

Online teaching of clinical skills in neurology: Experience from a teaching institution during the Covid-19 pandemic

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ABSTRACT

Background. Medical education was completely online during the lockdown caused by the Covid-19 pandemic. This introduced new challenges in teaching clinical skills to medical students virtually. We describe the methods used by a tertiary teaching hospital to teach clinical skills in neurology to final year medical students and present the qualitative analysis of the feedback received from the students.

Methods. Clinical teaching was broadly divided into background clinical knowledge, history taking, clinical examination, and decision making leading to a diagnosis. To facilitate background clinical knowledge, the students created a virtual class notebook using OneNote. History taking skills were taught by using simulated patients, patients' relatives with consent, faculty and peers to provide mock history. Clinical examination was taught by live streaming of clinical demonstration, home examination videos created by the students, and by pictures and videos of abnormal clinical signs. Clinical decision making and diagnosis were taught by using an online quiz with case scenarios where the students had to localize the lesion. Anonymous feedback was received from the students, and the themes from these were analysed.

Results. A higher percentage (36.9%, = 38) of students were confident in performing neurological examination and taking history independently compared to the students who were not confident (28.1%, = 29). The need for more clinical teaching was emphasized by the students. The students appreciated the OneNote compilation. The students also stated the difficulty in understanding without a real patient.

Conclusion. Teaching clinical skills in neurology through an online platform is challenging. The online platform can be used to strengthen the students understanding and background knowledge. It can be used to teach normal examination techniques and standardize teaching. However it is not a replacement for skills learnt by hands-on teaching.

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INTRODUCTION

The Covid-19 pandemic impacted medical education in an unprecedented manner and caused it to go entirely online. This forced both teachers and students to use various online tools in teaching and learning. Clinical teachers in medical colleges described various improvisations and innovative methods to

teach clinical medicine.¹⁻⁴ E-learning mitigated gaps in education in cognitive and psychomotor domains and provided stress management counselling.² Online discussion forums and virtual platforms were used for teaching,⁴ and virtual reality to teach anatomy.⁵

The pandemic and the subsequent lockdown were associated with a higher incidence of depression, suicidal thoughts, and substance use disorders among medical students.¹ A majority (52.8%) felt the pandemic affected their professional training.⁶

The constraints during the pandemic resulted in more didactic teaching and reduced hands-on instruction.⁷ The challenges with online teaching were technical glitches, poor internet connectivity, eye strain, and lack of concentration, although online teaching made content more accessible than traditional teaching.⁸ The other challenges were related to difficulty in teaching skills and communication skills.

The risks to the patients and the students hampered hands-on clinical teaching. The final MBBS year in general medicine is a critical phase where the students synthesize history taking, clinical examinations to make a clinical diagnosis and plan management. The progress in medical college, from growing in knowledge to understanding and applying their knowledge as envisaged by Bloom's taxonomy of learning, happens during this phase.⁹ When the pandemic impacted this phase, we used various innovative methods to teach clinical skills without working up actual patients. We describe the teaching methods used by us and present the qualitative analysis of the feedback received from the students.

METHODS

To teach clinical skills required for neurological system examination, four broad domains were identified as necessary for a clinician: background knowledge of neuroanatomy and physiology, history taking, clinical examination, and synthesis of the above skills to make a diagnosis. We planned a clinical programme to address these domains.

Background clinical knowledge

Comprehensive neuroanatomy and physiology knowledge were critical before proceeding with clinical skills teaching. Active learning through a virtual class notebook using OneNote was used. The modification rights for the notebook were shared with the class. The students were divided into 5 groups of 10 students each. Each group was given a subheading in the central nervous system, such as cranial nerves, motor system, sensory system, reflexes, and spinal cord tracts. The students created notes accessible to the rest of the class on their subtopic from the reading material provided. The faculty supervised the notes for errors and irrelevant details (Fig. 1). The students were encouraged to go through the entire notebook, and the theory assessment was based on the OneNote notebook.

History taking

It is an essential skill that includes building a rapport with the

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patient, communication, and reaching a diagnosis. During the lockdown, the students were unable to meet patients. Hence, we used the following methods to teach history taking.

Simulated patients. The residents or interns played surrogate patients, and the students were asked to call them and get their histories. The simulated patients were trained to provide relevant history to the students. The students would present the history they had collected to the faculty the next day during the group clinical teaching session on Microsoft Teams.

Asking the faculty for history. During the clinical teaching period, the students were asked to take a history from the faculty taking the class and reach a diagnosis with the history obtained.

History taking from the peers. The students were divided into 2 batches of 50. A separate WhatsApp group was created for both groups. Each of the 50 students in the group was paired with another student in the other group. One group would be designated the simulated patients, and a history sheet with instructions would be provided. The other group would call and get history from them. The other group would become the simulated patients the next day.

Calling patients' relatives. The faculty would identify patients admitted with neurological disorders in the ward. After taking consent from the patients and their relatives, the students would call the relatives of these patients and get their clinical history.

Clinical examination

Teaching clinical examinations was a challenge on the online portal. The students had to learn standard examination techniques and the identification of abnormal signs. To achieve this, we used the following methods:

Teaching on the simulated patient. Neurological examination was demonstrated on a voluntary subject and streamed live to the students via Microsoft Teams.

Home examination videos. The neurological examination was divided into subdivisions, and each group of students was asked to create a home video on the demonstration of clinical skills. The students used friends and family members with consent to make home videos of standard clinical examinations. The faculty gave feedback using these videos. These videos were shared with the students via Microsoft Teams.

Pictures and videos of abnormal signs. Pictures and videos of patients admitted to the ward with abnormal neurological signs were taken with consent and shared with the students.

Clinical decision-making and reaching a diagnosis

Localization following a neurological history and examination is a skill expected of a medical student by the end of their course.

The students were provided with reading material on neurological localization. An online quiz with case-based discussions followed this. The students had to localize the neurological lesion based on the information provided. Following the quiz, the faculty went through all the virtual cases, did an online discussion, and explained the basis of the localization.

Statistical analysis

At the end of the posting, anonymous feedback was obtained from the students regarding the methods used. The feedback received was anonymous, voluntary, and done online via Microsoft Forms. The students were asked to score their feedback on the various teaching methods on a Likert scale. The mean and standard deviation of the Likert scale feedback were calculated. This was followed by descriptive feedback regarding the teaching methods used. Two separate assessors reviewed the descriptive feedback provided by the students, and the key themes were obtained.

The study was approved by the institutional review board and ethics committee (IRB Min. No. 14522 [RETRO] dated 23.02.2022). Permission from the institution's principal was taken for publication of the student feedback.

RESULTS

At the end of clinical teaching programme on neurological history and examination, the students were provided a Likert scale for feedback regarding the various teaching methods used. The students appreciated the combined notebook creation on OneNote 4.20 (0.933). The lowest scores were for patients' life history taking 3.28 (0.994). Taking mock history from a post-graduate (PG) resident and making home videos demonstrating clinical skills on family/friends were given mean scores of 3.79 (0.859) and 3.38 (1.086), respectively (Table 1). A higher percentage (36.9%, n=38) of students were confident in performing neurological examinations and taking history independently compared to those who were not confident (28.1%, n=29; Fig. 2).

Qualitative analysis of the descriptive feedback from the students was done by 2 independent evaluators. The themes were broadly divided into feedback regarding the teaching programme and suggestions for improvement. The various themes identified from the feedback form were:

Need for more clinics, classes, and discussions in central nervous system (CNS) examination

The first theme identified was the need for more CNS history-taking and examination classes. The students felt that the time to learn these skills via an online platform was not sufficient. The components the students wanted to focus on varied from history taking, examination, and clinical localization of the neurological lesion. The students felt that examining facial nerves and examining a patient with paraplegia and stroke

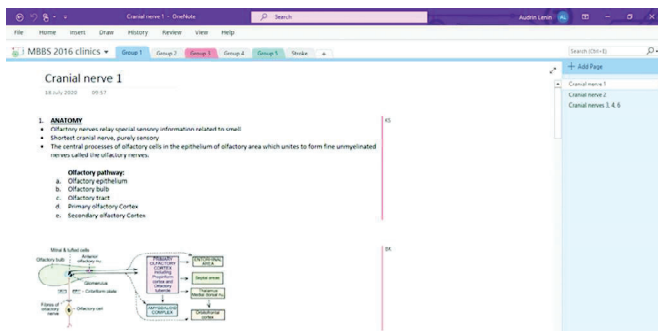


FIG 1. Shared notebook for background clinical knowledge

TABLE 1. Analysis of Likert scale feedback from students

Feedback	Mean (on a scale of 1-5)	Standard deviation
Working up a registrar as a mock patient	3.79	0.859
Taking history from patient relatives via phone	3.28	0.994
Shared Notebook compilation	4.20	0.933

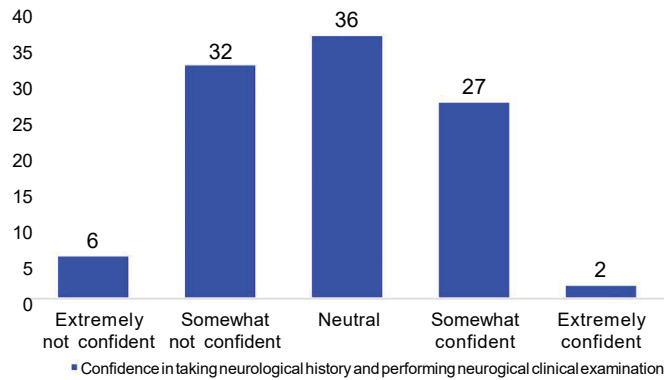


FIG 2. Students' confidence in working with a patient with a neurological illness

would require more clinics.

Appreciation for the faculty making the effort to teach despite the constraints of the online platform

The students were grateful for the faculty's effort to teach history taking, examination, and clinical skills, even with the challenges presented by online teaching. The students were appreciative of the OneNote compilation as it helped them understand the essential concepts well and served as a revision tool.

Difficulties understanding without a real patient

The students found it difficult to identify abnormal clinical findings without a real patient. The students were reasonably confident with normal CNS findings and standard examination techniques, but not very confident when examining a patient with abnormal clinical findings.

The students also provided a lot of suggestions for improvement. The main themes identified in the suggestions were:

Longer posting duration

The students felt that the posting duration was short, and they needed more time for CNS history taking and examination. The various suggestions to overcome this were extra classes after working hours and longer postings.

More case discussions

The students felt that more discussions would be helpful. They also suggested having more classes on the localization of neurological lesions. Some students suggested more focus on questions based on examinations,, which would help with the viva-voce. The students also suggested providing reading materials and references beforehand.

DISCUSSION

The teaching methods used in our institution focused on background clinical knowledge, history taking, examination, and clinical localization. The students were satisfied with the teaching-learning methods, but faced difficulty identifying abnormal clinical findings. Most students were adequately confident with history taking and examination of a patient with a neurological illness. They appreciated the faculty's effort and wanted longer clinical postings with more focus on clinical localization. The key gains from this period were the collaborative active learning between the students and the creation of the

OneNote class book, being surrogate patients. They learned teamwork and took responsibility for their learning with the creation of examination videos as online resources.

The PICRAT (passive-interactive-creative-replaces-amplifies-transforms) model is a paradigm to envisage medical education using technology.¹⁰ The PICRAT model considers the interaction between the students, the teachers, and technology. PICRAT's student axis examines whether the student and technology interaction was passive, interactive, or creative. PICRAT's teacher axis examines whether the interaction between the teacher and the technology replaced, amplified, or transformed traditional teaching (Fig. 3).¹⁰

Applying the PICRAT model, the OneNote virtual notebook and home video creation for neurological examination were creative in the student axis and transformative in the teacher axis. The PICRAT axis for the teaching-learning methods we used has been described in Table 2.

The challenges faced in teaching clinical skills in neurology online were difficulty demonstrating and practicing abnormal clinical skills, ensuring equal participation from all students, and communicating in the absence of an actual patient.

Teaching neurological history taking and clinical examination on an online platform is challenging but possible. The online platform can strengthen the students' background knowledge and normal examination techniques; however, the feedback highlights that it cannot replace the skills and knowledge acquired from hands-on learning in the hospital.

Conflicts of interest: None declared

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How do students interact with technology?	Passive	Interactive	Creative
How does technology impact teaching?	Replace	Amplify	Transform

FIG 3. PICRAT matrix for assessment of technology in education

TABLE 2. PICRAT levels of online teaching

Teaching-learning method	Student axis of PICRAT	Teacher axis of PICRAT
Virtual class notebook using OneNote	Creative	Transformative
History taking from simulated patients, peers and patient relatives	Interactive	Replaces
Home examination videos	Creative	Transformative
Video demonstration of abnormal signs on patients	Passive	Replaces
Neurological localization using simulated cases	Interactive	Replaces

PICRAT passive-interactive-creative-replaces-amplifies-transforms

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