

Perception of Anaesthesiology Residents about the Effectiveness of Online Learning: An Exploratory Observational Study

Bhavna Gupta¹, Vandana Singh² and Nidhi Gupta^{1*}

¹Department of Anaesthesiology, AIIMS, Rishikesh, India

²School of education, IGNOU, Delhi, India

*Corresponding author: nidhigupta.doon@gmail.com

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ABSTRACT

Introduction: COVID-19 pandemic has posed the biggest threat to international health in a way that had never been seen before. Due to the risk of viral transmission during in-person training, a shift toward online platforms is imperative in the current pandemic. Therefore, we compared the effectiveness of an online vs traditional method of teaching from post graduate anaesthesiologist's student's perspective.

Methods: The study consisted of a survey where questions were generated online in Google forms to find out the perceptions of the students towards online learning and were circulated to a total of 151 residents and anaesthesiologists from different hospitals. They were asked to rate the statements using the Likert scales. The questionnaire was divided into three sections, the first section contains participant consent, the second section contains participant demographics, clinical experience and the third section, was sub divided into subsections and contained logically sequenced questions.

Results: A significant difference was found in learning objectives and satisfaction scores, skill acquisition, doubts clarification, concept building, interaction with students, teachers in offline vs online groups of medical students (P value <0.00001), except in assessment (p value 0.842).

Conclusion: The abrupt transition of the medical educational system from traditional face-to-face teaching to online teaching was an urgent necessity. However, it has imposed a number of challenges that must be overcome in order to prevent the educational process from collapsing. A more holistic approach is required, taking into account the mental impact of COVID-19 on students and improving digital platform technology.

Keywords: COVID-19, medical education, online learning, distance learning, medical students

Medical education has often adapted to technological advancements and the needs of society. Learning and acquiring skills has traditionally been used to provide medical education. In light of the health risks posed by COVID-19 and social distancing measures, traditional "face to face" methodology has been deserted, even in medical education. Interrupting academic activities may have a mental and emotional effect on students' psychological health, given the uncertainty surrounding this outbreak. Some wonder whether the acceptance of online learning would continue to exist post-pandemic and how such a change will affect the

global education sector, although some believe that the haphazard and hasty transition to online learning – with little training, inadequate bandwidth, and little planning – will result in a poor user experience that will hinder long-term development, others believe that a new hybrid model of education will emerge, with significant benefits.

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Objectives of the Study

1. To study the perceptions of students towards the efficacy of online teaching to medical students by evaluating students' experiences, and levels of satisfaction.
2. To study whether online learning could provide equivalent or better interaction with teachers and peers.
3. To find out the level of satisfaction regarding the online assignments and practical.
4. To find out the challenges faced during the online interaction.

Hypotheses of the study

- There is positive perception of the learners about the efficacy of the online learning
- The online learning provides better interaction than face to face learning
- There is a high level of satisfaction among the learners regarding the practical activities done through online mode.

Methodology

This study was a descriptive research and survey based research design was adopted, The population constituted anaesthesiology residents who were recruited from various medical colleges of Uttarakhand. Simple random sampling technique was used to generate a sample of 151 participants.

After validation by two experts, the survey questions were generated online in Google forms intended to find out the perceptions of the students towards online learning and were circulated electronically through social media to groups of residents and anaesthesiologists from different hospitals.

The questionnaire was divided into three sections:

- (I) First section contains participant consent,
- (II) Second section contains participant demographics and clinical experience,
- (III) Third section, which later on was sub divided into subsections and contained carefully chosen, logically sequenced questions based on our research question and assessed the following criterion:

The following considerations were explored as part of the assessment criteria for question 1:

- Students' learning outcomes
- Students' satisfaction with various teaching methods
- Relevance in pandemic
- Computer literacy of students

The following considerations were included in the assessment criteria for question 2:

- Learning obstacles
- Students' positive or negative experiences with online teaching methods

The following aspects were investigated in the parameters for question 3:

- Interactions of students with other students.
- Contact between students and lecturers and support staff.
- How well the practical components were taken care of using the online learning.
- Whether the skills were being developed?

Data Collection

The survey had a checkbox layout and a free text field for each searched item that needs more direct details and explanations. Respondents had the option of concealing their identity, but they were mandatorily asked to answer questions in section 3 of the survey. In this section, students were asked to rate statements using the Likert scales: 1-strongly disagree, 2-disagree, 3-unsure, 4-accept, and 5-strongly agree as five options. As a strategy to increase the response rate, reminders were sent at regular intervals. The Web platform only allows one reply from each e-mail address, preventing multiple responses from a single user. The survey was completed at the end of three months.

Data analysis

Measures of central tendency were used to find out the mean responses of the sample group about their perception towards online learning. MS Excel sheet was used for exploratory analysis. The data was downloaded into a Microsoft Excel spreadsheet. The results were analyzed and expressed as percentages or numbers. Complex Descriptive statistical analysis

was done using IBM SPSS statistical software 22.0. The paired sample T test was applied to compare satisfaction, skill acquisition, doubts clarification, concept building, interaction with students, teachers and assessment in offline vs online groups of postgraduate residents. At 0.05, the P-value was deemed statistically important.

RESULTS

The survey was sent online to anaesthesia residents of various medical colleges in Uttarakhand and 151 residents filled up the questionnaire. Out of all the residents 31.7% were first year residents, 26.4%, second year and 23.1% were third year post graduates residents respectively (Table 1).

Students' satisfaction with various teaching methods

In terms of skill acquisition, the majority of students in both modalities expressed neutral contentment, with 29% of students in offline classes and 16.1% of students in online programmes ranking satisfaction as 4 on a scale of 1 to 5. In the event of a pandemic, the majority of students agreed that online instruction would be beneficial. 29% of students felt it was less effective, 45.2% said it was neutral, and 9.7% believed it was the least successful when compared to the traditional methods of instruction (table 1). Majority of participants (78%) felt that the practical component of teaching was lacking in online lectures.

Relevance in pandemic

Students' concentration levels were affected as a result of the long working hours during the pandemic situation. Around 21.2% of students strongly agreed that this will have a significant impact, while 10.6% disagreed. 58.1% of students think post-pandemic instruction should be mostly offline, 32.3% prefer hybrid, and 9.7% prefer online (table 1).

However, while 43.3% of students believe that online classes will revolutionise medical education, 26.7% do not. Overall, 60% of students were dissatisfied with the paradigm shift in education.

Computer literacy of students

Students utilised cell phones (87.1%), tablets (29%) and computers (16.1%). Online classes helped

students gain technical skills (51.6%), identify weaknesses (22.6%), intellectual skills (16.1%), verbal information (16.1%), and inner strength (12.9%). 74.2% of students had basic computer skills, 12.9% had intermediate, 3.2% had advanced, and 9.7% had no computer skills. On a scale of 1 to 5, students assessed the quality of internet access in their different study areas. 60.9% of residents gave it a 3, 29% a 4 and 7.9% a 2 (table 1).

Students used computer mainly for online classes (87%), thesis or proposal submission (24%), social networking (16%) and updating patient records (24%). The hardware commonly used for online classes was built-in microphone and speakers (64.5%), headphones (54.1%), video conferencing software (35.5%), high definition camera (3.2%), and a mouse and keyboard (3.2%). Regarding video conferencing software, students are well versed with Skype (55.6%), Zoom (15.9%), Google meet (23.2%) and Cisco WebEx (5.3%) (table 1).

Students' positive or negative experiences with online teaching methods

According to our findings, 64.5% of residents considered attending online lectures was convenient, 54.8% figured online classes were flexible, 29% of students considered they could get an uninterrupted flow of education, 25.8% of students demonstrated enhanced attendance, and 12.9% of students considered online classes were cost-effective (table 1).

Perceptions of students towards the efficacy of online teaching

When asked about learning outcomes from classes, the majority of residents stated that they wanted regular scheduled classes, academic lectures, dedicated workshops, dedicated skill stations and gaining more practical experience than theoretical knowledge. Their replies in their own words are tabulated in (table 2).

Students faced many learning obstacles in online learning. These included mainly net connectivity (43%), distraction (64.5%), fatigue and headache due to excessive screen time (45.2%) and technical incompetency (29%). Other difficulties were learning new skills (19.4%), understanding concepts (16.1%), and more expenditure than offline classes (16.1%). Overall distraction (71%) and technical

issues (64.5%) were the main negative experience of students with online classes. Furthermore, 25.8% of students strongly agreed that offline classes were better for doubt clarification in comparison to online classes for which only 16.1% of students agreed. Similarly, understanding concepts was more in offline classes. When asked regarding the ease to appear for internal assessment in both the modes, the response of most of the students was comparable. 45.2% disagreed that online mode was as effective as traditional method of learning (table 1).

Table 1: Demographics of Participants, their perception towards paradigm shift of medical education in current pandemic situation

Questions and their responses	N=151
Participant demographics (%)	
1 st year post graduate	31.7%
2 nd year	26.4
3 rd year	23.1
Senior resident	
Effect of pandemic	
Which had more negative impact on online learning? (n,%)	
Online classes	20 (13.2%)
Pandemic	131(86.8%)
Relevance of online classes during Pandemic (likert score 1-5)	
1	
2	16 (10.6%)
3	48 (31.8%)
4	55 (36.4%)
5	32 (21.2%)
Experience of online classes before COVID 19 pandemic	
Yes	28 (18.5%)
No	60 (39.7%)
Rarely	59 (39.1%)
Are students happy with paradigm shift of classes from offline to online platform	
Yes	28 (18.5%)
No	95 (62.9%)
May be	24(15.9%)
What is your preferred mode of classes post pandemic (%)	
Offline	58.1%
Online	9.7%
Blended	32.3%
Is learning via online mode as effective as traditional mode of learning	
Strongly Agree	0

Agree	7.9%
Neutral	31.6%
Disagree	47.4%
Strongly dis agree	13.2%

Student's perception

do you feel online learning is better than offline? (more than one was true) %

Watching pre recorded lectures	71%
Flexibility	22%
Convenience	56%
Attendance is better	45%

Do you feel your expectations are met considering pandemic situation

Yes	12(%)
No	84(%)
May be or not sure	4(%)

Use of technology during current COVID 19 pandemic

Quality of internet connectivity in your area of learning (scale of 5)

1	0
2	12 (7.9%)
3	92 (60.9%)
4	44 (29.1%)
5	3 (2%)

Which video conferencing software is most preferred by you

CISCO WebEx	8 (5.3%)
Google meet	35 (23.2%)
Skype	84 (55.6%)
Zoom video conferencing software	24 (15.9%)

Gadget commonly used by students for online classes (%)

Smart phone	87.1%
Tablet	29%
Laptop	16%

Level of computer proficiency (%)

0-no computer knowledge	9.7%
1-Basic-This level of skills is required to perform tasks and work with data	74.2%
2-Intermediate - This level of skills is required to work with multiple worksheets, filter data, use integrate functions, and manipulate databases	12.9%
3-Advanced-This level of skills is required to use advanced techniques for analysing and manipulating data	3.2%

Major use of computers these days (%)

1-online classes	87%
2-thesis or proposal submission	24%
3-social networking	16%
4-patient records updatation	24%

Hardware and software do you use for online classes (%)

0-none	32%
1-built-in microphone and speakers	64.5%

2- headphones	54.1%
3- Video-conferencing software e.g. zoom, google meet etc.	35.5%
4-high definition camera	3.2%
5- and a mouse and keyboard	3.2%

Negative experiences with online classes (more than one was true) (%)

Distraction	71%
Technical issues	64.5%
Learning new skills	19.4%
Understanding concepts	16.1%
Expensive	16.1%

Positive experiences with online classes

Convenient	64.5%
Flexible	54.8%
Uninterrupted flow of education	29%
Enhanced attendance	25.8%
Cost-effective	12.9%

Satisfaction scores

Your' perceived satisfaction and usefulness level (in terms of learning objective) with offline mode of classes (%)

1	0
2	8%
3	26.3%
4	31%
5	34.2%

Your' perceived satisfaction and usefulness level (in terms of learning objective) with online mode (%)

1	5.3%
2	26.3%
3	57.9%
4	10.5%
5	0%

Your' perceived satisfaction and usefulness level (in terms of skills acquirement) with offline mode (%)

1	0%
2	12.9%
3	32.3%
4	29.0%
5	25.8%

Your' perceived satisfaction and usefulness level (in terms of skills acquirement) with online mode (%)

1	9.7%
2	29%
3	45.2%
4	16.1%
5	0%

Adequacy of lecturer and peer participation

Interaction of students with other students in offline classes (%)

1	7.9%
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2	7.9%
3	34.7%
4	31%
5	18.4%

Interaction of students with other students in online classes (%)

1	15.8%
2	36.8%
3	39.5%
4	2.6%
5	0%

Interaction between students and lecturers in offline mode (%)

1	2.6%
2	5.3%
3	26.3%
4	39.5%
5	26.3%

A significant difference was found in learning objectives and satisfaction scores, skill acquisition, doubts clarification, concept building, interaction with students, teachers in offline vs online groups of medical students (P value <0.00001), except in assessment (p value 0.842) (table 3).

DISCUSSION

Recently, the COVID-19 pandemic posed the biggest threat to international health in a way that had never been seen before. Interrupting academic activities may have a mental and emotional effect on students' psychological health, given the uncertainty surrounding this outbreak. Similar to our results, Al balas *et al.* who did a cross-sectional study based on a survey that was designed and disseminated to medical students during their clinical years, found that majority of learners wanted to learn via offline classes than online sessions and satisfaction with medical distance learning was only 26.8%, but it was significantly higher in students who had previous distance learning experience.

According to the findings of our study, students are disinclined to use e-learning as a mode of learning. In contrast, a study conducted in India by Sunita and colleagues predicted that e-teaching increased students' satisfaction with learning. [4] According to the results of the survey, skills were acquired more through offline classes than through online classes. A nationwide survey conducted by Guadixetal to identify the concerns of neurosurgery residents revealed a similar challenge for senior residents pursuing neurosurgery as a specialty.

Table 2: Student’s learning outcomes

Offline Learning should be executed
Offline classes should be there. It will be more useful and easy to grasp if topics related to OT, if taken inside OT with demonstration.
As a resident most time we are spending dealing with COVID patients .. in terms of academics I feel we are missing prime ot time and exposure.
More offline classes should be there
Having scheduled teaching classes
Regular academic classes Dedicated workshops and exams But with COVID everything has come to a standstill
Classes should be regular and interactive
Learning through work
Daily offline classes need to be done
Learn from our OR experience and understand the concepts
Confident in all anaesthetic procedures, could able to involve in Super speciality cases, conducting skilled procedures like Fiberoptic bronchoscopy, paediatric anaesthetic managements.
To learn, practical applications can be taught when equipment’s are there in our hand. Hands on learning is lacking in online classes
To have regular classes even in pandemic
I am used to fill gaps in other dept in the name of covid which is injustice to my degree. This is not what I signed up for
Get hands on training in doing procedures and quality lecture classes
In online modes everyone is bombarding their knowledge
Good learning curve
Whenever possible residents can be grouped and offline class can be conducted
Get to learn new procedures
Nothing other than M.D degree and a good health care professional
Interactive offline classes
Offline class
Able to have regular classes and teaching schedule
We want some regular offline classes teaching in ot offline
I expected to get more chances at procedures
During Residency ..we need more department duties .. So that we can be be better in clinical management and procedure skills.. Need offline classes
Lesser hectic work environment
Different than what it is
Learning thoroughly
More learning
Academics should not get hampered
Balance between academics and work
Taking into consideration our long duty hours
Maximum learning and exposure
More of practical learning in the OT and gaining more of practical experience than theoretical knowledge.
Maximum exposure and learning
Structured learning

Table 3: Comparative difference in two groups- offline vs online via paired T test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Offline satisfaction learning objectives offline vs online satisfaction	1.179	1.239	.101	.980	1.378	11.694	150	.000
Pair 2	Offline vs online skill acquisition	1.219	1.523	.124	.974	1.463	9.834	150	.000
Pair 3	Offline vs online interaction of students with one another	.987	1.657	.135	.720	1.253	7.317	150	.000
Pair 4	Offline - vs- online teacher student interaction	1.199	1.474	.120	.962	1.436	9.991	150	.000
Pair 5	Offline vs online doubts clarification	1.199	1.217	.099	1.003	1.394	12.107	150	.000
Pair 6	Offline vs online concepts clarification	1.146	1.349	.110	.929	1.363	10.440	150	.000
Pair 7	Offline vs online assessment of students	.020	1.219	.099	-.176	.216	.200	150	.842

An effective educator moves around the podium during face-to-face sessions to engage the audience and keep the students' attention. Adopting an open stance, maintaining eye contact, and encouraging learner participation are all essential components of effective teaching. However, during online instruction, the teacher's position in front of a screen can be detrimental to retaining students' attention. While recording class attendance based on students' presence or absence would undoubtedly increase student attendance, some students may log in to the lecture, mute the microphone, and then engage in other activities. This problem can be mitigated by incorporating interactive question-and-answer sessions, quizzes, and brainstorming sessions, as well as encouraging students to conduct additional research and deliver a presentation.

Every student in our survey had a smart phone, a personal computer, and internet access. In our study majority of the students (87%) used smart phones for online classes as compared to laptops and tablets. This can be attributed to the easy availability and accessibility of the device in OT environment, when they are also involved in managing cases. In one of the studies conducted in a private medical college it was found that 76% residents use mobile devices for e-learning, which is very similar to our study. Abassi *et al.* also found

that in particular, 77% of students have negative perceptions toward e-learning. A computer with the following minimum specifications should be adequate for online education: greater hard drive, good RAM, microphone and speakers for computer and a Webcam. Wi-Fi connection at a high speed obtained either at home or from an external source such as a library, a quiet restaurant, etc.

Regarding the use of video conferencing software, most of the students were well versed with Skype followed by Zoom and Google Meet. Only five percent used Cisco webex. Web portals like Zoom and Skype are popularly used for teaching and attending classes. They have free features and a meeting can be scheduled with capacity of about 100 people. Presentations on the screen can be shared among all viewers. Additionally, the video meeting can be recorded/saved for future use.

Students expressed satisfaction with the flexibility, cost-effectiveness, accessibility of electronic research, and ease of Internet connection. There was better interaction (31%) of students with others students and with lecturers (39.5%) in offline mode when compared to online mode (2.6% and 13.2% respectively). This interaction occurs naturally in a classroom setting, as students listen to each other's remarks, engage in discussion, and establish rapport through regular communication. In an online

setting, instructors can also encourage student-to-student interaction, but this may necessitate the creation of formal and informal interaction and feedback.

In an online environment, student-to-student interaction is essential for fostering a sense of community, which promotes productive and enjoyable learning while also assisting students in developing problem-solving and critical thinking skills (Kolloff, 2011). Students who had a lot of interaction with other students reported higher levels of satisfaction and learning in one study (Swan, 2002). Students in an online course with a high level of interaction performed better than those in a similar online course with a moderate level of interaction (Beaudoin, 2001). As evidenced by test result, grades and student satisfaction, interaction has an impact on student achievement and satisfaction (Roblyer & Ekhaml, 2000).

Students who learn online require assistance because the distractions are too great and the temptation to avoid doing the work is too strong. To put it another way, schedule one-on-one video calls with each student to discuss their progress, concerns, and feedback, among other things.

Regarding the comfort level with internal assessment through online and offline classes, response of majority of the students was neutral. Developing a valid assessment method while maintaining social distance is a challenge. However, in previous SARS outbreak in 2003, certain universities conducted examination via telephonic conference based viva voice. Other methods like web based clinical scenarios, digital spotters, virtual mannequins may also provide help. These techniques may sound weird routinely but considering the situation it was feasible to adopt such means. Another fundamental flaw of virtual teaching was the lack of face-to-face instruction. Furthermore, Hilburg *et al.* described a life-changing effect in which a student's lack of clinical linkages throughout medical school may have an impact on the speciality they choose to seek later in life.

CONCLUSION

From a social, health, educational, and economic standpoint, the Covid-19 outbreak has had a significant negative impact on societies all over the world. The abrupt transition of the medical

educational system from traditional face-to-face teaching to online teaching was an urgent necessity. However, it has imposed a number of challenges that must be overcome in order to prevent the educational process from collapsing. A more holistic approach is required, taking into account the mental impact of Covid-19 on students and improving digital platform technology. Education faculties must make significant investments to improve the virtual learning process. An unexpected pandemic should be viewed as an opportunity rather than a barrier to the development of new innovations and learning methods.

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