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Undergraduate online teaching of family medicine during the epidemic with SARS-CoV-2

Dodiplomsko spletno poučevanje družinske medicine v času epidemije virusa SARS-CoV-2

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Abstract

Background: At the time of the SARS-CoV-2 epidemic, the entire theoretical part of family medicine rotation had to be conducted through online teaching.

Methods: Teaching of family medicine was adapted to the implementation via a video conferencing system. We added epidemic-related topics, introduced regular homework, increased the use of the virtual classroom, and introduced the use of forums. We used new methods, such as "flipped classroom", problem-based learning with clinical vignettes and video consultations in teaching communication skills. The method of gamification worked especially well with the introduction of a quiz in teaching.

Results: We asked students and teachers to assess the quality of online lessons. In the students' opinion, the lessons went well and they liked the modern methods. They suggested there should be more discussion on clinical cases and common conditions in family medicine. They gave online teaching the same score as clinical rotation. Educators mentioned high self-motivation and innovation in changing lessons, and liked the time flexibility, but at the same time found that online teaching increased time demands. In the future, some students from remote parts could perform clinical rotations in their home environment, which would reduce the number of mentors needed in Ljubljana. Online teaching offers the opportunity to learn the modern skills of a family doctor (such as video consultations), motivation of students (such as gamification) and enables creation of a repository of teaching materials and participation of guests from abroad. The disadvantages are lack of personal contact with the students, and inadequate learning opportunities of clinical skills.

Conclusion: With the immediate transition to online teaching, we tested new teaching methods and identified some advantages and disadvantages. This experience will be important for changes in teaching in the coming years.

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Izvleček

Izhodišča: V času epidemije covida-19 v Sloveniji je bilo potrebno celotni teoretični del pouka družinske medicine izvesti po spletu.

Metode: Pouk družinske medicine smo prilagodili izvedbi preko videokonferenčnega sistema. Dodali smo aktualne teme o epidemiji, uvedli redne domače naloge, povečali uporabo spletne učilnice in vzpostavili možnost foruma. Uporabili smo nove metode, na primer predavanje z "obrnjeno učilnico", problemsko usmerjeno učenje s kliničnimi vinjetami in video-posvet o pouku sporazumevanja. Posebej se je obnesla metoda igrifikacije oz. uvedba kviza v pouk.

Rezultati: Kakovost, prednosti in nevarnosti spletnega pouka smo ocenili z anketo študentov in mnenjem pedagogov. Študenti so ocenili, da je pouk dobro potekal, sodobne metode so jim ugajale, predlagali pa so več kliničnih primerov in predstavitev najpogostejših stanj v družinski medicini. Spletni pouk so ocenili enako visoko kot klinične vaje. Pedagogi so navedli visoko lastno motivacijo in inovativnost pri spremembi pouka, poudarili prednost časovne prilagodljivosti, po drugi strani pa časovno zahtevnost spletnega poučevanja. V prihodnosti bi lahko s pomočjo spletnega poučevanja določen delež študentov opravljal klinične vaje v domačem okolju, s čimer bi potrebovali manj mentorjev v Ljubljani. Spletno poučevanje ponuja možnost učenja modernih veščin zdravnika družinske medicine (npr. videoposvet), aktivacije študentov (npr. igra vlog) ter omogoči ustvarjanje repozitorija učnih gradiv in sodelovanje gostov iz tujine. Slabost pa je odsotnost osebnega stika s študenti ter neustreznost za učenje kliničnih veščin.

Zaključek: Ob takojšnjem prehodu na spletno poučevanje smo preizkusili nove metode pouka, ugotovili nekatere prednosti in pomanjkljivosti. Te izkušnje bodo pomembne za spremembe pouka v naslednjih letih.

1 Introduction

1.1 Online teaching and its effectiveness

The concept of online teaching and learning has been around for several decades and is represented by distance learning using information technology, and learning using local multimedia applications (1). Online teaching began with the exchange of e-mails, recorded lectures, or uploaded multimedia content. Since 2000, the development of technology has enabled many methods, including direct ones using video conferencing systems, blogs, virtual classrooms, podcasts (audio broadcasts) and other forms (2). There are many advantages to distance learning, as it overcomes the problem of distance as well as time differences. The student also has a greater opportunity to individually adjust the content and the scope of learning (3). Many participants find it easier to get involved in discussions. There is, however, a problem of a lack of social interaction between students and teachers and the need for appropriate information equipment and well-functioning technology (3).

With the rapid development and increase in the use of online teaching, it was necessary to scientifically check the quality of such teaching and, above all, to determine the difference in knowledge, skills, attitudes, and student satisfaction compared to traditional teaching. In a systematic review of 2,011 articles, only 30% of the surveys included showed that knowledge acquired through online lessons was better, while skill lessons were shown to be more successful in 62% of surveys. In 42% of surveys, online teaching showed a greater number of changes in students' perspectives than traditional teaching. Compared to traditional teaching methods, student satisfaction with online teaching was higher in 56% of surveys. There was even less consensus on the evidence of the cost-effectiveness of online lessons (4). Genischen et al. found that online teaching is cost-effective in terms of teacher timing, savings in travel costs, labour costs and institutional infrastructure (5). The results of the research, however, contradict each other and allow us to conclude that online teaching is at least equivalent to traditional teaching, and perhaps even more effective in acquiring knowledge. In the reviewed literature, the authors list many more opportunities for further research, e.g. which elements and forms make online teaching effective and how they (should) differ according to the level of knowledge of the students (6). Online teaching approaches and materials need to be evaluated (7).

At the Faculty of Medicine in Ljubljana, forms of online teaching and its tools have existed for a long time; there is a virtual classroom available and the use of various multimedia content, which has so far usually represented individual elements in study content.

1.2 Description of the Primary Health Care course

The Primary Health Care (PHC) course is taught in the sixth year of medical school and it combines the Family Medicine (FM) and Occupational, Traffic and Sports (OTSM) courses. The rotation lasts six weeks and takes place four times a year. As part of the FM, students have three days a week of clinical practice in outpatient clinics, and one day is dedicated to working in small groups. One day a week is dedicated to obligations regarding the OTSM course.

The theoretical part of family medicine lessons is implemented in the form of lectures, seminars and work in small groups. Learning objectives are defined on the basis of its definition, or the six characteristics: primary care management, person-centred care, specific problems solving skills, comprehensive approach, community orientation, and hollistic modelling (8).

Each day of theoretical lessons begins in the morning with a lecture on the topic of the day for all students of rotation, then classes continue in four small groups of 10-12 students. In groups, students present a clinical case from an outpatient clinic on the topic of managing a patient with an acute or chronic illness, a multimorbid patient, a patient with a mental disorder or an inappropriate lifestyle. This is followed by watching and commenting on a role-play video, a conversation between the student and the simulated patient as part of a communication skill exercise, and finally a conversation about the homework assignments that students are given each week. After working in a group, a plenary seminar for all students follows, at which topics of a practical nature are presented and where Slovenian or non-native guests often participate.

The theoretical part of the lesson is closely connected with the clinical work in the outpatient clinic with the presentation of the patient and the assignments.

1.3 Modified teaching methods during the COVID-19 epidemic

During the epidemic, undergraduate medical education around the world had to quickly adapt. In the second half of this year, many articles were published in which the authors presented various challenges and experiences with online teaching. The latter posed a particular challenge for teachers, who had to enable support in the transition to online teaching, share experiences, and identify shortcomings in both technological needs and content implementation (9). Various teaching methods were tested, such as team-based learning, by dividing students into breakout rooms (10). The students were mostly satisfied with the online lessons, although in qualitative research they mentioned a problem regarding the quality of the lessons and their own understanding of lectures, schedules, etc. (11). Online lessons in large groups showed lack of possibility for communication between participants, usually only possible through messages. The opportunity of using an additional communication platform for additional group discussions, also during plenary debates, was presented (12). Communicating with students and learning clinical skills were also presented as a problem by others (13).

Two weeks after the start of the third rotation of the 2019/2020 school year, an epidemic of the SARS-Cov-2 virus was declared in Slovenia, thus making clinical practice and theoretical lessons in the traditional way impossible. We had to quickly reorganize and move to online teaching of theoretical content. This required a significant adjustment of the content, which was also the case for the fourth rotation of the academic year. This one took place entirely online.

In the framework of online teaching, we wanted to preserve the content of lessons by adapting learning objectives and methods to existing conditions. We followed the planned schedule of theoretical lessons as closely as possible, with some modifications depending on the circumstances. However, the connection with outpatient learning was absent, which could not be replaced with online teaching. In this article, we will describe the process of adapting lessons, the evaluation methods used and the possibilities for lessons in the future.

1.3.1 Changes to conducting lectures and plenary seminars

Plenary lectures and seminars were held via a video conferencing system. Unlike traditional lessons, in which mainly lecturers of the Faculty of Medicine in Zagreb participated among the non-native attendees, the technology enabled us to invite lecturers from more distant countries. Lectures included current topics and used modern methods, e.g. "flipped classroom". This method allows for greater involvement and activation of students compared to a traditional lecture. They are expected to prepare in advance, either by watching a recorded lecture or by reviewing the literature. The lecture itself is intended for questions, discussion, and solving problems that the student perceived during their preparation. In this way, the lecturer learns which areas he/she needs to further explain and can assess the students' knowledge. The

"flipped classroom" method usually uses a combination of online lessons and a classic live meeting. In our case, for one rotation of students, a combination of watching a lecture via a video and a "lecture" itself was used, where students, together with teachers, asked a guest lecturer from Singapore questions on the topic of the epidemic.

Virtually all rotation students were present in the plenary online teaching methods, but the discussion was not particularly lively. They were also invited to exchange views via a "chat room", but this option was rarely used.

1.3.2 Changes to clinical case presentations

Instead of presenting the patient from the outpatient clinic, which is prepared individually by students during traditional lessons, all pedagogical staff created several patient vignettes and established a problem-based learning (PBL) method. Students in groups of three created a problem list for each patient and, according to the proposed aspects of treatment, looked for literature for clinical decisions. Each case was presented by one group consisting of three students.

A presentation of a clinical case of a patient with several diseases:

Mrs. AZ, born in 1952, a former production worker, retired on disability, is being treated in your clinic. She lives alone in a block of flats, on the fourth floor, but without an elevator. She has repeatedly stated that she has a low "pension" and can hardly afford anything.

The lady has been a widow for 14 years, has a son who lives in the same town. She and her son are on good terms, but he is very busy and she does not want to be too much of a burden to him.

She regularly visits a diabetologist, an ophthalmologist and a psychiatrist. A diabetologist has diagnosed her with poorly controlled diabetes; Hba1c = 9.5; a psychiatrist with a stable state of paranoid schizophrenia. Laser photocoagulation has been required several times due to diabetic retinopathy. She also has AH and IBS (having PTCA 2012). She is also suffering from GERD. The lady is overweight.

She says she feels quite lonely, also due to knee problems, having so many stairs to deal with when leaving her apartment, and then returning back to her apartment.

- A student is asked to write a problem list
- Regularly prescribed medications
  - Insulatard Insulin in the evening
  - Metformin 2 times per 1000 mg
  - Gliclazide 120 mg in the morning
  - Aspirin 100 mg
  - Rosuvastatin 40 mg
  - Aripiprazole 6 mg
  - Pantoprazole 40 mg
  - Perindopril 8 mg
  - Amlodipine 5 mg
  - Diclofenac for knee pain
  - Alprazolam 0.5 mg
- A student is asked to present a patient treatment plan that includes:
  - Preventive measures;
  - Instructions for non-pharmacological treatment;
  - Drug treatment (check the suitability of the prescribed drugs according to the indication and the suitability of the drugs in relation to their interaction and suggest changes);
  - Referrals for further diagnosis and treatment/possible referrals.
  - Evaluate the patient's involvement in the treatment and suggest what could be done to improve it;
  - How could a relative (son) help;
  - Other measures (e.g. involvement of a community nurse, social work centre, etc.);
  - Are there any other problems you are identifying?

The group that prepared the case had to give their opinion on managing such a patient, taking into account all the health, psychological and social problems and priorities of the patient. Other students had to be involved as actively as possible in the discussion on the treatment of the patient. This was partially realized; the online lessons probably presented a bit of an obstacle. Occasionally, the presentations of professional recommendations for the treatment of individual diseases were too extensive and students got lost in the details, so the presentation was more like the classic lecture, which proportionally held back other students from participating.

1.3.3 Changes to learning communication skills

Part of the lessons in PHC is also a video recording of the student's management of a simulated patient, which positively contributes to learning communication skills. An essential part, however, is the feedback the student gets from the "patient" and colleagues (14). It is known that such teaching improves communication skills, develops professionalism and improves understanding of nonverbal messages as well (15,16). While students acknowledge the usefulness of such lessons, they nonetheless also mention the discomfort they feel when recording (15). In the third rotation, recording consultation with simulated patients was dropped. Instead, the students

recorded a short video consultation at home on management a relative's lifestyle. Since there was no pre-determined scenario, the conversations were unfortunately too unprofessional. Therefore, in the fourth rotation, we recorded student consultations with simulated patients according to pre-prepared scenarios using a video conferencing system. The conversations were recorded within specific deadlines outside the regular on-line course hours, and we watched them during the regular course in small groups. Each student recorded one video conversation with a simulated patient. As video consultations are becoming more and more common practice in regular medical work (17), the analysis of the recording included the specifics of video consultations compared to in-person consultations (e.g. poorer conversation efficiency, poorer perception of hints, distracting minimal time lag between image and sound, less possibility of eye contact due to looking at the screen and not at the camera, greater importance of a clear explanation with sign-posting, and checking that the patient understood) (18). At the same time, the students also analyzed how to make decisions without the possibility of a physical examination. Management of the patient was also more difficult than in person due to occasional audio and Internet disruptions. However, we assume that filming in the home environment was less stressful for the students than doing so in the faculty premises.

1.3.4 Changes to homework assignments

In normal classes, students of PHC have regular homework assignments related to work in the outpatient clinic (19). As clinical practice in the outpatient clinic was not possible at the time of the epidemic, we had to adjust the content of the assignments and made them more up-to-date. Some new assignments were related to the topic of the SARS-CoV-2 virus epidemic, e.g. mental disorders in times of social distancing and isolation, domestic violence, the work of family medicine in altered conditions, and so on. Instructions for assignments were located in the virtual classroom, where students also found a link to the recommended literature.

Some assignments have been adapted: for example, the assignment of practicing recording outpatient consultations was replaced by a description of the most common reasons for outpatient consultations based on at least two relevant sources of literature.

As part of one of the assignments, students were introduced to administrative rules through literature and websites. We discussed this assignment in the form of a quiz in which smaller groups competed with each other. The quiz is one of the methods of gamification. Gamification of learning is a concept of using game design elements in a traditional non-gaming context. It can be an effective addition to traditional learning strategies and is used more and more in medicine. The method is supposed to motivate millennials more effectively to study, as it makes them more active in achieving a common learning goal (20). The assignment that we turned into a game with a quiz is to know the rules of Health Insurance Institute of Slovenia, various laws and regulations related to the implementation and the right to health care. The Kahoot! online quiz, which students solved individually, consisted of examples of questions about the rules. Time was quite limited and the questions complex. The entire quiz lasted 20 minutes and provoked a lively group discussion upon completion.

1.3.5 Changes to conducting an exam in Primary Health Care

Due to restrictive measures, the written part of the final exam, comprised of 80 multiple choice questions was conducted via video conference. The time for answering the questions was limited based on the instructions of the Faculty of Medicine. Help with finding answers in the literature (book, notes, Internet) during the exam itself is not allowed. When taking an online exam, it is even more difficult than during the classic exam to prevent copying, consulting or seeking help in other illicit ways.

Even before the tool was offered by the virtual classroom, we had chosen an exam program (www.exam.net). This program prevents simultaneous active switching to other applications or programs on the same computer, which may, nevertheless, still be running in the background. Using a password the student has received from the exam organizer, he enters the program, which opens in full screen. If a student leaves the screen (e.g. to search for information on other websites), the exam is automatically cancelled. An exam is also terminated for an individual if there are Internet disruptions, which the exam organizer notices during the exam. He may decide to reopen the exam to the student where it was interrupted. Of course, the program does not prevent the possibility of using two monitors, two computers or a smartphone. To reduce the possibility of manipulation, students had to enter a video conference in the Zoom program before entering the exam program with the microphone on so any consultation for answers would be heard, and with the camera on to see if they were reading while answering the questions. Students with computers that had no

camera used smartphone cameras. The course of the exam was monitored by our teachers and assistants.

Prior to the exam, students were sent an e-mail with detailed instructions on the course of the exam. A mock exam with a few questions was also conducted for them to see how the questions were displayed and how the answers were to be entered. After that, we talked to them again via video conference about possible ambiguities. The exam went smoothly.

The oral part of the exam took place on the online platform without any other changes. However, the OSCE (Objective Structured Clinical Examination) stations, where clinical skills are tested, were dropped.

1.3.6 Using a virtual classroom

Even before the epidemic, we included a virtual classroom in teaching sixth-year students, where all instructions for practical work and power point presentations of most lectures and plenary seminars were published. Students also submitted a Family Report assignment to the virtual classroom.

During the epidemic, the virtual classroom offered additional tools for teaching, especially a video conferencing system, and towards the end of the epidemic, also a system for conducting a written exam with remote access. Additionally, it also offered other opportunities for active student participation in class, e.g. organization of quizzes, etc. The usage intensified as students submitted all weekly assignments to the virtual classroom, which the assistants reviewed and commented on. Each group also had an open forum for discussion, which was not used much.

1.3.7 Summary of modified teaching methods

Table 1 presents all the content changes that we introduced in online lessons during the epidemic, and possible changes that could be used in future lessons, if they should take place in the traditional way.

2 Methods

The evaluation was carried out with students and teachers/assistants who participated in the online lessons.

Table 1: Use of online teaching methods before and during the epidemic and possible future use.

Type of class	Before the epidemic	During the epidemic	After the epidemic?
Using a virtual classroom	• "Power point" lectures. • Exercise instructions. • Submitting a family report.	• Video conferencing system. • Submission of all assignments. • Forum by groups.	• Lecture videos. • Online written exam tool. • Possibility of quizzes.
Lectures, seminars	Lectures at the faculty.	• Using a video conferencing system. • Guests from abroad. • New methods (e.g. flipped classroom).	• Use of new interactive lecture methods. • Preview of recorded lectures.
A clinical case of a patient	• An example from a clinic.	• Problem presentation of a prepared case.	• Modification of instructions for problem presentation of a patient from an outpatient clinic.
A class on communication	• Role-play at the faculty.	• Video consultation.	• Video consultation as one of the options.
Homework	• Most of the assignments were not in writing. • They were linked to a clinic.	• Written assignments submitted to the virtual classroom. • Assignment evaluation. • Content customization and updating. • Using a quiz.	• Some assignments in writing. • New assignment content in connection with clinical rotation. • Use of quizzes, new methods.
Exam	• Three-part (written, OSCE stations, oral).	• Homework assessment. • Written exam with online program. • Oral exam with video conferencing system.	• Homework assessment. • Transition to the old way of conducting exams according to epidemiological circumstances.

Legend: OSCE – Objective Structured Clinical Examination.

2.1 Students' evaluation

At the end of the fourth rotation in the 2019/2020 school year, which took place entirely online, we gathered student opinion about the lessons by asking them the following questions: *What was good about the online family medicine (FM) course? What did you not like about the online FM course? What realistic improvements do you suggest for online FM course?* Students were able to express their opinions anonymously via the 1Ka web survey or via the Google Forms app.

Students also completed a standard online survey in which they rated practical training on groups, plenary lectures, and plenary seminars from 1 (worst) to 5 (best). The online survey has been used for many years, but it also contains many other questions regarding the interest in specialization and the opinions of students about the knowledge they gained in FM practical work. In this paper, only assessments related exclusively to online lessons are presented.

2.2 Teachers'/assistants' evaluation of the lessons

Nine teachers participated in the online classes in the Department of Family Medicine. All were included in the Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis of online teaching. The SWOT analysis for reaching consensus in all four mentioned areas took place in two rounds: in the first, each educator gave an opinion in the form of several statements in each of the SWOT categories. We then combined similar claims with the same meaning and ranked the five most commonly expressed claims in each category in the final round. From each category, we selected five statements with the highest frequency and presented them as a result of the analysis.

To search for ways to use opportunities or remedy shortcomings, SWOT analysis usually continues in the next round. However, we did not continue with it in this case, as these are only initial experiences with this type of class.

3 Results

The results of online classes can be assessed from three aspects: acquired knowledge, acquired skills and changes in attitudes, the opinion or satisfaction of students and the opinion of teachers or assistants. The acquired clinical skills are mostly related to the clinical courses in the outpatient clinic, which was postponed due to the epidemic. We did not assess the clinical skills that are otherwise assessed by a part of the OSCE exam, nor did we assess changes in attitudes.

48 students of third rotation (16 M, 33.3%, and 32 W, 66.6%) and 61 students of fourth rotation (14 M, 22.9% and 47 W, 77.0%) participated in online classes.

3.1 Acquired knowledge

The classic assessment of acquired knowledge is the performance at the exam. All registered third-rotation students successfully passed the online written exam. Fourth-rotation students took a test at the faculty. The results of the online written exam were roughly comparable to the results of the exams that were held at the faculty before. All 46 registered students passed the exam, and out of 80 points, the average score was 63.26 (SD 4.1), which is 79.1%.

Due to exceptional circumstances, students were able to take the exam before completing clinical training, which is otherwise part of the class. As examinations were conducted in different ways before and during the SARS-CoV-2 virus epidemic, and there were also several differences between the two types of classes (e.g. postponed clinical training to the time after the exam), statistical comparison of examination results or acquired knowledge according to the type of classes are not possible.

3.2 Opinions of students

At the end of the rotation, students completed an online satisfaction survey and a regular survey assessing the training.

3.3 A survey on online classes and evaluation of the training

3.3.1 Qualitative assessment of training

Qualitative assessment of training was given by 42 students (68%) of the fourth rotation (7 M (17%) and 35 W (83.3%)).

The students were asked three questions.

- When asked, *"What was good about the online FM practical work?"*, they answered that they were satisfied with the online course and that they appreciated the quick adaptation of the department to the new situation. They liked the comfort of doing the work from home, but at the same time they felt that the quality of the course was the same. They praised the

Table 2: The average and average value of plenary and group lesson assessment in the traditional implementation (year 2018/2019) and the third, fourth rotation 2019/2020 (online lessons).

Theoretical lessons	Classic lessons	Online lessons
	Average value (SD)	Average value (SD)
FM in whole	4.02 (0.70)	4.2 (0.64)
Plenary lectures	2.98 (1.02)	3.5 (0.97)
Work in groups	4.18 (0.81)	4.6 (0.65)
Plenary seminars	3.60 (1.00)	3.8 (0.87)

Legend: FM – family medicine.

commitment of the assistants. They praised the recordings as a way of learning communication skills and the quiz in learning the rules of Health Insurance Institute of Slovenia. They praised the possibility of discussions in small groups.

Quotes:

- *The possibility of meeting at a distance suited me very well, it should probably be considered even in the absence of an epidemic - given that many students live in the outskirts (and driving to Ljubljana twice a week would not be necessary). I think the training was of good quality because the technology allowed for screen sharing, presentation of seminars, and collaboration.*
- *Better communication than live. It seems more personal.*

When asked "*What did you not like about the online FM practical work*", they stated that they missed personal contact, that inclusion in the discussion was easier in traditional classes, they mentioned that commenting on the video recordings took too long, the presentation of a clinical case was too long, dealing with practical problems was insufficient, commenting on the assessments was too short and the obligation of assessments in general.

Quote:

- *I missed the personal contact, it is quite difficult for me to look through the camera and talk, when students talk over each other, there was no right atmosphere when filming the roles, it is completely different if we treat someone in person than via the screen.*

Table 3: Analysis of Strenghts, Weakness, Opportunity and Threats (SWOT) online teaching.

Advantages	Disadvantages
• Flexibility and innovation in working in exceptional circumstances. • Knowledge of the use of modern communication methods. • Curiosity / challenge to try new teaching methods. • Work from home. • Rational use of time, time flexibility.	• Less personal contact with students. • More demanding and rigid lectures because you have no contact with the audience. • A laborious and time-consuming way of teaching. • Ignorance of the reliability of teaching methods. • Tiring long-term use of screens. • Written formative assessment requires a lot of effort.
Opportunities	**Dangers**
• New learning methods give new possibilities (e.g. gamification). • Possibility of a repository of learning materials that is quickly and easily updated, no more paper instructions. • Possibility of learning more modern skills of a family doctor, which are also used in practice (video conversations, etc.). • Students find it easier to do clinical exercises at home. • Possibility of participation of lecturers from abroad or from distant places.	• Inability to learn and assess certain segments of knowledge (skills, attitude, physical examination). • Reduced interpersonal interactions between students and between students and educators. • High teacher/assistant workload in critical situations with clinical work - difficult adaptation / implementation of lessons. • Large number of students in groups. • Reduced interactions between educators.

When asked "*What realistic improvements do you suggest for online FM lessons*", they answered that they appreciate an overview of the most common conditions and treatments, more quizzes, more systematic time management, more interactivity in some patient presentations, more training in filling out various forms (referrals, prescriptions, etc.), more presentations of administrative tasks (sick leave management, laws, insurance), more multimedia (video, quizzes, surveys…).

Quotes:

- *Sometimes I would like better structured trainings in terms of a specific topic to be addressed in a particular training. In doing so, I would also like a rough overview of common medical conditions.*
- *The training was ok. Regarding the lectures, perhaps involving students through quizzes, as Rifel and Kolšek did.*

3.3.2 Answers to the questionnaire

The questionnaire was answered by 33/61 (54%) students of the fourth rotation, among them 6 men (18%) and 27 women (82%). We did not interview students of the third rotation. The results are presented in Table 2.

3.4 Analysis of the opinions of educators

After the fourth rotation, the assistants and teachers, who participated in the online teaching of students, carried out an analysis of online teaching in terms of strengths, weaknesses, opportunities and dangers. After removing the duplicate claims, five claims, which were considered to be the most important, were selected by consensus in each category.

The analysis of the educators' opinion is shown in Table 3.

4 Discussion

Online teaching has its advantages due to flexibility and accessibility, but the methods need to be adapted, as the content of traditional teaching is not easily transferable to the electronic medium. During the epidemic, we gained important experiences for further lessons. Due to the circumstances, the introduction of changes was extremely fast, as online teaching was the only option for continuing the academic year. Usually, however, the introduction of the online teaching method takes place gradually, which helps to overcome potential problems and enables long-term changes (21,22).

4.1 Modification of lessons

Practical problems such as Internet access, computer equipment, and the room in which students were implementing the study program were not very pronounced, although technical barriers were the most important problem identified. The students even praised the possibility of adjusting the time in relation to other obligations, although we tried to adhere to the usual schedule as much as possible. They also praised the educators and our quick "technological" adaptation.

This method of teaching was more demanding regarding time and implementation for teachers/assistants, who performed regular clinical work during the epidemic and additional medical obligations brought about by the epidemic. The research also showed increased time consumption for online lessons, student follow-up and preparation of learning content (2).

We tested new teaching methods: lessons with flipped classroom and the use of quizzes. Given that in the analysis of training, students rated the plenary forms of teaching (lectures, seminars) the lowest, it will be necessary to continue in the next school year with methods that motivate students and better follow their learning needs. A review article by Hewa et al. showed greater satisfaction of students and more effective learning with the flipped classroom method (23). This method offers several options. For example, at the beginning of the scheduled time intended for the lecture, knowledge can be tested with a quiz, which must be prepared by the teacher himself/herself. This reinforces the student's prior knowledge and demonstrates his understanding of the field and the lecturer receives feedback on where further explanation is needed. Quizzes belonging to the so-called gamification of lessons greatly increase the motivation of students to participate in the learning process and break the monotony of lectures (24,25). In general, our students also emphasized their enthusiasm for quizzes and suggested the use of even more multimedia content in class.

The introduction of problem-based learning has also proved to be effective. A systematic review of the literature conducted by Quin et al. showed significantly better results compared to traditional teaching (26). We will need to expand clinical cases, establish precise learning objectives in relation to the family doctor's responsibilities, and suggest a link to the relevant literature. Due to the speed with which we had to adapt to the new situation, we were not able to fully achieve this. We also expect to encourage active participation of the whole

group in this way. According to our experience, students must also learn to present case problems by asking questions and presenting dilemmas to the whole group and thus involve it in finding solutions. This is a bit more difficult with online teaching; it is also more difficult to structure the group-work time in a meaningful way. Excessive attention to some topics was one of the criticisms of students, specifically to the presentation of a clinical case in the context of PBL. The connection with the clinic or working in it must remain, which was not possible during the first wave of the epidemic. A step forward in classes on clinical decision-making, which students really want, are clinical scenarios that enable interactive computer simulation of patients within the framework of computer-assisted learning (27,28).

Learning how to use video communication is necessary, as this method of consultation is now also used in FM clinics (17). Otherwise, video conferencing in groups seems to hinder the delivery of feedback from colleagues. Therefore, some students found that role-playing with video counselling in the context of learning to communicate is less feasible and thus the objectives of this lesson are less achievable.

We would also like to mention the untapped potential of online teaching during the epidemic: an online forum for encouraging critical thinking and mutual reflection in comparing clinical practices in outpatient clinics, clinical problems, examining opinions and seeking a broader perspective (29). Few articles describe similar experiences with distance learning during the SARS-CoV-2 virus epidemic, both regarding clinical cases and regarding video consultations with the patient, and in regard to the importance of forums (30). Educators observed the difficulty of involving students in the discussion and the passivity of some. The students themselves also mentioned problems in actively participating in the discussion. In the literature, some findings are similar to ours (31) and others are not (3). Overall, we found poor use of the chat and forum feature options.

The biggest change in conducting an exam was the absence of OSCE stations. According to the experience from the literature, their implementation is possible, but not in all areas. The online implementation of OSCE is most effective in testing the skills of history taking, clinical decision making, record keeping and communication. It performs poorly for assessing physical examination (32).

In synchronous communication (in real time) using video conferencing systems, Internet security is particularly problematic (33,34). Despite some information about safety deficiencies, we teachers initially used the Zoom system, due to its ease of use. The Faculty of Medicine chose the Webex system for the learning process, for which it also offered training on use and support later on. In the future, it will therefore make sense to use the Webex system in online lessons at the Medical Faculty in Ljubljana.

4.2 Students' opinions about online lessons

Evaluations of online lessons are interesting. As expected, plenary forms (lectures, plenary seminars) are rated the lowest, but better than in previous years. The ratings are good, but difficult to compare with previous ones. Given the extraordinary circumstances in which the practical work took place, the students mentioned in the evaluation that they appreciated the efforts of pedagogues to offer the highest quality work. Perhaps, in addition to more active forms of lectures, this also contributed to a higher numerical assessment. Qualitative assessment of students is presented in the discussion on teaching methods.

4.3 Opinions of educators about online teaching

Finally, based on the analysis of educators, we can assess the possibilities of using online lessons in the future. The members of the department believe that we are quite flexible and innovative and that new teaching methods are a professional challenge for us. Given that we are all also partially employed in clinics, the flexibility of online teaching with the possibility of rational use of time is very welcome, but on the other hand, online teaching is very time-consuming, at least in the state of transition which requires adjustments to methods. We were aware of not knowing how much the new methods had been tested, as we had no personal experience with them and no performance analyses were available. Above all, we missed personal contact with students and with each other. Nevertheless, we found many opportunities for online teaching: it is easier to combine the group work from student dormitory and the clinical training in their local environment, as students do not have to travel to Ljubljana once a week. This could relieve the pressure on mentors in Ljubljana. It seems to make sense to keep at least one group in each rotation with online lessons for more distant students. We can also expect even greater development of technology and new teaching methods, that will be available and at the same time, the information technology also provides the opportunity to learn more modern methods of telemedicine, which will be

even more present in the future. The department can expand horizons with the online participation of foreign lecturers and teachers from the most remote parts of the world. The danger we have observed is the passivity of the students. This should be reduced by modern methods of integration into online teaching. The virtual classroom has greatly expanded its usefulness, with the help of the Institute for Biostatistics and Medical Informatics (IBMI) at the Medical Faculty in Ljubljana. We must also be aware of the limitations of online teaching, as practical professional skills or attitudes cannot be taught and assessed, which is the task of clinical training, something that cannot be substituted by group work and simulation techniques. Good clinical training with a mentor as a role model is still extremely important for the lessons and the profession to seem attractive to students (35). The social aspect of student networking and the effect of isolation with online lessons is also important.

4.4 Disadvantages of evaluation methods

The analysis of the comparison of online lesson assessments from the questionnaire is methodologically weak, as the sample is very small. The percentage of participants is comparable to the usual percentage of participants in online surveys. Qualitative analysis gave a good insight into the opinions of students in terms of guaranteed anonymity and the appropriate number of participants for this method.

5 Conclusion

Numerous adjustments are needed when bringing the entire theoretical teaching of family medicine online. Mutual support and cooperation of the pedagogical team are important. Some online teaching methods are modern and encourage active involvement of students. It therefore makes sense for them to stay in the curriculum in the future. The manner and success of conducting a course are also important from the perspective that modern teaching methods can (or not) inspire students to later choose to specialize in family medicine. This might become clear in the future. However, direct contact with patients and work in outpatient clinics are still irreplaceable for the student's experience of family medicine.

Conflict of interest

None declared.

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