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Research Article

Residents Well-Being and Clinical Metrics during COVID-19 Pandemic in a Rural Neurology Setting

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Abstract

COVID-19 has caused significant disruption to resident education and training. To assess the residents' well-being and their clinical training metrics in a rural neurology residency program affected by COVID-19. An anonymous web-based survey was created and sent to residents for assessing the resident's clinical activities, didactics, and well-being in 2020. Data from inpatient and outpatient settings were reviewed and analyzed according to patients seen before, during, and after the COVID-19 lockdown. The well-being survey included 14 neurology residents. The calculated response rate was 100%. 4 (28%) of the residents reported that the COVID-19 had impacted them "a lot", while half of the residents were "moderately" affected. 11 (78%) of the residents reported that in-person patient visits were the best for outpatient settings, while 3 (21%) favored the tele-video visits. 10 (71%) residents felt that headache was the most appropriate subspecialty for tele-neurology, while 8 (57%) residents mentioned neuromuscular was the least relevant subspecialty. Anxiety (42%) and the risk of being infected with COVID-19 (35%) were significant social issues reported by the residents. The number of patients increased from 306 (pre-COVID lockdown phase) to 375 during the COVID lockdown phase. The number of patients increased during the COVID lockdown phase, as the residents were able to effectively adapt to the tele neurology. Residents did report significant anxiety and the risk of getting infected as their well-being issues. While some of the neurology subspecialties like headache work well with tele-neurology, others like neuromuscular do not.

Keywords: *Residents; Clinical Metrics; COVID-19*

Introduction

The Coronavirus disease 2019 (COVID-19) pandemic has far-reaching consequences and impact on the health care system across the globe [1-4]. To date, it has infected 47 million people across the world, from which about 67569 are health care professionals [5].

Neurology is a high-risk specialty, as stroke patients and other acute neurological emergency patients are typically not initially screened for COVID-19 due to time constraints for administrating intravenous thrombolysis (IV TPA). Secondarily, if the patients had any underlying deficits like global aphasia or altered mental status, they might not communicate about their exposure, travel history or any symptoms concerning COVID-19 infection. On the one hand, the residents must adhere to the Centers for Disease Control and Prevention

(C.D.C.) recommendations of staying 6 feet apart for social distancing to reduce the transmission. While on the other hand, there is the importance of performing a detailed neurological examination to make an accurate diagnosis, making things even more challenging [6-8].

In all, 16 neurology residents make up the stroke and the general neurology services with inpatient and consult teams. Residents cover the stroke pager at the main campus, primarily running the stroke codes and a neuro-hospitalist (trained in vascular neurology).

During the initial COVID-19 break-out phase, we stopped all outpatient electives to limit the residents' unnecessary exposure. The residents were divided into two teams. Team A comprised of active duty inpatient residents, and team B residents were tele-neurology based while working remotely. It was to minimize the impact of COVID on residents so that if they were exposed to a COVID patient, a back-up resident would cover up for that resident. The teams would alternate one week at a time on service. ACGME rules were strictly adhered to in regard to the team sizes and duty hours [9]. Our didactics have always had a virtual sign in (skype business/Microsoft teams) for any attendings to join in the lecture if needed, so the transition to making lectures virtual was straight forward. We made the lectures virtual, with both the attendings and residents logging in remotely. For inpatient residents, they were to sit in the conference room at least 6 feet apart and wear a mask to listen to the faculty's lecture virtually while team B would log in online. Individual neurology textbooks and online Q banks were available to all residents as a courtesy from the neurology residency program. Residents do have a continuity medical education fund to buy specific books/online resources if needed. Our program maintained a balance between the residency training and ensuring that residents met all ACGME requirements during pandemic [9].

Since the lockdown has eased up, the service models are back with mandatory face masking and eye shields. The in-person visits in outpatient continuity clinic and electives have also been restored to their 70% in-person capacity, while the 30% are tele-neurology. Strict COVID-19 precautions, including screening of patients and caregivers at all hospital entrances, were implemented. Visitation policies for admitted patients are also updated to limit unnecessary exposure. Visitors without masks are given masks at entrances before they can proceed to the clinic area. If they exhibit any symptoms or have a recent exposure, they could not visit the hospital and directed to the emergency room testing location. Pre-visit phone calls to ensure that the patients do not have any of the COVID-19 symptoms, no prior exposure, no previous travel history, and their pre-charting is up to date. Most of the didactics have now been moved to in-person teaching lectures with social distancing and mandatory face masking, although off-call residents can connect remotely in the lecture.

Although several studies have been done in the neurology setting, describing the impact of COVID-19 in their clinical setting, specifically looking at specific stroke protocols, there are not many studies addressing clinical metrics and didactics.

Aim of the Study

Our study aimed to assess our residents' well-being and impact on the inpatient and outpatient resident clinic metrics during the pandemic.

Materials and Methods

An anonymous web-based survey was created and delivered to the residents electronically. The survey followed the principles of the Declaration of Helsinki. The data was analyzed and reported using descriptive analysis and statistics by using PRISM statistical software. The survey questions mainly encompass the residents' demographic information, didactics, outpatient continuity clinic, well-being questions, and tele-neurology aspects. The residents evaluated them as being well above average, above average, average, below average, and well below average.

In terms of the patient's metrics, we divided the time durations to "pre COVID lockdown phase" (time duration between January-March (2020), "During COVID lockdown phase" (between March-June, 2020), and "post-COVID lockdown phase" (from the start of July to end

of September 2020). The residents were divided according to the training level to access for impact on their continuity clinic. From our software, we were able to look at the residency inpatient and outpatient clinical metrics, including the number of patients, types of visits, and billing during these three phases.

As it was a quality improvement project, it was exempt from the Institutional review board (I.R.B.).

Results

Fourteen residents were part of the study, with a 100% response rate. Nearly all residents were between the ages of 25 - 34 years. The residents were divided equally between males and females (50%). 4 (28.5%) residents reported that their well-being had been affected "a lot." In contrast, half of the residents mentioned that they were "moderately" affected, as shown in figure 1A. Female residents were three times more likely to be affected in terms of their well-being from the pandemic than their male co-residents. Anxiety (43%) and the risk of being infected (36%) were the two most significant social issues affecting resident's well-being, as shown in figure 1B. 71% of residents reported that headache is the most appropriate subspecialty seen in the tele-neurology clinic. In comparison, 57.14% of residents said that neuromuscular is the least relevant subspecialty, as shown in figure 1C.

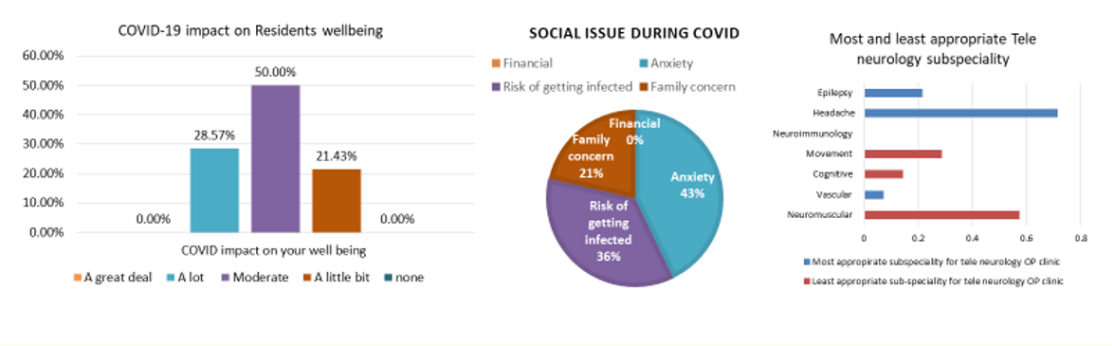

Figure 1: *(A) Showing the results from the web-based survey regarding the impact of COVID-19 on residents well being. The color-coding legend represents the different opinions from residents. (B) Represents the resident's social issues during the COVID-19 pandemic. (C) Showing the results from the web-based survey regarding the tele-neurology visits most appropriate to least appropriate neurology subspecialty.*

In terms of teaching during the tele-neurology clinic visits, 28.5% of residents reported "above average" teaching by the attending, half of the residents reported "average" teaching. For online didactics content, 42.8% of residents reported "above average" content, 57.1% of residents reported "average" content. Regarding faculty involvement during online didactics, 21.43% of residents reported "far above average", 42.86% reported "above average" and 35% of residents reported "average" experience, which speaks highly of the faculty involvement with resident's learning. In terms of the overall experience in the outpatient tele-neurology clinic during the COVID-19 pandemic, 14.2% of residents reported "far above average" experience, 28.5% reported "above average" experience, 50% reported "average" experience, and 7.14% residents reported "below average" experience, as shown in figure 2.

57% of residents reported "average" overall tele neurology experience while 28% reported "above average" experience. 13 (92.8%) residents said that technology is the primary concern behind the online didactic problems.

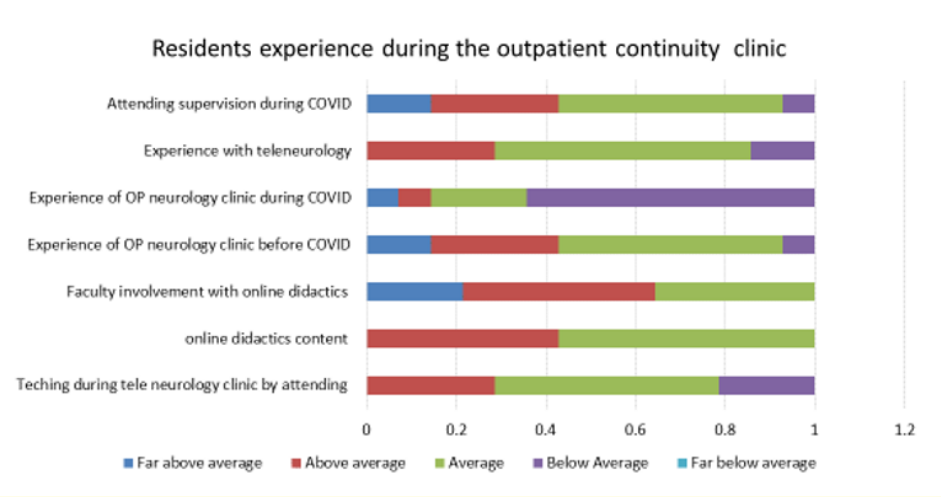

Figure 2: *Showing the results from the web-based survey. The color-coding legend represents the different opinions from residents during the outpatient clinic.*

For outpatient resident clinic visit modality, 78.5% favored in-person patient visits, while 21.5% of the residents approved the tele-video visits. None of the residents were enthusiastic about the telephonic visits due to not examining the patient.

Regarding tele-neurology logistic issues, 28.5% of residents reported technological difficulties, and 57.1% reported neurological exam limitations. In comparison, 14% of the residents said the complicated neurological patients were the main reason for the limitations. 92.6% of the residents reported that the time allocated for the tele-neurology visits as appropriate.

The total number of outpatient visits during the pre-COVID lockdown phase was 306 (86.2%), while 46 (13.8%) patients were no shows. During the COVID lockdown phase, the number of patients increased to 375 (90.8%) while the no-show rate decreased to 38 (9.2%) patients, which shows a 22% increase in patients' number seen by neurology residents. Although the number later reduced to 328 (86.1%), which was similar to the pre-COVID lockdown phase, as shown in figure 3.

Concerning the inpatient neurology admissions, we saw a decrease in the number of patients admitted during the pre-COVID lockdown phase, which decreased even further during the COVID lockdown phase to an all-time low. Still, the number of patients improved back to their baseline during the post COVID lockdown phase, as shown in figure 4A. Figure 4B and 4C show the initial neurology consult level during the three stages.

The number of tele-neurology visits before the pandemic was nonexistent, but it increased dramatically during the COVID locked down phase. The total number of telephonic visits was 191 (46%), new tele-video visits were 81 (19.6%), while return tele-video visits were 96 (23.2%). In terms of the post-COVID lockdown phase, the residents were still able to do 39 (12.5%) telephonic visits, 18 (5.8%) tele-video return visits, 27 (8.7%) new tele-video visit. In terms of the level of residency training, PGY-4's saw 119 (33.5%) patients in the pre-COVID lockdown phase, 166 (34.6%) patients during COVID lockdown phases, and 134 (31.8%) during post-COVID lockdown phases. The types of other outpatient visits in all the three stages are shown in figure 5A.

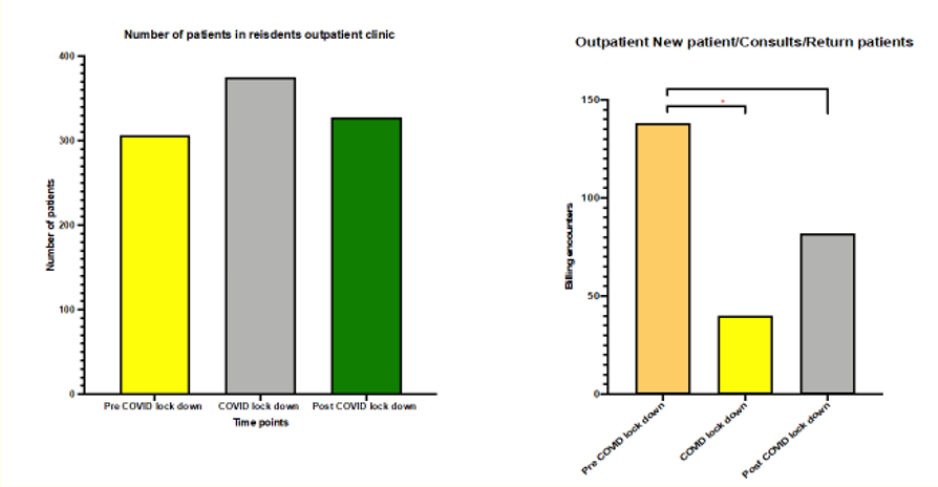

Figure 3: *(A) Showing the number of patients that were seen in the resident's outpatient clinic during the pre COVID lock down, during COVID lock down phase and post COVID lock phase. (B) Showing the different types of outpatient visit billing in the resident's outpatient clinic during the pre COVID lock down, during COVID lock down phase and post COVID lock phase (*P < 0.05).*

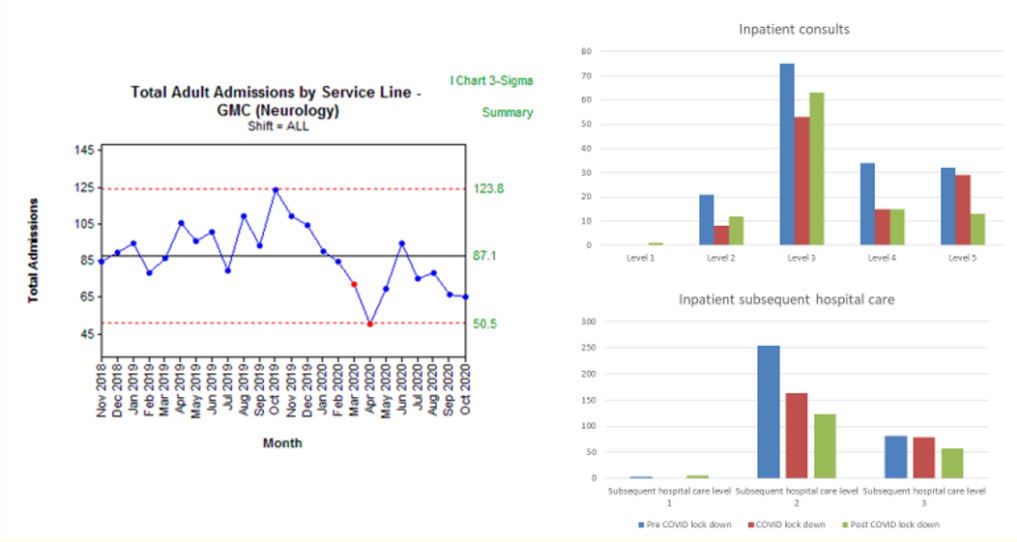

Figure 4: *(A) Showing the total numbers of admission in neurology during the three different phases. (B) Showing the number of inpatient consults according to the level of billing. (C) Showing the level of billing in the inpatient during the subsequent hospital care.*

According to the billing class, the number of new outpatient consults, new and return patients seen in the outpatient clinic, as shown in figure 5B. There was a statistically significant difference between the pre-COVID lockdown phases compared with COVID lockdown phases ($p < 0.05$).

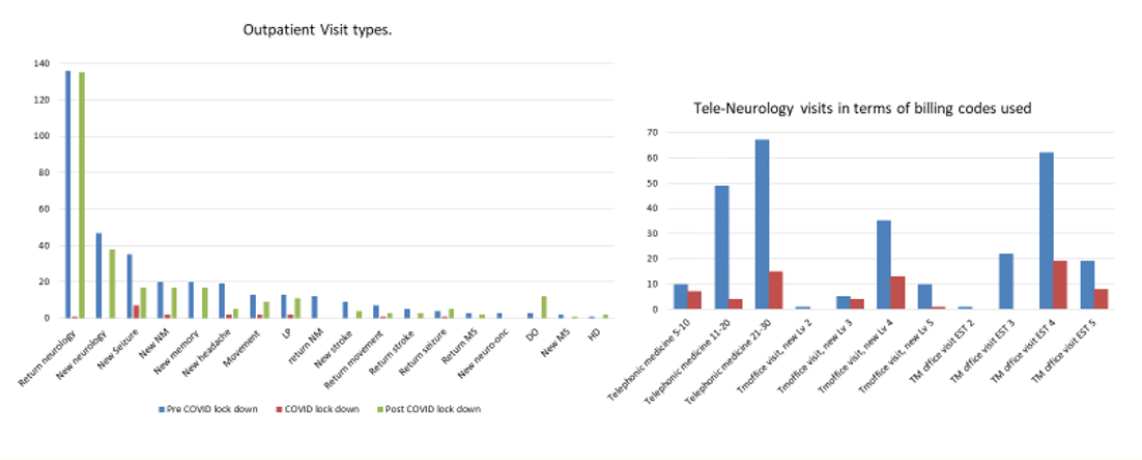

Figure 5: *(A) Showing the different types of visit in the resident's outpatient clinic during the pre COVID lock down, during COVID lock down phase and post COVID lock phase, (B) Showing the different types of tele-neurology visit in the resident's outpatient clinic during the COVID lock down phase and post COVID lock phase.*

Discussion

COVID-19 has impacted everyone's life. On one side, residents are trying to stay safe from the pandemic and, on the other side, provide critical health care delivery for sick patients. With the COVID-19 lockdown, residents' training and education were also prone to interruptions and potential delays, affecting them both financially and psychologically [12,13]. It is essential to make sure that the residents' teaching is at par with the milestones set by ACGME, and they are completing graduation requirements.

Our study reviewed and evaluated the impact of COVID-19 on neurology residents' well-being, training, and education, along with the outpatient and inpatient clinical metrics. Our neurology residents were very quick to adapt to this changing environment by embracing the tele-neurology technology [14], thereby evaluating more patients during the COVID-19 lockdown phases than the total number of the outpatient neurology patients before and after the COVID-19 lockdown phases. Although residents documented their experience as being average during the COVID-19 lockdown phase secondary to not examining patients, the attending supervision and teaching were satisfactory during the COVID-19 lockdown phases. Female residents were three times more likely to experience anxiety from COVID-19 as compared to their male co-residents.

In terms of outpatient metrics, COVID-19 drastically reduced outpatient in-person outpatient visits. Still, with the help of tele neurology, the total number of patients seen in the outpatient setting increased by 22% with the tele-neurology platform's use. The need for social distancing, which led to minimal in-person evaluations, led to a significant increase in the number of tele-neurology visits, which were beneficial in terms of decreasing the exposure to patients and providers from COVID-19 and also reduced the need of traveling from patient's home to the clinic.

Virtual clinic visits also pose some serious technological challenges, as we are situated in a rural setting with transportation issues. Not every patient has a camera-enabled device, and due to remote locations, others have internet connectivity issues. If the patients were having technical difficulties, residents were able to change their visits to telephonic visits. If a patient were to be seen earlier, our clinic staff would make arrangements at our satellite clinics to be seen sooner with proper safety and precautions. In terms of telephonic visits, some of the attendings were able to listen to the whole conversation to assess whether the residents could get a complete history, counsel the patients, and come up with a plan. Our teaching attendings evaluated the residents during these tele-neurology visits, based on the guidelines recommended as per the American Academy of Neurology. Regarding tele-video visits, residents could discuss the patient with the attending, and both would join the patient in the virtual waiting room to go over the plan [14,15].

In terms of the didactics, our educational model comprises of half-day dedicated didactics in which the attendings on service and off-service residents can take care of the urgent consults leaving neurology residents to focus on their education. The teaching faculty converted the morning report and grand rounds to a remote presentation. The didactic teaching did not get much affected as the attending could give lectures online and send their presentation electronically to residents. Residents were also able to ask a question on the Skype business and Microsoft teams application using the chat feature. Several e-learning tools, including question banks, podcasts, and video lectures, were also available to the residents. Residents could also access these resources through Microsoft share point even logging remotely from their homes [16-21].

We managed to alter the residency program with certain measures to avoid COVID exposure and make sure that the quality of training is not affected.

Our study has some limitations, as it was a single-center, stand-alone, non-university based academic center study. On the other hand, it also gives firsthand knowledge about how the neurology residents perceive during the pandemic terms of their didactics and their impact on their training. Our study did show an unbiased view from the resident's perspective about the challenges they have been facing in this unprecedented time.

The present pandemic has also given us a learning opportunity to adapt to changes quickly and accurately. This learning experience will not only benefit us for this current pandemic. Still, it will also help to make sure that if something of this magnitude happens in the future, we are ready for it so that the learning environment and quality of education are not compromised.

Conclusion

In conclusion, during the current pandemic, our rural neurology residency program effectively adapted to the challenges posed in terms of clinical teaching, didactic learning, and well-being. Although there is always room for improvement and limitations to our study, our unique perspective can be shared and adopted by other programs to avoid resident teaching interruptions.

Data Availability

Data available requests can be addressed to the corresponding author.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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Disclosure

The authors report no financial disclosures.

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