



Utility of Real-Time Online Teaching During COVID Era Among Surgery Postgraduates

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Abstract

A cross-sectional study was conducted to assess the utility of online teaching for general surgery postgraduate residents at the end of 1 month of online teaching during the COVID-19 lockdown. A questionnaire related to different aspects of online teaching was developed on a 5-point Likert scale from “strongly agree” to “strongly disagree”. Following a pilot study, the questionnaire was shared among surgery residents, and response collection was done. The residents who did not attend at least 90% of scheduled classes were excluded. A total of 55 resident doctors without prior experience of online teaching program were enrolled in the study. All the participants responded to all questions and submitted their responses within stipulated time. On the basis of validity testing, questions 1 and 2 were found invalid and hence deleted. The median value for the total cohort was 4 indicating that majority of residents gave affirmative response. On segregating the result with the year of residency program, similar results were found in the 1st year and 2nd year group; however, the 3rd year group showed a median of 3, thus eliciting that only 50% of 3rd year residents liked online teaching. From the present study, it can be concluded that the online teaching is a feasible alternative to the physical class among surgical postgraduates. The questionnaire utilized in the present study can be used for assessing similar online teaching protocols.

Keywords COVID-19 · Medical education · e-Learning · Medical education · SARS-CoV-2 · Coronavirus

Introduction

The COVID-19 pandemic has affected the life of most people across countries, age, race and profession. The teaching institutions were closed, and students were sent home well before the nationwide lockdown was announced. At most of the institutions in India, the medical postgraduates gradually restarted teaching, though on a different “online platform” [1]. The palpable panic of this new pandemic and the accessibility to good quality Internet have given a boom to various

online educational programs in the form of sharing of clinical material, discussion on social media groups and real-time online teaching on platforms like Zoom®, GoToWebinar®, Cisco Webex® and Google Classroom®. It has been shown that e-learning can foster learning equivalent to traditional didactic lectures and medical students even find e-learning enjoyable [2, 3].

Although not in routine practice, the online teaching programme may be a feasible option in times of disruption of conventional teaching modes. We herein share our early initial

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experience of online training in the Department of General Surgery at one of premier medical institutions of the country.

Methods

A cross-sectional study was conducted in the Department of General surgery of a university teaching hospital following 1 month of online postgraduate teaching of residents during the COVID-19 lockdown period. Out of the various available options for online classes, we adopted Cisco Webex online teaching with audio, video and screen sharing options (<https://help.webex.com/en-us/e09qofb/Get-Started-with-the-Cisco-Webex-Meetings-Suite>) hosted from the telemedicine facility of the institute. The teaching classes were scheduled on the same days of the week and for same duration as the physical classes before lockdown. All the residents of the 3-year residency program registered with the Department of General Surgery, and the entire faculty members of the department were asked to download the free application of the software in their computer or mobile device. The students who did not attend at least 90% of scheduled classes for any reasons or having previous experience and exposure with online teaching were excluded from the study. The schedule of classes along with the designated faculty moderator was circulated to all the residents and the teachers through e-mail. A dedicated WhatsApp group was created for communication and reminders for the scheduled classes. Rules like use of chat box for in-between class interaction and use of the microphones wherever needed after permission from the speaker were informed to all members. An orientation program for all the teachers and residents was conducted to familiarize the participants to this platform.

A questionnaire was developed including questions related to different aspects of online teaching. The questions were divided into four domains, namely, accessibility ease, communication ease, comparative teaching quality with physical classes and overall opinion about the online class. Each category had 5 questions having response grading using Likert scoring method on a 5-point scale from “strongly agree” to “strongly disagree”. The questions were framed in such a way that response 5 favoured the online teaching while response 1 did not so that all the responses were unidirectional. A pilot study was conducted on randomly selected 10 residents which showed that the questions were valid. Further, the questionnaire was provided to the remaining residents, and the responses were collected for analysis. The questionnaire and response collection were done by an independent assessor PT via e-mail who was not a part of the department teaching or assessment program to eliminate the bias of response of a student to a teacher. The residents were communicated to submit their anonymous response within 24 h of the receiving

the e-mail. All the responses were collected within stipulated time and subsequently analysed.

Statistical analyses were performed using the IBM SPSS 19.0 Statistics for Windows software. The reliability of present scale was calculated using Cronbach’s alpha and validity with the item-test correlation test. The difference of median was calculated using Mann-Whitney *U* test.

Results

A total of 55 resident doctors without any previous exposure to online teaching program were enrolled in the study. There were 17 residents in the 1st year, 18 residents in 2nd year and 20 residents in third year including 44 boys and 11 girls. All the participants responded to all the questions and submitted their responses within stipulated time. Table 1 shows the Cronbach’s alpha reliability value for individual questions and for domains assessed along with the validity obtained by the item-test correlation method. Two items, i.e. questions 1 and 2, were invalid and hence deleted in the final analysis. In the remaining 18 questions, the item-test correlation value range was 0.347–0.790 suggesting a higher to strong validity score. After deleting the 2 invalid questions, the combined Cronbach’s alpha value calculated was 0.905 suggesting a high reliability of the remaining 18 questions. Of the 4 domains to be tested, accessibility ease had 3 items in the questionnaire, and the remaining domains, i.e. communication ease, quality of online teaching and overall opinion, had 5 items each. A median value of more than or equal to 9 in accessibility ease and 15 in the other three domains was considered an adequate or sufficient score for a favourable response in the particular domain with regard to the real-time online teaching [4].

The median scores and the quartile difference (QD) (Q3–Q1) of all the residents and year wise group are shown in Table 2. All the domains showed a favourable response although the accessibility ease and overall response showed just sufficient score. It is also evident from the year wise resident groups that each domain of the online teaching was favoured except for accessibility ease in the 3rd year resident group (median score 7 out of 15). On comparing the median score between the three groups of residents (year wise), there was no difference in the median score. Table 3 shows a median score and QD for each item of the questionnaire domain wise for all responders ($n = 55$) along with a glimpse of questions asked.

The box and whisker plot in the Fig. 1 shows that the median value for the total cohort was 4 indicating that majority of residents response favoured online teaching. On segregating the result with the year of residency, similar results were found in the 1st year and 2nd year group; however, the

Table 1 Cronbach's alpha reliability and validity by the "item-test correlation" method for all 20 items of the questionnaire

S.N.	Items	Cronbach's alpha	r_{xy}
	Accessibility of online teaching method	0.854	
1.	I did not have difficulty in installing the video conferencing app	0.894	0.224 (NS)
2.	I did not have difficulty in connecting	0.902	0.180 (NS)
3.	I did not have difficulty with video	0.897	0.343*
4.	I did not have difficulty with audio	0.890	0.519**
5.	I did not have any interruption of AV during class	0.886	0.615**
	Communication ease during online class	0.657	
6.	I could freely communicate/had less inhibition during presentation	0.886	0.654**
7.	All the teachers were speaking in a coordinated manner	0.890	0.490**
8.	All the students were speaking in a coordinated manner	0.888	0.561**
9.	My queries were answered satisfactorily	0.887	0.624**
10.	I felt that students and teachers expressed their views in better way than in the physical class	0.885	0.656**
	Quality of teaching in online class	0.701	
11.	Seminars discussed better than physical class	0.880	0.790**
12.	Case presentations discussed better than physical class	0.880	0.784**
13.	Journal club discussed better than physical class	0.881	0.775**
14.	Radiology discussions were better than physical class	0.889	0.555**
15.	I could understand better than classroom teaching	0.885	0.669**
	Overall opinion about online class	0.628	
16.	Time was utilized fully	0.884	0.702**
17.	Prefer same teaching way after lockdown	0.884	0.698**
18.	I will advise other students for same	0.882	0.751**
19.	Cyber safety is a not concern	0.891	0.440**
20.	A good mode for teaching of surgery students	0.891	0.478**

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed). Validity range 0.343–0.790 (higher and strongly valid for the question 3 to 20). The overall Cronbach's alpha value for the 18 questions was 0.905

3rd year group showed a median of 3, thus eliciting that only 50% of the 3rd year residents favoured online teaching. Figure 2 shows domain and year wise response plot. For

accessibility ease median response for the 1st year and 2nd year residents was 4, while the 3rd year response median was 3. For communication ease all three years median response

Table 2 Median score, QD (quartile difference) (Q3-Q1) of accessibility of online teaching method, communication ease, quality of teaching and overall opinion about online class among each year of residency program

Domains	Maximum score	All residents		1st year		2nd year		3rd year	
		Median	QD	Median	QD	Median	QD	Median	QD
Accessibility of online teaching method	15	9	5	10	3	10	6	7	4
Communication ease during online class	25	18	5	18	4	19	6	19	8
Quality of teaching in online class	25	16	8	14	8	17	5	16	10
Overall opinion about online class	25	15	4	15	3	16	3	14	10

There was no difference in comparing the median score among resident groups

Table 3 Median score, quartiles and QD (quartile difference) (Q3-Q1) for each item of the questionnaire domain wise accessibility ease (3 items), communication ease (5 items), quality of teaching (5 items) and overall opinion (5 items)

Domain and questions		Median score	Q1	Q3	QD (Q3-Q1)
Accessibility ease					
Q1	I did not have difficulty with video	4	2	4	2
Q2	I did not have difficulty with audio	3	2	4	2
Q3	I did not have any interruption of AV during class	2	1	3	2
Communication ease					
Q4	I could freely communicate/had less inhibition during presentation	4	3	4	1
Q5	All the teachers were speaking in a coordinated manner	4	3	5	2
Q6	All the students were speaking in a coordinated manner	4	3	5	2
Q7	My queries were answered satisfactorily	4	4	5	1
Q8	I felt that students and teachers expressed their views in better way than in the physical class	3	2	4	2
Quality of teaching in online class					
Q9	Seminars discussed better than physical class	3	2	4	2
Q10	Case presentations discussed better than physical class	3	2	4	2
Q11	Journal club discussed better than physical class	3	2	4	2
Q12	Radiology discussions were better than physical class	3	2	4	2
Q13	I could understand better than classroom teaching	3	2	4	2
Overall opinion about online class					
Q14	Time was utilized fully	4	4	5	1
Q15	Prefer same teaching way after lockdown	3	1	4	3
Q16	I will advise other students for same	3	3	4	1
Q17	Cyber safety is not a concern	1	1	2	1
Q18	A good mode for teaching of surgery students	3	2	4	2

was 4. For quality of teaching and overall opinion, the 1st year, 2nd year and 3rd year median response was 3. There is an outlier in quality of teaching in online class ease domain for the 2nd year student’s response.

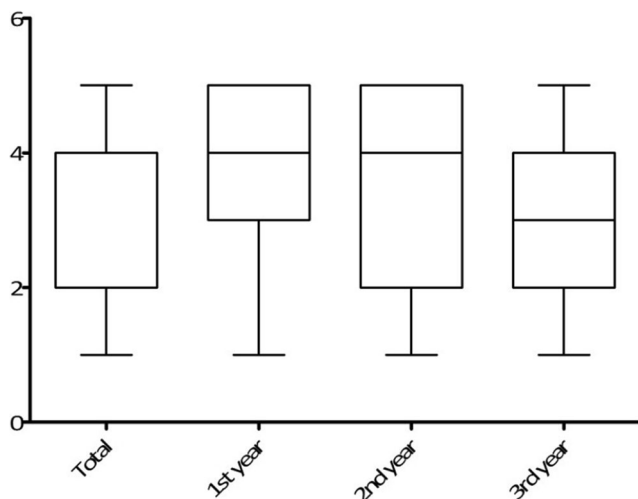


Fig. 1 Rating of online classes by residents on a Likert scale of 1–5 based on valid questions. The median value for total residents, 1st year, 2nd year and 3rd year is 4, 4, 4 and 3

Discussion

The medical profession by large and medical education in particular has been known for changes and challenges, yet

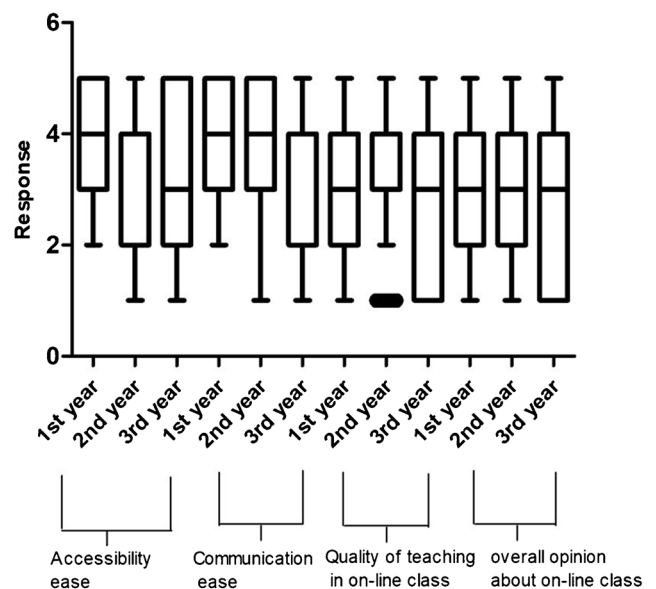


Fig. 2 Rating of responses year wise in each of domains studied

COVID-19 has emerged to have surpassed all of them put together over past more than a century. After the forced disruption of medical education throughout the world, medical schools and colleges have quickly shifted themselves to online teaching system as an alternative to physical class [5–9]. Outbreaks with Middle East respiratory syndrome (MERS) and severe acute respiratory syndrome (SARS) in the past have shown the utility and success of distant education with online technology. However, information and communication technology may sometimes be challenging to medical students in rapidly updating and adapting with the latest informatics competency requirement for these alternative methods [10]. In India, postgraduate clinical subjects especially like surgery rely largely on traditional bedside clinics or classroom teaching for resident training; however, the recent nationwide lockdown has compelled most of the teaching institutions to embark upon various online video conferencing-based virtual classrooms. The present study has tried to assess the perception of this unprecedented and rather not so planned online teaching program among surgery residents. The present study utilized a structured self-administered simple English language questionnaire that has a proven validity and reliability.

We tried to keep the online classes as much close to conventional physical class as possible by keeping the online class schedule and timing same as before lockdown. Thus, we conducted four classes per week each of seminar, case presentation, journal club and surgical radiology of 60-min duration. A similar approach was described by Singh et al. in paediatrics. This was however carried on MBBS students of different semesters [5] with a set of 4 questions assessing the 4-h teaching schedule with a mix of lectures and practical demonstrations/case discussions on a 10-point Likert scale. The questionnaire however lacked a structured approach. A similar Indian study was done among biochemistry students of a single batch using the Google Classroom platform in the pre-COVID time [11]. The assessment was done on a 5-point Likert scale with 9 questions. Although the ease of accessibility was evaluated in this study, specific attributes like audio/video quality and interruptions were not assessed as done in the present study. These problems are relevant to evaluate as the lack of technical skill is an established barrier in implementation of online learning [12]. In era of cyber revolution educators, students and clinicians need to continuously update their skills not only in healthcare advances but also to remain “digitally literate”. Digital literacy has been defined as follows: (a) the ability to use digital technology, communication tools or networks to locate, evaluate, use and create information; (b) the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers; and (c) the ability to read and interpret media, to reproduce data and images through digital manipulation and to evaluate and apply new knowledge gained from digital environments [13]. We found interruption of online classes in a significant proportion of students, and this

might be because many residents accessed the classes on mobile and possible interruption arising thereof during incoming calls. Further, it is challenging for teachers to continuously engage students due to issues like attention span, multi-tasking while attending sessions, poor audio and video quality and Internet issues [14].

A good communication remains one of the foremost attributes in teaching and learning. We found that residents felt less inhibition, teachers and students communicated in a coordinated manner and residents also felt that their queries were answered satisfactorily (median score 4 for each). The postgraduate teaching is largely a problem-based learning rather than the didactic lectures. Although the communication was well coordinated, yet the expression of views in online classes score was borderline (median score 3) when compared with physical class. Singh et al. also concluded that majority of the students felt that they were given the opportunity to ask questions (92.3%) and their interaction with the teacher was better than (27%) or as good as (27.8%) that during physical classroom. Students from another study have reported that they attained better knowledge and felt more satisfied due to easy accessibility, flexibility and increased interactivity with co-participants [15]. However, studies also reported lack of interaction with the teacher and lesser in-depth group discussion for clarification as drawbacks of e-teaching program [16, 17].

We also tried to analyse the quality of teaching with respect to various types of classes, viz. seminar, case presentation, journal club and radiology discussions. All the scores were borderline (median score of 3). The borderline scoring of quality indices in comparison with physical class may be attributed to lack of face-to-face interaction, lack of tutor support in-person, adapting to a new change in short time, absence of any formal training and most importantly the psychological issues among residents like resistance to need for change. These are all well-attributed factors to online teaching shown in various studies [18–21], but one of the most pertinent reasons could be the psychological stress of contracting COVID infection while working as these residents attended teaching in midst of their hospital duties in pandemic.

Finally, we tried to figure out the overall opinion of the online teaching program and found a paradox. Although residents opined in favour of better utilization of time (median score 4) but regarding preference of same teaching method after lockdown, a similar advise for other fellow students and opinion regarding a good mode of teaching surgery students scored borderline (median score 3). A study from India found that while students were appreciative of the platform, 50% of the students still believed that physical classroom was better than e-classroom. These results and the projected indefinite course of COVID infection force us to rethink of implementing newer teaching techniques complementing the conventional teaching methods. This blended learning combining the conventional face-to-face teaching with e-learning

is going to establish in medical teaching institutions [22–24]. Cyber security as expected was a significant concern in the study. On studying the overall and domain wise response with respect to year of residency program, it was seen that the 3rd year resident's median score was 3 but for 1st year, 2nd year and for all residents combined the score was 4. We feel that the viewpoint of 3rd year residents is extremely important in overall evaluation of quality of online teaching as they have the maximum experience of real-time physical classroom teaching among the study participants. Their assessment of online teaching raises important questions about the actual quality of online teaching. But there may be bias in the opinion of 3rd year students as they were about to have their formative assessment in near future as they were at the end of the academic session and hence may not have been interested in devoting time in preparation of class material or in trying a new modality. On one hand, the resident doctors are keen to play their part in the fight with this novel virus; they are equally concerned about the academic loss resulting not only from lockdown but also the effects of social distancing norms on the regular hustle and bustle of physical classes. Whether things are going to revert to normal, after how long and with what changes remains a mystery to unfold in future.

The authors admit the limitation of the study in being a single-centre and single department study, but further use of the questionnaire in a multicentric study design may infer the real fact and fallacy of online teaching programs for medical education.

Conclusion

The present study shows that the video conferencing application is a feasible way of online teaching; however, it cannot be labelled as an alternative or replacement of the physical teaching. The questionnaire used in present study was found to be highly reliable and valid and hence can be used for assessing online teaching protocols.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

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