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Authors Contribution Statement:.

Contributor Role	Role Definition	Authors					
		1	2	3	4	5	6
Conceptualization	Ideas; formulation or evolution of overarching research goals and aims.	X	X		X	X	X
Data Curation	Management activities to annotate (produce metadata), scrub data and maintain research data (including software code, where it is necessary for interpreting the data itself) for initial use and later reuse.	X		X		X	X
Formal Analysis	Application of statistical, mathematical, computational, or other formal techniques to analyze or synthesize study data.		X				
Funding Acquisition	Acquisition of the financial support for the project leading to this publication.						
Investigation	Conducting a research and investigation process, specifically performing the experiments, or data/evidence collection.	X	X				
Methodology	Development or design of methodology; creation of models	X	X				
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Software	Programming, software development; designing computer programs; implementation of the computer code and supporting algorithms; testing of existing code components.						
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Writing – Review & Editing	Preparation, creation and/or presentation of the published work by those from the original research group, specifically critical review, commentary or revision – including pre- or post-publication stages.	X	X	X	X	X	X

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Discussion Points:

1. How is surgical teaching perceived by medical students in Italy?
2. How can surgery have a more prevalent role in medical education?
3. How do surgical teaching methods influence medical student satisfaction?
4. What is the best way to teach surgery in medical school?

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ABSTRACT.

Background

Medical student satisfaction regarding the inclusion of surgical education into the medical curriculum may vary among learners. In this study, we analyzed the satisfaction of medical students in regard to how surgical topics were taught in Italian schools in 2021 through a survey. The results collected can be used to not only improve the quality of medical education in the future but to help students make informed decisions about their own education.

Methods

An electronic survey was sent out to medical students in their third to sixth years across three medical schools in Northern Italy via their respective institutional secretaries. The questionnaire was available in Italian and English. It included both closed and open-ended questions regarding satisfaction with the teaching of surgical topics in Italian medical universities.

Results

Results were reported following the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). Most respondents (87%) preferred to have an increase in surgery-related electives and/or extracurricular courses. Further, 51.2% of respondents expressed an increased interest in surgery after having observed in the Operating Room (OR). The majority of respondents (73.3%) also expressed that the coronavirus disease 2019 (COVID-19) pandemic had negatively impacted the quality of teaching of surgical topics.

Conclusion

In the present survey study, Italian medical students preferred hands-on practice over theoretical lectures for surgical education. The majority of students stipulated that the inclusion of suturing, scrubbing, and good surgical practice workshops along with an increased OR attendance would facilitate a better understanding of surgery.

Key Words: surgical procedures, operative, education, medical, survey (Source: MeSH-NLM).

INTRODUCTION.

Surveys represent a valuable tool for collecting information on student perceptions of medical education. Educators and educational institutions often use surveys to collect relevant feedback and improve the quality of education.[1,2]

It is crucial to understand the perception of surgical educational programs by students as student satisfaction with their training is essential for the program's effectiveness and their career output. It goes without saying that the technical skills of surgeons are directly related to postoperative outcomes. In Italy, several studies based on surveys have been done. A study conducted in 2016 comparing the attitudes of medical students who experienced different training models for their surgical rotations demonstrated that learning in the Operation Room (OR) and through observed ward rounds provided the most effective training experience. Students who were not admitted to the OR reported poor educational experiences.[3] Several studied in Saudi Arabia, for example, showed that surgical students were generally dissatisfied with their current training programs and revealed significant weaknesses in their education.[4,5]

Other surveys conducted in Italy revealed that the majority of medical students expressed concerns regarding distance learning during the SARS-CoV-2 disease (COVID-19) pandemic.[6] Additionally, the COVID-19 pandemic has affected surgical medical education in unprecedented ways. Many different countries have faced the necessity to move to distance learning through different methods and this has imposed many restrictions on surgical training and reflected in various ways on student satisfaction.[7] Surgical residents and early-career surgeons across the globe have experienced reduced operating times due to cancellation of elective surgeries leasing to a decline in intraoperative practice and training opportunities.[8,9]

However, information regarding the level of student satisfaction with regards to the teaching of surgical skills in the context of the COVID-19 pandemic is still limited. This study, designed as a survey, aims to delineate the level of satisfaction in surgical training and the opinions of medical students on how surgical topics are taught in Italy in the context of the COVID-19 pandemic.

METHODS

Setting and Sampling method

Electronic Surveys were sent via email to the student's respective medical school secretaries in three universities in Northern Italy. Answers were collected between the 26th of April and the 10th of August, 2021.

Population

Italian medical students in their third through sixth year.

Survey

This survey was developed using a precise sequence of item generation, item reduction, questionnaire formatting, composition, pilot testing, and transcription in both Italian and English.[10] The closed-ended questions were created using Likert's 5-point rating scale system ranging from 1 to 5 (in which 1 corresponds to "not interested at all" and 5 to "very interested") as well as multiple-choice questions. The full survey is available in **Appendix 1**. Closed-ended questions facilitated robust data analysis, allowing for reliable quantification of effect size.[11] Respondents were also able to express their opinions through open-ended questions and to obtain a better understanding of participants' perceptions. A soft-launch approach with a pilot survey determined the expected response rate and was used to correct any ambiguities before finalizing the survey.

Analysis

Results were reported following the Checklist for Reporting Results of Internet E-Surveys (CHERRIES).[12]
Simple descriptive statistics (frequencies and percentages) were computed for each survey question using the Excel Office 16.51 functions and performed statistical analysis using GraphPad online software (QuickCalcs; http://www.graphpad.com/quickcalcs). The Google Forms platform chosen to collect the data is in accordance with the European Union General Data Protection Regulation.[13] The survey questions were also reviewed and approved by the organization Women in Surgery Italia, who themselves carried out a survey study to assess satisfaction among female surgeons in Italy and gender-based discrimination.[14]

RESULTS.

Responses obtained before August 10th, 2021, at 12:00 pm Central European Time were analyzed. The survey was sent to a total of 419 students, of whom 103 responded (response rate of 24.6%). Two students (1.9%) enrolled in their non-clinical years were excluded from the survey. Overall, 30 (29.1%) respondents were enrolled in their third year, 22 (21.4%) in their fourth year, 36 (35.0%) in their fifth year, and 13 (12.6%) in their sixth year. The baseline characteristics of the participants are outlined in **Table 1**. Students' interest in surgery (**Figure 1)** was variable throughout their degree.

Theoretical surgery courses included in the curriculum were evaluated by survey respondents with the use of a Likert scale. Only 5% of students found the classes "very interesting" while 76.3% of students ranked the courses from "not interesting at all" to "mildly interesting". Just 4.1% of the respondents claimed that the existing surgery clerkships were very useful for their learning experience; 39.8% of respondents described the clerkships as somewhat useful for their learning experience and 24.5% as not useful. Of the responding students, 31.6% had not had surgical clerkship experiences yet.

As demonstrated in **Figure 2**, the majority of respondents (82.2%) agreed that the mandatory hours of practice included in their institutional surgical courses were insufficient. Only 5.9% of respondents reported that the hours of practice were sufficient. A significant proportion of the respondents had never been to the OR (26.7%) or had been to the OR only 1 to 5 times (43.6%). Only 15.8% of respondents had been to the OR more than 10 times. Of those that attended the OR, more than half (51.2%) expressed an increased interest in surgery after the OR experience. Significant percentages of students reported wanting to go to the OR more frequently and disclosed that the hours of practice included in their surgical course were insufficient (**Figure 2**).

Regarding the impact of the COVID-19 pandemic, most respondents (73.3%) confirmed that it affected the quality of teaching of surgical topics in a negative way. Less than a quarter (24.8%) did not notice any change in the quality of teaching of surgical topics due to the pandemic and 2.0% of the students found that the pandemic affected the quality of teaching in a positive way.

Unpaired t-tests were performed[10] to compare the interest in surgery among the participants at the beginning of medical school as well as their interest in surgery at the time of the survey. No statistical difference was found between men and women. However, a paired t-test of the interest in surgery in all participants at the beginning of university compared to the time of the survey showed a statistically significant decrease ($p=0.01$).

DISCUSSION.

This was the first study to evaluate the quality of surgical teaching as reported by students at Italian medical schools. High levels of dissatisfaction were highlighted in that a significant percentage of the students (82.2%) reported that not enough hours of practice were included in the surgical courses at their institutions. The majority of the respondents (43.6%) had attended the OR one to five times only or had never attended it (26.7%) at all. The benefit of increasing surgical practical skill development is demonstrated by 51.2% of the respondents expressing an increased interest in surgery after OR experiences. The same percentage of students claimed

that an increase in OR attendance would increase satisfaction with surgical training. The majority of respondents (87.0%) maintained that they would like to have more surgery-related electives and/or extracurricular activities to be included in core courses. Further, a large percentage (**Figure 2**) of students responded that the inclusion of good surgical practice, scrubbing and suture workshops, as well as increased OR attendance would help in having a deeper understanding and knowledge of surgery[14].

Strengths

The present survey provided critical insight into the opinions of third- to sixth-year medical students in Medicine and Surgery International courses in Italian medical schools. The inclusion of "Other" as an alternative to selected multiple-choice answers minimized the potential inflexibility inherent to questionnaires[12,13]. A soft launch approach via a pilot survey allowed the design of a clear and easily understandable questionnaire. The bilingual characteristic of the survey minimized the potential language barrier interference.

Limitations

Reduction of sampling bias was done by reaching out to students through their respective medical school secretaries. Due to the lack of response from many medical schools, it was only possible to reach students studying in the Lombardy and Emilia-Romagna regions which limited the generalizability of this study geographically. Further investigation is vital to obtain a broader perspective of medical student surgical experiences. Nevertheless, such a limitation has a positive impact on the specificity of findings in characterizing a more specific population of medical students in Italy. In addition, the easily replicable method can be used in other regions to quantify the same variables.

Conclusion

Studies have previously shown that students are dissatisfied with how the theoretical aspects of surgery are taught. Furthermore, there is a much greater percentage of students that are dissatisfied with the number of learning opportunities for surgical practical skills. The present survey sheds light on the areas in which changes are necessary to improve the overall experience of students regarding surgical training and teaching. Lastly, regarding the implications of COVID-19 restrictions on surgical topics teaching, a large proportion of students reported significant impacts on medical learning. This result reiterates the preference for practical lessons and active learning in surgical teaching for students.

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FIGURES AND TABLES.

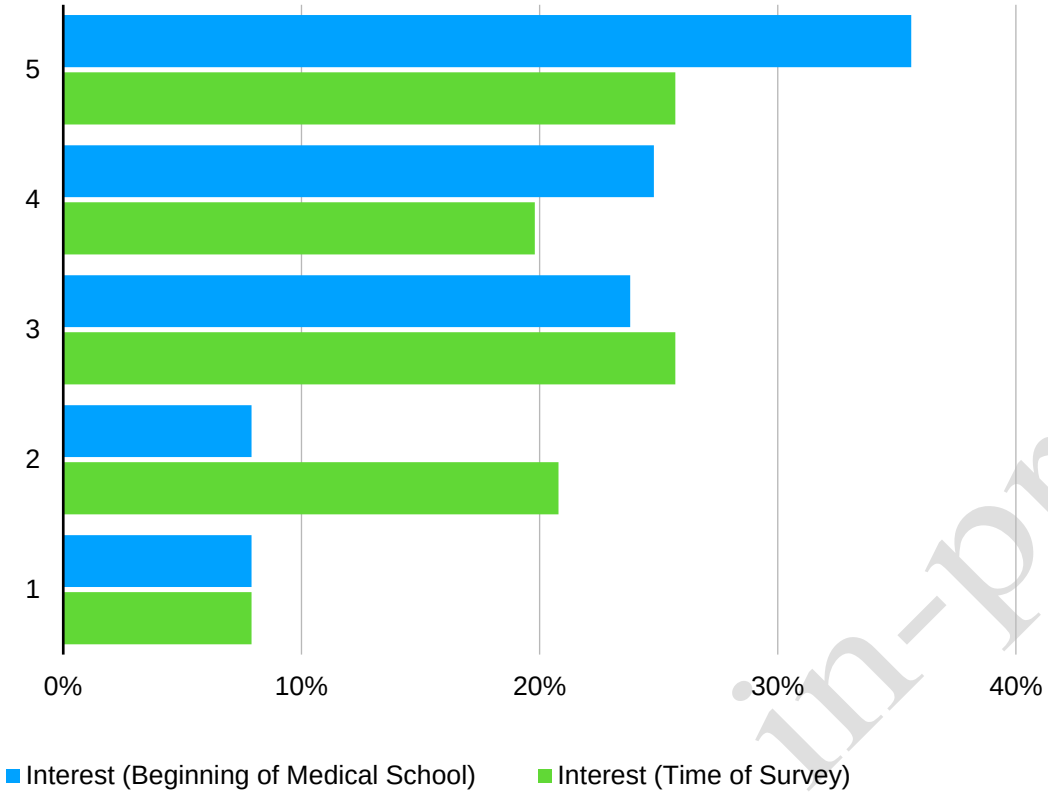


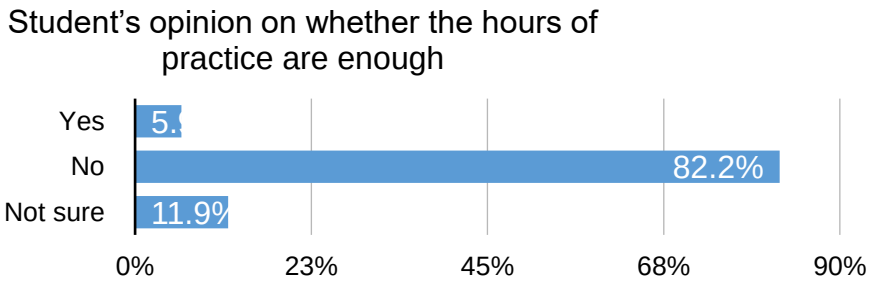
Figure 1. Interest in surgery at the beginning of students' medical education compared with the time of the survey.

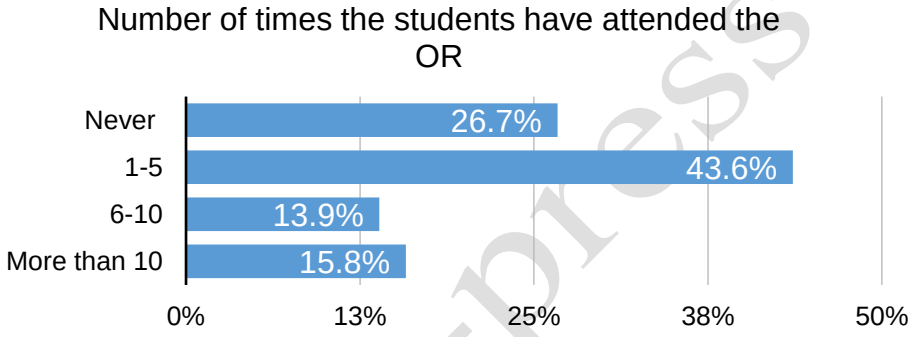
Level of Interest Rated from 1 (Not interesting at all) to 5 (very interested).

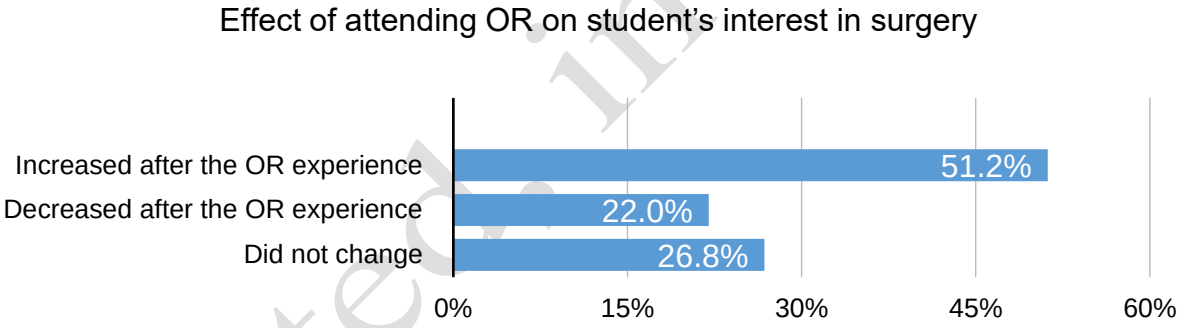
Student's interest in Surgery at the beginning of their medical education compared to their interest in surgery at the time of answering the Survey. The answers were graded according to a Likert scale where 1 corresponded to "no interest at all" and 5 corresponded to " very interested".

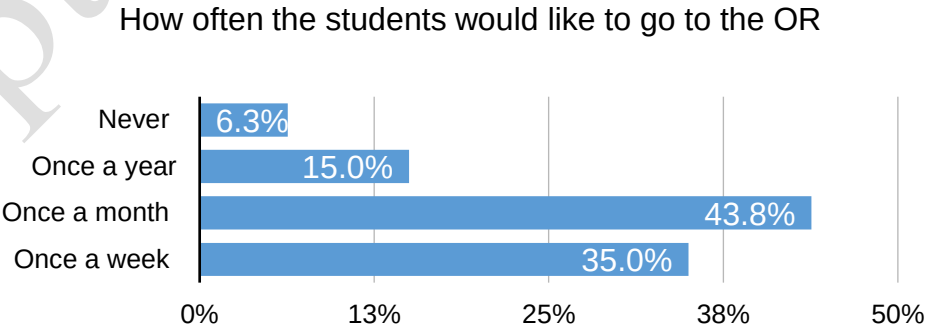
Figure 2. Student's experience of and ideas for improvement for surgical skills teaching.

This figure presents the percentage of students that have selected these possible answer options for various questions in the survey pertaining to their experience and their suggestions for improvement relative to how surgery is taught.









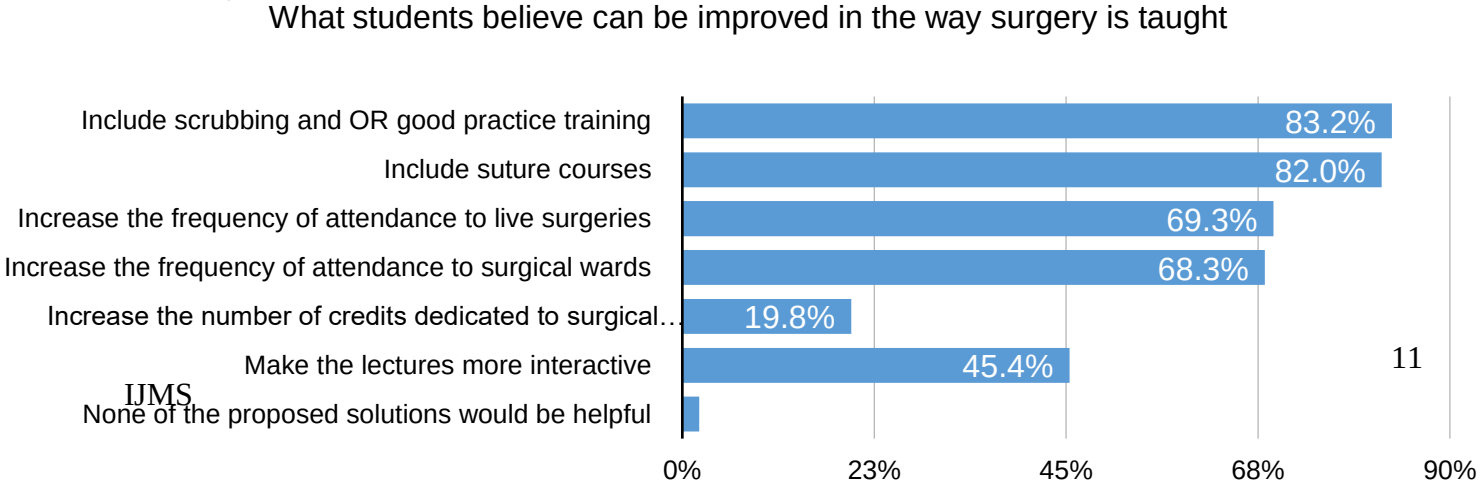


Table 1.Participant's Characteristics

Participant characteristics that were obtained through their answers at the beginning of the survey.

Participant characteristics	Number	Percentage (%)
Number of students that received the survey	419	N/A
Total number of survey respondents	103	N/A
Response rate	103/419	24.6
Those who answered in English	87	84.5
Those who answered in Italian	16	15.5
Age (years)*		
20-23	50	49.5
24-27	43	42.6
28	8	7.9
Gender		
Female	74	73.3
Male	24	23.8
Other	3	3.0
Year of study		
1st and 2nd year	2	1.9
3rd year	30	29.1
4th year	22	21.4
5th year	36	35.0
6th year	13	12.6
Nationality		
Italian	41	40.6
Non-Italian	60	59.4
Employment status		
Full-time students	73	70.9
Occasional workers	16	15.8
Part-time workers	7	6.9
Full-time workers	2	2.0
Place of study		
Lombardy	85	84.2
Emilia-Romagna	16	15.8

(N/A): non-applicable