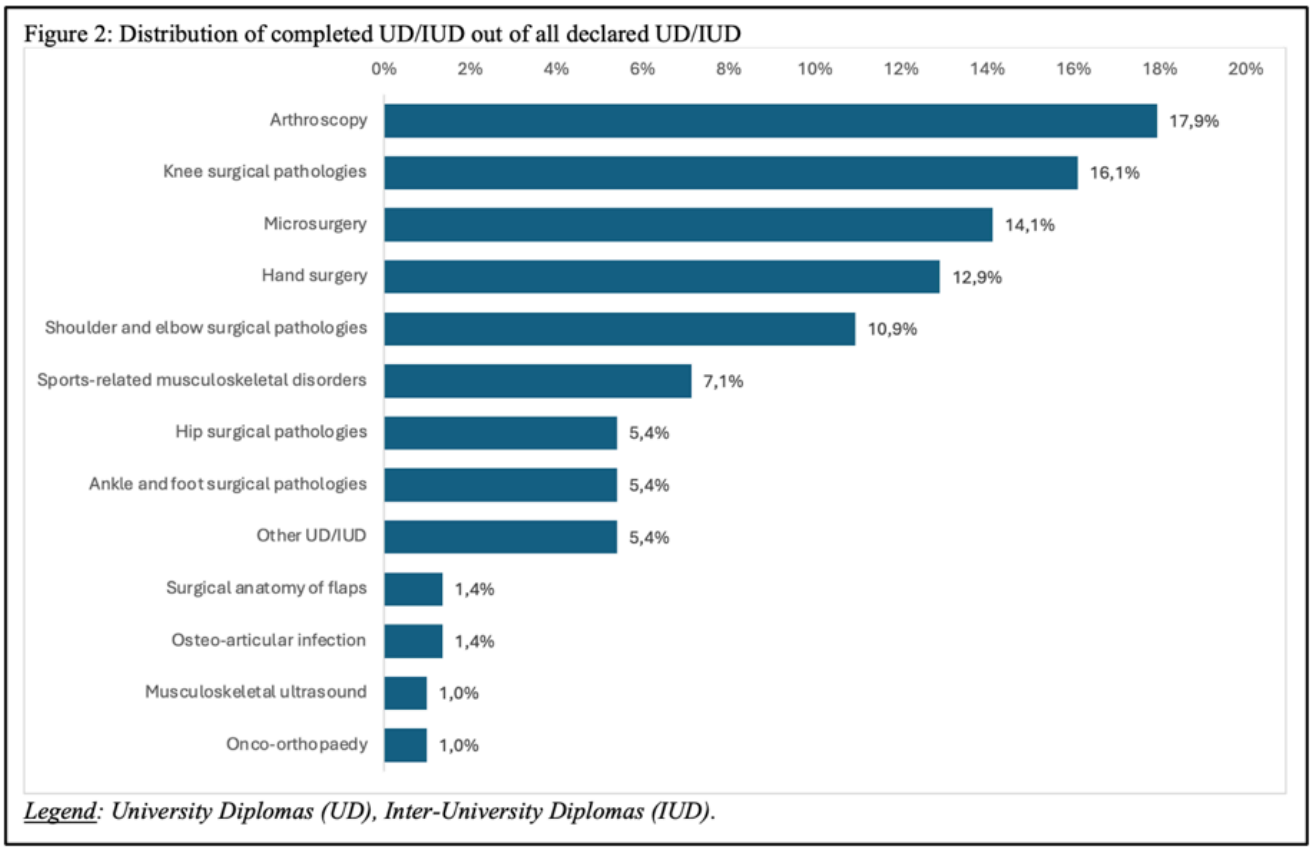


Figure 2

See image above for figure legend.

Supplementary Files

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