

Education in academic emergency medicine during the COVID-19 pandemic – our experience from an ongoing crisis

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Abstract

Background: The COVID-19 pandemic resulted in suspension of the whole teaching program at the Medical University of Vienna until the end of summer semester. Therefore, a substantial waste of learning time threatens. As the responsible department for emergency medicine teaching, we adapted our program to continue with our courses and maintain the learning progress. Our objective was to evaluate the number of conducted courses and to report the used methods.

Methods: Teaching was classified in credit hours per week (CHW). One CHW represents 15 academic hours (45 minutes) during one semester. Computations were performed on basis of the official numbers from the prospectus of the university, or - if not available - were calculated with the formula above. Webinars were performed using CISCO Webex Events®, Webex Training® and ZOOM®. We further utilized Moodle® for resuscitation courses.

Results: Overall, courses and clerkships equivalent to 80.2 out of 101.4 CHW (79.1%) will be held during the ongoing crisis in summer semester. Courses in winter semester were completed regularly. In the human medicine curriculum, we could perform 73.7 out of 94.9 CHW (77.7%). In the emergency lectures for the dentistry curriculum, we could adapt all courses to webinars (6.5 CHW, 100%). After adjustment for the exact number of students in each class, courses and clerkships equivalent to 78.7% could be conducted.

Conclusions: Despite the challenge to be prepared for the treatment of numerous patients during an ongoing pandemic, we could maintain the majority of our teaching responsibilities. Although sufficient skill training cannot be achieved under those circumstances, we could provide the theoretical backgrounds to allow students further continuation in their studies.

Background

On 25th of February 2020, the COVID-19 pandemic reached Austria with the first diagnosed cases. In the next days, the number of new confirmed cases raised with a doubling time of two to three days.¹ As part of the efforts to “flatten the curve” and to minimize transmission of the virus, the whole teaching program of the Medical University of Vienna was suspended with immediate effect on 10th of March 2020. This decision affected also the clinical training for students in the last two academic years, although those in the last year could continue their clinical internship year (the so called “clinical practical year”) voluntarily. As far as possible, teaching should be migrated to distance learning with webinars or other online teaching elements. This obligation was first estimated for two weeks but got extended up to the end of the summer semester later.

As Department of Emergency Medicine, we had to expect numerous patients with COVID-19. The reported high numbers of infected or even deceased healthcare workers from China and Italy caused disturbances

and led to anxiety even among medical staff. ^{2,3} Following the exploding numbers of critically ill patients in those countries, we used the calm before the storm to get prepared for the worst.

Apart from that, we early started to plan how to implement distance learning for our courses. Our department was the first chair in emergency medicine in the German-speaking countries and is responsible for courses in all sections of the human medicine and dentistry curriculum. On the time of the suspension of the teaching program, several courses were ongoing and some lessons were already held.

We had to design a program which fulfils both the requirements to protect students and staff members due to physical separation as well as to keep the teaching ongoing wherever it seems reasonable. As mentioned, this was accompanied by the complex task to dispose ourselves as good as possible for the suspected number of patients with COVID-19.

In this cleavage, we decided to stop all elective subjects and to concentrate on the mandatory elements of the curriculum despite all limitations.

This paper gives an overview how our department handles its teaching in times of exceptional circumstances and how we achieve to still teach a relevant part of our courses.

Methods

Setting

The Medical University of Vienna is the biggest medical university in the German-speaking countries with about 8000 medical students. The Department of Emergency Medicine (ED) and all other clinical departments are located in the General Hospital of Vienna, a tertiary care centre with 1728 beds.

Our department is split into an outpatient ward, a resuscitation bay with all intensive care facilities and an intermediate care station for 10 patients. The clinical and scientific emphases are placed on patients with cardiac arrest, myocardial infarction, arrhythmias, stroke and other life-threatening conditions.

As an academic teaching centre, education is one of our core tasks. Despite our low staffing levels and a large clinical volume, we fulfill a notable part of the university's teaching responsibilities (3.14%). In the per capita ranking, we are on position two of all clinical and preclinical departments.

Emergency Medicine in the Medical Curriculum Vienna

The ED is responsible for training students in the Medicine Degree and the Dentistry Degree programs in first aid, resuscitation and critical care medicine. This ranges from first aid training in the first semester to Intermediate and Advanced Life Support (Resuscitation training I and II) as well as scenario-based resuscitation training as the student progresses.

The Clinical Practical Year

In this 16-week course with 35 hours per week, students are an integrated part of our staff and work in our ED under direct supervision. This is accompanied by exclusive tutorials held by physicians or senior nurses from our team. During the academic year, we take care of three rotations with 10 students. Each of them is allocated to a mentor who is responsible for their technical and non-technical qualification. Structured feedback is given at introduction, midterm and completion as well as with the well evaluated feedback tools “direct observation of procedural skills” (DOPS) and “mini-clinical evaluation exercise” (mini-CEX).^{4,5}

Hygiene Aspects during COVID-19 Pandemic

At our ED, all employees have to don FFP-2 masks, goggles, double non-sterile gloves and surgical caps as soon as entering our treatment rooms. In social areas, they wear FFP-1 or surgical masks and are instructed to keep distance to other colleagues. All patients were equipped with surgical masks as soon as they enter the hospital. Prior to aerosol generating procedures and treatment of COVID-19 suspicious cases, long sleeved gowns, FFP-3 masks and face shields are added to the standard personal protective equipment (PPE). This precautions are in accordance with the world health organization & the European Centre for Disease Prevention and Control.⁶

Software

To enable direct interaction with the students, we used the voice over IP-services Webex Events® (Cisco Systems, Inc., San Jose, CA, USA) and ZOOM® (Zoom Video Communications, Inc., San Jose, CA, USA). Both software tools permit to share slides and to communicate with the students via video-chat.

We further used Webex Training® (Cisco Systems, Inc., San Jose, CA, USA) to implement multiple choice questions during some of the lectures.

For resuscitation courses, we use the learning platform and course management system moodle® (M. Dougiamas et al., under GNU General Public License, <http://www.moodle.org>).

Credit Hours per Week

The Medical University of Vienna classifies their whole teaching in form of credit hours per week. An average semester lasts 15 weeks. Therefore, a weekly held course with a duration of 1 academic hour (45 minutes) is calculated with 1 credit hour per week (CHW). For our computations, we took the official numbers from the prospectus of the university. If not available, we calculated the CHW with the formula mentioned above.

Statistics and data management were performed using MS Excel for MAC V16.3 (Microsoft Corporation, Redmond, WA, USA).

Results

Overall, courses and clerkships equivalent to 80.2 out of 101.4 CHW (79.1%) will be held during the ongoing crisis in summer semester. Courses in winter semester were completed regularly. In the human medicine curriculum, we could perform 73.7 out of 94.9 CHW (77.7%). In the emergency lectures for the dentistry curriculum, we could adapt all courses to webinars (6.5 CHW, 100%). After correction for the exact number of students in each course during this semester, courses and clerkships equivalent to 78.7% (76.3% in human medicine and 100% in dentistry curriculum) could be conducted (*Table 1*).

Table 1. Conducted courses during summer semester 2020

	Crude data from the university's prospectus		After adjustment for the exact number of students in each course	
	planned	conducted	planned	conducted
Human medicine in CHW (%)	94.9	73.7 (77.7)	1120.5	855.0 (76.3)
Dentistry in CHW (%)	6.5	6.5 (100.0)	126.5	126.5 (100)
Total in CHW (%)	101.4	80.2 (79.1)	1247.0	981.5 (78.7)

Abbreviations: CHW: credit hours per week

The courses in responsibility of the Department of Emergency Medicine with their current status are listed in *Table 2* and *3*.

Table 2. Overview of the courses held during summer semester 2020 – human medicine curriculum - mandatory

Subject	Semester	Status
First aid	1.	Completed in winter semester
Resuscitation training I	5.	Completed in winter semester
Resuscitation training II	8.	Converted to interactive moodle course
Objective Structured Clinical Examination and preceding training	8.	Suspended as per the dean
Clinical training in emergency medicine (5 week rotation)	9.-10.	Suspended as per the dean
Clinical practical year, emergency medicine trimester (16 week rotation)	11.-12.	Frequent webinars, special training in hygiene aspects, modification of roster to reduce the number of simultaneously attending students and to avoid overlap with different physician-teams on duty

Table 3. Overview of the courses held during summer semester 2020 – dentistry curriculum - mandatory

Subject	Semester	Status
First aid	1.	Completed in winter semester
Emergency medicine lectures	9.-10.	Held as webinar
Emergency medicine training	9.-10.	Held as webinar
Refresher in emergency medicine	11.-12.	Will be held as webinar

Resuscitation Training II

Over the winter semester, we designed an interactive moodle® course with short videos on how to perform correct cardiopulmonary resuscitation, rhythm checks and how to use several airway management devices. We further implemented excerpts from the current resuscitation guidelines with following mandatory questions, interactive video clips and drag & drop tests. This course was primarily designed for students preparation but is now used as replacement in an adapted form.

Clinical Practical Year

A new group of students arrived one week after teaching suspension. Because of multiple ongoing changes in our ED (e.g. establishment of a hygiene-lock between social areas and treatment rooms, hygiene training for our staff, pandemic-related spatial concept), teaching was switched to up to daily webinars in the first three weeks. Via this method, we trained students on our department-specific processes, gave lectures on frequent reasons of consultation (e.g. chest pain), techniques (e.g. emergency sonography, extracorporeal life support) and encouraged students to present emergency related cases from former clerkships.

As far as we could ensure students safety in the ward, we trained the correct PPE handling with two students at a time. Only students without preconditions were allowed to attend. We also clarified again

that attendance is strictly voluntarily as defined by the dean.

We rearranged the roster to a more flexible system to reduce the number of simultaneously attending students and to avoid overlaps between different physician-teams on duty. Three “COVID-mentors” were defined for continuous mentorship, arrangement of further webinars and as support in mentally challenging situations.

Dentistry Curriculum

All courses were switched to webinars with the possibility of direct student-teacher interaction. For practical aspects in the courses, flexible solutions were found (e.g. recovery position training with people living in the same household, chest compressions on pillows). Procedures with the need of equipment were demonstrated using video clips.

Discussion

In this paper, we could show that also during the COVID-19 pandemic, emergency medicine education is feasible both with distance and presence learning. We achieved a rate of 79.1% held courses (78.7% after correction for the exact number of students) up to now. As all future lectures are already planned, we assume that this number will be stable. The experiences we make during this global crisis could help to improve teaching with webinars and in clinical clerkships during the emergence of future diseases with epidemic or pandemic impact. To our knowledge, no data dealing with teaching of medical students during the COVID-19 pandemic in the field of emergency medicine is available to date.

Students Role during COVID-19

The COVID-19 pandemic had a global impact on medical education with not foreseeable consequences. Medical schools in various countries closed due to mitigate the virus spread.^{7,8} One of our central teaching aims in emergency medicine is self-protection and personal security for the aides. The risk of infection with COVID-19 is high especially during aerosol generating procedures like airway management, cardiopulmonary resuscitation or non-invasive ventilation as common in EDs. Further, it is literally impossible to detect all infected patients at pre-triage resulting in a high contagion risk whilst patient handling. Therefore, an ED seems to be the most inappropriate place for clerkships during a pandemic.

On the other hand, student’s motivation to help in the upcoming crisis was high. We got several proposals from former or scientifically active students from our ED to support us during the pending duties, already at a time when we had not yet seen a single COVID-19 patient. Some of them are also trained as paramedics and are familiar with our routines. That’s why they might be helpful in case of overstraining of our ED.

Nevertheless, COVID-19 is highly transmissible.⁹ The World Health Organization stated that 3.7% of laboratory confirmed cases in China were healthcare workers.² In Italy, our bordering country, even 20% of healthcare workers dealing with COVID-19 patients have infected themselves.³

Accordingly, we discussed in our staff whether it is responsibly towards our students to allow them to enter our ED under these circumstances. Facing a global shortage of PPE and a higher chance of virus transmission, we decided not to permit the attendance of voluntary students or further clerkships. The same decision was made in the USA and in the UK^{7,10}, even though it is under debate in both countries to fast-track final year students to get doctors registered quickly.^{11,12} For the ten actual students in the clinical practical year, we made an exception because of some considerations: Most of the healthcare workers have been infected in few but frequent situations: Beside unprotected contact, especially aerosol generating procedures and self-contamination during doffing of PPE bear an increased risk.¹³ We therefore assured, that our students are properly trained in the use of personal protective equipment. They are not allowed to perform aerosol producing procedures and are further instructed to keep sufficient distance in case of possible aerosolization. Together with regular debriefing of organizational, social and medical issues via video conferences with the COVID mentors, thus, a close meshed support is guaranteed, and emerging problems could be intercepted early. On our opinion, with this small number of students, a clinical clerkship is justifiable.

Distance Learning

Distance or blended learning has been widely implemented in medical education over the last years.¹⁴ Luckily, this gave us the opportunity to adapt to the new situation quickly.

Before the crisis, our university used moodle®, a virtual microscope and several video tutorials on how to perform clinical examinations or procedures. Additionally, the Medical University of Vienna streams their so called “Grand Rounds Lectures” to students who are in Erasmus-exchange-program and who are therefore absent during the fifth year.

Video conferencing and messaging have not been widely used before, but were implemented quickly after shutdown and seem to be appropriate tools for lectures and seminars. The same adaptations for the COVID-19 pandemic have been reported by Chick et al., Moszkowicz et al. and Zhou et al..¹⁵⁻¹⁷

In our normal learning environment, a main aspect of our courses is practical skill training (e.g. cardiopulmonary resuscitation, airway management, assessment of emergency patients). Naturally, distance learning can never be an adequate substitute for hands-on teaching with proper equipment. Nevertheless, in default of alternatives, we tried to transform our teaching as good as possible. All practical aspects are designated to be taught several times during the studies in a redundant fashion. We

therefore can assure that all students achieve this learning objectives, although special attention in the correct execution will be needed in future courses.

Strengths and Limitations

To our knowledge, this is the first article on the rate and realization of educational aspects for students of an academic ED during the COVID-19 pandemic. Our data might be useful especially for other institutions in the field of emergency, intensive care or respiratory care medicine which attempt to maintain their courses. Moreover, we think that some of the evolved techniques have the potential to get implemented to our teaching methods also in less busy times to achieve the highest possible learning success for our students.

Nevertheless, we have some limitations to acknowledge. With CHW, we are just able to report the quantity of the performed teaching. As this is an ongoing crisis, we are not able to evaluate our teaching referring to reached learning objectives or learning satisfaction at this point. Although we are able to pursue the same staff students ratio as before the crisis with the used methods, such data can only be surveyed after restart of our usual university life. It is therefore necessary to examine the impact of COVID-19 on medical education globally at a later point in time.

Conclusions

Despite the challenge to be prepared for the treatment of numerous patients during an ongoing pandemic, we could maintain the majority of our teaching responsibilities. Although sufficient skill training cannot be achieved under those circumstances, we could provide the theoretical backgrounds to allow students further continuation in their studies. We hope that our reported experiences could inspire other institutions in regard of their educational duties during the COVID-19 pandemic and in some aspects act as a model for blended learning also after recurrence of normal university life.

Abbreviations

CHW – Credit Hours per Week

COVID-19 – Corona Virus Disease-19

DOPS – Direct Observation of Procedural Skills

ED – Emergency Department

FFP – Filtering Face Piece

Mini-CEX – Mini Clinical Examination

PPE – Personal Protective Equipment

UK – United Kingdom

USA – United States of America

Declarations

Ethical approval

An exemption of ethical approval was obtained by the Ethical Committee of the Medical University of Vienna und furthermore the need for consent was waived since no personal data was utilized.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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None.

Author's contributions

MM, CS and FE conceptualized this study. MM prepared the manuscript. MH, MR and ANL provided data and supported the conceptual work with their ideas. All authors critically revised the manuscript for important intellectual content. All authors read and approved the final manuscript.

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