



Insight into the changing patterns in clinical and academic activities of the orthopedic residents during COVID-19 pandemic: a cross-sectional survey

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Abstract

Purpose The COVID-19 pandemic has presented an unprecedented challenge to the orthopedic residency training programs to adapt to a form of a web-based learning process and simulation-based training. This study focusses on the viewpoint of the orthopedic residents to the paradigm shift in clinical care as well as the academic activities.

Methods An anonymous questionnaire was created in an online survey generator and was sent through e-mail to 227 orthopedic residents of seven tertiary care centres in North India. The questionnaire was divided into three sections, academic activity section, mental health section, and clinical activity section. There were a total of 44 single answer questions with answers according to the increasing difficulty at present situation compared to a previous time before the COVID-19 pandemic.

Results A total of 158 questionnaires were filled by 107 junior residents (67.7%) and 51 senior residents (32.3%). 49 residents (31%) were quarantined and three became positive for COVID-19. Although all of them knew about necessary precautions, personal protective equipment was difficult to avail at times. Increased difficulty in recruiting new patients for research (48.9%) and conducting prospective research (48.7%) was observed. The online-based learning process was reported to be easier (44.2%) by most of the residents. Routine clinical work in the operating room, out-patient department, and inpatient department was found to be difficult according to the majority of the residents along with the anxiety of contracting the infection.

Conclusion There are unique opportunities for improvement of residency programs during these times of uncertainty and the findings of this study can help the universities as well as program chairs to develop a robust program that can outlive this pandemic. The web-based learning process might prove to be useful and can be incorporated into the resident training program in the long term.

Level of evidence Level V.

Keywords COVID-19 · Orthopedics · Personal protective equipment · Residency · Mental health

Introduction

The COVID-19 (coronavirus disease 2019) global pandemic has emerged to be the biggest threat faced by the healthcare system of India at present. Since the first case reported in Kerala, the epidemic has rippled through the whole country within a matter of days [17, 18]. While facing a crisis of healthcare workers, all elective surgeries had been cancelled in most of the hospitals in India since April 2020 [3]. Like other specialties, orthopedic residents have been frontline soldiers in this battle against coronavirus pandemic since the beginning [4, 5]. Looking at the drastically falling numbers of elective orthopedic surgeries [4, 5, 11, 16], residents have been posted in COVID-19 screening out-patient

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departments, intensive care departments, inpatient departments, and telemedicine centre at different centres around the world [12, 13]. They have been utilized by dividing into teams, where one team will be appointed to serve COVID-19 patients, whereas other teams will be posted in orthopedic duties or kept in quarantine [9]. There has been a paradigm shift in the learning process of residents from problem-based learning to the virtual web-based learning process [7]. There has been an upsurge of webinars and educational meetings conducted on different web platforms [7]. Teams of orthopedic residents have been quarantined routinely or after being exposed to some COVID-19-positive patients. Some of the orthopedic residents have also appeared for different forms of examinations too during this period including end-term examination for junior residency.

The current body of literature lacks specific studies focusing on the resident's feedback on these drastic changes in the routine clinical and academic activities. The resident's perspective can help to improve the curriculum of orthopedic residency program all over the world according to the present pandemic situation. This study aims to highlight the experience of orthopedic residents while working in current situations in orthopedic as well as non-orthopedic duties. It also aims to bring the mental status of the residents into the spotlight, while they cope with this stressful work environment which has not been explored before.

Materials and methods

The study was done in accordance with the ethical standards of our institution (AIIMS/IEC/20/174). An online survey was conducted by emailing 227 anonymous questionnaire to orthopedic residents of seven tertiary care centres in North India. Among them, 158 filled questionnaires were received (78.4%). The questionnaire was divided into three sections, namely, the academic activity section, the mental health section, and the clinical activity section (see Figs. 1, 2). The academic activity section was divided into three subsections—online academic activities, research, and examination section. Most of the residents underwent summative assessments in between this period in different centres. The cognitive domain was assessed by multiple-choice questions. Whereas the affective and psychomotor domains were evaluated by objective structured clinical/practical examination (OSCE/OSPE) and case scenarios using standardized patient. The respective sections were designed to get to know the perspective of the residents on the change of curriculum and clinical works. All participants were also required to answer general questions about their age, current affiliation, the experience of treating COVID-19 positive patients, awareness about precautions while working in COVID-19 designated area including steps of donning and doffing

personal protective equipment (PPE), history of quarantine, or taking COVID-19 tests and if anyone tested positive for the infection. All participants were asked to provide a single answer for all the questions if possible and skip the questions which they did not find suitable to answer. The questions had the same options for answers according to the increasing difficulty at present compared to a previous time before the COVID-19 pandemic. All junior or senior orthopedic residents working in the present situations were included in the study. A pilot study was conducted in ten residents fulfilling the inclusion criteria for testing comprehensibility, ease of reading, and acceptability of questionnaires. Each question was assessed for suitability on a Likert scale of 1–5 (1: suitable to 5 highly suitable). Missing responses for each question were also assessed. Data from the pilot study were not included in the main study. The aim of the study was to assess the maximum percentage of responses for each questions denoting the degree of difficulty of that work at the present time.

The questionnaire was created in an online survey generator and the collected data were transferred to excel sheets (Microsoft excel 2016) for further analysis. The percentage of response for each answer in all of the 44 questions were noted. All quantitative variables were expressed in terms of mean and standard deviation. The statistical analysis was done in IBM SPSS version 26.0.

Results

The mean age of participants was 29.7 ± 4.3 years. There were 107 junior residents (67.7%) and 51 senior residents (32.3%). All of the residents had been posted in COVID-19 patient care areas and were aware of all the precautions for COVID-19 patient care including steps of donning and doffing PPE. However, 49 residents (31%) were quarantined due to contact with a COVID-19-positive patient. A total of 57 residents had undergone COVID-19 testing due to various reasons and three residents among them tested positive. The questionnaire was completely filled by 133 residents (84.2%), whereas the examination-related questions in the academic activity section were not attempted by 19 residents (12.02%), and 8 residents (5.06%) left research questions incomplete. In the pilot study, all of the questions were answered by most of the participants (97.27%). The mean score according to the Likert scale was 3.85 ± 0.5 .

Academic activity section

Most of the residents found overall learning through web platforms (44.2%) to be easier than before. However, the majority of residents felt that participating in an online case presentation (55.3%) and maintaining the attention of the

Fig. 1 Figure showing questionnaire (academic activity section and mental health section)

Effect of COVID-19 on Resident training program

Please put single answer for each question. Leave the questions that doesn't applicable to your experience. Comparison is to be done with academics or clinical activity before and after COVID-19 affection.

Your current affiliation and designation?

What is your age?

Have you been treating COVID positive patient? Yes/No

Are you aware of all precautions while working in a COVID area? Yes/No

Have you been quarantined? Yes/No

Have you taken any COVID test? Yes/No, If yes how many?

Have you been tested positive? Yes/No

	Very difficult	Difficult	Same	Easy	Very easy
❖ Academic activity section					
1. Examination					
Interaction with examiners					
Interaction with standardized patients (dummy)					
Online interface-based viva voce					
Environment of exam					
“Multiple choice question” pattern of the Theory exam					
Complete OSCE/OSPE pattern					
2. Research					
Recruiting new patients for research					
Conducting a prospective research					
Conducting retrospective research with available data					
Getting time for research					
Getting research published					
3. Online academic activities					
Managing time to study					
Preparing for an academic activity(slides)					
Interaction with audience					
Maintain the attention span of the audience					
Any gain in knowledge for a presenter					
Technicality of an online conference					
Quality of Case scenario/case presentation					
Overall learning through web platforms					
❖ Mental health section					
Spending time during isolation/quarantine					
Pursuing non-orthopaedic hospital duties					
Managing time for yourself					
Socializing with others					

audience (63.8%) during any online presentation were relatively difficult than offline activities.

During the present situation, recruiting new patients (48.9%) and conducting prospective research (48.7%) posed difficulty to most of the residents. Although there were difficulties in facing a complete online interface-based viva voce (45.8%), multiple-choice questions (MCQ) or Objective Structured Clinical and practical examination (OSCE/

OSPE) di not pose any problem for most of the residents (47.8% and 45.6% respectively). The responses are summarized in Table 1.

Mental health section

The majority of residents found spending time during quarantine (40.4%), pursuing non-orthopedic hospital duties (59.5%),

Fig. 2 Figure showing questionnaire (clinical activity section)

❖ Clinical activity section					
1. Working in Operating Room					
Pre-operative preparation of a patient posted for surgery					
Arrangement of necessary implant					
Scheduling a slot for surgery					
Learning options in Operating Room					
Getting Hands-on surgical experience					
Availability of PPE					
Working with anxiety about COVID infection					
2. Emergency room/Out-Patient Department					
Managing Patient volume					
Examination of patients					
Dressing and plaster room services					
Sending laboratory and radiological investigations					
Obtaining expert opinion (from a consultant)					
Availability of PPE					
Working with anxiety about COVID infection					
3. Inpatient ward					
Follow up of patient admitted					
Sending laboratory and radiological investigations					
Availability of adequate medicine / equipment					
Obtaining references from other departments					
Availability of PPE					
Co-operation from co-residents and staff					
Working with anxiety about COVID infection					

and socializing with others (48.9%) to be difficult in the current situations.

Clinical activity section

PPE was difficult to obtain in operating room (OR) (46.8%), out-patient department (OPD) (38.3%), and inpatient department (IPD) (38.3%). Among clinical activities, working in OR was found to be difficult in all aspects. It was also noticed that the clinical examination of patients (68.1%), working at dressing and plaster room (53.2%), and sending laboratory or radiological investigations in OPD (55.3%) are to be difficult than before. The majority of the residents (51.3%, 53.2%, and 56.3% in IPD, OR, and OPD, respectively) were found to be working with anxiety about contracting COVID-19 infection.

Discussion

The most important findings of the present study were that the orthopedic residents had been facing difficulties in performing routine OR, OPD, and IPD works during COVID-19

pandemic. The present situation has posed a threat to the mental health of residents by increased anxiety of contracting the disease and difficulty in spending time alone without socializing with others. Although residency training in orthopedics has been profoundly affected due to the present situation, it has been advocated for orthopedic surgeons to step up as role models in these times, both in clinical and medical education activities [2]. In the absence of little or no guidance, the administrators of residency programs had to develop methods and strategies to keep imparting quality as well as feasible clinical care as well as medical education in these times. However, the literature lacks the feedback of orthopedic residents to these changes and whether they can be carried out in the long term. This study, one of the first in the literature, focusses on the viewpoint and feedback of the orthopedic residents to the paradigm shift in clinical care as well as the academic activities.

Crises like this are an opportune moment for educators to potentially alter the mode of resident training. The medical education in these times has transitioned into a more digital format with an increased amount of seminars and didactic lectures being conducted online with the help of video

Table 1 Percentages of responses to all questions

	Very difficult	Difficult	Same	Easy	Very easy
Academic activity section					
1. Examination					
Interaction with examiners	2.4	40.1	35.9	19.1	2.4
Interaction with standardized patients (dummy)	2.4	53.3	24.8	17.1	2.4
Online interface-based viva voce	2.4	45.8	34.8	14.6	2.4
Environment of exam	4.3	27.2	31	35.3	2.2
“MCQ” pattern of the theory exam	8.7	34.7	47.8	6.5	2.2
Complete OSCE/OSPE pattern	4.3	28.1	45.6	19.7	2.1
2. Research					
Recruiting new patients for research	38.3	48.9	12.8	–	–
Conducting a prospective research	48.7	44.9	6.4	–	–
Conducting retrospective research with available data	25.5	27.7	36.2	2.1	8.5
Getting time for research	2.1	12.8	23.4	48.9	12.8
Getting research published	17	31.7	38.6	10.6	2.1
3. Online academic activities					
Managing time to study	4.3	21.5	25.5	44.7	4.3
Preparing for an academic activity (slides)	2.1	23.5	25.5	40.4	8.5
Interaction with audience	4.3	21.5	18.9	51.1	4.3
Maintain the attention span of the audience	8.5	63.8	23.4	4.3	–
Any gain in knowledge for a presenter	2.1	23.4	44.7	27.7	2.1
Technicality of an online conference	–	17.2	40.2	36.2	6.4
Participating in a case scenario/case presentation	2.1	55.3	38.3	2.1	2.2
Overall learning through web platforms	4.3	13.4	31.7	44.2	6.4
Mental health section					
Spending time during isolation/quarantine	21.3	40.4	10.6	27.7	–
Pursuing non-orthopedic hospital duties	29.8	59.5	2.1	8.6	–
Managing time for yourself	4.3	28.3	35.5	27.7	4.3
Socializing with others	23.4	48.9	17	6.4	4.3
Clinical activity section					
1. Working in operating room					
Pre-operative preparation of a patient posted for surgery	21.7	52.2	21.7	4.4	–
Arrangement of necessary implant	17	61.7	19.1	2.2	–
Scheduling a slot for surgery	19.1	51.1	14.9	12.8	2.1
Learning options in Operating Room	14.9	40.4	40.4	4.3	–
Getting Hands-on surgical experience	23.4	44.8	27.7	4.1	–
Availability of PPE	4.3	46.8	21.3	25.5	2.1
Working with anxiety about COVID-19 infection	23.5	53.2	19.1	4.2	–
2. Emergency room/out-patient department					
Managing patient volume	6.4	21.3	53.2	17	2.1
Clinical examination of patients	14.9	68.1	14.9	2.1	–
Dressing and plaster room services	17	53.2	23.4	4.3	2.1
Sending laboratory and radiological investigations	12.8	55.3	29.8	2.1	–
Obtaining expert opinion (from a consultant)	4.3	38.3	51.1	6.4	–
Availability of PPE	8.5	38.3	27.7	19.1	6.4
Working with anxiety about COVID-19 infection	18.2	56.3	19.1	6.4	–
3. Inpatient ward					
Follow up of patient admitted	4.3	63.8	25.5	4.3	2.1
Sending laboratory and radiological investigations	2.2	51.1	42.6	4.1	–
Availability of adequate medicine / equipment	4.3	38.5	52.9	4.3	–
Obtaining references from other departments	8.8	63.5	21.3	6.4	–
Availability of PPE	8.5	38.3	35.5	27.7	–
Co-operation from co-residents and staff	8.5	34	42.6	14.9	–
Working with anxiety about COVID-19 infection	19.1	51.3	21.3	8.3	–

COVID-19 2019 novel coronavirus, MCQ multiple-choice questions, OSCE objective structured clinical examination, OSPE objective structured practical examination, PPE personal protective equipment

conferencing and e-learning platforms [2, 15]. As overall learning through web platforms was found to be easy by the majority of residents in this study, online platforms can surpass the effectiveness of offline activities in future times. Similarly, instructional videos for procedural learning with faculty intervention for answering the questions of residents are a novel way forward. In the absence of broad guidelines from universities, it has been up to the program director to devise innovative ways to conduct medical education in consultation with the academic wing of the hospitals. Due to a sharp decrease in patients visiting hospitals with orthopedic complaints, residents had found it difficult to conduct a prospective research study during these times. Moreover, enrolling new patients or following them up might pose a threat to the patients and also to contract the disease while a visit to the hospital. The telephonic consultation and follow-up might be the way forward.

Many countries have started including OSCE/OSPE as the form of assessment for residents in their curriculum and use standardized patients for exams [6]. The literature lacks any conceptual framework for framing standardized OSCE/OSPE questions [14]. Also, it is not clear whether the successful performance of OSCE/OSPE can be adjudged as having sound clinical judgement [8]. Although the majority of residents found it more difficult to get used to the online-based exam and its resultant difficulty in interaction with examiners as well as standardized patients, it has helped the final year residents to complete their junior residency within the stipulated time period.

The residents were demanded to bridge the gap in COVID-19 healthcare while managing emergency orthopedic cases during the pandemic. It was observed in this study that most of the work related to routine clinical activity has become more difficult during this pandemic. This finding may be attributed to the fact that many healthcare workers have been diverted from their routine services towards COVID-19 management [1]. The exception to this finding was noted in the ability to manage the patient volume, which was rated as easy owing to the reduced orthopedic cases during this period. Another factor that can be attributed to the same is that the residents were pooled into three teams. There was one team each for COVID-19 care and emergency orthopedic cases and the third team was placed on standby in case one of the above teams is quarantined for exposure. Despite the known highly contagious nature of the infection, a significant number of respondents had difficulty in obtaining PPE at their work stations (Table 1). This led to the increased anxiety regarding acquiring COVID-19 during their work routine as noted in this study. This anxiety has also got accentuated due to the frequent change of guidelines for the management and prevention of COVID-19.

It is still unknown how long will this pandemic last and for how long will the orthopedic residents be expected to

care for non-orthopedic patients, which leads to a focus on the mental well-being of the residents [7]. The majority of residents in this study had apprehension regarding the quarantine/isolation and risk of infection during work. During these uncommon times of social distancing and less frequent face to face interaction, virtual social hours with the faculty and residents can be organised through online platforms to engage in topics apart from medical education. Efforts to reduce interpersonal isolation (increase interpersonal communication) help in minimising anxiety and stress that the residents are going through [10].

A major limitation of this study is that the findings are based on the responses of orthopedic residents from only one country, which may not be extrapolated to other countries all over the world. As other countries may have different types of health care system infrastructure and resident training programmes. Moreover, this study is also limited by the rapidly evolving strategies in public health as well as medical education, it has tried to provide a glimpse of the feedback from the orthopedic residents regarding early strategies employed after the cancellation of routine clinical and medical education services. It is difficult to quantify the efficacy of current strategies with respect to previous routine protocols.

As the fate of this pandemic is still unclear, some major changes need to be integrated into the residency training programmes all over the world. The findings of this study might enlighten the path in this decision-making. The emphasis must be put on web-based learning, simulation-based surgical process, and telemedicine-based patient consultations while providing the residents' maximum safety and mental support. Embracing these changes will lead the way to better patient care as well.

Conclusion

To conclude, this pandemic represents a challenge to program chairs to provide effective and feasible strategies for clinical care and medical education. There are unique opportunities for improvement of residency programs during these times of uncertainty and the findings of this study can help the universities as well as program chairs to develop a robust program that can outlive this pandemic. The web-based learning process might prove to be useful and can be incorporated into the resident training program in the long term. For all these strategies to succeed, the residents must feel protected and cared for. Embracing the feedback from the residents shall help the orthopedic education community to rise to the challenges of this pandemic.

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Compliance with ethical standards

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

Ethical approval This study was approved by institutional review board.

Informed consent Informed consent was obtained from all individual participants included in the study.

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