Current news

Distance learning experience for medical students during a pandemic and martial law

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Being unable to use the usual form of education focused mainly on the teacher, higher education institutions are forced to introduce rules and instructions that would be focused on education seekers and help facilitate the perception of educational material. The consequence of the current situation is the growth of the general interest in distance learning during the pandemic, which later continued during the Russian aggression. In the case of clinical disciplines, certain features determine the use of methods and elements of simulation and individualized training for students of medical faculties, interns and students of the faculty of postgraduate education. Objective. To study the peculiarities of distance learning during the pandemic of acute respiratory disease COVID-19, caused by SARS-CoV-2, and martial law, the identification of the main determinants for the successful arrangement of the online education process.

The logical method was used to create instructions for optimizing the conditions and means of learning and teaching. The article reflects the peculiarities of distance learning, introduced during the pandemic and continued under circumstances of martial law caused by the armed aggression of the Russian Federation. Positive aspects of an adequate visual presentation of information during clinical lectures are determined. The results of the survey conducted to determine the attitude of education seekers and scientific and teaching staff to distance learning are presented to identify the shortcomings of this form of education and the development and implementation of Internet resources based on methods and tools that can be used in training to increase the level of student success. Based on its results, the most important features that have the biggest effect on the quality of education were identified.

Keywords: Education, distance learning, online resources, epidemic, martial law, force majeure.
Introduction

Problem statement. The issue of identifying the shortcomings of the distance learning of medical students under force majeure conditions and its development is very relevant today and is covered in the studies of numerous scientists [1–3; 6; 9; 11–12]. Researchers note that the partial use of the online format for students of medical faculties and university teachers has already been an integral part of the educational process [1; 6; 7]. However, the complete transition to distance learning involves certain responsibilities and duties that are part of the educational process for students, research and teaching staff [11–13]. As it was impossible to use the usual form of education under the conditions of the pandemic, higher education institutions were forced to introduce rules and instructions aimed at students for easier perception of educational material [2; 7]. This situation resulted in the growth of the general interest in distance learning during the pandemic of the acute respiratory disease COVID-19, caused by the SARS-CoV-2 coronavirus, and continued under the conditions of martial law caused by the armed aggression of the Russian Federation. This is evidenced by the increased number of search queries in search services of various Internet sources [4; 13]. Distance learning offers new forms of knowledge acquisition that greatly simplify the educational process, namely attending classes at any educational institution in the world, virtual trips, and excursions to famous museums, galleries, exhibitions, etc. Therefore, while acquiring a new meaning, distance learning is becoming popular both among participants in the educational process of universities and ordinary citizens. However, for clinical disciplines, some peculiarities determine the application of methods and elements of simulation and individualized conduct of classes for medical students, interns and students of the faculty of postgraduate education.

Analysis of recent research and publications. One of the important aspects of our country’s social life is education, which has undergone significant changes due to quarantine measures related to the 2019 coronavirus disease (COVID-19) pandemic that started in China. As a result, all spheres of society changed, and one such change was the transition to distance learning [1; 5]. For all educational institutions, the academic year started under the conditions resulting from the outbreak of the coronavirus disease epidemic and global changes due to the imposition of restrictive quarantine measures. In a short time, all educational institutions had to switch from traditional to distance education. This situation contributed to the identification of issues in the field of education and the search for new forms of presenting clinical material and their introduction for maintaining a high level of basic and professional knowledge. All educational institutions had to develop special work programs taking into account new teaching conditions and conduct research on the students’ readiness to switch to a new learning format, namely on how well they are provided with the necessary equipment for remote learning, whether they have experience working with the required programs and how competent they feel in the field of online learning [5; 10; 11]. The problem intensified with the aggression of the Russian Federation, hostilities in the east of Ukraine, bombings, missile strikes, air raid alarms, and cyber-attacks, which caused instability of the Internet connection and the disruption of normal Zoom network communication.

All research on the peculiarities of distance learning under conditions of quarantine and lockdown is aimed at studying public opinion as an active and integral participant in the educational process, identifying the best conditions for its implementation and improvement, as well as finding new forms of assessment and sharing information required for obtaining professional knowledge [2; 3–5]. Therefore, by researching experiments to identify the most common characteristics of distance learning under the conditions of the pandemic, which were conducted by leading experts in the field of education, it is possible to highlight the benefits and shortcomings of this form of education. According to surveys conducted by scientists in many countries of the world, accessibility, flexibility, popularity, easy information sharing, and interactive software infrastructure of the educational process were highlighted as the main advantages [2; 6], along with the possibility of using virtual classrooms and easy access to virtual resources [2]. Distance learning does not require a physical presence on the university premises, so medical students can attend online classes in circumstances of force majeure, even if their health condition prevents doing it in person. With this form of education, they can receive educational material at a convenient time, as well as study in an educational institution of any country in the world, regardless of their place of residence. This considerably simplifies admission to an educational institution and obtaining the required knowledge. The use of new forms of educational material presentation allows for obtaining the desired amount of knowledge, which is not limited to the curriculum, which contributes to an advanced level of training [2; 5]. With the latest technologies, the process of independent learning is simplified, which is an important component of the educational process [5].
Objective. To study the peculiarities of distance learning during the pandemic of acute respiratory disease COVID-19, caused by SARS-CoV-2, and martial law. The comparison of traditional education with distance learning under circumstances of force-majeure and the identification of the main determinants for the successful arrangement of the online education process.

Materials and Methods
Using the comparative analysis, the difference between traditional distance learning [5; 8; 13] and distance education under the conditions of the pandemic of acute respiratory disease COVID-19, caused by the SARS-CoV-2, and during martial law, was identified. Areas for the implementation of the principles of scientific ethics in the educational process under such circumstances, the criteria for education efficiency, in particular, at clinical departments, stages and corresponding methods and means were identified [2; 5; 8]; primary results of the survey of teachers and students were analyzed. 318 educational presentations, 3,185 clinical, intraoperative photo and video materials, created at humanitarian, theoretical and clinical departments of medical faculties, as well as clinical departments of the postgraduate education faculty of Danylo Halytsky Lviv National Medical University, were reviewed and analyzed. Since a full harmonization of existing online courses and work programs was impossible due to the urgency of the transition from traditional or partially distance learning to exclusively distance education as the only form of material and educational information presentation, the quality of such resources sometimes did not meet the standards and expected results. The logical method was used when creating instructions for optimizing the conditions and means of learning and teaching [2].

Results
Despite the significant advantages of distance learning, there are certain shortcomings of this form of education. First, the dependence of knowledge acquisition on technical means, which is the only possibility of communication with the teacher [1–3; 9; 10]. At the same time, during such classes, teachers must consider potential opportunities and individual needs of each person. Under conditions of martial law or active hostilities, not all education seekers have the opportunity to connect to the Internet or purchase special equipment required to receive educational resources online. Therefore, for the effective introduction of distance learning, it would be advisable to implement free Internet for all participants in the educational process and provide them with the necessary equipment for distance education [2; 5]. The same applies to the quality of online resources used by teachers during classes [8]. Hence, for successful teaching, educators need high-quality online resources, which will meet the requirements of the Ministry of Education and Science, as well as ensure an effective learning process. Educational and methodological information should be backed up to the cloud storage, electronic archives, repositories and websites of structural units within educational institutions [2; 5].

Given the rules for using technical equipment necessary for the organization of the educational process during distance learning, optimal conditions should be created for the successful material perception, the organization of a comfortable workspace and the observance of a special schedule created for the purpose of maintaining the balance between study time and rest [1–3; 5; 7]. Unless screen time rules provided by doctors for specific ages and individual peculiarities of education seekers are followed, a computer or any other device used by the student during the educational process may produce a negative impact. These rules should be prescribed in the working curricula of educational institutions, which teachers must follow during online classes [1; 2]. It would be appropriate to take regular breaks between academic work and homework, which will help maintain the student's mental and physical condition at the appropriate level. Incentives for properly completed work should be an integral part of the learning process, which will encourage students to become more active in knowledge acquisition [1; 3]. According to scientists, one of the most significant disadvantages of distance learning in such force-majeure conditions is the lack of socialization and the inability to acquire social communication skills, which are one of the main factors of coexistence and successful interaction between people [13]. We confirmed that 27.3–41.7% of the faculty, in particular, 32.5–43% of clinical department teachers and 25–34.6% of medical faculty students are dissatisfied with distance learning as the only form of learning, which, among other things, leads to "professional burnout" due to difficulties with the possibility of acquiring adequate practical skills outside the direct contact with clinical simulators and/or department patients, which also correlates with the data in professional literature [4; 5; 9–11].

The mentioned shortcomings are the consequences of the rapid pace of distance education introduction under the conditions of the pandemic with insufficiently ready methodical and technical support. The introduction of distance
Distance learning is characterized by this transition being mandatory under conditions of total lockdown [3]. Before the coronavirus epidemic, distance learning was used as an auxiliary resource to traditional education, which helped integrate the latest technologies into the educational process. Distance education during the COVID-19 epidemic was the only tool used as part of the educational process not just in Ukraine but also in almost all countries across the globe.

Despite natural and man-made disasters in many countries, their consequences were not so massive as changes caused by the coronavirus disease. Participants in the educational process had to urgently find new means of information transmission, organization of education and assessment systems without insufficient knowledge, skills and resources for this [1; 3; 10]. These changes were seen as short-term measures that would allow supporting all aspects of the learning process until the lockdown end. Traditional distance learning is voluntary and can combine online and offline classes; it includes theoretical, practical courses and laboratory classes; it is often inaccessible to students of higher education with special educational problems; it requires psychological readiness of all participants in the educational process for this form of education; adaptation to existing curricula and programs.

Distance learning during the pandemic of the acute respiratory disease COVID-19, caused by the SARS-CoV-2, and under conditions of martial law caused by the armed aggression of the Russian Federation, is compulsory with only online classes being held; certain types of practical classes cannot take place at the appropriate level; there is a problem of educational material perception by students with special educational needs, even in the presence of appropriate technical equipment; students and teachers lack preliminary preparation; incomplete correspondence of online resources to educational curricula [1; 3; 4]. To assess the consequences of distance learning introduction under conditions of the rapid transition to a new form of knowledge acquisition and to improve the material and technical base of educational institutions, experts consider the social, personal, pedagogical and psychological peculiarities of the influence of distance learning [1; 2].

If we consider the social aspects of the impact of distance learning, we can talk about the negative attitude of a certain number of education seekers and teachers towards the distance form of knowledge acquisition. Some participants in the educational process believe that this form of education makes it impossible to acquire vital social communication skills and can have an adverse impact on the development of an individual as a component of society [1; 5]. We have also confirmed significant difficulties in students acquiring adequate practical skills and competencies, not only social, in particular professional communication, conducting an examination, collecting and evaluating anamnesis, but also clinical (physical) examination, providing emergency medical care, etc., which determines the need for the application of services with educational interactive modules, additional creation of adequate resources, educational and game tools for interactive component of classes and clinical online video simulators with remote or combined control.

The personal component of a person's life also underwent certain changes, which affected relations with family members living in the same territory, the level of tolerant attitude towards the peculiarities of other people decreased due to the lack of daily examples of tolerance. In addition, when conducting a study of the personal opinion of students forced to stay at home due to distance learning, answers were registered about the violation of personal space, which had an adverse effect on the psychological state of the individual and contributed to lower academic success rates [2; 12].

The pedagogical component of the peculiarities of distance learning’s impact on the level of academic success and the quality of education consists of two opposite opinions. Proponents of the first opinion believe that distance learning reduces the level of education due to an imperfect system of education in the conditions of the pandemic. The insufficient level of the material and technical support of all participants in the distance educational process does not allow for holding classes at a level required for the effective acquisition, mastering and repetition of clinical material. To create more effective training, it is necessary to include all types of classes in the curriculum, in particular, combined classes; presentation of new material; consolidation of learned material and development of practical skills; individual work; class conferences; seminar classes; repetition, generalization and systematization of the studied material [3; 11]. The use of such variations in the conditions of distance learning, in particular, at the department of family medicine, causes certain technical difficulties that teachers must overcome when preparing for classes. Various Internet resources come to the rescue, including Zoom, Google Class, Viber, etc., which are basic software tools, using which is the main determinant of the successful organization of the online educational process. Classes in a format of
a flipped classroom provide for the basic acquisition of the educational material during the independent study of the topic, while classroom work time is allocated to tasks, exercises, conducting practical research, individual consultations [3]. But to use this method of presenting educational material and developing skills, it is necessary to make significant changes to the curriculum and improve it under conditions of martial law. For example, a web portfolio is a resource that reflects the state of the owner’s educational or professional achievements, helps identify problematic aspects in the learning process and draws attention to topics that require repeated or more in-depth study. A student’s web portfolio is a website displaying the results of their training: completion of project tasks, laboratory work and joint activities. One of the most popular types of modern distance learning for medical students is mobile learning, that is, learning that involves the use of portable technologies without violating copyright (intellectual property of a specific teacher or department), which allows receiving educational material regardless of the place of residence [3; 12]. This type of distance education is very relevant in the conditions of the coronavirus pandemic, martial law, hostilities and other force majeure circumstances, as it allows for avoiding the interruption of the educational process even if the student or teacher is staying in places without stationary equipment necessary for communication with all study participants [1; 2; 6; 9–11; 13].

At Danylo Halytsky Lviv National Medical University, digital micro repositories, presentation archives in .ppt and .pptx using Microsoft Office and Libre Office licensed software packages are in place in morphological and clinical departments of the medical faculties for distance learning, introduced during the pandemic of acute respiratory disease COVID-19, caused by SARS-CoV-2 and extended during martial law resulting from the military aggression. Such presentations are accompanied by 77.3% of the lecture material for students of years 1–3, 83% – for students of years 4–5, and 83.8% – for students of the 6th year and medical interns. 70.2% of the training material is also duplicated in the cloud storage for backup purposes. The provided educational photo and video material, in addition to the generally accepted description of clinical observations, includes statistical data, intraoperative and intra-bandaging photographs, results of laboratory, instrumental, and morphological examinations (Figure 1), voice comments of the operating surgeon and/or a person conducting the examination and a teacher, as well as captions that optimize the lecture, unify the presentation of clinical material, improve it for acquisition by students.

![Image: Fragment of the presentation of the clinical lecture “Chronic purulent-necrotic and combined onychopathology in palliative patients: clinical and morphological parallels” (Lviv National Medical University website, .pdf). Visual presentation of intraoperative clinical material, results of morphological and radiological studies.](https://example.com/image.png)
Educational photo and video recording at the clinical bases of the Department of Family Medicine of the Municipal Non-Profit Enterprise Lviv Territorial Healthcare Association “Clinical Hospital for Planned Treatment, Rehabilitation and Palliative Care”, in particular intraoperative, was carried out without violating the requirements of bioethics using digital compact professional cameras Olympus SZ-14, Olympus SZ-30MR, Fujifilm FinePix S1800 HD/Fujifilm FinePix S2900, Canon PowerShot SX120 IS and Canon PowerShot SX130IS (Optical Zoom ≥ 10.0, resolution ≥ 8.0 MP). These cameras are characterized by high optical zoom, light-sensitive optics and high-quality matrices, which allow obtaining high-quality photos with clear macro-detailing of tissues in the macro mode, including pathological changes, and the possibility of further digital zoom and visual examination of the footage. Four cameras were used simultaneously. Three cameras from different manufacturers were placed on tripods at different viewing angles, but at the same distance from the surgical wound. The fourth camera (Canon PowerShot SX130 IS) was used for manual video recording (intraoperative) or photography (intrabanding), which was performed by the ward nurse on duty. Photo equipment was operated manually – photos were made using manual presetting to aperture priority mode, focus in the center – on the bottom and edges of the surgical wound. Radiographs were digitized by direct photography from a negatoscope fixed on a tripod with a SONY Cybershot DSC-W180 digital camera with a Carl Zeiss® Vario-Tessar® lens (10 MP, manual mode without flash, ISO 100). Thus, using the capabilities of optics from different manufacturers, focusing accuracy at a low level of light sensitivity (ISO80-100) without stabilization or other software means that can distort the results, a series of photos and videos were obtained, which were later archived and actively used in the educational process. Photos were saved in .jpg (Joint Photographic Experts Group) format. The intraoperative video was recorded in Full HD format (with a resolution of 1920×1080 pixels and a frame rate of at least 24/sec). Intraoperative and intrabanding photographs were not retouched using photoshop or any other software. Only cropping with the help of Microsoft Office Picture Manager licensed software with proportional image zoom was used. These measures do not affect the transmission quality and detail, do not distort the visual picture and do not affect the Exchangeable Image File Format (EXIF – photo files) – a standard that allows adding additional information (metadata) to comment on this file to images and other media files, describe conditions and methods of its obtaining and the authorship, i.e., camera data). Presentations for students of years 4–5 include a thematic photo and video recording of clinical observations and results of laboratory and instrumental research; for students of the 6th year and medical interns – the presentation of intraoperative photo and video footage with the help of manual photo and video recording carried out under rational viewing angles of the operating field (without the use software image zoom, with proper external backlighting of the operating field, using wide angle lens, with a low ISO level), as well as a collage with the results of various stages of complex treatment. Conversion into .pdf was made using LibreOffice 5.4 – LibreOffice Impress and Ilovepdf (https://www.ilovepdf.com), as well as Smallpdf (https://smallpdf.com/ru/ppt-to-pdf). Intraoperative and intrabanding photos, videos and presentations were presented via the ZOOM platform using the screen sharing feature (Figure 2) and Honeyview and Media Player Classic software.

![Figure 2. ZOOM conference. Screenshot of the screen sharing feature. A pre-launched Honeyview software is visualized to present intraoperative photography in a slide show format with EXIF image data](https://www.zoom.com)
Microsoft Office PowerPoint presentations were demonstrated similarly. The recommended literature was presented on the department's website among educational and methodological materials and was additionally shown at each session in the ZOOM conference chat. Presentations also include charts comparing the effectiveness of various methods and means of complex treatment, empirical, comparative and statistical analysis data determining the visual perception of information and the development of a rational creative approach to the customization of diagnostic and treatment tactics within the framework of generally accepted clinical protocols. We pay considerable attention to the design of summaries and their presentation after each structural and logical block of educational material; analysis of treatment results, the long-term consequences of surgical interventions, the quality of life, the results of re-examination, the presence of complications and relapses (Figure 3).

Figure 3. A fragment of the presentation of the clinical lecture “Treatment of bedsores with colliquative necrosis of soft tissues and purulent complications in the palliative care department: A clinical review” (website of the Department of Family Medicine, .pptx). Parallel collage presentation of treatment results at different stages

Discussion
Presentations of clinical lectures and other educational material using digital technologies are converted to .pdf (see Figure 1) and other password-protected formats – read (view) only, which reduces the likelihood of their unauthorized use and the risks of plagiarism. Each presentation ends with conclusions that are adequate in relation to the structural and logical blocks of the educational material, correspond to the goal and objectives of the class, and to some extent reflect the thematic scientific achievements of the department (Figure 4). Conclusions summarize and specify the educational material and motivate students to further clinical research and in-depth analysis of the specialized literature.
All presentations are gathered in logical blocks according to the topics of departments, training courses and analytical characteristics; they are publicly available on the university’s website. All other educational materials are presented on the websites of respective departments and clinics, which allows for reviewing and analyzing clinical resources for better mastering. The availability of the presentation on the website of the medical university in a protected .pdf format during the pandemic of the acute respiratory disease COVID-19, caused by the SARS-CoV-2, and extended during martial law, determines the possibility of free access to the text and visual clinical educational information, which is a kind of educational clinical archive for teachers and students, a backup copy of materials, which is an extremely important measure under conditions of martial law and cyber-attacks [3; 12]. A visual view of clinical data in the presentation in the form of photographs with comments and automatic playback of slides, materials of clinical, intraoperative video recording enables a full online broadcast of the lecture material, automated playback of information, which is relevant in the conditions of an air raid alarm; it allows temporary implementation of life safety measures and information security without interrupting the educational process, in this specific case – a seminar or practical session [3]. The assessment was made using the generally accepted MISA university testing system (MISA). In the ZOOM chat, information was provided about educational materials and websites, based on the class topic, and the results of the current assessment were made public.

Special attention should be focused on the use of virtual classrooms, which are an alternative to traditional communication between a teacher and a student. The lack of such communication affects the psychological component of distance learning under conditions of disrupted daily routines. Limited cognitive activity in the learning process, namely the inability to attend seminars, symposia, conferences, master classes and thematic meetings, also had an adverse effect on the general condition of a person and their daily activities. During the pandemic and martial law, the management of higher education institutions also faced the problem of organizing pre-examination training [3; 5]. For quite a long time, these events were an integral part of the educational process, but
after the transition to distance learning under conditions of hostilities, there was an urgent need to change the format of extracurricular events to restore the traditions of the educational process.

Having considered the peculiarities of the influence of distance learning during the pandemic in terms of four important components of the learning process in universities, it is advisable to pay attention to the impact of the arrangement of the educational process and learning space at home. The transition to distance learning contributes to changing the usual schedule [3]. The possibility of waking up later than usual, spending most of the day in bed or changing the usual meal schedule leads to reduced activity and can cause obesity and other associated diseases. Therefore, to maintain the usual level of physical and social activity [6; 9; 12], the learning process, which is an integral part of students' lives and takes up most of their day during the working week, must be improved [1; 9].

The analysis provides grounds for using such peculiarities of the educational process organization that would contribute to improving the perception of the educational material by students, namely:

- introducing innovative and traditional teaching methods adapted for distance learning (verbal, visual and practical);
- using various teaching aids that will contribute to increasing the level of success (environmental objects, devices and means for demonstration experiments, technical teaching aids, devices for monitoring knowledge and skills);
- adapting existing online resources to educational curricula;
- conducting psychological training and providing psychological assistance to all participants in the educational process;
- paying particular attention to special physical and mental exercises aimed at relieving physical and emotional stress [9].

Despite a large number of shortcomings related to distance education [8–11], which was urgently implemented in the context of the introduction of preventive measures during the coronavirus epidemic, some teachers and students believe that distance learning provides some additional opportunities for all participants in the educational process [1; 2; 4; 6; 9–11]. We believe that the results of the survey data analysis, the educational material of departments, and our experience confirm the need to focus students' attention on nosological forms, peculiarities of complex treatment, and the acquisition of practical skills and competencies necessary under conditions of force majeure, which should be taken into account when adapting existing and developing new curricula and programs for distance education, in particular, those that are relevant during the pandemic and hostilities. Practice shows that under such conditions, due to its specificity, inclusive education also needs special attention. While earlier the issue of introducing the latest technologies into the educational process of students with special needs was the task of a small number of specialists from certain ministries and departments, after changes in the education system caused by the consequences of the coronavirus epidemic and the military invasion, this issue has become more pressing and is now treated by specialists with particular attention [1–3; 6]. During martial law, special educational institutions can provide psychological-pedagogical and correctional-developmental services using remote technologies. During the pandemic and martial law, departmental institutions have developed instructional and methodical recommendations for training people with special educational needs [1; 4–6]. Today, under conditions of distance learning during the pandemic of COVID-19 and martial law, more attention is focused on the independent work of university students, which facilitates the enhancement of such personal qualities as self-organization, self-discipline, perseverance, and creativity. Independent work contributes to the development of cognitive abilities, mastering the techniques of the cognitive process, interest in cognitive activity, deepening and expanding knowledge, all of which positively affect the acquisition of the necessary knowledge in the process of learning under force majeure conditions [6; 12]: pandemic and military aggression (martial law).

In conclusions:

1. The introduction of distance learning for all educational institutions in Ukraine and across the globe as a single form of education became a new experience using state-of-the-art technologies, while completely modifying the structure of knowledge acquisition at all levels. At the same time, during such classes, teachers
must take into account the potential opportunities and individual needs of each person, who needs significant revision and improvement of the technical and methodological framework of the educational process to create a high level of presentation and acquisition of knowledge, which are fundamental for the higher education in our country.

2. Distance learning in force majeure conditions – pandemic and martial law – has become practically the only chance to obtain an education, especially for people with learning disabilities, which will later enable the acquisition and improvement of professional skills, as well as getting a proper job to ensure the necessary standard of living. If appropriate measures are introduced, special educational institutions will be able to provide psychological-pedagogical and correctional-developmental services using remote technologies.

3. Recommendations concerning the organization of the educational process in force majeure conditions, in particular during military aggression, are mostly aimed at the theoretical component of learning and require further discussion and development for the creation, implementation and improvement of special methods and resources that will be used for effective sharing of educational information.

Prospects for further research

Improvement of procedures and recommendations for distance learning in force majeure circumstances, testing of modern software to expand opportunities and improve the quality of the educational process, in particular, the creation and visual playback of educational presentations, current and final assessment.

References


