Students’ attitudes toward digital learning during the COVID-19 pandemic: A survey conducted following an online course in gynecology and obstetrics

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Abstract

Purpose The purpose of this survey was to assess medical students’ opinions about online learning programs and their preferences for specific teaching formats.

Methods

Between May and July 2020, medical students who took an online gynecology and obstetrics course were asked to fill in a questionnaire anonymously. The questionnaire solicited their opinions about the course, the teaching formats used (online lectures, video tutorials featuring real patient scenarios, and online practical skills training), and digital learning in general.

Results

Of 103 students, 98 (98 %) submitted questionnaires that were included in the analysis. Eighty-four (86 %) students had no problem with the online course and 70 (72 %) desired more online teaching in the future. Thirty-seven (38 %) respondents preferred online to traditional lectures. Seventy-two (74 %) students missed learning with real patients. All digital teaching formats received good and excellent ratings from >80 % of the students.

Conclusion

The survey results reflect medical students' broad acceptance of the online course and indicate that digital learning options can partially replace conventional face-to-face teaching. Especially for theoretical content, such as that taught via lectures, online teaching might be an alternative or complement to traditional education. In contrast, skill development and the application of practical knowledge still need a patient-centered structure.

Introduction

The novel coronavirus (COVID-19) pandemic has posed challenges for medical education facilities, with the need to shift rapidly from the usual face-to-face teaching to online learning as routines in hospitals and medical schools have been interrupted by COVID-19 lockdown [1, 2]. Before the pandemic, digital learning had a small, mainly additive role in medical education [3]. Existing problems with its implementation included the lack of infrastructure and technology at universities and negative attitudes among educators [4, 5].

Most digital learning studies conducted before the coronavirus outbreak had theoretical foci and demonstrated how such learning can improve students’ knowledge in domains such as communication skills [6, 7]. Data on medical students’ attitudes toward online education in clinical specialties, such as internal medicine, surgery, and gynecology, and techniques for the digital teaching of practical skills and examination administration, are rare. The present survey-based study was conducted to assess medical
students’ opinions about and attitudes toward online learning programs, and to identify their digital teaching format preferences.

**Material And Methods**

**Setting and participants**

The survey was conducted among medical students who completed a digital course between May and July 2020 at the Department of Gynecology, Obstetrics and Reproductive Medicine, Saarland University Hospital, Homburg/Saar, Germany. The five-day online course replaced a practical course in gynecology and obstetrics and was administered using different digital education formats: online lectures in gynecology and obstetrics, including live presentations on the main gynecological and obstetric diseases; video tutorials featuring real patient scenarios on topics such as vaginal delivery and caesarian section; and online education in gynecological examination and practical skills (e.g., cardiotocography).

After completing the course, students were invited to fill in a written questionnaire anonymously. The obtained questionnaires were stored at the hospital’s Department of Gynecology and Obstetrics. Questionnaire data and those on respondents’ gender and age, extracted from their course registration files, were entered into an SPSS (version 19; SPSS Inc., Chicago, IL, USA) database.

**Questionnaire**

The survey questionnaire was used to investigate medical students’ opinions about digital learning in the context of the gynecological curriculum, and their attitudes toward different online teaching formats. It was adapted in 2020 for digital course evaluation from a standardized questionnaire developed by medical educators at our hospital for curriculum evaluation, which was approved in 2017.

The questionnaire had two parts. The first part comprised nine items covering students’ opinions about the online course and attitudes toward digital learning in general. Respondents rated their degree of agreement with the item statements (“true”; “mostly true”; “neutral”; “mostly untrue”; “not true”). The second part was used to characterize students’ acceptance of three digital teaching formats (lectures, videos featuring real patient scenarios, and online practical skills education). Rating options ranged on a five item Likert scale from (1.) excellent, (2.) good, (3.) sufficient, (4.) moderate, to (5.) poor.

**Data analysis**

Descriptive analysis was performed to characterize the data. Categorial variables are expressed as frequencies and percentages. Teaching format data were analyzed using the chi-squared and Kruskal–Wallis tests. The analyses were performed using SPSS software (version 19; SPSS Inc., Chicago, IL, USA).

**Results**
One hundred of 103 students who took the digital course submitted questionnaires after course completion (97% response rate). After the exclusion of two incomplete questionnaires, data from 98 (98%) questionnaires were included in the analysis. Forty (41%) of the respondents were male and 58 (59%) were female. The median age was 25 years (range, 23–50 years, Table 1).

| Characteristic | n (%) or median (range) |
|----------------|-------------------------|
| Gender         |                         |
| Male           | 40 (41%)                |
| Female         | 58 (59%)                |
| Age (years)    | 25 (23–50)              |

**Students’ opinions about the online course content and structure**

Most [$n = 87 (89\%)$] students agreed that the online course topics were relevant for praxis [“true,” $n = 58 (59\%)$; “mostly true,” $n = 29 (30\%)$]. Three (3%) students found the chosen topics not to be relevant [“mostly untrue,” $n = 1 (1\%)$; “not true,” $n = 2 (2\%)$]. Seventy-four (76%) students agreed that the instruction of the online course was well prepared [“true,” $n = 40 (41\%)$; “mostly true,” $n = 34 (35\%)$], whereas six (6%) students did not [“mostly untrue” and “not true,” $n = 3 (3\%)$ each]. A majority [$n = 84 (86\%)$] of students could follow the online course [“true,” $n = 53 (54\%)$; “mostly true,” $n = 31 (32\%)$]; four (4%) students indicated that they had difficulty following it [“mostly untrue,” $n = 1 (1\%)$; “not true,” $n = 3 (3\%)$]. Eighty-four (86%) students agreed that the online course improved their knowledge of gynecology and obstetrics [“true,” $n = 53 (54\%)$; “mostly true,” $n = 31 (32\%)$]. Eleven (11%) students had a neutral position on this statement, and three (3%) students disagreed with it (Table 2).
### Table 2
Questionnaire responses (n = 98)

| Item                                                                 | n (%)  |
|----------------------------------------------------------------------|--------|
| The topics chosen for the online course are relevant for praxis     |        |
| True                                                                 | 58 (59%) |
| Mostly true                                                          | 29 (30%) |
| Neutral                                                              | 8 (8%)  |
| Mostly untrue                                                        | 1 (1%)  |
| Not true                                                             | 2 (2%)  |
| The instruction of the online course was well prepared              |        |
| True                                                                 | 40 (41%) |
| Mostly true                                                          | 34 (35%) |
| Neutral                                                              | 18 (18%) |
| Mostly untrue                                                        | 3 (3%)  |
| Not true                                                             | 3 (3%)  |
| I could follow the online course                                    |        |
| True                                                                 | 53 (54%) |
| Mostly true                                                          | 31 (32%) |
| Neutral                                                              | 10 (10%) |
| Mostly untrue                                                        | 1 (1%)  |
| Not true                                                             | 3 (3%)  |
| The online course improved my understanding of gynecology and obstetrics |        |
| True                                                                 | 53 (54%) |
| Mostly true                                                          | 31 (32%) |
| Neutral                                                              | 11 (11%) |
| Mostly untrue                                                        | 0 (0%)  |
| Not true                                                             | 3 (3%)  |
| An online course can replace a practical course with patient contact in the hospital |        |
| True                                                                 | 4 (4%)  |
| Mostly true                                                          | 9 (9%)  |
| Item                                                                 | n (%)          |
|----------------------------------------------------------------------|----------------|
| Neutral                                                             | 11 (11%)       |
| Mostly untrue                                                       | 22 (23%)       |
| Not true                                                            | 52 (53%)       |
| I would prefer an online lecture instead of a traditional lecture  |                |
| True                                                                | 19 (19%)       |
| Mostly true                                                         | 18 (18%)       |
| Neutral                                                             | 15 (16%)       |
| Mostly untrue                                                       | 27 (28%)       |
| Not true                                                            | 19 (19%)       |
| I am looking forward to the integration of more online teaching in the future |            |
| True                                                                | 45 (46%)       |
| Mostly true                                                         | 25 (26%)       |
| Neutral                                                             | 14 (14%)       |
| Mostly untrue                                                       | 5 (5%)         |
| Not true                                                            | 9 (9%)         |
| I missed learning with patient contact for better understanding     |                |
| True                                                                | 45 (46%)       |
| Mostly true                                                         | 27 (28%)       |
| Neutral                                                             | 13 (13%)       |
| Mostly untrue                                                       | 10 (10%)       |
| Not true                                                            | 3 (3%)         |
| In the future, I wish to learn further with real patients           |                |
| True                                                                | 72 (74%)       |
| Mostly true                                                         | 17 (17%)       |
| Neutral                                                             | 6 (6%)         |
| Mostly untrue                                                       | 1 (1%)         |
| Not true                                                            | 2 (2%)         |

Acceptance of the three digital teaching formats
Overall, ratings for all three teaching formats were good or excellent. Forty-four (45 %) rated the online lectures as excellent and 38 (39 %) rated them as good [total, n = 82 (84 %)]. Similar results were obtained for the video tutorials [n = 86 (88 %); excellent, n = 47 (48 %); good, n = 39 (40 %); <good, n = 12 (12 %)] and online education in practical skills [n = 87 (89 %); excellent, n = 51 (52 %); good, n = 36 (37 %); <good, n = 11 (11 %)] (Table 3). The median rating was highest for the online lectures [1.7 (range, 1–4)], followed by the video tutorials [1.7 (range, 1–5)] and online education in practical skills [1.6 (range, 1–6)], but the ratings did not differ significantly among formats (p = 0.368).
### Evaluation of the digital teaching formats

| Format                                                                 | n (%) | Median (range) |
|------------------------------------------------------------------------|-------|----------------|
| Online lectures                                                        |       |                |
| (1.) excellent                                                         | 44 (45%) | 1.7 (1–4)     |
| (2.) good                                                              | 38 (39%) |               |
| (3.) sufficient                                                        | 13 (13%) |               |
| (4.) moderate                                                          | 3 (3%)  |               |
| (5.) poor                                                              | 0 (0%)  |               |
| Median (range)                                                         | 1.7 (1–4) |               |
| Video tutorials featuring real patient scenarios                       |       |                |
| (1.) excellent                                                         | 47 (48%) | 1.7 (1–5)     |
| (2.) good                                                              | 39 (40%) |               |
| (3.) sufficient                                                        | 9 (9%)  |               |
| (4.) moderate                                                          | 1 (1%)  |               |
| (5.) poor                                                              | 2 (2%)  |               |
| Median (range)                                                         | 1.7 (1–5) |               |
| Online education in gynecological examination and practical skills     |       |                |
| (1.) excellent                                                         | 51 (52%) | 1.6 (1–6)     |
| (2.) good                                                              | 36 (37%) |               |
| (3.) sufficient                                                        | 10 (10%) |               |
| (4.) moderate                                                          | 0 (0%)  |               |
| (5.) poor                                                              | 1 (1%)  |               |
| Median (range)                                                         | 1.6 (1–6) |               |

### Students’ opinions about online learning

Most [\(n = 74\) (76 %)] students indicated that an online course cannot replace a practical course with patient contact in the hospital. Eleven (13 %) students had neutral responses to this item and 13 (13 %) students agreed that an online course can replace a practical course [“true,” \(n = 4\) (4 %); “mostly true,” \(n = 9\) (9 %)]. The majority \([n = 47\) (46 %)] of students indicated that they did not prefer online to traditional lectures [“mostly untrue,” \(n = 27\) (28 %); “not true,” \(n = 19\) (19 %)]; 38 % \(n = 37\) of students preferred online
lectures [“true,” \( n = 19 \) (19 %); “mostly true,” \( n = 18 \) (18 %)] and 15 % (\( n = 16 \)) had neutral opinions on this statement. Seventy (71 %) students indicated that they would welcome the integration of more online teaching in the future [“true,” \( n = 45 \) (46 %); “mostly true,” \( n = 25 \) (26 %)] (Table 2).

Students’ opinions about learning without real patients

Most [\( n = 72 \) (74 %)] students missed learning with real patients [“true,” \( n = 45 \) (46 %); “mostly true,” \( n = 27 \) (28 %)]; 13 (13 %) students had a neutral opinion on this statement and 13(13 %) students did not agree with it [“mostly untrue,” \( n = 10 \) (10 %); “not true,” \( n = 3 \) (3 %)]. The majority [\( n = 89 \) (91 %)] of students indicated that they desired further learning with real patients [“true,” \( n = 72 \) (74 %); “mostly true,” \( n = 17 \) (17 %)] (Table 2).

Discussion

This survey of medical students who took an online course in gynecology and obstetrics that replaced a face-to-face practical course revealed great acceptance of digital learning in general; most participants indicated that they desired more online teaching in the future. In addition, all three digital teaching formats used in the course (online lectures, video tutorials featuring real patient scenarios, and online education in practical skills) received good ratings.

As modern technology and web-based systems are now integral parts of everyday life, medical students’ demand for and use of digital learning options (e.g., self-directed programs from local universities and other institutions) has increased [8]. These students’ use of social media platforms has also increased and provides the opportunity to interact, discuss cases, and study in session for examinations [9]. Some authors believe that the availability of 5G and artificial intelligence technologies represent a breakthrough enabling the optimization of educational programs [10]. The COVID-19 pandemic obligated students to engage in digital learning and revitalized digital learning options [11]. For example, during the period of campus closure, universities in China implemented 24,000 online courses (401 including virtual experimental simulation and 22 providing learning platforms), coordinated by the Chinese Ministry of Education, which monitored online education progress and quality [10]. A survey of 39,854 students at the Southeast University in China emphasized the importance of this tremendous undertaking; 50 % of respondents believed that the planned teaching objectives were attained fully [10]. The survey also revealed that students prefer a mixture of different learning formats, such as the use of recorded videos in combination with live courses; this mixed teaching style appeared to increase students’ participation and mitigate the impact of unstable networks [10]. The researchers concluded that in the absence of face-to-face communication, teachers need to put greater effort into preparing for online courses, innovating and designing lessons [10]. The good ratings that students gave to the different teaching formats in this study are in line with these findings, but our students also indicated that teaching and learning with real patients were elementary for future curricula.

Data from the University of Washington document a tenfold increase in digital education in pathological anatomy for distant students during the COVID-19 pandemic. One such course examined was similar to
ours; it was a comprehensive two-week remote-learning program for third- and fourth-year students that included lectures, slide presentations, virtual discussion groups, and case-based activities [12]. A survey on course effectiveness yielded positive student feedback; in contrast to our findings, the students found the educational quality to be equivalent to that of an in-person course [12]. This difference might be explained by the difference in course objectives, which included practical skill development in our course and were more theoretical in Parker et al.’s course, although those authors did not report results by teaching format. We obtained high ratings for online lectures that imparted theoretical knowledge, but our students preferred to learn practical skills with real patients.

Schulz-Quach et al. examined 670 medical students’ acceptance of a digital course in palliative care that included online lectures, YouTube videos, self-reflection exercises, and interactive case management, and culminated in a multiple-choice examination. In line with our results, responses to a standardized university questionnaire on students’ palliative care competence revealed broad acceptance of digital learning in e-learning and non–e-learning subgroups [13]. The authors also observed a positive, but not significant, trend toward higher examination grades among students who took the digital course, but no difference in self-estimated palliative care competence between groups, argued to be attributable to the lack of experience-based learning with real patients. Like our findings, this result emphasizes the need for patient contact in the teaching of skills to medical students.

In a study conducted with 205 medical students, Brockfeld et al. found that video lectures were as effective as live lectures for preparation for a medical examination consisting of 301 multiple-choice questions; 48 % of students preferred live lectures, 27 % preferred video lectures, and 25 % had a neutral opinion. The authors concluded that video lectures could serve a complementary role in medical education [14]. These results are in line with our findings of good lecture ratings and some students’ preference of online over traditional lectures. The affinity toward digital learning is known to vary among students; based on a two-semester-long prospective study, Backhaus et al. identified two types of medical student: digital natives and traditional learners. Digital learners had greater difficulty with traditional lectures than with e-learning, whereas traditional learners showed no difference in knowledge gain between formats. The author emphasized that medical educators should be aware of changes in learning habits, and our results may provide hints of such changes [3].

A broad array of options is available for the remote teaching of theoretical content; for education in the history of medicine and medical ethics, these include podcasts, chatrooms, and a vocabulary trainer [15]. The use of digital teaching for gross anatomy and pathological anatomy is also common [6, 12]. Our results suggest that the acceptance of digital teaching of theoretical background content is also increasing in clinical medicine.

In a randomized study, Gonzalves et al. investigated the use of video tutorials and slide shows to teach maneuvers for shoulder dystocia to medical and midwifery students. At the end of the course students were evaluated by graders. Scores in practice and theory were significantly higher among students in the video tutorial group, leading the authors to conclude that video tutorials improved learning relative to
standard lectures alone [16]. Our survey also showed broad acceptance of video tutorials among medical students. Such tutorials are also used to teach skills to radiology residents; a course composed of ten minute video tutorials improved these residents’ ultrasound knowledge and hands-on skills, as measured by pretest and posttest questionnaires [17].

Schlupeck et al. reported medical students’ acceptance of an online course on wound care; 69.4 % of students found the online course to be superior to a conventional lecture, and students’ perceived competence increased significantly. In line with these results, our students rated the online course highly [18]. Despite the good performance of the digital teaching formats and the broad acceptance of digital learning, our results reflect an important limitation of digital education, namely that it does not allow for learning with real patients. Our students indicated that the online course could not replace a practical course with patient contact and indicated that they missed patient-centered learning, an elementary educational component that enhances students’ understanding and awareness of the complexity of patient care [19, 20]. In addition to bedside teaching, practical units on diverse topics (e.g., intrauterine devices, conization, laparoscopy, and obstetric ultrasound) with patient contact or realistic scenarios improve medical students’ knowledge and understanding [21–29].

Arús et al. showed that conventional learning was superior to digital learning for skill development for magnetic resonance imaging of the temporomandibular joint among dental students, despite improvements in both groups [30]. A review of e-based learning programs for nursing students yielded similar results, showing that e-learning is a flexible teaching method but is not superior to face-to-face patient simulation. The authors concluded that combined traditional and e-based learning could achieve the best results [31].

The limitations of this study include those inherent to survey-based research. In addition, we evaluated only students’ opinions, and not the effectiveness of online teaching, as reflected for example in examination scores. Thus, although the students showed broad acceptance of online teaching, we cannot comment on the effectiveness of this educational approach in terms of knowledge and medical skill acquisition. As the degree of knowledge transfer is a key indicator in the evaluation of teaching methods, additional studies of the relative effectiveness of online and conventional teaching formats are needed.

**Conclusion**

In this study, we found a high degree of acceptance of digital teaching formats among medical students. In particular, the teaching of theoretical knowledge (i.e., via lectures) seems to be partially transferable to an online format. To learn practical skills and patient treatment, medical students require patient-centered education. These findings can be used to further implement digital online formats into students’ medical education.

**Declarations**
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Conflicts of interest/Competing interests

The authors declare the following conflicts of interests.

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Author Contribution

GL Olmes: Manuscript writing and Data management

JSM Zimmermann: Data analysis and critical revision of manuscript

L Stotz: Data acquisition and editing of the manuscript

ZF Takacs: Data acquisition and editing of the manuscript

A Hamza: Data acquisition and editing of the manuscript

MP Radosa: Project development and critical revision of the manuscript

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Ethics approval

Waiver

Consent to participate

Waiver

Consent for publication

Waiver

Availability of data and material

The dataset used and analyzed during the current study is available from the corresponding author on reasonable request.

Code availability

Not applicable

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