ORİJİNAL ARAŞTIRMA ORIGINAL RESEARCH

DOI: 10.5336/dermato.2021-85447

The Impact of the Pandemic on Dermatology Residency Training in Turkey: Descriptive Studies

Pandeminin Türkiye'deki Dermatoloji Uzmanlık Eğitimine Etkisi: Tanımlayıcı Araştırmalar

Çağrı TURAN[a], Nurcan METİN[a], Ozan ERDEM[b]

[a]Department of Dermatology and Venereology, Health Sciences University Erzurum Regional Training and Research Hospital, Erzurum, TURKEY
[b]Clinic of Dermatology and Venereology, Başakşehir Çam and Sakura City Hospital, İstanbul, TURKEY

ABSTRACT Objective: It has raised drastic changes in the routine flow-through of daily life since the beginning of the coronavirus disease-2019 pandemic. One of these is also the education and training of life from the cradle to the grave. We aimed to investigate the pandemic's impact on the dermatology residents' knowledge, skill, and experience levels in this study. **Material and Methods:** This descriptive research was conducted on dermatology residents from Turkey. The demographic characteristics, the residency duration, teledermatology use, number of outpatients, bedside visits, diagnostic diversity among inpatients, and bed occupancy rates were recorded. Before and after the pandemic in various dermatology-related issues, self-assessment levels of competence were also questioned with the visual analogue scale. **Results:** A total of 88 residents, 57 (64.8%) women, were included in the study. Sixty nine (78.4%) residents have worked in a pandemic hospital, 81 (92.0%) of the participants thought the pandemic had a negative effect on residency training. Issues such as the decrease in occupancy rates of dermatology service and diagnostic diversity of the inpatients, interrupted physicians' bedside visits, markedly reduced training time, and the inability to conduct theoretical exams reinforced this negative perception ($p=0.005$, $p=0.023$, $p=0.003$, $p=0.011$, $p<0.001$; respectively). There was a significant decrease compared to the expected level in the issues such as biological agent therapy, phototherapy, and dermato-surgery and dermatoscopy, although it varied according to the residency duration ($p<0.05$). **Conclusion:** Our study revealed that the pandemic affects the dermatology residents more negatively in terms of practical skills and experiences rather than theoretical knowledge level.

Keywords: COVID-19; pandemic; dermatology; residency; education

ÖZET Amaç: Koronavirüs hastalığı-2019 pandemisi, ilk günden itibaren günlük yaşamın rutin akışında ciddi değişikliklere neden oldu. Bunlardan biri de beşikten mezara kadar olan eğitim ve öğretim hayatıdır. Bu çalışmada, pandeminin dermatoloji asistanlarının bilgi, beceri ve deneyim düzeylerine etkisini araştırmayı amaçladık. **Gereç ve Yöntemler:** Bu tanımlayıcı araştırma, Türkiye'deki dermatoloji asistanları üzerinde yapıldı. Demografik özellikler, asistanlık süresi, teledermatoloji kullanımı, ayaktan hasta sayısı, yatak başı vizitleri, yatan hastalar arasındaki tanı çeşitliliği ve yatak doluluk oranları kaydedildi. Pandemi öncesi ve sonrası çeşitli dermatolojik konularda yeterlilik düzeylerin kişisel değerlendirmeleri vizüel analog skala ile sorgulandı. **Bulgular:** Araştırmaya 57'si (%64,8) kadın olmak üzere toplam 88 asistan dâhil edildi. Altmış dokuz (%78,4) asistan bir pandemi hastanesinde çalışıyordu. Katılımcıların 81'i (%92,0) pandeminin uzmanlık eğitimini olumsuz etkilediğini düşündü. Dermatoloji servisinin doluluk oranlarının düşmesi ve yatan hastaların tanısal çeşitliliği, doktorların yatak başı vizitlerinin kesintiye uğraması, eğitim süresinin belirgin şekilde azalması, teorik sınavların yapılamaması bu olumsuz algıyı pekiştirdi ($p=0,005$, $p=0,023$, $p=0,003$, $p=0,011$, $p<0,001$). Biyolojik ajan tedavisi, fototerapi, dermato-cerrahi ve dermatoskopi gibi konularda asistanlık süresine göre değişmekle birlikte beklenen düzeye kıyasla anlamlı azalma vardı ($p<0,05$). **Sonuç:** Çalışmamız, pandeminin dermatoloji asistanlarını teorik bilgi düzeyinden ziyade pratik beceri ve deneyimler açısından daha olumsuz etkilediğini ortaya koydu.

Anahtar Kelimeler: COVID-19; pandemi; dermatoloji; asistanlık; eğitim

It has raised drastic changes in the routine flow-through of daily life since the beginning of the coronavirus disease-2019 (COVID-19) pandemic. One of these is also the education and training of life from the cradle to the grave. In our country, shortly after the first confirmed case in March 2020, distance education was started instead of face-to-face training in line with the government's decision.[1] It was impossi-

Correspondence: Çağrı TURAN
Department of Dermatology and Venereology, Health Sciences University Erzurum Regional Training and Research Hospital, Erzurum, TURKEY/TÜRKİYE
E-mail: cagrituranmd@gmail.com

Peer review under responsibility of Turkiye Klinikleri Journal of Dermatology.

Received: 12 Jul 2021 ***Accepted:*** 08 Oct 2021 ***Available online:*** 15 Oct 2021

ble for under and post-graduate medical education to be uninfluenced by this conjuncture. Actually, dermatology residents have also been assigned at the front-line of the fight against COVID-19, while their training and responsibilities in the residency program have kept on. Since most of the hospitals with the residency programs were re-positioned as pandemic hospitals, major changes in the inpatient and outpatient services were required.[2] Pandemic hospitals have provided services only in the fight against COVID-19 with all available technical equipment and human resources.

Residency training is an organized education program offered to post-graduated physicians under the guidance and supervision of competent and qualified specialists. Dermatology residents can be placed in a total of 69 tertiary hospitals in 42 different cities of Turkey. The aim of the dermatology and venereal diseases residency training program is to provide physicians with sufficient knowledge, skills, and attitudes about the diagnosis and treatment of dermatological diseases in adults and children, as well as healthy skincare and cosmetic procedures. In Turkey, residency programs are managed and monitored per the curriculum and standards established by the Board of Medical Specialties.[3] During the four-year dermatology and venereology residency program, all residents have to participate in various educational activities (seminars, meetings, examinations etc.), complete their rotations, gain clinical and interventional competencies, prepare and present their thesis, and eventually take a final exam.

We aimed to investigate how and to what extent the deviation from the normal process in the dermatology core education curriculum due to the pandemic affects the residents' knowledge, skill, and experience levels in Turkey. We believe that various solutions can be developed for post-graduate education in the era of COVID-19 by identifying the problems and the parameters associated with these problems.

MATERIAL AND METHODS

Dermatology residents from Turkey via a self-administered online survey consisting of 57 multiple choice and free text questions participated in this descriptive research. The survey link was repeatedly shared through the e-mail group of the Turkish Dermatology Association, the resident groups on WhatsApp, the dermatologist groups on Telegram and Facebook from 01 to 20 March 2021. We estimate that almost all of the dermatology residents in Turkey were delivered the questionnaire link. We estimated that currently, there were approximately 330 dermatology residents in Turkey.

No personal information was questioned in the survey, and the responses were recorded anonymously. The participants were asked questions about their demographic characteristics, institutional and academic characteristics of the hospital, the residency duration, and the changes in training, research, and patient care processes (teledermatology, number of outpatients, bedside visits, diagnostic diversity among inpatients, bed occupancy rates). Besides, participants were asked to self-assess their level of competence in various dermatology-related issues and procedures on two different dates (pre-pandemic, as the memory-based: March 2020 and post-pandemic, currently: March 2021, respectively) with the visual analogue scale (VAS). Perception about the overall effect of the pandemic on residency training was also evaluated by VAS (between -10 and +10), and the +/- sign meant positive and negative directions, respectively.

The study's inclusion criterion was being a dermatology resident for at least 6 months in March 2020. The exclusion criterion was to leave for more than three months for any reason after the pandemic. Twenty three of 111 residents answering the questionnaire were excluded because they did not meet the study criteria. Seven of 88 residents included in the study had answered all questions except those about self-assessment of their knowledge levels. However, these participants were not excluded.

This study was approved by the Ethics Committee of Regional Training and Research Hospital, Erzurum, Turkey (Date: 01.02.2021, Decision No: 2021/03-60). It was conducted according to the tenets of the latest version of the Helsinki Declaration.

The residency duration of the participants was determined according to March 2020. The residency

periods when the pandemic were declared in March 2020 as follows: The first-year residents, apprentices: 6-12 months, second-year residents: 13-24 months, third-year residents: 25-36 months, fourth-year residents: 37 months and beyond (Figure 1). The change in residents' knowledge and skill levels within a year after the pandemic was investigated with dependent sample analysis [comparison of A and (A) groups shown in Figure 1]. It should be borne in mind that all residents gained a year of seniority during this period. A year after the pandemic, the knowledge and skills levels of the residents who became co-senior according to the classification in March 2020 were compared [comparison of A and (B) groups shown in Figure 1]. In other words, those who were third-year residents in March 2020 and those who reached the third-year seniority in March 2021 were compared with their competence levels at the aforementioned dates. Thus, it became feasible to determine the differences caused by exposure to pandemic according to residency periods. Informed consent was obtained from the patient.

STATISTICAL ANALYSIS

All statistical procedures were conducted using Statistical Package for Social Sciences software (SPSS Inc., Chicago, IL, USA, v21.0). The normal distribution of the data was evaluated by Shapiro-Wilk test. Since the data did not represent normal distribution, non-parametric tests were used in all analyzes. Mann-Whitney U and Kruskal-Wallis H tests for independent samples and Wilcoxon test for dependent samples were used. Pearson chi-square test was used for categorical variables. Data for qualitative variables were given as a number (percentage), and data for quantitative variables as median (interquartile range). Spearman's rho correlation test was applied to the continuous variables of the study. A two-sided p-value <0.05 was accepted as statistically significant.

RESULTS

When the pandemic was declared in March 2020, the number of participants from the first to the fourth-year residents was 16, 26, 22, 17, respectively. The participants' descriptive statistics were presented in Table 1. Residents working in a pandemic hospital (n=69, 78.4%) have worked in units related to COVID-19 between 1 and 9 months, with a median of 3 (4) months. Eighty one (92.0%) of the participants have thought that the pandemic had a negative effect on residency training. Perception about the pandemic's general effect on residency training was determined as a median of 8 (3) out of 10 points. According to the residents' statements, there was a significant decrease in the number of patients in the outpatient clinics and the occupancy rate of the inpatient services during the pandemic ($p<0.001$, $p<0.001$, respectively). However, compared to before the pandemic, there was no significant difference in academic issues such as the number of (virtual) congresses in the last year and authorship in peer-reviewed journals ($p>0.05$) (Appendix 1).

First, the comparison of the residents' data on knowledge, skills, and experiences before and after the pandemic was performed by stratification ac-

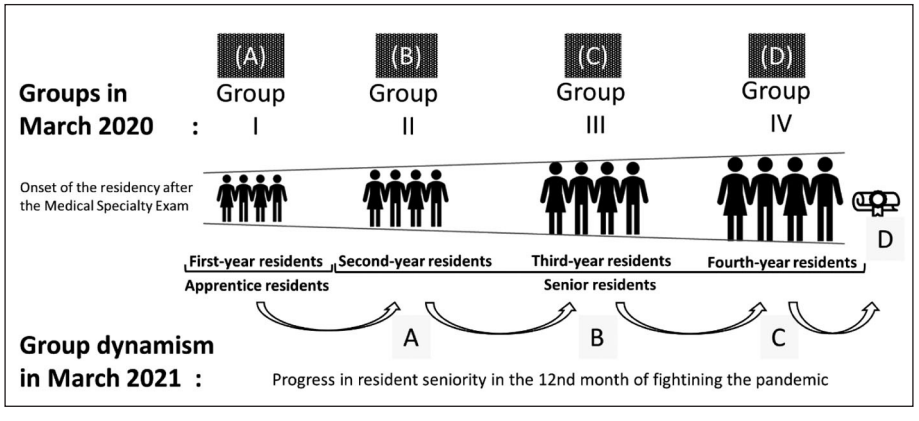


FIGURE 1: Distribution and dynamism of the groups in the study sample during the residency process.

cording to their residency periods in March 2020 (Table 2). Thus, residents' subjective progress levels at the end of the one year under pandemic conditions could be evaluated in 4 different residency periods. Accordingly, a statistically significant increase was found in first-year residents' subjective knowledge levels on clinical dermatology and dermatopathology (p=0.007, p=0.043, respectively). It was remarkable that no statistically significant change was observed for any senior residents (p>0.05). There was no significant change in the cosmetic dermatology knowledge level for any residency period (p>0.05). In terms of skills and/or experiences, the first-year residents have diverged from the others in the opposite direction. The first-year residents had progress in punch biopsy and dermato-surgical procedures during the pandemic (p=0.024, p=0.040, respectively). However, it was noteworthy that there were significant regressions in the senior residents for these issues, especially in the third-year residents (p<0.05). In other issues related to skills and experiences, while there was no significant change in the first-year residents, there were significant decreases in seniors, especially in the third and fourth-year residents.

Possible parameters related to the differentiation of the first-year residents from seniors were presented in Appendix 2. It should be known that 14 of the fourth-year residents (n=17) had graduated by January 2021, after working at least 6 months under the pandemic conditions. While investigating the effect of the pandemic on residency training, the relevant residents were not included in the analysis to avoid the asymmetric effect of taking the "dermatology education final exam". The first and second-year residents were assigned a more extended period in the pandemic than the third-year residents (p<0.001). The first-year residents were ahead of the third-year residents on the taking at least one in-training exam-

TABLE 1: Descriptive statistics of the participants.

Parameters	n (%)
Number of participating residents	88/330 (26.7%)†
Number of residents from university hospital	42 (47.8%)
Number of residents from training and research hospital	46 (52.3%)
From how many different cities†	21/42 (50.0%)
From how many different hospitals†	41/69 (59.4%)
Sex	
Male	31 (35.2%)
Female	57 (64.8%)
Working in a pandemic hospital	
Yes	69 (78.4%)
No	19 (21.6%)
Impact of the pandemic on resident training	
Negative effect	81 (92.0%)
No effect or undecided	3 (3.4%)
Positive effect	4 (4.5%)
Teledermatological method preference during the pandemic	
No, never	23 (26.1%)
Yes, rarely	31 (35.2%)
Yes, often	26 (29.5%)
Yes, predominantly	8 (9.1%)
Your personal effort during the pandemic	
Clinical dermatology	63 (71.6%)
Cosmetic dermatology	8 (9.1%)
Dermatoscopy	4 (4.5%)
Dermatopathology	0 (0.0%)
Dermato-surgery	0 (0.0%)
Other interests/hobbies other than dermatology	9 (10.2%)
None	4 (4.5%)

†Dermatology residency can be done in 69 different tertiary hospitals in 42 of the 81 provinces in Turkey with almost 330 residents.

APPENDIX 1: The impact of the pandemic on patient care and academic participation.

Parameters	Pre-pandemic	Post-pandemic	p value
The daily number of outpatients in similar periods before and after the pandemic (n=88)	60 (20)	30 (24)	<0.001
The bed occupancy rate (%) of your service with dermatological patients (%) (n=88)	80% (36%)	20% (40%)	<0.001
The number of scientific activities in 1 year before and after the pandemic (n=81)			
The number of congresses† attended only as an audience	2 (2)	1 (3)	0.439
The number of congresses† attended as a verbal presenter	0 (1)	0 (0)	0.150
The number of publications in scientific journals	0 (1)	0 (1)	0.078

†Virtual congresses were included in the analysis. Wilcoxon test was used. All measures of central tendency were expressed in terms of the median (interquartile range).

TABLE 2: The change of knowledge and competence level after the pandemic according to the stratified-residency periods.

	Self-assessed level of competence [VAS: 0-10, median (IQR)]											
	Pre-pandemic (March 2020)				Post-pandemic (March 2021)				p value			
Various issues and procedures (n=81)	I (A)‡ (n=16)	II (B) (n=26)	III (C) (n=22)	IV (D) (n=17)	I (A) (n=16)	II (B) (n=26)	III (C) (n=21)	IV† (D) (n=17)	I (A)&A	II (B)&B	III (C)&C	IV (D)&D
Total residency duration, months, median (IQR)	8 (0)	22 (3)	29 (5)	38 (5)	20 (0)	34 (3)	41 (5)	49 (5)				
Theoretical knowledge												
1 Clinical dermatology (ability to recognize and differential diagnosis of dermatosis)	5 (1)	8 (2)	7 (1)	8 (2)	7 (2)	7 (0)	7 (2)	8 (2)	0.007*	0.170	0.527	0.811
2 Cosmetic dermatology (mesotherapy, toxin, filling, laser, thread lifting, peeling, etc.)	3 (2)	3 (6)	5 (5)	4 (5)	4 (5)	2 (4)	6 (4)	3.5 (4)	0.054	0.238	0.908	0.139
3 Dermatopathology (theoretical knowledge level)	3 (5)	4 (4)	4 (4)	5 (5)	4 (3)	4.5 (2)	5 (4)	6 (5)	0.043*	0.792	0.915	0.322
Skills and/or experiences												
4 Direct potassium hydroxide (KOH) examination of skin scrapings and nails	6 (5)	7 (5)	9 (3)	9 (2)	6 (3)	7 (5)	8 (2)	8 (6)	1.000	0.149	0.046**	0.041**
5 Punch biopsy (ability to indication and perform)	8 (6)	8.5 (2)	10 (2)	10 (3)	8 (3)	8 (3)	8 (5)	10 (6)	0.024*	0.227	0.011**	0.058
6 Level of knowledge and experience in biological agents (for indications such as urticaria, psoriasis, bullous disease, atopic dermatitis)	7 (2)	7 (1)	9 (2)	9 (2)	6 (3)	7 (4)	7 (2)	9 (2)	0.465	0.045**	0.012**	0.343
7 Phototherapy (ability to indication and perform)	5 (4)	5.5 (5)	8 (4)	8 (2)	4 (6)	4 (3)	5 (4)	5.5 (7)	0.365	0.016**	0.004**	0.025**
8 Patch and prick tests (ability to indication and perform)	5 (5)	7 (2)	8 (6)	8 (5)	6 (6)	6 (4)	4 (4)	5.5 (7)	0.397	0.112	0.010**	0.041**
9 Dermato-surgical skills (nail extraction, excisional biopsy, etc.)	5 (5)	7.5 (3)	8 (3)	8 (3)	7 (2)	6 (5)	5 (4)	6 (6)	0.040*	0.007**	0.003**	0.017**
10 Intralesional injections (ability to indication and perform)	8 (2)	8.5 (1)	10 (1)	9 (2)	9 (3)	8 (2)	8 (4)	9 (7)	0.102	0.020**	0.010**	0.026**
11 Cryotherapy (ability to indication and perform)	9 (3)	9 (2)	10 (2)	9.5 (1)	9 (2)	9 (2)	9 (4)	9 (4)	0.098	0.176	0.035**	0.027**
12 Electrosurgery (ability to indication and perform)	8 (3)	9 (4)	8 (3)	9 (3)	8 (1)	8 (5)	7 (5)	9 (8)	0.303	0.020**	0.004**	0.031**
13 Dermatoscopy (for pigmented and non-pigmented lesions)	5 (3)	4 (4)	7 (3)	8 (2)	4 (3)	5 (4)	6 (4)	6.5 (4)	0.235	0.561	0.438	0.008**

†14 of those in the 4th period of residency had taken the "dermatology education final exam" or "board exam" before March 2021; ‡The letters refer to the group classification as mentioned in Figure 1. Note that there was no group dynamism, and a dependent sample comparison was made; The residency duration of the participants was determined according to March 2020. The residency periods when the pandemic was declared in March 2020 as follows: I. 6-12 months, II. 13-24 months, III. 25-36 months, IV: 37 months and beyond; Dependent group analysis (Wilcoxon test) was performed in the comparison since there is no transition between groups in March 2021; Significant value was shown in bold. In March 2021 compared to March 2020, those with significant increases and decreases were indicated by * and **, respectively; VAS: Visual analogue scale (expressed in integers between 0 and 10 points); IQR: Interquartile range; KOH: Potassium hydroxide.

ination (ITE) and the number of exams after the pandemic (p=0.026, p=0.011, respectively).

The comparison of the knowledge, skills, and experience levels of co-senior residents in independent groups before and after the pandemic was presented in Table 3. Significant results were also presented with box plots in Appendix 3. It was made inferences that the residents working under pandemic conditions for one year were not better in any subjects than their co-senior colleagues in the pre-pandemic period. It was found that there was a significant decrease compared to the expected level in the treatment options such as biological agent, phototherapy, and dermato-surgery and dermatoscopy, although it varied according to the residency duration (p<0.05).

We presented the parameters related to perception about the general effect of the pandemic on residency training and self-assessed level of competence in clinical and cosmetic dermatology before and after the pandemic in Table 4. Accordingly, significantly lower points were recorded in clinical dermatology knowledge levels in women, in those whose training time decreased markedly, and those who never took an ITE after the pandemic (p=0.003,

APPENDIX 2: Investigation of changing parameters according to the residency periods.

Parameters (n=64)	Residency period†		I (n=16)	II (n=26)	III (n=22)	p value
Age, years, median (IQR) (n=64)			28 (3)	28 (2)	29 (3)	0.005[b,c]
Sex	Man (n=23)		5 (31.3%)	8 (30.8%)	10 (45.5%)	
	Woman (n=41)		11 (68.7%)	18 (69.2%)	12 (54.5%)	0.517
Work place	Training and research hospital (n=37)		10 (62.5%)	15 (57.7%)	12 (60.0%)	
	University hospital (n=25)		6 (37.5%)	11 (42.3%)	8 (40.00%)	0.953
Working in a pandemic hospital	Yes (n=50)		15 (93.8%)	21 (80.8%)	14 (63.6%)	N/A
	No (n=14)		1 (6.3%)	5 (19.2%)	8 (36.4%)	
Working time in the COVID-19 during pandemic, months, median (IQR) (n=49)			7 (6)	4 (5)	2 (2)	0.001[b,c]
Academic staff, median (IQR)	The number of residents (n=64)		6.5 (3)	7 (4)	7 (4)	0.791
	Number of specialist dermatologist (n=64)		1 (1)	1 (2)	1 (2)	0.277
	Number of associate professors and professors (n=64)		2 (3)	2 (3)	2 (3)	0.970
The number of patients applying to the outpatient clinic after the pandemic (n=64)			40 (19)	30 (31)	30 (30)	0.694
The bed occupancy rate of dermatology service after the pandemic (0-100%) (n=64)			20% (15%)	20% (43%)	17.5% (40%)	0.719
Diagnostic diversity of inpatients after the pandemic	Similar to pre-pandemic (n=16)		1 (6.3%)	7 (28.0%)	8 (36.4%)	0.101
	Dermatological emergencies or none (n=47)		15 (93.8%)	18 (72.0%)	14 (63.6%)	
Inpatient visits	Yes, regularly (n=45)		11 (68.8%)	22 (84.6%)	12 (54.5%)	0.075
	No visit or irregularly (n=19)		5 (31.3%)	4 (15.4%)	10 (45.5%)	
Using teledermatology for your daily practice during the pandemic	Yes (n=46)		12 (75.0%)	17 (65.4%)	17 (77.3%)	0.626
	No (n=18)		4 (25.0%)	9 (34.6%)	5 (22.7%)	
Post-pandemic education	Fundamental changes were made	Yes (n=20)	7 (43.8%)	6 (23.1%)	7 (31.8%)	0.372
		No (n=44)	9 (56.3%)	20 (76.9%)	15 (68.2%)	
	Online training programs were started	Yes (n=45)	10 (62.5%)	18 (69.2%)	17 (77.3%)	0.609
		No (n=19)	6 (37.5%)	8 (30.8%)	5 (22.7%)	
	Training time decreased markedly	Yes (n=39)	11 (68.8%)	14 (53.8%)	14 (63.6%)	0.598
		No (n=25)	5 (31.3%)	12 (46.2%)	8 (36.4%)	
	Encouraging sponsored-webinars	Yes (n=38)	11 (68.8%)	16 (61.5%)	11 (50.0%)	0.488
		No (n=26)	5 (31.3%)	10 (38.5%)	11 (50.0%)	
Participating in scientific congresses after the pandemic	Yes (n=49)		12 (75.0%)	17 (65.4%)	20 (90.9%)	0.113
	No (n=15)		4 (25.0%)	9 (34.6%)	2 (9.1%)	
Writing in scientific journals after the pandemic	Yes (n=11)		2 (12.5%)	4 (15.4%)	5 (22.7%)	N/A
	No (n=53)		14 (87.5%)	22 (84.6%)	17 (77.3%)	
Taking at least one ITE after the pandemic	Yes (n=30)		12 (75.0%)	11 (42.3%)	7 (31.8%)	0.026[b]
	No (n=34)		4 (25.0%)	15 (56.7%)	15 (68.2%)	
The number of ITEs you took after the pandemic, median (IQR) (n=64)			1 (1)	0.5 (1)	0 (1)	0.011[b]

†The residency duration of the participants was determined according to March 2020. The residency periods when the pandemic was declared in March 2020 as follows: I. 6-12 months, II. 13-24 months, III. 25-36 months;
Kruskal-Wallis H and Person's chi-square tests were used for scale and categoric variables, respectively; Bonferroni correction was applied as post hoc:
[a]: Adjusted p value <0.05 for the difference between I and II groups; [b]: Adjusted p value <0.05 for the difference between I and III groups; [c]: Adjusted p value <0.05 for the difference between II and III groups; IQR: Interquartile range; N/A: Not applicable; ITEs: In-training examinations.

p=0.018, p=0.041; respectively). The remarkable improvement in the cosmetic dermatology knowledge level of residents working in centers with interrupted physicians' bedside visits was interesting (p=0.006). The negative perception level of the overall effect of pandemic on resident training was significantly higher in women (p=0.042). Issues such as the decrease in occupancy rates of dermatology service and diagnostic diversity of the inpatients, interrupted physicians' bedside visits, markedly reduced training time, and the inability to conduct ITEs reinforced this negative perception (p=0.005, p=0.023, p=0.003, p=0.011, p<0.001; respectively).

DISCUSSION

The COVID-19 pandemic has dramatically affected routine daily life as well as our medical practices. Along with the other specialty residents, dermatology residents have also fought at the forefront against the pandemic. Shortly after the pandemic has been announced, most dermatology clinics have been transformed into COVID-19 services, and it was impossible to make room in pandemic hospitals for any dermatology patient. So, the number of patients examined in the outpatient clinics and the bed occupancy rate in inpatients services have drastically decreased. Besides, regular bedside visits have been interrupted, and the average training time and the number of ITEs decreased markedly.

Pandemic hospitals have crucial changes in the delivery style and infrastructure of health services. 78% of the participants declared that they have worked in a pandemic hospital. Thus, it was inevitable that dermatology residency training would also be negatively affected during this period. Several publications indicated the negative impacts of the pandemic on this issue.[4-8] Rana et al. reported that the pandemic has negatively affected the residency training programs belong to half of the medical and surgical residents.[9] In 2 publications reported from the USA, 56% and 85% of dermatology residents stated that their residency training was negatively affected due to the pandemic.[4,5] Of the participants, 92% negatively rated the overall effect of the pandemic on residency training with the median 8 (3) out of 10. Moreover, the negative perception level of women was stronger than men. Issues such as the decrease in the number and diagnostic diversity of inpatients, irregularity of bedside visits, reduction in training times and interruption of ITEs significantly strengthened negative perception regarding residency training. We also found that reduced training times and taking no ITE negatively affected the clinical dermatology knowledge level. Indeed, the importance of the number and diversity of patients and regular educational activities for an ideal dermatology residency has been demonstrated in a study from Turkey.[10]

In this study, the effect of the pandemic on residency training was handled in 2 different ways, as expressed in detail in the methodology and Figure 1. The first was to investigate the change in the self-assessed level of knowledge within the last year under pandemic conditions of samples in stratified residency periods according to March 2020. The second was to examine the co-senior residents' responses according to two different dates, March 2020 and 2021. As seen in Table 2, we observed significantly opposite trends between the first-year residents and others.

Although the first-year residents have been assigned to the pandemic clinics longer than seniors, interestingly, they stated that their theoretical knowledge about clinical dermatology and dermatopathology has improved. Nevertheless, seniors did not mention any change in their theoretical knowledge. There was roughly no change in first-year residents after the pandemic compared to the pre-pandemic, while seniors were roughly in decline in skills and experience-related issues. In this context, the apparent reasons for the first-year residents to differ from the seniors were evaluated. It was observed that although the apprentices were assigned longer in the pandemic, they took the ITEs more frequently than seniors. Individuals growing up with the oppressive effects of exams since early childhood in our country may consider the exam as the most critical motivation tool, even if they were dermatology residents. Because having a self-driven personality can take root through the society's supportive mindset, you live in.

We found that the conventional training methods were replaced mainly by online ones with high

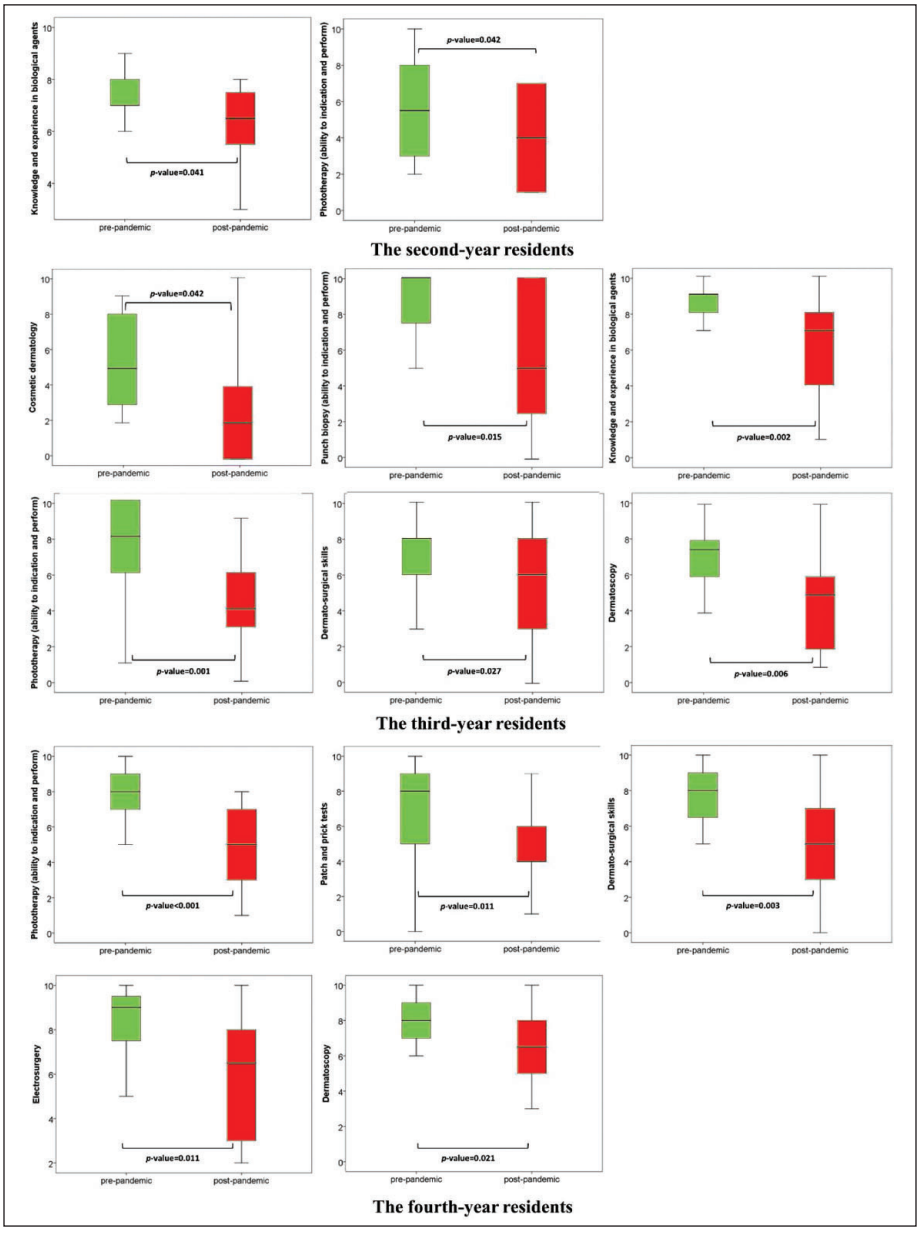
TABLE 3: The comparison of the knowledge, skill, and experience levels of co-senior residents in independent groups before and after the pandemic.

	Self-assessed level of competence [VAS, median (IQR)]								
	Second-year residents			Third-year residents				Fourth-year residents	
Various issues and procedures (n=67)	March 2020 (B)† (n=26)	March 2021 (A) (n=16)	p value	March 2020 (C) (n=22)	March 2021 (B) (n=26)	p value	March 2020 (D) (n=17)	March 2021 (C) (n=22)	p value
Total residency duration, months, median (IQR)	22 (3)	22 (2)	0.454	29 (5)	33 (3)	0.156	38 (5)	40 (5)	0.092
Theoretical knowledge									
1 Clinical dermatology (ability to recognize and differential diagnosis of dermatosis)	8 (2)	7 (2)	0.154	7 (1)	7 (0)	0.223	8 (2)	7 (2)	0.078
2 Cosmetic dermatology (mesotherapy, toxin, filling, laser, thread lifting, peeling, etc.)	2.5 (6)	4 (5)	0.575	5 (5)	2 (4)	0.003	4 (5)	6 (3)	0.715
3 Dermatopathology (theoretical knowledge level)	4 (4)	4 (3)	0.555	4 (3)	4.5 (2)	0.825	5 (5)	5 (3)	0.372
Skills and/or experiences									
4 Direct potassium hydroxide (KOH) examination of skin scrapings and nails	7 (5)	6 (5)	0.404	9 (3)	7 (5)	0.058	9 (2)	8 (2)	0.101
5 Punch biopsy (ability to indication and perform)	8.5 (2)	8 (3)	0.270	10 (1)	8 (3)	0.015	9.5 (3)	8 (5)	0.089
6 Knowledge and experience in biological agents (for indications such as urticaria, psoriasis, bullous disease, atopic dermatitis)	7 (1)	6.5 (3)	0.041	9 (1)	7 (4)	0.002	9 (2)	7 (2)	0.084
7 Phototherapy (ability to indication and perform)	5.5 (5)	4 (6)	0.042	8 (4)	4 (3)	0.001	8 (2)	5 (4)	<0.001
8 Patch and prick tests (ability to indication and perform)	7 (2)	6 (5)	0.152	8 (6)	6 (4)	0.130	8 (5)	4 (3)	0.011
9 Dermato-surgical skills (nail extraction, excisional biopsy, etc.)	7.5 (3)	7 (4)	0.154	8 (2)	6 (5)	0.027	8 (3)	5 (4)	0.003
10 Intralesional injections (ability to indication and perform)	8.5 (1)	8.5 (3)	0.790	9 (1)	9 (2)	0.277	9 (2)	8 (2)	0.189
11 Cryotherapy (ability to indication and perform)	9 (2)	9 (2)	0.524	10 (2)	9 (2)	0.190	9.5 (1)	9 (2)	0.234
12 Electrosurgery (ability to indication and perform)	9 (4)	8 (1)	0.140	8 (3)	8 (5)	0.477	9 (3)	6.5 (5)	0.011
13 Dermatoscopy (for pigmented and non-pigmented lesions)	4 (4)	4.5 (3)	0.968	7.5 (2)	5 (4)	0.006	8 (2)	6.5 (3)	0.021

†The letters refer to the group classification as mentioned in Figure 1. Co-seniority in different temporal sections before and after the pandemic means that residency duration is the same as the year on the relevant date.
There is absolutely no dependent sample within the groups in comparison. Mann Whitney U test was used. Significant value was shown in bold; Second-year residents: 13-24 months, Third-year residents: 25-36 months, Fourth-year residents: 37 months and beyond;
VAS: Visual analogue scale (expressed in integers between 0 and 10 points); IQR: Interquartile range; KOH: Potassium hydroxide.

participation during the pandemic. Virtual congresses, which were popular and became widespread, have contributed in this sense. It has been emphasized in many publications that this situation due to the pandemic may have improved efficient learning for residents.[11,12] Besides, the importance of telemedicine in under/post-graduate education, as well as improving the health service disruption due to the pandemic, has been underlined.[13-15] However, we found no association between matters such as teledermatology use and participating in online training/webinars/virtual congresses and clinical and cosmetic dermatology knowledge levels. So, we thought these methods would not contribute as much as necessary if not using the appropriate feedback mechanisms causing to increase learning motivation. We believe that online-based methods may be insufficient to improve practical skills and experiences in residency training, as some procedures used in diagnosis and treatment require face-to-face interviews. Even so, the effects of distance education are beyond the scope of this study, and it is a fact that more comprehensive publications are needed for a defensible conclusion.

One of the most remarkable results of the study is that almost all practical skills and experiences were below the expected level, especially in third and fourth-year residents. The difference is particularly striking in phototherapy, biological therapies, dermato-surgery,



APPENDIX 3: Issues with significant differences in the comparison of the knowledge, skill, and experience levels of co-senior residents in independent groups before and after the pandemic.

electrosurgery, and dermatoscopy, which are fundamentals for dermatology training. Many conditions imposed during the pandemic may be responsible for this situation: Both patients and physicians have avoided non-emergent interventional procedures; therefore, there was not enough chance for residents to improve their practical skills. Even more, external clinical assignments in pandemic hospitals have prevented residents from working with their teams. Peer-assisted learning has a tremendous place in medical education, as well as dermatology training.[16,17] Therefore, it can be proposed that the deprivation of peer-assisted learning had a significant impact on this decline.

The competency-based medical education approach has gained worldwide interest in recent years. Under/post-graduate medical students are encouraged to take an active, self-directed role in their education in this approach. Sloychuk et al. drew attention to the importance of mastery mindset in

TABLE 4: Investigation of parameters related to perception about the overall effect of the pandemic on residency training, and subjective competence level in clinical and cosmetic dermatology before and after the pandemic.

		Self-assessed level of competence [VAS: 0-10, median (IQR)]								Perception about the effect of the pandemic on residency training	
		Clinical dermatology				Cosmetic dermatology					
		Pre-pandemic		Post-pandemic		Pre-pandemic		Post-pandemic		Personal opinion	
Parameters (n=67[†])		(Mar 2020)	p value	(Jan 2021)	p value	(Mar 2020)	p value	(Jan 2021)	p value	[VAS (+/-) 0-10, median (IQR)]	p value
Age, year (r)		r=0.143	0.248	r=0.188	0.128	r=0.060	0.636	r=0.204	0.102	r=-0.094	0.448
Sex											
Man (n=23)		7 (2)	0.855	8 (1)	0.003	3 (3)	0.314	4 (4)	0.675	(-) 8 (2)	0.042
Woman (n=44)		7 (2)		7 (2)		4 (5)		4 (5)		(-) 9 (2)	
Work place											
Training and research hospital (n=39)		7 (2)	0.357	7 (2)	0.523	4 (5)	0.157	4 (5)	0.955	(-) 8 (2)	0.555
University hospital (n=28)		7 (3)		7 (1)		3 (2)		4 (5)		(-) 8 (2)	
Working in a pandemic hospital											
Yes (n=51)		7 (2)	0.289	6.5 (2)	0.478	3.5 (4)	0.520	4 (5)	0.771	(-) 9 (3)	0.120
No (n=16)		8 (2)		6 (1)		3 (5)		4 (5)		(-) 8 (3)	
Working time in the COVID-19 during the pandemic, months (n=67)		-	-	r=0.173	0.164	-	-	r=-0.027	0.828	r=0.039	0.758
Academic staff											
The number of residents (n=67)		r=0.033	0.794	r=0.021	0.870	r=0.030	0.813	r=-0.062	0.621	r=0.017	0.889
Number of specialist dermatologist (n=67)		r=0.046	0.714	r=0.120	0.341	r=-0.052	0.679	r=0.028	0.822	r=0.211	0.086
Number of associate professors and professors (n=67)		r=0.007	0.957	r=0.128	0.310	r=-0.098	0.440	r=-0.008	0.947	r=0.121	0.330
The number of patients applying to the outpatient clinic after the pandemic (n=67)		-	-	r=0.115	0.352	-	-	r=-0.086	0.488	r=-0.053	0.654
The bed occupancy rate of your service with dermatological patients after the pandemic (%) (n=67)		-	-	r=0.140	0.258	-	-	r=-0.109	0.379	r=-0.325	0.005
Diagnostic diversity of inpatients after the pandemic											
Similar to pre-pandemic (n=16)		-	-	7 (1)	0.389	-	-	4.5 (5)	0.952	(-) 7.5 (4)	0.023
Dermatological emergencies, only (n=37)				7 (2)				4 (5)		(-) 9 (2)	
No patient hospitalization (n=14)				6.5 (2)				3 (8)		(-) 8.5 (3)	
Bedside visits for inpatients											
Yes, regularly (n=45)		-	-	7 (2)	0.260	-	-	3.5 (4)	0.006	(-) 8 (2)	0.003
No visit or irregularly (n=22)				7 (2)				6 (3)		(-) 9 (1)	
Using teledermatology for your daily practice during the pandemic											
Yes, often or regularly (n=43)		-	-	6.5 (2)	0.119	-	-	4 (5)	0.869	(-) 8.5 (3)	0.291
Never or rarely (n=24)				7 (1)				4 (5)		(-) 8 (2)	
Post-pandemic education											
Fundamental changes were made	Yes (n=20)	-	-	7 (1)	0.273	-	-	4 (4)	0.631	(-) 9 (3)	0.614
	No (n=47)			7 (2)				4 (5)		(-) 8 (3)	
Online training programs were started	Yes (n=48)	-	-	7 (2)	0.781	-	-	4 (5)	0.566	(-) 8 (3)	0.181
	No (n=19)			7 (2)				4 (4)		(-) 9 (2)	
Training time decreased markedly	Yes (n=39)	-	-	7 (2)	0.018	-	-	4 (5)	0.604	(-) 9 (2)	0.011
	No (n=28)			7 (1)				4 (3)		(-) 8 (3)	
Encouraging sponsored-webinars	Yes (n=39)	-	-	7 (2)	0.540	-	-	4 (5)	0.887	(-) 8 (2)	0.108
	No (n=28)			7 (2)				3.5 (5)		(-) 9 (3)	
Participating in scientific congresses after the pandemic	Yes (n=50)	-	-	7 (2)	0.078	-	-	4 (5)	0.662	(-) 8 (3)	0.664
	No (n=17)			7 (1)				3.5 (4)		(-) 8 (2)	
Writing in scientific journals after the pandemic	Yes (n=12)	-	-	7 (2)	0.454	-	-	3.5 (6)	0.720	(-) 8 (3)	0.488
	No (n=55)			7 (2)				4 (5)		(-) 8 (3)	
Taking at least one ITE after the pandemic	Yes (n=31)	-	-	7 (1)	0.041	-	-	3.5 (5)	0.418	(-) 8 (2)	>0.001
	No (n=36)			6 (2)				4 (4)		(-) 9 (1)	
The number of ITEs you took after the pandemic (n=67)	-	-	r=0.210	0.088	-	-	r=-0.141	0.256	r=-0.499	>0.001	

[†]Those who have taken the "dermatology education final exam" or "board exam" in March 2021 were excluded from the analysis; Mann-Whitney U and Spearman's rho correlation tests were used. Significant values were shown in bold.

VAS: Visual analogue scale; IQR: Interquartile range; r: Correlation coefficient; ITE: In-training examination; VAS was expressed in integers between 0 and 10 points. The +/- sign means positive and negative directions, respectively.

residency training and defined the mastery mindset as "a collection of beliefs and attitudes that result in a self-directed, persistent, and intrinsically motivated self-drive for knowledge".[18] We agree with Hall et al. that competency-based medical education should be supported to respond to changing needs in the changing world.[19] Despite the development of various vaccines, the precarious climate has been persisting worldwide. Normalization processes still create new epidemic waves in our country and subsequently bring severe restrictions. We believe that an educational plan for mastery mindset and feedback mechanisms boosting motivation need to be developed.

This study has some limitations and advantages. First of all, unfortunately, the response rate in our study was quite below our expectations due to reasons beyond our control. The knowledge and skills of the participants before the pandemic were questioned based on memory. Constantly changing pandemic conditions may affect the questionnaire responses in a descriptive research. We preferred VAS as a self-assessment scale, inspired by some studies.[20,21] There is a need to develop validated, easily applicable scales that address all aspects of resident training competence and produce effective and quantitative results. It should be taken into account that the subjective effect was investigated rather than quantitative data. In other words, this study provides information about the subjective experience of the pandemic and therefore subject to bias. It is very difficult to plan a standardized study, as resident training differs greatly from region to region, nationally and internationally. So, our results cannot be generalized as the educational process is affected by geographical, sociocultural, and economic factors. Despite efforts being made for the standardization of resident training in our country, the level of facilities and competence of centers in subjects such as cosmetology, teledermatology, dermato-surgery, and allergy still represents great differences. However, to the best of our knowledge, this paper is the most comprehensive study in the field of dermatology. We believe that this is an important study and will be of interest to the whole dermatology community.

CONCLUSION

In conclusion, our study revealed that the pandemic affects the dermatology residents more negatively in terms of practical skills and experiences rather than theoretical knowledge level, particularly for seniors. We consider that the negative effects of the pandemic can be minimized by paying attention to ITEs, patient admissions to inpatient services, and the regularity of bedside visits and training times. New standards and practices should be developed according to the COVID-19 era to maintain residency training consistently. It should not be too late to spark change. Despite its limitations, our study provides so valuable contributions in this respect.

First-year residents: 6-12 months; second-year residents: 13-24 months; third-year residents: 25-36 months; fourth-year residents: 37 months and beyond.

The letters show the current residency periods in 2021, and the letters in parentheses represent the residency period of the same group in March 2020, just before the pandemic. In Table 2 and Table 3, dependent and independent sample analyses were performed according to this classification.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Çağrı Turan, Nurcan Metin;* ***Design:*** *Çağrı Turan, Nurcan Metin;* ***Control/Supervision:*** *Çağrı Turan, Nurcan Metin, Ozan Erdem;* ***Data Collection and/or Processing:*** *Çağrı Turan, Nurcan Metin, Ozan Erdem;* ***Analysis and/or Interpretation:*** *Çağrı Turan, Nurcan Metin, Ozan Erdem;* ***Literature Review:*** *Nurcan Metin, Çağrı Turan;* ***Writing the Article:*** *Çağrı Turan, Nurcan Metin, Ozan Erdem;* ***Critical Review:*** *Çağrı Turan, Nurcan Metin, Ozan Erdem.*

REFERENCES

1. The Republic of Turkey Ministry of Health [Internet]. [Cited: 06.04.2021]. COVID-19 (SARS-CoV-2 infection) guide. Available from: [Link]
2. Turan Ç, Metin N, Utlu Z, Öner Ü, Kotan ÖS. Change of the diagnostic distribution in applicants to dermatology after COVID-19 pandemic: what it whispers to us? Dermatol Ther. 2020;33(4):e13804. [Crossref] [Pubmed] [PMC]
3. Resmî Gazete (26.04.2014, Sayı: 28983) Tıpta ve diş hekimliğinde uzmanlık eğitimi yönetmeliği; 2014. [Link]
4. Stewart CR, Lipner SR. Experiences of resident dermatologists during the COVID-19 pandemic: a cross-sectional survey. Dermatol Ther. 2021;34(1): e14574. [Crossref] [Pubmed] [PMC]
5. Li YM, Galimberti F, Abrouk M, Kirsner RS. US dermatology resident responses about the COVID-19 pandemic: results from a nationwide survey. South Med J. 2020;113(9):462-5. [Crossref] [Pubmed] [PMC]
6. Patel P, Guzman AK, McLellan B, Blasiak R. Optimizing education for dermatology residents during the COVID-19 pandemic. J Am Acad Dermatol. 2020;83(4):e319-e20. [Crossref] [Pubmed] [PMC]
7. Martin A, Lang E, Ramsauer B, Gröning T, Bedin GL, Frank J. Continuing medical and student education in dermatology during the coronavirus pandemic-a major challenge. J Dtsch Dermatol Ges. 2020;18(8):835-40. [Crossref] [Pubmed]
8. Bari AU. Dermatology residency training in COVID-19 pandemic: transition from traditional to online teaching. J Coll Physicians Surg Pak. 2020;30(6):63-6. [Crossref] [Pubmed]
9. Rana T, Hackett C, Quezada T, Chaturvedi A, Bakalov V, Leonardo J, et al. Medicine and surgery residents' perspectives on the impact of COVID-19 on graduate medical education. Med Educ Online. 2020;25(1):1818439. [Crossref] [Pubmed] [PMC]
10. Yılmaz S, Akkaya VB. Dermatoloji uzmanlık eğitiminde sorunlar ve çözüm önerileri: asistan görüşlerinin değerlendirilmesi [Problems and proposals of their solutions in dermatology residency training: a survey of residents' opinions in Turkey]. Turkderm. 2009;43(1):10-4. [Link]
11. Svoboda SA, Swigert A, Murina A, Motaparthi K. Teaching dermatology to the millennial learner. Clin Dermatol. 2021;39(2):304-8. [Crossref] [Pubmed]
12. Emanuel EJ. The inevitable reimagining of medical education. JAMA. 2020;323(12):1127-8. [Crossref] [Pubmed]
13. Mufti A, Maliyar K, Sachdeva M, Doiron P. Modifications to dermatology residency education during the COVID-19 pandemic. J Am Acad Dermatol. 2020;83(3):e235-e6. [Crossref] [Pubmed] [PMC]
14. Ashrafzadeh S, Imadojemu SE, Vleugels RA, Buzney EA. Strategies for effective medical student education in dermatology during the COVID-19 pandemic. J Am Acad Dermatol. 2021;84(1):e33-e4. [Crossref] [Pubmed] [PMC]
15. Turan Ç, Utlu Z. Investigating the factors enabling the accurate implementation of the patient-assisted teledermatology model during the pandemic in Turkey: a pilot study. Dermatol Ther. 2021;34(2):e14741. [Crossref] [Pubmed]
16. Guraya SY, Abdalla ME. Determining the effectiveness of peer-assisted learning in medical education: a systematic review and meta-analysis. J Taibah Univ Med Sci. 2020; 15(3):177-84. [Crossref] [Pubmed] [PMC]
17. Huang J, Licatino LK, Long TR. Methods of orienting new anesthesiology residents to the operating room environment: a national survey of residency program directors. J Educ Perioper Med. 2020;22(3):E645. [Pubmed] [PMC]
18. Sloychuk J, Szafran O, Duerksen K, Babenko O. Association between family medicine residents' mindsets and in-training exam scores. PRiMER. 2020;4:33. [Crossref] [Pubmed] [PMC]
19. Hall AK, Nousiainen MT, Campisi P, Dagnone JD, Frank JR, Kroeker KI, et al. Training disrupted: practical tips for supporting competency-based medical education during the COVID-19 pandemic. Med Teach. 2020; 42(7):756-61. [Crossref] [Pubmed]
20. Meretoja R, Isoaho H, Leino-Kilpi H. Nurse competence scale: development and psychometric testing. J Adv Nurs. 2004;47(2):124-33. [Crossref] [Pubmed]
21. Kajander-Unkuri S, Meretoja R, Katajisto J, Saarikoski M, Salminen L, Suhonen R, et al. Self-assessed level of competence of graduating nursing students and factors related to it. Nurse Educ Today. 2014;34(5):795-801. [Crossref] [Pubmed]