

Student's limitations of pregrade surgery course during COVID-19 pandemic

Limitaciones de los estudiantes en el curso de cirugía de pregrado durante la pandemia de COVID-19

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Abstract

Objective: To know the limitations that the students encountered during the undergraduate surgery course during COVID-19 pandemic. **Method:** Through an online questionnaire, students were asked about the evaluation of the undergraduate surgery course, the limitations encountered during the course, both those perceived by themselves, and the limitations they perceived in teachers. Questions were asked about the total evaluation of the surgery course and the clinical part of the course. **Results:** 63 students of the subject of surgery were included. The most mentioned limitations of the students were the availability of schedule and teaching material. The most mentioned limitation in relation to the teachers was the lack of technical knowledge. A relationship was found between the evaluation of the course and the interaction between the teacher and the student. **Conclusions:** The medical education have undergone great changes, especially the clinical part. There are several limitations in this process that can be improved by teachers and students and the perception of the quality of the course is related to the degree of interaction that teachers had with the students.

Keywords: Medical teaching. Surgery. Pandemic. Limitation. COVID-19.

Resumen

Objetivo: Conocer las limitaciones que los estudiantes encontraron durante el curso de pregrado de cirugía durante la pandemia de COVID-19. **Método:** Mediante un cuestionario en línea, se interrogó a los estudiantes acerca de la evaluación del curso de cirugía de pregrado y las limitaciones encontradas durante el curso, tanto las percibidas por ellos mismos como las que percibieron en sus maestros. Se preguntó acerca de la evaluación total del curso de cirugía y de la parte clínica del curso. **Resultados:** Se incluyeron 63 estudiantes de la materia de cirugía. Las limitaciones de los estudiantes más mencionadas fueron la disponibilidad de horario y de material didáctico. La limitación más mencionada en relación a los maestros fue la falta de conocimientos técnicos. Se encontró relación entre la evaluación del curso y la interacción que se tuvo entre el maestro y el estudiante. **Conclusiones:** La educación en medicina ha sufrido grandes cambios, sobre todo la parte clínica. Existen diversas limitaciones en este proceso que pueden mejorarse por parte de maestros y estudiantes, y la percepción de la calidad del curso está relacionada con el grado de interacción que los maestros tuvieron con los estudiantes.

Palabras clave: Enseñanza médica. Cirugía. Pandemia. Limitación. COVID-19.

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Introduction

The emergence of the SARS-CoV-2 pandemic, considered as such by the World Health Organization on March 11, 2020, produced important changes in society aimed at keeping a distance to avoid further transmission. It has especially affected the health field^{1,2}, where several changes have had to be made, such as reconverting hospital spaces for the care of infected patients, involving health personnel in pandemic-related care activities separate from their usual activities, suspending elective procedures and non-essential consultations, and separating personnel at risk of complications from care activities³.

These changes have also affected medical teaching, as students have been separated from the physical spaces of universities and clinical practices to avoid being vectors of the virus to patients, some of them at risk of complications, and to avoid infection among students in order to prevent this from resulting in a chain of family and social transmission^{3,4}. These limitations are most evident in undergraduate students who have been completely separated from clinical activity, while the specialty-specific activity of intern and resident students has been limited to allow for their participation in the care of patients infected with COVID-19³.

Although medical teaching has undergone some transformations in recent years, including the integration of certain technologies into teaching strategies, such as virtual classes, simulators, virtual reality, *podcasts*, interactive campuses, and chat rooms, the sudden emergence of the pandemic put all medical education systems on edge, leading to an immediate search for ways to continue educational programs^{5,6}. The most immediate solution was distance learning on platforms available on the Internet, such as *Zoom*, *Google Meeting*, and *Teams*, to mention a few^{3,7}.

This need to respond in order to continue the academic program posed a series of challenges for both students and teachers. These challenges have entailed economic costs related to the acquisition of technologies, such as the purchase of computers, *laptops*, tablets, or cell phones, as well as the acquisition of platforms for the development of classes, some of which can be used free of charge with some restrictions. The need for the Internet has also highlighted the differences that exist in the field of education⁶.

For the time being, the use of virtual classes conducted by the teacher provided a temporary solution for

the end of the 2019-2020 academic year. However, the development of the 2020-2021 course faced limitations not only related to the development of the theoretical program, but especially related to clinical teaching⁸.

The aim of this study was to learn about the limitations that students encountered during the undergraduate surgery course and to look for the association between these limitations and the overall evaluation that students gave to the surgery course.

Method

Quantitative, observational study, carried out by means of a survey, administered to the undergraduate surgery course students who completed said course at the School of Medicine of the San Luis Potosí Autonomous University. The evaluation covered both the theoretical and the clinical components. The subjects included in the undergraduate surgery course are oncology, neurosurgery, urology, otolaryngology, reconstructive surgery, orthopedics, ophthalmology, surgical emergencies, and basic principles of surgery.

The questionnaire was anonymous, and it was distributed through *Google Forms* among students who completed the course. It was circulated by email and social networks during the period from June 14 to June 21, 2021, the last day of questionnaire reception.

The age, sex, and year of study were collected in order to eliminate students from other grades, and the following questions were asked:

- “Did you have clinical practice in hospital prior to COVID-19 confinement?”, which called for a binomial “yes or no” response.
- “From 1 to 10, how did you find the entire year of the surgery course?”, which asked for a five-choice Likert-type response: very good, good, not so good, bad, and very bad.
- “What type of device did you use the most in online classes during the surgery course year?”, which gave the options of *laptop*, cell phone, tablet, or *desktop*.
- “From 1 to 10, how relevant did you find the digital material used by the teachers in the theoretical classes during the surgery course year?”
- “From 1 to 10, how relevant did you find the digital material used by the teachers in the clinical classes during the surgery course year?”
- “What limitations did you find as a student in the online course this year? (it can be more than one)”, with the following options: adequate digital

device, technological knowledge, adequate Internet access, access to teaching materials, schedule and other, with an open option for the student to answer.

- “What limitations did you find on the part of teachers in the online course this year? (it can be more than one)”, with the following options: adequate digital device, technological knowledge, adequate Internet access, access to teaching material, schedule and other, with an open option for the student to provide any other answer not indicated.
- “From 1 to 10, how much interaction did you have online with the theoretical class teachers during the surgery course year?”
- “From 1 to 10, how much interaction did you have online with the teachers in clinical practice during the surgery course year?”

Age and the answers to the questions in which the student had to choose from 1 to 10 were taken as continuous variables. Sex, the responses to course limitations by both students and teachers, and the responses to the question about previous clinical practice were taken as binomial variables. The evaluation of the surgical course and the responses to the type of technological device used the most were considered as categorical variables.

A descriptive analysis was performed using mean and standard deviation for continuous variables, and percentages for binomial and categorical variables. An association was sought between the limitations found in the student and in the teacher with the evaluation of the surgery year. Statistical analysis was performed using the Shapiro-Wilk normality test for continuous variables. Pearson's χ^2 analysis was performed for binomial and categorical variables in case of normality, and Fisher's exact test for variables with absence of normality. An ANOVA test was performed to look for an association between continuous and categorical variables, and a Kruskal-Wallis test in the absence of normality. All of the above, with a 95% confidence interval. For the statistical analysis, the R and R Commander programs in version 4.0.4 were used. The questionnaire was completed anonymously, and the confidentiality of the data was guaranteed.

Results

The questionnaire was shared with 118 fourth grade students, of whom 63 (53.3%) answered it during the time it was kept open. All questionnaires were answered

Table 1. Limitations considered and number of students who considered them for themselves and for teachers

	Limitations of the students		Limitations of the teachers		Total
	n	%	n	%	
Schedule	32	50.79	47	74.6	63
Internet availability	18	28.57	37	58.73	63
Technical expertise	4	6.35	56	88.89	63
Teaching material	32	50.79	16	25.4	63

in their entirety, so none was eliminated. The average age was 22.79 ± 1.36 years, with a minimum of 21 years and a maximum of 28 years. Of the participants, 36 (57.14%) were female.

Among the electronic devices used the most by students during the distance surgery course during the COVID-19 pandemic, the *laptop* was the most frequent with 35 students (55.56%); the tablet was used by 14 students (15.87%); the cell phone was used by 10 students (15.87%), and the desktop computer by 4 students (6.35%). The limitation most frequently mentioned by the students was the schedule (50.79%), while the limitation most frequently encountered by the teachers was technical knowledge (88.89%) (Table 1).

No relationship was found between the overall evaluation of the surgery course and the limitations of time availability of both teachers and students, nor with the availability of Internet for both teachers and students, or with the knowledge of technology of both teachers and students (Table 2).

A relationship was found between the course evaluation and the interaction that the teacher had with the students in both the clinical and theoretical courses. A relationship was also found between the course evaluation and the teaching material used in both the clinical and theoretical courses (Table 3).

Discussion

The COVID-19 pandemic posed new challenges for students, institutions, and teachers in medical education. The courses were generally carried out through online technology, requiring the institutions to adapt new technologies, and academic and technological support. From the teachers it required learning new technologies, the design of new teaching materials appropriate for the theoretical and clinical courses given online, and the

Table 2. Relationship between the overall evaluation of the surgery course and the number of students who considered the limitations according to each grade of the evaluation

	Overall evaluation of the surgery course					p	Total
	Very bad	Bad	Not so good	Good	Very good		
	n (%)	n (%)	n (%)	n (%)	n (%)		
Limited schedule for students	2 (6.2)	2 (6.2)	19 (59.3)	7 (21.8)	2 (6.2)	> 0.05	32 (100)
Limited schedule for teachers	2 (4.2)	3 (6.3)	25 (53.1)	15 (31.9)	2 (4.2)	> 0.05	47 (100)
Limited Internet availability for students	1 (5.5)	1 (5.5)	8 (44.4)	8 (44.4)	0 (0)	> 0.05	18 (100)
Limited Internet availability for teachers	2 (5.4)	1 (2.7)	22 (59.4)	11 (29.7)	1 (2.7)	> 0.05	37 (100)
Limited technical knowledge of the students	0 (0)	0 (0)	0 (0)	4 (100)	0 (0)	> 0.05	4 (100)
Limited technical knowledge of the teachers	2 (3.5)	2 (3.5)	33 (58.9)	17 (30.3)	2 (3.5)	> 0.05	56 (100)
Limited teaching materials for students	1 (3.1)	2 (6.2)	20 (62.5)	9 (28.1)	0 (0)	> 0.05	32 (100)
Limited teaching material for teachers	1 (3.8)	1 (5.8)	11 (64.7)	3 (17.6)	0 (0)	> 0.05	17 (100)
Total	11 (4.5)	12 (4.9)	138 (56.7)	74 (30.4)	7 (2.8)		243 (100)
Students with previous clinic	1 (2)	2 (5)	29 (58)	17 (34)	1 (2)	> 0.05	50 (100)

Table 3. Relationship between the overall evaluation of the course and the average of the evaluations of the teachers' interaction with the students and the teaching material of both theoretical and clinical classes

	Overall evaluation of the surgery course					p
	Very bad	Bad	Not so good	Good	Very good	
Teacher interaction in the classroom	4 (± 4.2)	3.6 (± 1.5)	6.1 (± 2)	7 (± 2)	7.5 (± 0.7)	> 0.05
Interaction of teachers in the clinic	2.5 (± 0.7)	3.3 (± 1.1)	5.2 (± 2.4)	7.1 (± 1.6)	6.5 (± 0.7)	< 0.01
Digital material in the classroom	5.5 (± 4.9)	6.3 (± 0.5)	7.5 (± 1.7)	8.5 (± 1.3)	1 (± 0)	< 0.05
Digital material in the clinic	1.5 (± 0.7)	5 (± 1)	5.6 (± 2.3)	7.3 (± 1.9)	7.5 (± 3.5)	< 0.01

application of new teaching strategies. During this school year, rather than learning about the technology, in which they are already very proficient, students needed to combine schedules, learn new learning strategies, and deal with the frustration of limiting their clinical time at the patient's bedside. In other words, distance education involves resources, skills, and competencies that are not always available to schools, teachers, and students^{4,9}.

The limited schedule, both their own's and even more so the teachers', was mentioned a lot by students. Facing a restriction in their attendance to educational or hospital settings, students devoted their time to solving

family and economic situations. As a consequence, the schedule changes in some of the previously programmed online classes implied a limitation for almost half of the students. On the other hand, teachers, who before the pandemic combined their clinical work with clinical teaching and theoretical classes held in classrooms inside the hospital facilities, saw their schedules transformed by the need for a stable Internet connection that was not usually available inside the hospital. Therefore, it was necessary to change the schedules and adapt them to the daily clinical work schedules and to places with stable Internet connection, a situation

that was also pointed out by the students. However, the schedule constraint was not relevant when students evaluated the course.

What was considered relevant to evaluate the surgery course was the interaction that the teachers had with the students, both in theoretical and clinical classes, as well as the teaching material that the teachers used during the theoretical and clinical classes. The better the course was rated, the higher were the perception of interaction and the quality of the teaching material. The social and physical contact between teacher and student, which fosters the teaching-learning mechanism, has been greatly limited by the use of distance classes; therefore, students value personal interaction with teachers and the availability of technological teaching materials for consultation^{1,3,4}.

Clinical education facilitates professional competence, problem-solving and problem-based teaching¹⁰, in which the patient is the main object of study. This has been undergoing a transformation since before the pandemic due to social and legal changes, and to the increase in the number of students, adding digital environments such as virtual classrooms, experimental models on mannequins or literature resources or videos on the Internet.

This clinical education requires an environment in which the student may be susceptible to infection and in turn be a transmitter of the virus by being asymptomatic while attending clinical learning sessions. Because of this, clinical education almost disappeared during these pandemic years¹¹.

Adapting online teaching has also been a challenge, especially for teachers and older students who are unfamiliar with technology, as well as for students living in rural areas where Internet connection is poor and the availability of electronic devices is limited^{12,13}.

The universities initially responded to this challenge with virtual classes and an increased use of *e-learning*, which was already being used to a lesser extent. This technological resource may be useful for preclinical stages, but it is not useful for fostering the development of professional skills. In addition, it also highlights the differences in Internet access, whether due to the availability of technological equipment, network connectivity or high data consumption when using mobile devices. These factors impact equity in student access¹⁴.

It is generally accepted that the objective of medical courses during the COVID-19 epidemic should encourage teaching for autonomous and self-regulated learning through entirely online methodology. Furthermore,

teachers should assume the role of facilitators, providing the tools that enable self-learning, and should teach their students how to assess their own learning¹.

The fact that only 53.3% of the students in the course answered the questionnaire could be a bias, since those who were eager to answer may have been satisfied with the course. Puljak et al.¹³ achieved a 70.3% response rate for a questionnaire in a multicenter study regarding student attitudes toward online study in times of pandemic. Although in this study classes were divided into clinical and theoretical, it also shows a limitation in that different aspects of the course could have been evaluated in order to link more specifically the limitations mentioned by the students to some aspect, whether clinical or theoretical, of the surgery course.

For upcoming courses, teachers should be trained in the online class modality to encourage a more individualized interaction with students, improve teaching materials, and make use of the different tools provided by technology. In addition, a greater number of teaching strategies should be implemented to achieve higher student performance in autonomous and self-regulated learning. In the case of clinical practice, a greater use of competency-based practices in a more defined, specific, and individualized manner should be made, in order to optimize the utilization of the reduced space and time available in the academic interaction with patients.

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There is no conflict of interest on the part of the authors.

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Protection of people and animals. The authors declare that no experiments were carried out on humans or animals for this research.

Data confidentiality. The authors declare that they have followed their center's protocols on the publication of patient data.

Right to privacy and informed consent. The authors declare that no patient data appear in this article.

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