Distance Learning and Assessment During the COVID-19 Pandemic—Perspectives of Polish Medical and Healthcare Students

Piotr Przymuszała, Łucja Zielińska-Tomczak, Michał Kłos, Angelika Kowalska, Paulina Birula, Martyna Piszczek, Magdalena Cerbin-Koczorowska, and Ryszard Marciniak

Abstract
The abrupt transition from the traditional model of medical education to online learning caused by the COVID-19 pandemic led to unprecedented changes in the education of future healthcare professionals. This study aimed to evaluate the opinions of Polish healthcare students on the changes introduced due to the COVID-19 pandemic and propose recommendations for improvement. Data were collected from June to July 2020 using an online questionnaire. The results demonstrate that students were generally satisfied with the online learning solutions implemented during the pandemic and appreciated their teachers’ efforts. In their opinion, some of the solutions should also be continued after the pandemic. Students noticed positive aspects of online learning: time efficiency, bigger student-friendliness and unlimited attention from teachers, the flexibility of the learning process, better learning conditions for students, and absences due to illness and other random situations. However, they also noticed its disadvantages: problems with the Internet connection and technical aspects, attitudes of teachers, limited interpersonal relations, limited learning of practical skills, health concerns, students’ engagement and distractions at home, and assessment. To conclude, our results indicate some necessary recommendations to improve the quality of further online learning in medical schools during the COVID-19 pandemic.

Keywords
COVID-19, medical education, distance learning, e-learning, assessment

Introduction
The COVID-19 pandemic outbreak caused an unprecedented threat to global public health, forcing governmental authorities worldwide to introduce social distancing and limit social contact between their citizens to the minimum. The education sector was also affected, causing many educational institutions, including universities, to suspend their traditional face-to-face classes and continue the education process online.

Online learning, also known as distance learning or e-learning, has great potential, and its importance was already increasing before the pandemic (Abbasi et al., 2020). Similarly, many of its benefits were already described in the literature, including greater flexibility, comfort, and time savings (Abbasi et al., 2020; Przymuszała, Cerbin-Koczorowska, et al., 2020). Furthermore, during the pandemic restrictions, it remained the only option available, leaving many educational institutions with the choice of either e-learning or no learning at all. Still, many difficulties may come along the way, and the limitations of distance learning should also be acknowledged. The transition of the education process to the online environment is already a challenging process that requires careful planning and time for execution, and the sudden character of the change and the accompanying economic uncertainty did not make it easier (Rajab et al., 2020). Consequently, many institutions tended to choose simpler and low-cost solutions (Rajab et al., 2020). In this aspect, even before the pandemic, Cook (2014) recommended optimizing the use of e-learning to ensure its high quality with simultaneous low costs. Moreover, Nuere and de Miguel (2020) observed that

1Poznan University of Medical Sciences, Poznan, Poland

Corresponding Author:
Piotr Przymuszała, Department of Medical Education, Poznan University of Medical Sciences, 7 Rokitnicka St, Poznan, 60-806, Poland.
Email: pprzymuszala@ump.edu.pl
the transition process went easier in institutions with prior experience in conducting online classes.

Another obstacle is that e-learning is not suitable for all educational activities, especially at medical schools (Bani Hani et al., 2021; Camargo et al., 2020). Its incorrect implementation in areas such as clinical reasoning, practical skills, or patient communication may result in breaking basic principles of constructive alignment, assuming consistency between learning activities and previously defined learning outcomes (Biggs, 2003). Keeping this limitation in mind, medical teachers worldwide faced a dilemma on how to invent new ways to convey these topics, adapting them to distance learning in the new COVID-19 reality. Finally, e-learning methods are more dependent on students’ self-discipline and motivation than traditional face-to-face classes. Here the obstacle is that the transition to the online learning environment was not chosen nor even could be anticipated by students, leaving them no time to prepare for it beforehand. Meanwhile, students’ acceptance seems crucial for the success of online education (Almaiah, Al-Khasawneh, & Althunibat, 2020). According to the adaptation of the Kirkpatrick’s evaluation model to an e-learning environment proposed by Hamtini (2008), the interaction phase is the first of three stages of e-learning evaluation. It describes “the ease of utility of the e-learning interface, its aesthetic qualities, user satisfaction and interaction as well as the ease at which the interface facilitated learning.” (Hamtini, 2008). Getting to know students’ perspectives and opinions on the distance learning solutions implemented during the pandemic also gives the opportunity to recognize their advantages and disadvantages and introduce necessary changes, especially since it is not known how long the pandemic restrictions may last. What began as an “emergency education, a temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstance,” (Ramos-Morcillo et al., 2020) may become the mainstream model of the education system for a longer period of time. Meanwhile, current pandemic-related distance learning solutions were mostly developed rather hastily, without careful planning and utilizing the potential of e-learning to the full extent (Ramos-Morcillo et al., 2020).

The studies conducted so far in the context of the COVID-19 pandemic show mixed results. For instance, Khalil et al. (2020) reported high overall students’ satisfaction with distance learning and their positive attitudes towards the use of e-learning as a new teaching modality. Rajab et al. (2020) showed that 62.5% of their participants preferred blending online and face-to-face methods and 67% believed that the pandemic positively impacted e-learning. However, they noticed some problems during the first sessions due to adjusting to new conditions. A similar percentage of students satisfied or neutral towards e-learning was observed by Bani Hani et al. (2021). On the other hand, most of the respondents of Abbasi et al. (2020) demonstrated a negative perception of e-learning and preferred face-to-face teaching. Similarly, around two-thirds of students surveyed by Compton et al. (2020) wished to return to the clinical environment, and more than half of respondents of Alsoufi et al. (2020) did not believe in the ability to use e-learning for clinical aspects.

Meanwhile, there are many factors influencing students’ satisfaction with their studies. Researchers indicate two groups of elements influencing learning satisfaction: personal and institutional. Among the first, we can indicate gender, age, preferred learning style, and grade point average, while institutional factors include the level of lecturers and the quality of facilities. Satisfaction may also be influenced by the quality and content of training, course flexibility, university prestige, availability of equipment, clari ty of teacher expectations, or access to educational materials (Weerasinghe et al., 2017). In distance learning, the way the course is designed and the teacher’s supervision become important factors. The latter may be a key limitation for online learning, given the limited potential for direct influence of the teacher on the learner (Choe et al., 2019). Therefore, the intrinsic motivation of students to achieve learning outcomes seems to play an essential role in ensuring the quality of education. This factor influences the creativity or higher self-esteem of students (Shroff et al., 2007).

In Poland, the organization of face-to-face classes was first suspended by the Ordinance of the Ministry of Science and Higher Education of March 11, 2020 (Ministry of Science and Higher Education, 2020a) and on the same day by the Ordinance of the Ministry of Health (Ministry of Health, 2020a) for medical universities. The ordinances applied to all undergraduate and postgraduate types of higher education, and initially, the restriction was to last from March 12 to March 25, 2020. However, the Ministries continued to issue subsequent ordinances prolonging the suspension period (Ministry of Health, 2020b, 2020c, 2020d; Ministry of Science and Higher Education, 2020a, 2020c, 2020d). On May 21, 2020, and May 22, 2020, for medical schools (Ministry of Health, 2020c; Ministry of Science and Higher Education, 2020e), the restrictions were extended until September 30, 2020, however, leaving the Rector of the University with the possibility to reintroduce the face-to-face classes for those classes that cannot be realized with distance learning methods.

Taking all of the above into consideration, this study aimed to evaluate the opinions of medical students of our university on online classes conducted during the COVID-19 pandemic outbreak and collect data on potential areas for improvement.

The hypotheses in the study were as follows:

1. Medical and healthcare students perceive both advantages and disadvantages associated with online learning.
2. Students’ positive feelings on online learning are mostly related to classes focused on the knowledge domain (e.g., lectures and seminars).
3. Medical and healthcare students remain unsatisfied with practical classes conducted online.
4. Students indicate actions that should be undertaken to improve online learning during the pandemic.

**Materials and Methods**

**Study Settings**

Poznan University of Medical Sciences (PUMS) is a public medical university located in western Poland, with about 7,000 students learning in 20 different degree courses. During the suspension of the face-to-face classes, similarly to other Polish universities, PUMS also started conducting online classes for all its students. The synchronous forms of e-learning were conducted mostly with the help of the Microsoft Teams platform, while asynchronous e-learning using e-mails, WISUS system [internal informatics system of PUMS], AKSON module [module within WISUS used to send students didactic materials], sOLAT platform [PUMS LMS (Learning Management System) platform based on OpenOLAT software] and also Microsoft Teams platform. Exams were conducted on the sOLAT platform.

As a result of the governmental restrictions, both teachers and students had to adapt to the new reality. Although the distance learning methods were, at least to some extent, already present at PUMS, the leading role still belonged to the traditional face-to-face classes. As a result, most of the students had some contact with e-learning before pandemics, mostly in the form of asynchronous lectures. However, most of the academic staff had no prior experience in preparing and conducting distance learning classes. In order to promote the use of innovative techniques at PUMS, different faculty development initiatives were implemented, including workshops in the NESTOR [Nauczyciel – EkSper – TutOR (Teacher - Expert - Tutor)] program (Projekt NESTOR) and the development of guidelines on asynchronous e-learning (Przymuszala, Cerbin-Koczorowska, et al., 2020) or writing multiple-choice questions (Przymuszala, Piotrowska, et al., 2020), for example.

**Participants**

In order to get a more comprehensive picture of the situation on the University and reduce the impact of selection mechanisms on data obtained, we decided to invite all students of PUMS to participate in the study and share their perspectives on online learning during the COVID-19 pandemic, regardless of their degree course and study year. Therefore, the sole inclusion criterion in the study was the active status of a student of PUMS. Consequently, the exclusion criterion was not being a student of the university.

**Procedures**

The invitations to participate in the study were sent at the beginning of June 2020 to all students of PUMS on their institutional e-mail addresses with the help of the Administrative Office. Additionally, the study was also promoted on social media and the webpage of the University. Data were collected to the end of July 2020, when no new completed surveys were received over two weeks. The decision to finish data collection was additionally supported by data analysis indicating their saturation—that is, no new issues were arising anymore from students’ answers in the survey.

Qualitative data obtained in the study were thematically analyzed by two independent researchers using the Atlas.ti software (ATLAS.ti 8 EDU), following the steps described by Braun and Clarke (2006). Their results were later compared and discussed until reaching an agreement. Phenomenology was used as a qualitative approach to obtain a thorough picture of respondents’ opinions and experiences with online learning during the pandemic outbreak (Cleland, 2017).

**Tools**

Due to the pandemic, the study was conducted using an online questionnaire with open questions on students’ perception of distance learning and assessment during the COVID-19 pandemic outbreak. Open questions were aimed to gain more insight into respondents’ opinions than would be possible with closed questions. Additionally, an introductory paragraph was added with the information on the study’s aims and its voluntary and anonymous character. The draft of the questionnaire was subsequently subjected to evaluation by two experts on the subject of e-learning and medical education. Their input and comments allowed to create the final version of questions asked in the study (Table 1). The questionnaire was pre-tested on a sample of students from the Students’ Scientific Club of Medical Education to confirm its clarity and understandability.

**Ethical Considerations**

As the study only employed an anonymous online questionnaire, ethical approval was not required under the Polish legal system and the guidelines provided by the Institutional Review Board (Bioethical Review Board, Poznan University of Medical Sciences). Students’ participation in the study was voluntary, and no data were collected on the participants apart from their gender, faculty, and year of study. To ensure students’ complete freedom of expression, no fields in the survey were required, and the decision to answer any question belonged to the respondent. During the study, efforts were made to meet the standards of the Helsinki Declaration.

**Results**

Data on students’ perceptions about their education during the COVID-19 pandemic were collected using an online questionnaire with open questions. It was displayed by 524 students and completed by 143 of them. Among the
respondents, 114 were female and 29 were male. The mean age of respondents was 21.9 ± 2.4 years. They were representatives of different degree courses offered at PUMS as presented in Table 2. Additionally, 26 students provided answers to some of the open questions but resigned before completing the survey.

Responses of participants were subjected to thematic analysis, which was conducted independently by two researchers. This procedure included familiarizing with data, initial coding, searching for themes, reviewing the themes, naming the themes, and creating a report.

The thematic analysis of students’ responses revealed themes presenting both positive aspects associated with online learning during the COVID-19 pandemic (Themes 1—5) and their negative aspects (Themes 6—12).

Students were mostly satisfied with the organization of distance learning in the initial months of the COVID-19 pandemic. However, it should be emphasized that their positive opinions mostly revolved around classes focused on the transfer of knowledge (e.g., lectures and seminars). In students’ opinion, these were also the forms that should be preserved after the pandemic. Analysis of students opinions and arguments on online learning during the COVID-19 pandemic revealed five themes pertaining to their advantages, namely time efficiency, bigger student-friendliness and unlimited attention from teachers, the flexibility of the learning process, better learning conditions for students, and absences due to illness and other random situations.

**Theme 1: Time Efficiency**

Classes conducted online, especially lectures and seminars, were seen as more convenient and time-efficient than traditional classes before the COVID-19 pandemic. Students seemed to appreciate the possibility to participate in them from their homes, as it allowed them to save much time, which was usually wasted on commuting to the university. Similarly, after the classes, students could immediately start other activities (like studying, household chores, or rest). They also noticed improved organization of their schedules, including no time wasted on moving between classrooms or departments and reduced inconvenience of any free periods between the classes.

“Live-streamed online lectures and seminars do not differ from those conducted in the class (and it’s even better to listen to them at home as you don’t have to spend time traveling to get to them)”

“it reduces the “dead time” associated with traveling to the university and the gaps between classes”

“I am very pleased with the way online classes were conducted. In my opinion, this should mobilize universities to

| Degree course                             | Number of respondents |
|-------------------------------------------|-----------------------|
| Medicine                                  | 62                    |
| Dentistry                                 | 15                    |
| Pharmacy                                  | 13                    |
| Physiotherapy                             | 12                    |
| Nursing                                   | 7                     |
| Midwifery                                 | 7                     |
| Pharmaceutical engineering                 | 7                     |
| Dietetics                                 | 4                     |
| Medical analytics                         | 4                     |
| Optometry                                 | 4                     |
| Criminal and forensic analytics            | 2                     |
| Public health                             | 2                     |
| Cosmetology                               | 1                     |
| Electroradiology                          | 1                     |
| Medical biotechnology                     | 1                     |
| Medical rescue                            | 1                     |
introduce online classes, with an emphasis on lectures and seminars conducted in the form of presentations. Thanks to e-learning, we can save a lot of time”

Theme 2: Bigger Student-Friendliness and Unlimited Attention from Teachers

Students noticed that even though the face-to-face interaction was impossible due to social distancing, in some aspects, the cooperation and contact with their teachers improved during the pandemic. Teachers were more flexible and willing to change the time of the classes or share their lecture presentations, for instance. Also, the online contact after the classes was viewed as easier and more instant via the online learning platform than traditional e-mails. Students also recognized the work of their teachers to transfer their classes into the online environment. Although not everything was perfect, they appreciated their efforts and paid much attention to particular forms of classes they liked and the differences between them.

“I am generally satisfied. I understand that the lecturers are just learning this form of classes, and not everything is perfect, but the form of online classes suits me”

“I especially liked the lectures/seminars made available with a recording of the teacher explaining individual slides, this way you can repeat the information very well, paying the most attention to the issues raised by the teacher, and at the same time you can recreate the information that you did not manage to write down”

“I rate the “live” online classes higher than the recorded presentations because the lecturers spent time explaining the subject in detail, and if in doubt, you can ask questions immediately. [. . .]”

Students also noticed that their impression from online clinical classes was often better because teachers paid more attention to them and were less distracted by other duties than in the hospital ward.

“During classes, they focus only on students and not simultaneously on students, documentation, clinic, ward, and operating room as usual”

“First of all, the teachers are prepared, and all their attention is focused on the classes. They are usually at home, so they are not disturbed by patients, they do not have to go out to take care of other duties, and they are not distracted by anything”

Theme 3: Flexibility of the Learning Process

In the case of classes that involved recorded lectures or other forms of materials available for a longer time, students enjoyed the possibility to study at their own pace, including going back and repeating the material as many times as required. This allowed for a deeper and better understanding and consolidation of the topic. Students were also able to better adjust the learning process to their needs and daily schedule, allowing them to learn whenever and wherever they wanted. It allowed them to stay focused on the presented content and, when needed, take short breaks for a meal or other physiological needs.

“The possibility of going back and repeating [the material] gives significantly greater educational possibilities”

“I can pause the recording to have more accurate notes. Usually, we have a few days to acknowledge the material, so I don’t have to do everything at once. I can split it up, do it accurately and work efficiently for several days instead of doing everything at once”

“I believe that online lectures are a very good form of teaching because normally, lectures were organized in the afternoon or evening hours, and it was sometimes difficult to get to them after an intense day of classes. In this version, you would always be able to turn them on at home and listen to interesting content”

“I believe that it would be worth continuing to conduct lectures and seminars online because of the facilitated participation in classes, the possibility of re-playing them anytime, anywhere, and any number of times”

Theme 4: Better Learning Conditions for Students

Students paid much attention to the improvement in learning conditions associated with the transition to the online environment. They mentioned the comfort of their own homes, desks, sitting places, and access to snacks and beverages. It was also easier for them to take notes from their own computer screens as slides were more readable. In addition, the teacher was often more clearly hearable, and other students did not cause distractions.

“There is no need to sit in an uncomfortable room, and still, the content is prepared more or less in the same way”

“In lecture halls, slides were often not easily readable, and this is not a problem on the computer”

“I have time and greater motivation for it, [. . .] I have access to good coffee, and it does not make me lazy, but makes me feel good, and it is easier for me to participate in classes”

“Being at home, you can spend more time on recordings, and go through the previously learned material faster; in online seminars, it is easier to take notes because sitting at my desk at home, I have much more comfortable conditions and more space for a book, notebook, etc.”

Theme 5: Absences due to Illness and Other Random Situations

The online format of classes facilitated the participation of students faced with different random situations, which would have otherwise prevented them from attending the classes. Among them, respondents listed illnesses, malaise, pregnancy, hospitalizations, traffic jams, and accidents, or oversleeping.
“When someone does not feel well, they can still participate in classes. Before the distance classes, such a person had to give up coming to the class, which was making them lose a lot.”

“The big advantage is that you can participate in them from virtually any place on earth, regardless of your situation or health condition, which prevents the need to make up for the absences. I think that it would be a very good idea to enable the use of this type of classes for sick students, students in hospitals, students in advanced pregnancy, or any impossibility to get to the classes in the department.”

Students also noticed some disadvantages of online learning during the COVID-19 pandemic. Their analysis revealed seven themes, namely problems with the Internet connection and technical aspects, attitudes of teachers, limited interpersonal relations, limited learning of practical skills, health concerns, students’ engagement and distractions at home, and assessment.

Theme 6: Problems with the Internet Connection and Technical Aspects

The occasional occurrence of technical problems during their online classes was brought up by some respondents. Among them, they complained about the slow speed of the Internet connection or losing the signal during rush hours, causing screen freezing and sound issues. However, turning their cameras off usually helped to resolve these issues by reducing the bandwidth usage. Similarly, sometimes noises and echoing sounds were also heard during lectures or seminars when students left their microphones on. The problems with access to the fully operational computer equipment, including a camera, a microphone, and a sufficient Internet data package, were also reported by some respondents. These students felt surprised by the sudden transition to online learning and described limited possibilities to fix their computer equipment or purchase a new one due to limited financial resources or closed shops during the lockdown. Some students also expressed concern about the safety of transmitted data, especially their images from the camera.

“The situation surprised everyone and not everyone has free access to the Internet, computer equipment with a camera and microphone, not everything always works as it should, and the purchase of new equipment is not only difficult or impossible but also burdening the budget of students who have been deprived of the opportunity to earn extra money [due to the pandemic].”

“There were people with poor connection, there were technical problems, some had one computer and younger siblings, which made the access difficult.”

Problems of the university staff with conducting the classes were also noted. Some students mentioned the lack of equipment, poor computer skills, and the reluctance to learn them among part of the older teachers. In their opinion, the University should offer more support to the teachers in this aspect.

“The lecturers were not able to organize the classes technically. Many of them were just sending materials and assignments.”

“The staff should have access to training in technical aspects of conducting online classes.”

Theme 7: Attitudes of Teachers

Students observed varying levels of their teachers’ engagement in conducting classes. While some of them well adapted to the new circumstances, others seemed to struggle, and their classes lacked creativity. Apart from technical problems and low computer skills described above, students also felt that some teachers seemed to cut corners, for example, only sending students presentations and giving them assignments. Although respondents appreciated their role in verifying their understanding of the topic and increasing their attention during classes, some teachers were reported to overuse them. On the other hand, students also noticed that teachers might have been overburdened with clinical duties due to the COVID-19 pandemic, which might have reduced their engagement.

“Most teachers adapted to this form by preparing materials, exercises, quizzes, recording seminars, they had to check the tasks and presentations sent by students, which was less frequent in the normal course of study. Some lecturers, however, were not so involved and were only sending learning materials.”

“Completing and submitting assignments is okay to organize the knowledge, but not as the only form of classes.”

“E-learning classes largely depend on the preparation and charisma of the teacher. There are lectures and seminars that are very interesting and engaging, but there are also very average ones; there is no rule. On the plus side, there are various quizzes that engage students in the activities. The tasks are okay, as long as the lecturers do not treat them as an alternative to conducting classes, they do not overwhelm us with a huge amount of tasks and do not surprise us with deadlines.”

Others acknowledged that the novelty of the situation interfered with the habits of the teachers in general, who had to get used to talking to the screen and had difficulty in verifying the actual attendance of students. As one student described it:

“They keep asking whether we are listening or “still alive,” and the microphones must be muted [to avoid echo sounds] so their perception of our interest may be wrong.”

Theme 8: Limited Interpersonal Relations

The lack of direct in-person contact with other people was also a difficult aspect of online learning during the COVID-19 pandemic. Students missed the company of their peers and teachers and firmly believed that the online conditions could not replicate the live experience. Equally important
was the lack of contact with patients, which is of great importance in the education of future medical professionals.

“Lack of contact and interpersonal interactions. And the medical professions require them to a large extent”

“Impaired contact. It is often the case that the greatest value of seminars or classes lies in the individual way of the teacher, in their ability to explain and show something in their own way. Something like this is much more difficult to achieve online”

“No direct interaction with people— I believe that this is a really big minus, which significantly affects the well-being and work of people. I think we all agree that it is extremely important and that nothing can replace direct contact with people”

Theme 9: Limited Learning of Practical Skills

Contrary to lectures or seminars described above, most respondents did not think that classes focused on learning practical skills (e.g., medical simulation, clinical, and practical ones) can be successfully conducted online even despite the teachers’ best efforts. They regretted not having the opportunity to use theory in practice, examine the patients, assist in performing medical procedures or work in a lab. The lack of hands-on clinical and practical experience was viewed as a waste of time, a missed opportunity to experience a particular field of medicine, and not enough to prepare for their future professional roles. They expressed a strong need to return to the face-to-face form of practical classes.

“[Online] practical classes conducted with even the greatest commitment are not able to replace us with practical experience”

“Lectures give us access to theoretical knowledge, but without practical classes, my field of study loses its sense”

“Classes with patients and on clinical topics should always take place in the face-to-face form because one learns completely different then. However, lectures can take place in a distance from, because students do not do anything else except taking notes, and you can do it at home”

“The disadvantages are the activities that should be done live. Learning to draw blood via the Internet, despite the very good presentation of recordings and explanations, will not replace classroom classes”

However, aware of the extraordinary character of the pandemic situation, students seemed to appreciate different efforts of their teachers to at least partially replicate the clinical and practical experience. Although they were mostly viewed as imperfect and temporary solutions, some, like a video library of different medical procedures or surgeries, were seen worth preserving as additional learning materials even after the pandemic.

“Clinical, practical, and laboratory classes cannot be conducted online. Their value drops drastically. These aren’t even substitutes. These are completely different classes with different outcomes, if any. There is an exception—in the operating room, you cannot see anything anyway. If the problem of the number of groups in such classes cannot be solved, recordings of surgeries should be introduced, at least create a database of such recordings available to students at any time”

“Videos from surgeries and medical procedures are also a plus because when we couldn’t see something live, at least in this form, you could learn anything practical”

“Classes with a simulated patient allow you to improve the history-taking technique, which worked quite well via the computer. Surgery videos allow you to see and understand more than with the student group in the operating theatre. Cases can be discussed online undisturbed”

Theme 10: Health Concerns

Students also expressed concerns about the implications of the amount of time spent daily in front of the computer on their health. They complained about the appearance of symptoms such as headaches, back pains, wrist pains, or conjunctivitis. Additionally, the specificity of online classes and sedentary lifestyle negatively affected their form and well-being.

“The constant, monotonous schedule of classes is tiring. Electronics and a constantly sedentary lifestyle have a bad effect on my well-being and focus”

“Health problems started to appear from very long computer work (conjunctivitis, back pain, etc.)”

Theme 11: Students’ Engagement and Distractions at Home

Some students observed no difference or even an increase in their own and their colleagues’ motivation and engagement during online classes compared to traditional ones. These students pointed out their inner motivation, sense of responsibility for their future patients, as well as the aforementioned advantages of distance learning.

“I learn regardless of the form of the classes - the life of another person will depend on my knowledge”

“If someone is interested in the classes, they will pay attention regardless of whether they are online or not”

However, what is worrisome, other students gave an account of how their and others’ engagement and motivation decreased during online education. In their opinion, the online environment limited their willingness to learn and pay attention during the classes, especially when they were not interested in the topic of the class. In this context, they brought up the positive role of different tasks and assignments sent by teachers during the classes to increase their attention and verify the actual attendance.

“I know that during online classes, I can always check something in a book, on the Internet. This gives you peace of mind but unfortunately makes you lazy at the same time. In classroom classes, I can only rely on my own knowledge to...”
answer the teacher’s questions, so I try to remember as much as possible while preparing for classes”.

“During online lectures, hardly anyone controls whether the student is actually listening. That’s why it happened to leave the computer for a while to do something at home”.

“There is a risk that during such online classes when the webcam is not turned on, etc., some people will do something else, instead of participating in the classes”.

Some students also admitted that they were more easily distracted than in the classroom and also found it difficult to focus at home just sitting in front of the computer, especially during longer lectures or seminars.

“Despite the lack of other students around, there are many distracting factors, despite appearances, even more of them are at home, so it is very difficult to focus on the classes throughout their duration, especially when they are 3-hour classes”.

“Online classes are not a beneficial form of teaching for me because it is harder to focus on, for example, a live lecture when at home. Especially when some of them last more than 2 hours. Homework and interactive quizzes are a good idea because it “forces” the student to work on their own, who as a result will surely gain some knowledge from the classes”.

Moreover, students sometimes felt lack of understanding from their relatives, and also as one of them put it:

“the environment (e.g., families) thinks that online classes are not learning (after all, I sit at home) . . .”

**Theme 12: Assessment**

Although most students believed that their exam results before and during the pandemics were comparable, they still mostly preferred the traditional form of writing exams. Students also listed many limitations associated with the current situation, including technical problems, potential distractions, and precautions introduced by the authorities of PUMS to prevent cheating. These solutions mentioned by our respondents included, among others, limited time to answer questions, randomized order of questions and answers, lack of possibility to return to previous questions, or asking students to have their cameras turned on during the exams.

“The stressful part is the limited time to answer [...] and no possibility to return to previous questions [...] It is understandable that these methods are designed to prevent cheating on the part of the examinees, but in my opinion, a similar effect could be achieved with only some of these methods, reducing unnecessary stress related to them”,

“[...] while writing exams at home some distractions often cannot be eliminated such as neighbor’s repairs or a postman’s visit [...]”.

“The advantage of online exams is that you don’t have to get to the exam. However, a considerable disadvantage is a stress associated with the possibility of computer failure, losing Internet connection”.

The advantages and disadvantages of distance learning indicated by students were summarized in Table 3.

**Discussion**

In this study, we examined the opinions of healthcare students on distance learning during the COVID-19 pandemic. Although students of our university had been previously exposed to some forms of e-learning, it was not the standard way of conducting classes, and the traditional face-to-face classes were still the majority.

Most respondents positively evaluated online learning and the efforts of their teachers in these unprecedented times. They also expressed interest in keeping some distance learning methods even after the end of the restrictions, recognizing their many benefits. In this context, students most commonly pointed out different forms of lectures and seminars conducted online. Similarly, in a study by Gupta et al. (2021), more than half of students wished to continue online classes along with the classroom ones after the pandemic. The comparison of themes resulting from our study with the existing literature also shows similarities in students’ perspectives. The themes describing the advantages of online learning in our study were as follows:

- **Time efficiency**—in this theme, students focused on convenience and time savings associated with online learning. Similarly, nearly two-thirds of respondents of Thapa et al. (2021) believed that e-learning helps to save time. Respondents of Al Zahrani et al. (2021) listed time-saving as its second most common advantage. Almost 60% of students surveyed by Ibrahim et al. (2021) believed that e-learning was an adaptable and less time-consuming method than classroom learning.

- **Bigger student-friendliness and unlimited attention from teachers**—this theme revolved around the more attentive and flexible approach of some teachers towards students’ needs during the pandemic. This included, for instance, easier contact, changing the time of classes to fit students’ schedules, sharing materials, or putting efforts into preparing online classes. The issue of easier communication via social media for less-confident students also appeared in responses collected by Mukhtar et al. (2020). Also, more than 90% of students in the study by Singh et al. (2021) wanted to receive presentations used during the class, and almost 80% of them said the same about the recorded lectures.

- **Flexibility of the learning process**—students in our study enjoyed the ability to learn whenever they wanted, at their own pace, with unlimited occasions for repetitions offered by asynchronous e-learning. Similar advantages of asynchronous learning also formed a theme in a study by Mukhtar et al. (2020) and Hayat et al. (2021). The ability to learn at one’s own pace was indicated as an advantage of e-learning by 64% of respondents of Bączek et al. (2021).
• Better learning conditions for students—this theme focused on comfort associated with online learning. More than half of respondents of Bączek et al. (2021) chose comfortable surroundings as an advantage of e-learning. The ability to stay at home and a comfortable environment were also among the most common advantages of e-learning in the study by Thapa et al. (2021). Comfortable conditions were also mentioned by respondents of Mukhtar et al. (2020). On the other hand, approximately half of respondents of Singh et al. (2021) believed on the contrary. However, these students mostly used mobile data as a source of the Internet, did not have separate rooms, and reported no computer training.

• Absences due to illness and other random situations—this theme covered the topic of easier participation in online classes in the face of random situations, like illnesses and pregnancy, among others. Half of the respondents of Thapa et al. (2021) believed that e-learning helps them catch up on missed lectures. Most of them believed that e-learning should be adapted to help married and working students balance studies with their family life and work, respectively.

On the other hand, students also noticed disadvantages of the current situation, and the revealed themes were as follows:

• Problems with the Internet connection and technical aspects—this theme focused on technical and Internet connection problems during online classes. Technical factors, in their broad understanding, including the equipment, software, technical skills, and adequate support for users, were also listed as critical factors affecting the usage of e-learning systems in the study by Almaiah et al. (2020). About one-third of respondents of Al Zahrani et al. (2021) reported the occurrence of technical difficulties during online classes and not being provided with adequate technical support. Additionally, students in their study mentioned poor Internet connection, technical obstacles, and lack of technological skills, among disadvantages of online learning. Internet bandwidth and connectivity limitations, technical support limitations, and unfamiliarity with online learning systems were also seen against its implementation in the study by Gismalla et al. (2021). Similar reports involving Internet problems, poor connectivity, and technical...
issues were also brought up by Thapa et al. (2021), Gupta et al. (2021), Olum et al. (2020), Elshami et al. (2021), Hayat et al. (2021), and Bączek et al. (2021). Different network issues were also reported by around one-third of respondents of Singh et al. (2021), including troubles with sound and video or unexpectedly being logged out from the classes. Also, not every student in their study owned their device. Some of our respondents also faced problems in getting access to the appropriate IT equipment due to the closure of shops or inadequate finances, and similar concerns on resource insensitivity of e-learning were also presented by respondents of Mukhtar et al. (2020). One of the most common barriers reported by Khalil et al. (2020) were technical problems, including poor Internet connection and computer skills of the teachers. Similarly to our study, the need for training on e-learning and technical support was also noticed by respondents of Mukhtar et al. (2020) and Hayat et al. (2021).

- **Attitudes of teachers**—in this theme, students reported how much the shape of classes depended on individual teachers, their engagement in creating and conducting them. Students noticed that the quality of some classes could have been lower because some teachers took the easy way out or were overburdened with other duties during the pandemic. In a study by Bani Hani et al. (2021), teachers’ performance was found to influence students’ satisfaction with e-learning and the knowledge gained. A need for setting at least minimal standards of e-learning teaching in order to control its quality was also noticed by respondents of Hayat et al. (2021). On a similar note, students’ evaluation of faculty was mentioned by nearly one-quarter of respondents of Rajab et al. (2020) as challenges to online learning.

- **Limited interpersonal relations**—students missed direct in-person interactions with their peers, teachers, and patients. Issues related to in-person communication were most commonly indicated challenges to online education in a study by Rajab et al. (2020). Similarly, lack of face-to-face interaction was also mentioned to be against e-learning implementation by respondents of Gismalla et al. (2021). Inadequate interactions with teachers for the asynchronous model of e-learning were raised by students interviewed by Hayat et al. (2021). Reduced socialization and interactions with patients were common disadvantages of e-learning in the study by Thapa et al. (2021). The lack of interactions with patients was indicated as a disadvantage of online learning by 70% of respondents of Bączek et al. (2021). Meanwhile, as studies show, contacts with patients have an important role in enhancing medical students’ motivation (Dornan et al., 2006).

- **Limited learning of practical skills**—our respondents were against maintaining online learning for practical, clinical, and medical simulation classes. This is consistent with previous studies indicating that the education process at medical schools cannot be successfully realized only with the use of e-learning, especially for clinical and bedside teaching, as indicated by respondents of Hayat et al. (2021). Our students appreciated the efforts of their teachers but recognized the imperfection and temporary character of proposed solutions. For instance, in response to the pandemic situation, simulated patient classes were adapted to be conducted online. With the help of video conferencing, students and teachers connected with the simulated patient to play the scenario. Similar temporary solutions were designed for medical simulation or practical classes, including instructional videos, online medical simulation scenarios, or video-streamed ward rounds and clinical case presentations. Problems with the lack of clinical exposure and practical skills learning were also noticed by respondents of Gupta et al. (2021). Khalil et al. (2020) observed that online learning was better accepted and more productive in the case of basic medical sciences and preclinical students. Contrarily, clinical students missed contact with patients, human interactions, and practical approach to their studies. The inability to use online learning in the case of practical skills and clinical work, as opposed to the knowledge domain, was also raised by faculty members and students in a study by Mukhtar et al. (2020). Their respondents recommended implementing case-based learning and, additionally, after the lockdown, organizing practical revision classes. Additionally, in their discussion, the authors recommended online simulated patients or role-play interactions as a substitute for teaching clinical and communication skills. As it can be observed in our study, students appreciate the effort, however, they still notice shortcomings and the surrogate character of these methods. One of the few exceptions mentioned by our students were the videos or live-streams from surgeries. Their positive reception was also observed by van Bonn et al. (2021).

- **Health concerns**—examples listed by students included, among others, headaches, back pains, wrist pains, conjunctivitis, deteriorated form and well-being resulting from sitting in front of the computer for a long time. Similar health concerns were also raised by students in the study by Singh et al. (2021), including eye strain, problems with sleep, pains in the neck and back, or headaches. Staying onscreen for a long time was also a common challenge during online learning in the study by Elshami et al. (2021). More than half of respondents of Alsoufi et al. (2020) stated that their well-being was affected by the pandemic. The stress and anxiety associated with the pandemic were also viewed as challenges to online learning by respondents of Rajab et al. (2020).
Students’ engagement and distractions at home—another aspect of a successful implementation of e-learning is the motivation and engagement of learners, who should take responsibility for their education and become active participants of the learning process. Still, some students in our study admitted to problems focusing on the classes and paid attention to the distractions at home. Lack of self-discipline was also seen as a disadvantage by around one-quarter of respondents of Thapa et al. (2021). The issue of students’ lower commitment to attendance and classroom etiquette (e.g., being on time or appropriate dress-code) was raised by students and faculty members in the study conducted by Hayat et al. (2021). Additionally, in a study by Mukhtar et al. (2020), students reported limited attention span and lower attention, while teachers had problems verifying students’ understanding during online lectures due to the limited possibilities for their feedback. As recommendations to improve the situation, their respondents suggested increasing the interactivity of the classes and reduction in their cognitive overload. The issue of maintaining students’ motivation to learn during the pandemic was also raised by Rahm et al. (2021). Their results showed the positive influence of interactive tasks, appealing media and design, occasions for repetition and deepening of knowledge, provision of practical context, and fun game-like appearance on students’ motivation to engage with the presented learning content.

Assessment—this theme covered tests and exams conducted online. Their limitations, like the stress associated with potential technical problems or losing Internet connection during the exam, distractions, and strict anti-cheating precautions, made them mostly prefer the traditional form of writing exams. This seems to be mirrored by results of Elsalem et al. (2021), showing that more than two-thirds of their respondents favored in-campus exams and almost one-third of them the remote ones. Student assessment was also listed as a challenge to online education by more than half of respondents of Rajab et al. (2020). The concerns about plagiarism and maintaining academic integrity during the assessment were also raised by respondents of Mukhtar et al. (2020). A study by Jaam et al. (2021) describes the introduction of similar anti-cheating solutions as ours, including reduction of exams’ duration, anti-plagiarism software, or asking students to turn their cameras on during exams. Some of the solutions proposed by them were already present at our university, for example, using higher levels of Bloom’s taxonomy in tests, so this is probably why our respondents did not mention them. However, as our study shows, it is important to balance the solutions to ensure the integrity of the assessment and not to cause unnecessary burden and stress on students. Similarly, respondents of Jaam et al. (2021) saw positive aspects of some of the solutions like anti-plagiarism software but had mixed opinions about using cameras, for instance. Their respondents also paid attention to distractions or technical problems that can occur at home.

The disadvantages associated with online learning during the current pandemic situation could have also affected the professional development of medical and healthcare students. The results collected on more than 30,000 students by Aristovnik et al. (2020) showed their career concerns and the anxiety and frustration experienced due to the current situation. Students learning online seem to be more likely to quit their studies, and their ability to study was mostly affected by social isolation (Bolatov et al., 2021). In a study by Harries et al. (2021), nearly three-quarters of students felt that the COVID-19 pandemic significantly disrupted their medical education. Although in the same study, around 70% of students responded that medical schools did everything they could to help them in adjusting, more than 60% of students answered that the pandemic still limited their ability to develop skills and competencies necessary to start residency, and for around 45% it interfered with their ability to apply to residency and influenced how their imagined spending their career. Interesting results on students’ burnout were provided by Zis et al. (2021). They observed that almost 20% of surveyed medical students were affected with burnout, with a higher prevalence for clinical years. Additionally, on analysis of burnout dimensions, an increase in cynicism levels was found across all years, which may signify that students start to lose interest and enthusiasm in their studies. Finally, another factor potentially affecting the current situation might be students’ involvement as volunteers during the COVID-19 pandemic. Some authors indicate potential risks for students’ physical and mental health. Others see it as a chance for learning and professional identity development, not to mention the value of their help for preoccupied healthcare workers (Aebischer et al., 2020). A study conducted in Switzerland found that anxiety, depression, and burnout among student volunteers were lower than among their colleagues not involved in the COVID-19 response (Aebischer et al., 2020). However, as the authors explained, their results may be caused by many other factors, including the potential lower likelihood of students with mental health problems to volunteer, good access to personal protective equipment in Switzerland, support from the employers, as well as coherence sense and contact with people. However, the situation and its influence on students could differ across healthcare and education systems, so further studies are needed to understand better the effect of students’ direct involvement at the pandemic frontlines on their mental health status, burnout, and future professional plans.

Consequently, despite the evidence for a generally good impression of students with distance learning during the COVID-19 pandemic as presented in this and other studies, some changes seem unavoidable. However, a lot will depend on the current epidemiological situation in a given country.
During the COVID-19 pandemic outbreak: the use of distance learning methods in medical education. While clinical, practical, and medical simulation classes should return to the face-to-face format as soon as possible. They can, and even should be supported using distance learning methods for theoretical aspects (e.g., seminars and lectures). However, nothing can truly replace the practical hands-on experience and clinical context. This is visible in students’ opinions presented throughout this and other studies in the pandemic context.

Taking into consideration the results of the presented study, we propose the following recommendations regarding the use of distance learning methods in medical education during the COVID-19 pandemic outbreak:

1. Theoretical classes focused on the knowledge domain, for instance, lectures and seminars, should be conducted online. They may involve both asynchronous (e.g., pre-recorded lectures or seminars) and synchronous (e.g., live online classes) forms of e-learning. However, to increase students’ attention and provide teachers with valuable feedback, they should be accompanied (but not replaced) with interactive forms, like quizzes or assignments (Theme 7 and Theme 11).

2. Presentations used during lectures and seminars may be shared with students as additional materials facilitating their learning and preparation for exams. They should not replace the aforementioned e-learning forms as the only method of learning (Theme 7).

3. Clinical rotations, practical and medical simulation classes focused on the skills domain should be conducted in the traditional face-to-face form as soon as the epidemiological situation allows it. As long as it is not possible, they may be replaced with other temporary solutions (e.g., recording of surgeries or medical procedures, clinical case presentations, online medical simulation, or online scenarios with simulated patients). However, their limitations should be kept in mind, and the quality of medical training cannot be compromised. Compensatory practical classes after the pandemic should be considered. Students also do not perceive these methods as full substitutes of traditional education forms (Theme 9).

4. Both the teaching staff and administrative employees should be more attentive to the needs of students. Quick contact paths should be provided via e-mails, social media, and e-learning platforms to keep the information flow. Teachers should encourage students to contact them in case of doubts on the presented topic. They should also actively engage during the classes to limit social isolation and keep students motivated just as they would have done in the real classroom (Theme 8 and Theme 11). Universities should gather information and seek ways to support students with special needs or in a difficult financial situation by providing them with computer equipment or access to the Internet (Theme 6).

5. The negative influence of sitting in front of the computer for a long time should be considered when planning the classes. Universities should also offer psychological support and counseling services to students affected by the COVID-19 pandemic (Theme 10).

6. Anti-cheating mechanisms and precautions should be introduced during online exams. However, the solutions implemented should not be disruptive for students, especially given the existing burden associated with the pandemic, social isolation, and sudden changes in their education (Theme 12).

7. Faculty development and support initiatives should be implemented or, when already present, they should be re-adapted to the new reality, for instance, unprecedented changes in clinical and practical education. Teachers with poor computer skills should also be offered institutional support (Theme 6).

**Limitations**

We acknowledge the limitations of the study. First of all, it was a single-center study, and the sample of students who decided to take part in it cannot be considered as representative of the whole population of medical and healthcare students in Poland. However, given the stress and anxiety accompanying the pandemic period, the necessity to adapt to the new conditions, social restrictions, and a load of academic duties, we believe that the sample we were able to gather seems quite reasonable. Moreover, given that the data saturation was reached and the dynamically developing situation, we did not want to postpone the end of data collection. We are also aware of the possibility of selection bias to the study. Although invitations to participate in the study were sent to all PUMS students, it is possible that those with either very strong positive or negative experiences were more motivated to make their voices be heard and were more willing to answer questions.

**Conclusion**

Although the presented shift towards online learning can be regarded as successful given the exceptional circumstances, some changes seem required. The solutions introduced may become a mainstream method of education for a prolonged period of time both at our university and many other institutions around the world, at least in the case of lectures and seminars. However, as presented by the results of this and other studies in the context of medical education, the clinical and practical parts of the curriculum of future healthcare professionals cannot be easily translated into the online environment. Appropriate steps should be undertaken to restore the face-to-face format of these classes as soon as possible, depending on the current epidemiological situation in a given
country. Overcrowding of the clinical hospitals can also be avoided by moving some part of clinical classes online, for instance, seminars or clinical case presentations. Our results show many advantages of online learning noticed by students. However, given the limitations mentioned by the respondents, appropriate measures should be taken. For teachers they should include, among others, designing and conducting the classes to make them engaging and interactive for learners, paying more attention to students needs during the classes, attempts to reduce negative effects of the social isolation on students’ well-being, offering students adequate support, and participating in faculty development initiatives on conducting online classes. Universities should take constant actions to improve and control the quality of online classes, offer or popularize faculty development initiatives in this regard, provide the staff and students with technical support and ascertain their access to hardware and fast Internet connection, pay more attentions to the needs of members of the academic community, and offer psychological support and counseling services to those affected by the COVID-19 pandemic. Finally, students should get more actively involved in the online classes and pay more attention to risks associated with their disadvantages, like lowered focus and distractions at home or limited learning of practical skills.

Acknowledgments
We would like to thank all the students who participated in the study.

Declaration of Conflicting Interests
The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding
The author(s) received no financial support for the research, authorship, and/or publication of this article.

Ethics statement
Due to the character of the study, the ethical approval was not required under Polish law and the guidelines of the Institutional Review Board provided on its webpage.

ORCID iD
Piotr Przymuszała https://orcid.org/0000-0001-8785-724X
Ryszard Marciniak https://orcid.org/0000-0001-7878-7403

References
Abbasi, S., Ayobb, T., Malik, A., & Memon, S. I. (2020). Perceptions of students regarding e-learning during covid-19 at a private medical college. Pakistan Journal of Medical Sciences, 36(COVID19-S4), S57–S61. https://doi.org/10.12669/pjms.36.COVID19-S4.2766
Aebischer, O., Weilenmann, S., Gachoud, D., Man, M., & Spiller, T. R. (2020). Physical and psychological health of medical students involved in the coronavirus disease 2019 response in Switzerland. Swiss Medical Weekly, 150(December), w20418. https://doi.org/10.4414/smw.2020.20418
Almiah, M. A., Al-Khasawneh, A., & Althunibat, A. (2020). Exploring the critical challenges and factors influencing the E-learning system usage during COVID-19 pandemic. Education and Information Technologies. https://doi.org/10.1007/s10639-020-10219-y
Al Zahraei, E. M., Al Naam, Y. A., Al Rabeeaeh, S. M., Aldosary, D. N., Al-Jamea, L. H., Woodman, A., Shawaeheen, M., Alht, O., Quiambao, J. V., Arulanantham, Z. J., & Elsafi, S. H. (2021). E-Learning of the medical profession’s college students during COVID-19 pandemic in Saudi Arabia. BMC Medical Education, 21(1), 443. https://doi.org/10.1186/s12909-021-02860-z
Aristovnik, A., Kerzič, D., Ravšelj, D., Tomazevič, N., & Umek, L. (2020). Impacts of the COVID-19 pandemic on life of higher education students: A global perspective. Sustainability, 12(20), 8438. https://doi.org/10.3390/su12208438
Bączek, M., Zagäczyk-Bączek, M., Szpringer, M., Jaroszyński, A., & Wozakowska-Kaplun, B. (2021). Students’ perception of online learning during the COVID-19 pandemic. Medicine, 100(7), e24821. https://doi.org/10.1097/MD.0000000000024821
Bani Hani, A., Hijazein, Y., Hadadin, H., Jarkas, A. K., Al-Tamimi, Z., Amarin, M., Shatarat, A., Abu Abeeleh, M., & Al-Taher, R. (2021). E-Learning during COVID-19 pandemic: Turning a crisis into opportunity: A cross-sectional study at The University of Jordan. Annals of Medicine and Surgery, 70(January), 102882. https://doi.org/10.1016/j.amsu.2021.102882
Biggs, J. B. (2003). Aligning teaching and assessing to course objectives. Teaching and learning in higher education: New trends and innovations. University of Aveiro, 13–17 April, 2003.
Bioethical Review Board, Poznan University of Medical Sciences. Retrieved May 4, 2020, from http://www.bioetyka.ump.edu.pl/BADANIA NAUKOWE NIESPONSOROWANE.html
Bolatov, A. K., Seisembekov, T. Z., Askarova, A. Z., Baikanova, R. K., Smailova, D. S., & Fabbro, E. (2021). Online-learning due to COVID-19 improved mental health among medical students. Medical Science Educator, 31(1), 183–192. https://doi.org/10.1007/s10639-020-01165-y
Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa
Camargo, C. P., Tempski, P. Z., Busnardo, F. F., de Arruda Martins, M., & Gemperli, R. (2020). Online learning and COVID-19: A meta-synthesis analysis. Clinics, 75, e2286. https://doi.org/10.6061/clinics/2020/e2286
Choe, R. C., Scuric, Z., Eshkol, E., Cruser, S., Arndt, A., Cox, R., Tomm, S. P., Shapiro, C., Levis-Fitzgerald, M., Barnes, G., & Crosbie, R. H. (2019). Student satisfaction and learning outcomes in asynchronous online lecture videos. CBE—Life Sciences Education, 18(4), ar55. https://doi.org/10.1187/cbe.18-08-0171
Cleland, J. A. (2017). The qualitative orientation in medical education research. Korean Journal of Medical Education, 29(2), 61–71. https://doi.org/10.3946/kjme.2017.53
Compton, S., Sarraf-Yazdi, S., Rustandy, F., & Radha Krishna, L. K. (2020). Medical students’ preference for returning to the clinical setting during the COVID-19 pandemic. Medical Education, 54(10), 943–950. https://doi.org/10.1111-medu.14268
przeciwdziałaniem i zwalczaniem COVID-19]. https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20200000405
Ministry of Science and Higher Education. (2020b). Ordinance of the Minister of Science and Higher Education of March 23, 2020 on the temporary limitation of the functioning of certain entities of the higher education and science system in connection with the prevention, counteraction and combating of COVID-19 [Rozporządzenie Ministra Nauki i Szkolnictwa Wyższego z dnia 23 marca 2020 r. w sprawie czasowego ograniczenia funkcjonowania niektórych podmiotów systemu szkolnictwa wyższego i nauki w związku z zapobieganiem, przeciwdziałaniem i zwalczaniem COVID-19]. http://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20200000511
Ministry of Science and Higher Education. (2020c). Ordinance of the Minister of Science and Higher Education of April 9, 2020 amending the ordinance on the temporary limitation of the operation of certain entities of the higher education and science system in connection with the prevention, counteraction and combating of COVID-19 [Rozporządzenie Ministra Nauki i Szkolnictwa Wyższego z dnia 9 kwietnia 2020 r. zmieniające rozporządzenie w sprawie czasowego ograniczenia funkcjonowania niektórych podmiotów systemu szkolnictwa wyższego i nauki w związku z zapobieganiem, przeciwdziałaniem i zwalczaniem COVID-19]. http://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20200000643
Ministry of Science and Higher Education. (2020d). Ordinance of the Minister of Science and Higher Education of April 24, 2020 amending the ordinance on the temporary limitation of the operation of certain entities of the higher education and science system in connection with the prevention, counteraction and combating of COVID-19 [Rozporządzenie Ministra Nauki i Szkolnictwa Wyższego z dnia 24 kwietnia 2020 r. zmieniające rozporządzenie w sprawie czasowego ograniczenia funkcjonowania niektórych podmiotów systemu szkolnictwa wyższego i nauki w związku z zapobieganiem, przeciwdziałaniem i zwalczaniem COVID-19]. http://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU2020000741
Ministry of Science and Higher Education. (2020e). Ordinance of the Minister of Science and Higher Education of May 21, 2020 on the temporary limitation of the functioning of certain entities of the higher education and science system in connection with the prevention, counteraction and combating of COVID-19 [Rozporządzenie Ministra Nauki i Szkolnictwa Wyższego z dnia 21 maja 2020 r. w sprawie czasowego ograniczenia funkcjonowania niektórych podmiotów systemu szkolnictwa wyższego i nauki w związku z zapobieganiem, przeciwdziałaniem i zwalczaniem COVID-19]. https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU2020000911
Mukhtar, K., Javed, K., Arooj, M., & Sethi, A. (2020). Advantages, limitations and recommendations for online learning during covid-19 pandemic era. Pakistan Journal of Medical Sciences, 36(COVID19-S4), S27–S31. https://doi.org/10.12669/pjms.36.COV19-S4.2785
Nuere, S., & de Miguel, L. (2020). The digital/technological connection with COVID-19: An unprecedented challenge in university teaching. Technology, Knowledge and Learning, 26, 931–943. https://doi.org/10.1007/s10758-020-09454-6
Olum, R., Atulinda, L., Kigozi, E., Nassozi, D. R., Mulekwa, A., Bongomin, F., & Kiguli, S. (2020). Medical education and e-learning during COVID-19 pandemic: Awareness, attitudes, preferences, and barriers among undergraduate medicine and nursing students at Makerere University, Uganda. Journal of Medical Education and Curricular Development, 7, 238212052097321. https://doi.org/10.1177/2382120520973212
Przymuszała, P., Cerbin-Koczorowska, M., Buraczyńska-Andrzejewska, B., Szczeszek, K., Dąbrowski, M., & Marciniak, R. (2020). Good practices in asynchronous e-learning — a short guideline document for Polish medical teachers — A pilot study. Disaster and Emergency Medicine Journal, 5(2), 1–9. https://doi.org/10.5603/demj.a2020.0014
Przymuszała, P., Piotrowska, K., Lipski, D., Marciniak, R., & Cerbin-Koczorowska, M. (2020). Guidelines on writing multiple choice questions: A well-received and effective faculty development intervention. SAGE Open, 10(3). https://doi.org/10.1177/2158244020947432
Rahm, A.-K., Töllner, M., Hubert, M. O., Klein, K., Wehling, C., Sauer, T., Hennemann, H. M., Hein, S., Kender, Z., Günther, J., Wagenlechner, P., Bugaj, T. J., Boldt, S., Nikendei, C., & Schultz, J.-H. (2021). Effects of realistic e-learning cases on students’ learning motivation during COVID-19. PLOS ONE, 16(4), e0249425. https://doi.org/10.1371/journal.pone.0249425
Rajab, M., Gazal, A., & Alkattan, K. (2020). Challenges to online medical education during the COVID-19 pandemic. Cureus, 12(7), e9866. https://doi.org/10.7759/cureus.8966
Ramos-Morciillo, A. J., Leal-Costa, C., Moral-García, J. E., & Ruzafa-Martínez, M. (2020). Experiences of nursing students during the abrupt change from face-to-face to e-learning education during the first month of confinement due to COVID-19 in Spain. International Journal of Environmental Research and Public Health, 17(15), 1–15. https://doi.org/10.3390/ijerph17155519
Shroff, R. H., Vogel, D. R., Coombes, J., & Lee, F. (2007). Student E-learning intrinsic motivation: A qualitative analysis. Communications of the Association for Information Systems, 19, 241–260. https://doi.org/10.17705/ICAIS.01912
Singh, H. K., Joshi, A., Malepati, R. N., Najeeb, S., Balakrishna, P., Pannerselvam, N. K., Singh, Y. K., & Ganne, P. (2021). A survey of E-learning methods in nursing and medical education during COVID-19 pandemic in India. Nurse Education Today, 99(January), 104796. https://doi.org/10.1016/j.nedt.2021.104796
Thapa, P., Bhandari, S. L., & Pathak, S. (2021). Nursing students’ attitude on the practice of e-learning: A cross-sectional survey amid COVID-19 in Nepal. PLOS ONE, 16(6), e0253651. https://doi.org/10.1371/journal.pone.0253651
van Bonn, S. M., Grajek, J. S., Schneider, A., Oberhoffner, T., Mlynks, R., & Weiss, N. M. (2021). Interactive live-stream surgery contributes to surgical education in the context of contact restrictions. European Archives of Oto-Rhino-Laryngology, 0123456789. https://doi.org/10.1007/s00405-021-06994-0
Weerasinghe, I. S., Lalitha, R., & Fernando, S. (2017). Students’ satisfaction in higher education literature review. American Journal of Educational Research, 5(5), 533–539. https://doi.org/10.12691/education-5-5-9
Zis, P., Artemiadis, A., Bargiotas, P., Nteveros, A., & Hadjiigeorgiou, G. M. (2021). Medical studies during the COVID-19 pandemic: The impact of digital learning on medical students’ burnout and mental health. International Journal of Environmental Research and Public Health, 18(1), 349. https://doi.org/10.3390/ijerph18010349