


**Research Article**

## Students Perception of Medical Education after End of Covid-19 Pandemic and Comparison with Results Obtained During Pandemic

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### Abstract

**Background:** The COVID-19 pandemic has changed the status quo of medical training. The primary aim of this work is to assess the opinion of the students regarding medical education after the end of the pandemic and to compare this with already published data about the perception of students during the pandemic in order to define future possibilities in modern teaching.

**Methods:** A questionnaire was answered by medical students at the end of the 9<sup>th</sup> semester in a German university hospital asking them about their perception of medical education after the end of the pandemic. Results were compared with those obtained from the same questionnaire administered during pandemic. Values are presented as mean [ $\pm$  standard deviation] and median [range] for continuous variables. Dichotomic variables are presented as absolute number as well as percent. Groups were compared with the Student t-test for independent samples.

**Results:** A total of 92 out of 155 students answered the questionnaire (59.3% response rate). Students felt disadvantaged in their medical education because of the pandemic on a scale from 0 (absolutely not) to 10 (completely) at  $5.94 \pm 2.2$  (range 0-10 points) which was comparable to the group which answered the questionnaire during pandemic. Students missed mostly practical exercises (92.4%), like the previous group (93.5%), followed by contact with other students (65.2%), again as the previous group (65.2%) and to patients (56.5 vs. 58.7% in the previous analysis). Analogously, presence lessons were missed at least (35.8% vs. 28.3% in the previous analysis). Recorded lessons were mostly appreciated ( $8.1 \pm 2.2$ , range 0-10 points) as also in the previous analyzed group ( $8.2 \pm 2.6$ ,  $p=0.76$ ). Skills lab was also appreciated but significantly less compared to the previous group ( $6.9 \pm 2.8$ , range 0-10 points vs.  $7.44 \pm 3.4$ ,  $p=0.031$ ). Live-stream lessons were considered as useful as skills lab ( $6.9 \pm 2.5$ , range 0-10 points), not differently from the previous group ( $6.6 \pm 2.6$ ,  $p=0.5$ ). E-learning was lesser appreciated than from the other group ( $6.4 \pm 2.4$ , range 0-10 points vs.  $6.8 \pm 3.4$ ,  $p=0.039$ ). 55% of the students found no difference in medical education during and post-pandemic.

**Conclusions:** The majority of students felt no difference in education during and after pandemic. Theoretical online education was highly appreciated even after the pandemic and could become the future standard.

**Keywords:** Medical education; strategies; Online learning; Pandemic; Skills lab

**Abbreviations:** OSCE: Objective Structured Clinical Examination

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## Introduction

The COVID-19 pandemic was a public health emergency which required undergraduate and postgraduate medical training programs around the world to rapidly respond, including re-deploying learners to other clinical spaces or removing them entirely, and moving education online to promote physical distancing [1,2]. The current COVID-19 pandemic has changed the status quo of medical training as we know it – whether this is for better or for worse remains unclear and may have profound implications [3]. Teachers have adapted to a constantly changing reality and attempted to find solutions to keep the best possible medical education and training program through the pandemic [4]. In our previous publication [5], we asked medical students who prepared for the Objective Structured Clinical Examination (OSCE) under pandemic restrictions about their opinion regarding medical education, in particular about the strategies adopted by faculty in order to maintain a high level of content delivery. The aim of this work is to assess the opinion of the students regarding medical education post-pandemic and to compare this with the perception of students during pandemic [5].

## Methods

### Questionnaire

This was a questionnaire-based cross-sectional study that followed a surgical OSCE for students at the end of the 9<sup>th</sup> semester of medical education in April 2023 in order to explore their perceptions of education after the end of the pandemic and restoration of the normal activities (internships, frontal lessons) for the preparation of the exam at the University of Ulm, Germany. The questionnaire used has been published by our group [5] and administered to students taking the OSCE in October 2022. These students prepared for the exam under pandemic restrictions. For the current study, students were provided the exam 6 months later, in the summer of 2023. They were able to prepare for the exam under normal educational conditions, in particular regarding internships, similar to that present before the pandemic. A comparison between the two groups of students is also presented. In comparison to the questionnaire administered to the first group of students, a last question about the status of the education after pandemic was added. Students could report if the education after the pandemic remained the same, improved or worsened. All students (n=155) who participated in the OSCE examination in Summer Semester 2023 were invited to participate in this survey directly after the end of the OSCE assessment. No personal identifiers were collected and the study adhered to the ethical principles of the Helsinki declaration.

### Statistical analysis

Values are presented as mean [ $\pm$  standard deviation]

and median [range] for continuous variables. Dichotomic variables are presented as absolute number (frequency) as well as percent. Groups were compared with the Student t-test for independent samples. A two-sided p-value  $< 0.05$  was considered statistically significant. Missing values were  $< 5\%$  in the data set, and no imputation strategies were needed. All calculations were conducted using R Project for Statistical Computing (The R Foundation, Version 3.1.0, Vienna, Austria).

## Results

For this study, 155 students were invited to participate in the survey with 92 students filling out the questionnaire at the end of the OSCE examination (59.3% response rate). 53% of the participants were female, with nearly all students being at the end of their 9<sup>th</sup> semester (96%). Only 16 students (17.4%) were oriented for a surgical residency program after completing the 6-year medical formation (Table 1), 50% of them were male and 50% female. In the group of students preparing for the OSCE during pandemic, 30 students (32.6%) were oriented for a surgical residency program, with 80% of them being female.

Students reported feeling mildly disadvantaged in their medical education ( $5.94 \pm 2.2$ , range 0-10 points). This response was comparable to the previous group of students, who prepared the OSCE during the pandemic ( $5.34 \pm 2.3$ ,  $p=0.063$ ). Similarly, to the previous group of students, no difference was observed in this perception, whether the student intended to pursue a surgical career (n=16) or not (n=63), respectively  $6.3 \pm 2.4$  vs.  $5.8 \pm 1.4$  ( $p=0.35$ ) as well as according to gender ( $5.6 \pm 2.5$  for male vs.  $6.2 \pm 1.9$  for female,  $p=0.16$ ).

As shown in Table 2, students reported missing practical exercises (92.4%) during the pandemic, like the previous group (93.5%), followed by contact with other students (65.2%), exactly as reported by the previous group (65.2%) and to patients (56.5 vs. 58.7% in the previous analysis). Analogously, in person lessons were missed (35.8% vs.

**Table 1:** The survey participating students' characteristics (n=92)

Characteristic	Frequency	Percentage (%)
Gender		
Male	43	47
female	49	53
Semester		
9 <sup>th</sup>	88	96
8 <sup>th</sup>	4	4
Intended specialty		
Surgical	16	17
Other than surgical	63	68
Not known	13	15

**Table 2:** what students missed (n=92)

	Frequency	Percentage (%)
Presence lesson	33	35.8
Contact to other students	60	65.2
Practical exercises	85	92.4
Possibility immediately to get an answer to a question	17	18.4
Patient contact	52	56.5

28.3% in the previous analysis) as well as the possibility of receiving immediate answers to questions (18.4%) as is provided by in person learning.

Recorded lessons were shown as the most important improvement or benefit ( $8.1 \pm 2.2$ , range 0-10 points) as was also seen in the previously analyzed group ( $8.2 \pm 2.6$ ,  $p=0.76$ ). Skills lab access was also favorably viewed but significantly less compared to the previous group ( $6.9 \pm 2.8$ , range 0-10 points vs.  $7.44 \pm 3.4$ ,  $p=0.031$ ). Live-stream lessons were considered as useful as a skills lab ( $6.9 \pm 2.5$ , range 0-10 points), not different from the previous group ( $6.6 \pm 2.6$ ,  $p=0.5$ ). E-learning was slightly less appreciated when compared to the previous group ( $6.4 \pm 2.4$ , range 0-10 points vs.  $6.8 \pm 3.4$ ,  $p=0.039$ ). 32 students out of 92 (35%) wrote an additional comment, 13 of them highlighting the desire for more skills lab and practical exercises, also in form of online tutorials/videos; 4 requesting to continue with on-line lessons, and 3 showing a desire to switch to in person lessons sooner. The majority of the students found no difference in medical education during and after the pandemic (51 out of 92, 55%), 28 students (30%) found an improvement of it after pandemic and 13 of them (15%) a deterioration. The frequencies were similar also when analyzing the subgroup according to the intended specialty; 58% of students not aiming a surgical career (36/63) found no difference in medical teaching during and after pandemic as well as 56% of students aiming a surgical career (9/16).

## Discussion

Across the world, medical students have reported dissatisfaction with online medical school education [6-10]. In the U.S., a survey of 1,389 medical students revealed that online education significantly decreased students' overall self-efficacy as it pertained to core competencies [6]. Two separate studies from Jordan reported that 26.8% and 25% of medical students, respectively, were not satisfied with their online education [7,8]. In a survey of a medical school in India, over half of the respondents prefer in person learning over online classes [9]. In a study in Saudi Arabia, only 25% of students prefer online only classes over integrated or in-person only classes [10]. Conversely, online lessons were highly appreciated in our cohort of students as well as in the previous one [5]. The majority of students wished

not to discontinue online lessons in the future. Brown et al. published 2021 the results of a large cross-sectional survey of medical learners (n=6492 from 140 countries). They reported that the disruption to the status quo of medical education was perceived by learners across all levels and geographic regions to have negatively affected their training and well-being, particularly amongst postgraduate trainees. The majority (84.3%) of clinical-level medical students were excused from clinical duties. Most spent their time in online learning coordinated by their medical school (68.2%), pursuing self-directed learning (44.1%), resting (36.4%), and engaging in more wellness activities than normal (31.4%). Most (80.9%) had online learning coordinated by their school but 66.5% felt their education would be of lower quality as a result [3]. In our analysis, the majority of students (55%) found no difference in the quality of the medical education during and after corona with 30% seeing an improvement of it after the pandemic. Chakadlar et al. published in 2022 a survey conducted with 300 medical students of 5 American universities to determine students' perceptions about the quality of medical education, professional development, and mental health during the COVID-19 pandemic. 77.2% agreed that course content was properly delivered virtually, and over 60% of students were satisfied with their instructors' and their institutions' adaptations to the new format. Among pre-clinical students, only 30.7% agreed that the course content they were learning was sufficient to prepare them for clinical rotations, and 44% of clinical-level students agreed that the skills they were learning would be enough to prepare them for residency. 54.7% of clinical-level students agreed that there was a decrease in the amount of clinical training they were receiving. 88.4% of all prompted students report the pandemic causing an increased sense of isolation from peers. Many students also report the pandemic being a factor that promoted increased feelings of depression (67.5%) and anxiety (73%) [11]. In our previous publication [5] as well as in the present study, students felt disadvantaged in their medical education on a point scale from 0 (completely not) and 10 (totally) between 5 and 6.

In our previous publication [5], 30 out of 92 students were oriented to a surgical career (32.6%). This population decreased post-pandemic in the surveyed population (17.4%). Surgery is becoming less attractive based on these results though the cause is not clear. It could be that, with the increasing online delivery, students appreciate more theoretical disciplines which do not benefit from continuous hands-on practical training. Declining interest in surgical careers among medical graduates has been a concern in recent decades [12,13]. Ensuring adequate recruitment and training of surgical residents is a main goal as we move past the pandemic. McInnis et al., 2022, published the results of an exploratory analysis of a survey-based assessment in preclinical medical students. A Surgical

Skills and Technology elective program was introduced for preclinical medical students that used simulation learning methodology to provide exposure to procedural specialties and enhance surgical skills. The majority of students agreed that the elective program influenced them to engage in more procedural opportunities during clerkship (73%) and that they felt more confident performing procedural tasks during clerkship (92%). Thirty percent of participants indicated that the elective program influenced them to pursue a procedural career [14]. In this regard, probably, more skills labs and structured programs should be generally offered in order to increase the interest of early stage medical students in surgery.

A limitation of our study is the small sample size as well as the mono-centricity of the study, as well as the relative small amount of questions. This was due to the fact that the questionnaire was administered at the end of the OSCE examination, when students were fatigued, and longer questionnaires likely would not have been completed.

## Conclusion

The majority of students felt no difference in education during and after pandemic. Theoretical online education was highly appreciated even after the pandemic and could become the future standard. Future studies should ask students from different countries about the quality of medical education after pandemic as well as about their preferred teaching methods, in order to maintain high the interest in medical education.

## Declarations:

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**Availability of data and materials:** The datasets generated and analysed during the current study are not publicly available due to authors decision, but are available from the corresponding author on reasonable request.

**Competing interests:** All authors have nothing to declare.

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