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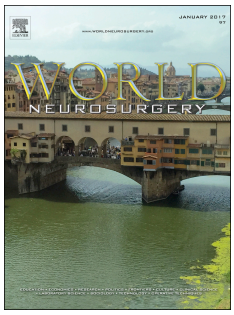

Adapting Neurosurgery Practice During The Covid-19 Pandemic In The Indian Subcontinent

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ADAPTING NEUROSURGERY PRACTICE DURING THE COVID-19 PANDEMIC IN THE INDIAN SUBCONTINENT

ABSTRACT

Background

The COVID-19 pandemic has changed the practice of neurosurgery. Significant resources have been dedicated to it. The pandemic in the Indian subcontinent, when compared to the rest of the world, is relatively delayed. The neurosurgical practice cannot remain unaffected by hugely disruptive measures such as a lockdown. The inevitable rise in covid infections with its gradual relaxation continues to pose a risk for health care providers. Therefore, it is imperative to evaluate whether the pandemic has had a discernible effect on the same especially in terms of practice modifications in private establishments and publicly funded hospitals, the emotional impact on the surgeon, and the influence of social media on the psyche of the surgeon.

Material and Methods

An online questionnaire-based survey was prepared, with questions related to the COVID specific themes of precautions taken in outpatient services and operation theaters, the influence of social media, the economic loss incurred, and the perceptible impact of telemedicine and webinars. The links to the survey were mailed to neurosurgeons in private and public practice all over the country. The responses were anonymized to ensure free and unbiased answers to the survey questions.

Results

A total of 176 responses were received from all over the Indian Sub-Continent. The median age of respondents was 39years (range 32-70 yrs) and the post-residency experience was 7years (range 0-34 yrs). Respondents were an equitable mix of public and private practitioners. 46% of the respondents were practicing restricted outpatient services, more in public institutions (p=0.22) which also had a higher incidence of tele-outpatient services(26% vs 17%). Wearing surgical masks, N-95 masks, and gloves were the most commonly practised precautionary measures in outpatient services(>60%). While private practitioners were continuing elective cases(40%), public institutes were more cautious with only emergencies being operated(29%). The greatest fear among all practitioners was passing the infection to the family (75%). Social media was helpful for brainstorming queries and updating practice modifications, but some surgeons admitted to receiving threats upon social media platforms(37.5%). Depression and economic losses were palpable for approximately 30% neurosurgeons.

Conclusion

The survey highlights the perception of the neurosurgeons towards the pandemic and the difference in public-private practice. Suspension of elective procedures, severe curtailment of the regular outpatient appointments, drastic modifications of the normal OPD/OR practices and apprehensions related to inadequacy of safety provided by PPE usage and financial losses of private establishments were some of the visible themes in our survey results. Though

telemedicine has not been as widely adopted as expected, yet online education has been favourably received.

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INTRODUCTION

"I understand that it's hard for everyone, but one cannot give in to emotions... we'll have to draw lessons from the current crisis and now we'll have to work on overcoming it."

-Boris Yeltsin

The COVID-19 pandemic has irrevocably challenged the traditional perspectives and practices of Neurosurgery. Medical services have been heavily scaled down during the lockdown as a huge amount of resources were deployed to face the emerging epidemic. Hospitals rapidly reduced scheduled clinical and surgical activities and were forced to postpone non-emergent procedures. During this period, a significant shrinkage in access to the emergency department for both minor and major pathologies has been observed, together with the precipitous decline in outpatient appointments[1]. Perhaps the fear of contagion prevented patients, even with severe symptoms, from seeking care. Alternatively, patients may also have experienced difficulties in accessing medical services given the extraordinary commitment to treat the new disease and curbs on mobility of people[2] . The lockdown imposed to contain the contagion had some unavoidable adverse consequences for healthcare delivery [3].

In this context, the effect of the disease and its influence on the health care system continues to be felt daily [4,5]. The neurosurgical practice is not untouched by the current situation. There are reports from various parts of the world including Europe and North America regarding the change in the neurosurgical practice during COVID pandemic [6-9]. Neurosurgical patients needing intensive care may have suffered as most of the resources like ICU beds, ventilators and intensivists were diverted to the care of COVID patients [10]. However, there are some major differences in the developed and developing world (e.g. Indian subcontinent); a large and dense population, limited resources, and already strained health infrastructure [11,12]. Recently, there are a few publications from the developing world describing the perception of neurosurgeons about pandemic and changes in the neurosurgical practice in the pandemic but there is none from Indian subcontinent [13-17]. Hence, there was a need felt to understand the effect of the COVID epidemic on neurosurgical practice in the Indian subcontinent. Moreover, there is a fear of an alarming rise in the number of cases of violence against medical personnel owing to a fear of contagion or frustration with the increasingly hamstrung healthcare system in the Indian subcontinent.

We surveyed the practicing neurosurgeons in the Indian subcontinent about the changes in the neurosurgical practice during this pandemic. We also discuss unconventional issues like the loss of economic remuneration, mental health worries, the impact of social media, and the

surge of surveys and webinars. Our primary intent here was to explore the disparity, if any, between private and publicly funded institutions, concerning the patterns of clinical neurosurgical practice and the use of Personal protective equipment (PPE) during direct patient exposure. We also discuss the use of telemedicine in Indian subcontinent.

METHODS

We prepared a comprehensive online questionnaire with 26 questions with multiple choice answers and circulated the same in various social media groups, focused email lists, and direct messaging platforms consisting of neurosurgeons from the Indian subcontinent (India, Pakistan, Bhutan, Bangladesh, Nepal, Sri Lanka). The total number of recipients of the survey was approximately 1000. The respondents were anonymized concerning name, place of practice, sex, and country of origin in order to have an unbiased opinion. Data was collected using Google Forms® software online. Questions were divided into three broad areas:

1. The pattern of neurosurgical practice during COVID-19 pandemic
2. Influence of social media and electronic learning platforms on neurosurgeons and their mental health
3. The financial and emotional impact of the epidemic on neurosurgeons

The statistical analysis was primarily descriptive. Data compiled on the online Google spreadsheet was analysed with the “R” language. The categorical variables were examined using chi-square statistics and the continuous variables were compared using Welch's t test. The responses collected on Likert scale patterns were studied using the non-parametric tests (Wilcox rank sum test and Kruskal-Wallis test). Statistically significant differences have been reported.

RESULTS

Responses

We received a total of 176 responses from a total of 1000 potential recipients (17.6% response rate) from the survey which received responses between from 1st May 2020 to 15th May 2020. The respondents were equally distributed among government and private institutions (81 vs 78 respondents) (Table 1) and were of varying duration of experience following residency (Figure 1). The median age of the respondents was 39 years (range 32-70 yrs) and the median post-residency experience was 7 years ((range 0-34 yrs). Most of the neurosurgeons had approximately a median of 7 beds (interquartile range = 9) to manage per head (Figure 2) with private neurosurgeons having more beds to manage per head than those in public institutions.

Public-Private disparity

There was a noticeable change in the outdoor patient department (OPD) practices of neurosurgeons with most of them either restricting OPD (31.8%) or opting for Tele-OPD (20.5%). Some stopped the OPD services completely (17.6%) . At the other end of spectrum were a similar number of surgeons who continued their regular OPD practices(14.2%) (Table 2). Interestingly, the practice varied with the number of neurosurgeons in a group. Whereas single/sole practicing neurosurgeons opted for restriction of OPD numbers or follow-up cases or continued unchanged, groups with >10 neurosurgeons either stopped OPD completely or relied completely on Tele-OPD. This can be attributed to the fact that most of the large neurosurgical practice groups belonged to public institutions and were obligated to close outpatient departments following government directives.

This is corroborated by observations when the OPD practices of private and public institutions were compared. Twenty six percent of the government/public practitioners had stopped OPD completely and the same proportion had opted for Tele-OPD services. In contrast only 9% of private practitioners had found it feasible to suspend their OPDs; 17.9% had started Tele-OPD (Table 2). These differences in the changing patterns of outpatient services were significant ($p<0.001$) when compared across groups. This needs to be interpreted in the context that most respondents (61.3%) worked in smaller (<5 surgeons) groups. It is reflective of the type of neurosurgery practice in our subcontinent which is still considerably individualized in the private sector. While government institutions had an almost equitable distribution of the number of neurosurgeons between >10 and <10 groups (37 vs 44), private practice was dominated by teams comprising 2-5 neurosurgeons per team (Figure 2D, Table 2).

Personal protective precautions and strategies

In outpatient clinics, ordinary surgical masks were being used primarily, although the respondents believed that ideally N95 masks with gown/gloves and prior screening of cases need to be adopted (Figure 3). Many neurosurgeons even expected glass barriers to be erected between patients and themselves or even the use of full PPE kits in OPD for maximal protection. However, these protective measures were being implemented sparingly when examined against the expectation of the clinicians (Figure 3 , Table 2). Surprisingly face shields were not popular either in usage or expectations in OPD probably because their prolonged use was considered to be cumbersome. This is even though face shields made with surgical sterilization wraps also made to meet FDA criteria report a BFE (bacterial filtration efficacy) of 98.9%–99.9%. Apart from this, practice more or less matched expectations both in public and private practice.

In operation theatres (OT) too, the operative strategy had shifted from elective and emergencies to doing mainly emergencies and occasional elective cases during the pandemic (Figure 4, Table 4). Here too, while government hospitals did either only emergencies or emergencies with COVID testing, non-government organizations continued to do occasional electives or had their practice unchanged i.e. continued to do electives too (Table 3). There was no difference in terms of the expectation of OT precautions with donning/doffing area, full PPE usage, and face shields/goggles being expected by both private and government institutions (Figure 4 , Table 4). In terms of practice, however, the private practitioner was more careful and had higher usage of donning/doffing area (23.1%vs 19.8%), full PPE usage (53.8% vs 42%) and face shields/goggles(60.3% vs 48.1%) when compared to government institutions.

One of the biggest concerns among practitioners during this time was passing the infection to family members with >70% of all respondents wanting to prevent the same (Figure 5). This was way higher than the fear of getting infected and financial losses (Table 4). Regarding their outlook towards the resumption of clinical practice many felt the same would be restricted for the foreseeable future (43.8%) while a substantial number of them were uncertain (26.1%). In the absence of government regulations most wanted to continue semi-elective and elective cases with testing for COVID (46.6%) or do only very restricted practice like only emergency cases (29%) (Table 4).

Social media role and Mental Health

About a quarter of the respondents were mentally depressed during the past six weeks of the lockdown period following the declaration of the COVID pandemic measures.
Social media was rife with fake news claiming false treatments and more than 80% of respondents seem to have encountered such news daily (Table 4). However, PPEs and prophylactic medications like hydroxychloroquine were also discussed frequently by neurosurgeons on social media as the pandemic struck the subcontinent. Most respondents (> 60%) found social media to be useful in deciding workflow and planning during the pandemic (Table 5). Most respondents denied facing any threats from the community during the COVID pandemic, in contrast to the social media stories. However, 30% of the respondents admitted that they felt discriminated against or encountered hostility on social media during the pandemic with 61% never reporting the same and 9% choosing not to respond to the same . An overwhelming majority of respondents (78.2%) felt that an 'infodemic' of papers and surveys on COVID-19 had accompanied the pandemic, perhaps more than can be humanly absorbed.

Tele-Medicine, webinars, and journals
About two-thirds of the respondents expected a greater role in telemedicine in the post COVID era. Most of the respondents were aware of the neurological manifestations of COVID-19 (64.2%) and recounted names of reputed journals (NEJM, Lancet, JAMA, Nature) as their popular sources of scientific information on the pandemic. Almost 47.2% of the respondents remarked that webinars were a good source of learning during this phase of social distancing (Table 5).

Economic loss
Most of the neurosurgeons reported economic losses during this period with only 17.3% reporting no loss. The salaried surgeons face a deduction in the salary ranging from 20-30% while private practitioners face setbacks as they need to meet the running cost of the infrastructure. The estimated losses ranged from 700 USD to 4000 USD (INR 50,000 to 3,00,000 rupees per month. Average monthly salary of a neurosurgeon in India has been estimated to be 4000 USD (range from 2600 USD to 10000 USD)[6]. This should be interpreted carefully as the losses not only meant salaries but erosion of savings and investment valuations.

DISCUSSION
COVID-19 has infected almost 9,825,000 people worldwide as of this writing and has spread to more than 200 countries across the globe [13,14]. As of now, India has more than 508,000 cases and is just behind the US, Brazil and Russia in terms of caseload. The surge of cases in India has been delayed perhaps due to the strict lockdown implemented by the government in the initial period which was inevitably lifted due to socio-economic compulsions. This was important to collect and streamline the resources and increase public awareness necessary to counter the epidemic. The relaxation of the lockdown and increased covid testing has led to an expected recent rise in the number of cases in India.
The experience from most countries including India, Brazil and Russia shows that the pandemic has been disproportionately severe in densely populated metropolitan centres. High population density is one of the most important factors responsible for the uncontrolled spread of the virus with a maximum number of cases seen in metropolitan cities with population more than 20 million (Mumbai and New Delhi). Similarly, St. Petersburg in Russia and Rio De Janeiro and Sao Paulo in Brazil have borne the brunt of disease.This is probably attributable to the prolonged and close contact between the infected and susceptible population, occasioned by the crowded nature of these urban centres. Thus, a short term

dispersion of the population outside crowded urban centres may be a useful middle path strategy vis a vis an absolute lockdown.

Comparison of India with Russia and Brazil

While most of the developed nations in Europe and scores of US states have seen enough progress in their fight against the virus to focus on how best to reopen their economies, the developing nations of Brazil India and Russia have seen a surge in cases and now place 2-4th in the list of cases overall. However, the response in all these nations has been different. While India initiated an early lockdown and had a spike of cases later, Brazil had a partial lockdown and later lifted the same. Russia on the other hand had a partial economic shutdown imposed in late March helped slow the outbreak and prevent the nation's health care system from being overwhelmed. The nationwide lockdown was later needed and encouraged provincial governors to consider reopening industries and construction sites. One of the common factors in all these nations is the incapability to sustain long periods of lockdown due to economic factors which has led to a late increase in cases. Developed nations on the other hand have had resources to sustain a lockdown and thus have been able to contain the spread and reopen early (USA, Italy and Spain).

Impact on medical practice

Given the serious public health risk, medical practice has changed remarkably during this pandemic. Although the virus primarily affects the respiratory system, the neurological manifestations of the COVID are now well recognised [18]. Though, neurosurgery is not at the forefront of the medical battle against this pandemic, neurosurgical practice and training is not insulated from this epidemic. Many organizations have advocated against operating elective cases during this time [7,8], as more and more resources are being claimed by the response to the pandemic. We sought to highlight a seldom explored disparity between the response of private establishments and public hospitals offering neurosurgical services as they grapple with this pandemic. We also intended to examine the effect of social media, the economic losses incurred and the most effective sources of information for a neurosurgeon in the Indian subcontinent during this pandemic.

All the neurosurgical societies worldover including Indian society have responded to this pandemic by making changes in the existing protocols and reorganizing the neurosurgical activities[7,9,10]. Focus has been shifted to triaging patients on the basis of pathology into those needing emergent or elective care , though not many pathologies are amenable to elective management in neurosurgery. Scoring system for triaging patients for spine surgery in the setting of limited resources has also been developed [11]. Our survey similarly reflected the global trend towards postponing non emergent surgeries.

Precautions

There was a noticeable difference between the outpatient practices being followed at private and government institutions. Quite unexpectedly, neurosurgeons in larger practice groups (> 10 neurosurgeons) saw a much sterner closure of normal outpatient services. This may be because most of such large practice groups belonged to public institutions and were obligated to close outpatient departments following government directives. Many government hospitals were declared COVID centers by the government and even the specialists were kept ready to take care of the patients admitted with a diagnosis of COVID. This policy resulted from the strategy of ‘preserving’ the ‘manpower’ for the worst.

Operative strategy in government hospitals was adapted to the directions issued by the Neurological Society of India and other organizations [7,12]. Private practitioners too scaled down their operation to occasional electives with very few continuing unchanged. These policy decisions are not insulated from the financial implications being faced by the

respondents. Private practitioners needed to continue the practice to remain financially viable and government institutions needed to balance the risk of operating emergencies with the high risk of iatrogenic transmission, given the larger caseload and active COVID-19 cases being treated at most of the public hospitals.

It was interesting to note that neurosurgeons were most anxious about passing the infection to their families. However, this does not mean that the neurosurgeons were not worried about their safety. Even in the immediate future most of them envisage doing only emergencies and semi-elective with COVID testing implying their commitment towards preventing transmission of the virus and keeping themselves safe (Table 4). These concerns were also reflected when we enquired about practice outside the regulation umbrella.

Telemedicine

Eight hundred million Indians have limited access to secondary and tertiary care, having to travel mostly to metropolitan centres for superspecialty care [13]. Telemedicine provides a potential solution to mitigate this deficiency, more so, during the mobility restrictions due to the COVID pandemic. Telemedicine has been the predominant mode of patient follow up and has significantly replaced outdoor visits to neurosurgery departments in most of the developed world [14]. One major centre from the US reported that 60% of visits to neurosurgery departments were deferred to a later date and more than 80% of the remaining visits were successfully converted to virtual [8]. Another centre reported a 40-fold increase in the use of telemedicine after the shelter-in-place measures were initiated with a significant increase in the mean number of patients evaluated via telemedicine per week across all divisions of neurosurgery (4.5 to 180.4 patients/week) [15]. They reported that both the established patient visits and new patient visits increased significantly.

However telemedicine services were offered by only 16.7% of neurosurgeons in our survey, which is quite low. There are many reasons responsible for this low figure. First, not many Indian patients have access to the internet at home except for smartphones, and are uncomfortable with various platforms like Zoom® and Webex® etc for telemedicine are concerned. Secondly, telemedicine facilities were practically nonexistent in India before COVID pandemic began and it is difficult to ensure rapid adoption of a relatively new service both for the patients and doctors. Third, most of the patients do not have any medical insurance and few of those who have it are covered under various schemes run by the government. In both the scenarios there is no remuneration for the physician that leads to low initiative on the part of the neurosurgeons to offer teleOPD services. The increased risk of malpractice suits with teleOPD and undefined regulations further discourage remote consultations.

PPE use

Use of PPE has been recommended during interaction and transfer of patients presenting with neurosurgical emergencies as well as during neurosurgical surgeries and procedures for confirmed and suspected patients with COVID-19 . Most of the respondents across different set ups felt the need to use PPE during patient encounters in OPD as well as during surgery in operation theatre. However, there was a difference in the felt need and practice regarding the use of PPE found amongst the respondents of our survey (Tables 2,3) .

There might be several reasons for this observation. The supply of PPE was initially erratic due to disruption of the global supply chains. The ordinary PPE suits often become very uncomfortable for the surgeon during involved and prolonged neurosurgical procedures, discouraging its use.

Private practitioners were more punctilious in terms of PPE usage. These observations may be attributed to diversion of PPEs in large public hospitals to other departments that were facing higher caseloads of COVID patients or suspects.

Mental health

Mental health has been an often-neglected issue among neurosurgeons. Physicians and medical students had higher rates of burnout and depression than the general population [16]. Before the COVID pandemic, physicians were able to mitigate their stress levels with social and familial interactions. Currently, the stress extends outside of the realm of healthcare facilities. Physicians worrying about infecting their families and contaminating their homes may choose to self-isolate or face the guilt of potentially infecting a family member . This was reflected in our survey too with the primary concern being not spreading the infection to families and around 27% neurosurgeons feeling depressed during this time. A recent survey involving 375 respondents from 52 countries found that 34% of the respondents felt tense, 32.5% were unhappy, 25% experienced insomnia, almost 20% had headaches, and 5% had suicidal ideation during the pandemic [17]. Fourteen percent of the respondents were found to have scores consistent with depression on Self-Reporting Questionnaire-20. Various factors identified by this study to be associated with higher risk of depression included those who did not receive guidance about self-protection, those who did not feel safe with provided personal protective equipment, and those whose families considered their workplace unsafe.

Violence against doctors

A recent report from China [18] has highlighted a welcome response that there was no ripple effect or violence against doctors when they started resuming their routine neurosurgical outpatient clinics after lockdown of three months. In contrast, at least 30% of the respondents in our survey admitted to receiving unwelcome and intimidatory messages via social media during this pandemic, though it is difficult to ascribe all this to COVID pandemic. Majority of these threats specific to COVID pandemic resulted from misplaced apprehension of the general public that healthcare workers could carry the infection into the neighbourhood . The other reasons for hostility could be the delay in the treatment of patients who require neurosurgical attention due to the difficulties posed by suspension of regular services,

Limitations of our survey

Any survey suffers from many limitations with the foremost being selection bias. This was not an epidemiological study and does not allow concluding the actual prevalence and incidence of the variables investigated. It does allow, though, to conclude the perception of neurosurgeons about the COVID-19 health emergency concerning the actual epidemiology data. Another shortcoming is that the perceptions are likely to change over time as the pandemic is evolving and no survey can possibly surmount this limitation. However, we do not expect major changes in the perception and practices of the surgeons as the risk of catching the disease remains high till we pass the pandemic. In an area with more than 3500 neurosurgeons we were able to generate only 176 respondents. Despite this, we are the first survey to analyze seldom asked questions on mental health, social media impact, and differences among private and public centers which has somehow lost in this pandemic.

Conclusions

Neurosurgical fraternity in developing countries cannot insulate itself from the implications of the COVID pandemic and must adapt rapidly to the changed scenario in healthcare delivery. Suspension of elective procedures, severe curtailment of the regular outpatient

appointments, drastic modifications of the normal OPD/OR practices and apprehensions related to inadequacy of safety provided by PPE usage and financial losses of private establishments were some of the visible themes in our survey results. Though telemedicine has not been as widely adopted as expected, yet online education has been favourably received.

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LEGENDS

FIGURE

FIG 1(A): Histogram showing age in years of respondents; (B): Histogram showing post residency experience in years

FIG 2: (A) Patterns of clinical practice of respondents; (B) Scatter plot of the inpatient bed strength per head in relation to the age of the respondent ; (C): Team strength variations among public and private institutions; (D): OPD practice modifications compared across different team strengths,

Fig 3(A): PPE/protection strategies used in OPD (B)PPE use /protection strategies employed by different practice groups

Fig 4 (A): PPE use in OT (B) Felt need vs PPE utilisation

Fig 5: (A): The greatest fear of respondents (B): Graph showing amount of financial loss in Indian National rupee currency compared across practice patterns.

TABLES

Table 1: Characteristics of respondents. Figures are represented as n(%) (N= 176)
Table 2: Changes in outpatient clinic practices during COVID epidemic. Figures in n(%) and N=176
Table 3: Changes in Neurosurgical OR practice during COVID epidemic. Figures in n(%) and N=176
Table 4: Emotional aspects, resumption of practice, social media use and e-learning. Figures in n(%).
Table 5: Queries regarding social media use and awareness of neurological manifestations of COVID19. Figures in n(%)

Type of clinical practice	
Government academic institute/ teaching hospital	77(43.8)
Government non academic hospital	4(2.3)
Multiple affiliations	17(9.7)
Private academic institute	33(18.8)
Private non academic hospital	45(25.6)
Post residency practice experience	
<3 yrs	40(23.3)
3-6 yrs	37(21.5)
6-10yrs	34(19.8)
>10 yrs	61(35.5)

Strength of neurosurgical team in various types of practice models			
	Type of practice		
Strength of team	Govt	Multiple affiliations	Private
Single	2(2.5)	7(41.2)	19(24.4)
2 -5	30(37)	7(41.2)	43(55.1)
5-10	12(14.8)	2(11.8)	13(16.7)
10-20	23(28.4)	1(5.9)	3(3.8)
more than 20	14(17.3)		

Table 1: Characteristics of respondents. Figures are represented as n(%).
N= 176

Outpatient (OPD) visit patterns across practice models				
OPD practice	*Govt (n=81)*	*Multiple affiliations (n=17)*	*Private (n=78)*	
Stopped completely	21(25.9)	3(17.6)	7(9)	*p- value= 0.001
Tele OPD	21(25.9)	1(5.9)	14(17.9)	
Restricted OPD f/up and new	11(13.6)	11(64.7)	34(43.6)	
Previous routine	8(9.9)	1(5.9)	16(20.5)	
Restricted OPD for follow up	18(22.2)	1(5.9)	6(7.7)	
Others	2(2.5)		1(1.3)	

Outpatient (OPD) visit patterns compared across team strength of practising groups						
OPD practice	*Single (n=28)*	*2-5 (n=80)*	*5-10 (n=27)*	*10-20 (n=27)*	*more than 20 (n=14)*	
Stopped completely	3(10.7)	15(18.8)	3(11.1)	4(14.8)	6(42.9)	p-value =0.22
Tele OPD	3(10.7)	13(16.2)	5(18.5)	8(29.6)	7(50)	
Restricted OPD f/up and new	14(50)	34(42.5)	5(18.5)	3(11.1)		
Previous routine	6(21.4)	8(10)	7(25.9)	4(14.8)		
Restricted OPD for follow up	2(7.1)	8(10)	6(22.2)	8(29.6)	1(7.1)	

Personal protective equipment utilisation/ preventive strategies across practice groups				
Personal protective equipment/strategies	*Govt (n=81)*	*Multiple affiliations (n=17)*	*Private (n=78)*	
Face shield	1(1.2)	2(11.8)	6(7.7)	P-value = 0.07
Full PPE kit	9(11.1)	2(11.8)	6(7.7)	
Glass Barrier	9(11.1)	3(17.6)	10(12.8)	
Gown/gloves	20(24.7)	7(41.2)	26(33.3)	
N95 mask	17(21)	5(29.4)	29(37.2)	
Prior screening	0(0)	0(0)	4(5.1)	
Surgical mask	50(61.7)	11(64.7)	45(57.7)	

Table 2: Changes in outpatient clinic practices during COVID epidemic. Figures in n(%) and N=176

OR practice changes across practice models			
OR practice	*Public/teaching hospital (n=81)*	*Multiple affiliations (n=17)*	*Private (n=78)*
Elective with COVID/CT screening	3(3.7)		3(3.8)
Emergency only	33(40.7)	11(64.7)	23(29.5)
Emergency with COVID/CT screening	18(22.2)		14(17.9)
Unchanged	1(1.2)	2(11.8)	4(5.1)
Emergency+ occas. electives	24(29.6)	4(23.5)	30(38.5)
Stopped completely	2(2.5)		4(5.1)

PPE desirability and utilisation across practice models						
PPE strategies	*Public/teaching hospital (n=81)*		*Multiple affiliations (n=17)*		*Private (n=78)*	
	Felt Requirement	Practiced	Felt Requirement	Practiced	Felt Requirement	Practiced
Donning/doffing area	27(33.3)	16(19.8)	7(41.2)	5(29.4)	27(34.6)	18(23.1)
Face shield/googles	44(54.3)	39(48.1)	10(58.8)	8(47.1)	46(59)	47(60.3)
Full PPE	53(65.4)	34(42)	11(64.7)	11(64.7)	52(66.7)	42(53.8)
N 95 masks	38(46.9)	39(48.1)	11(64.7)	9(52.9)	46(59)	47(60.3)
Varied	1(1.2)	4(4.9)	1(5.9)	2(11.8)	0(0)	2(2.6)

Table 3: Changes in Neurosurgical OR practice during COVID epidemic. Figures in n(%) and N=176

Biggest fear during the epidemic			
	Govt (n=81)	*Multiple affiliations (n=17)*	*Private (n=78)*
Passing infection to family	59(72.8)	13(76.5)	60(76.9)
Hospital being sealed/taken over	5(6.2)		2(2.6)
Getting infected	10(12.3)	1(5.9)	9(11.5)
Financial	7(8.6)	2(11.8)	5(6.4)
All the above		1(5.9)	2(2.6)

When will you restart practice ?		**Pattern of foreseeable practice upon resumption**	
Don't know	46(26.1)	Continue semi-elective and elective with testing	82(46.6)
Financial obligation to restart	14(8)	Normal practice	13(7.4)
Post antiviral	6(3.4)	Only emergencies and that too with testing	19(10.8)
Post vaccine	31(17.6)	Very restricted practice (only emergency cases)	51(29)
Restricted for foreseeable future	77(43.8)	Miscellaneous	11(6.2)
Resumed with PPE	2(1.1)		

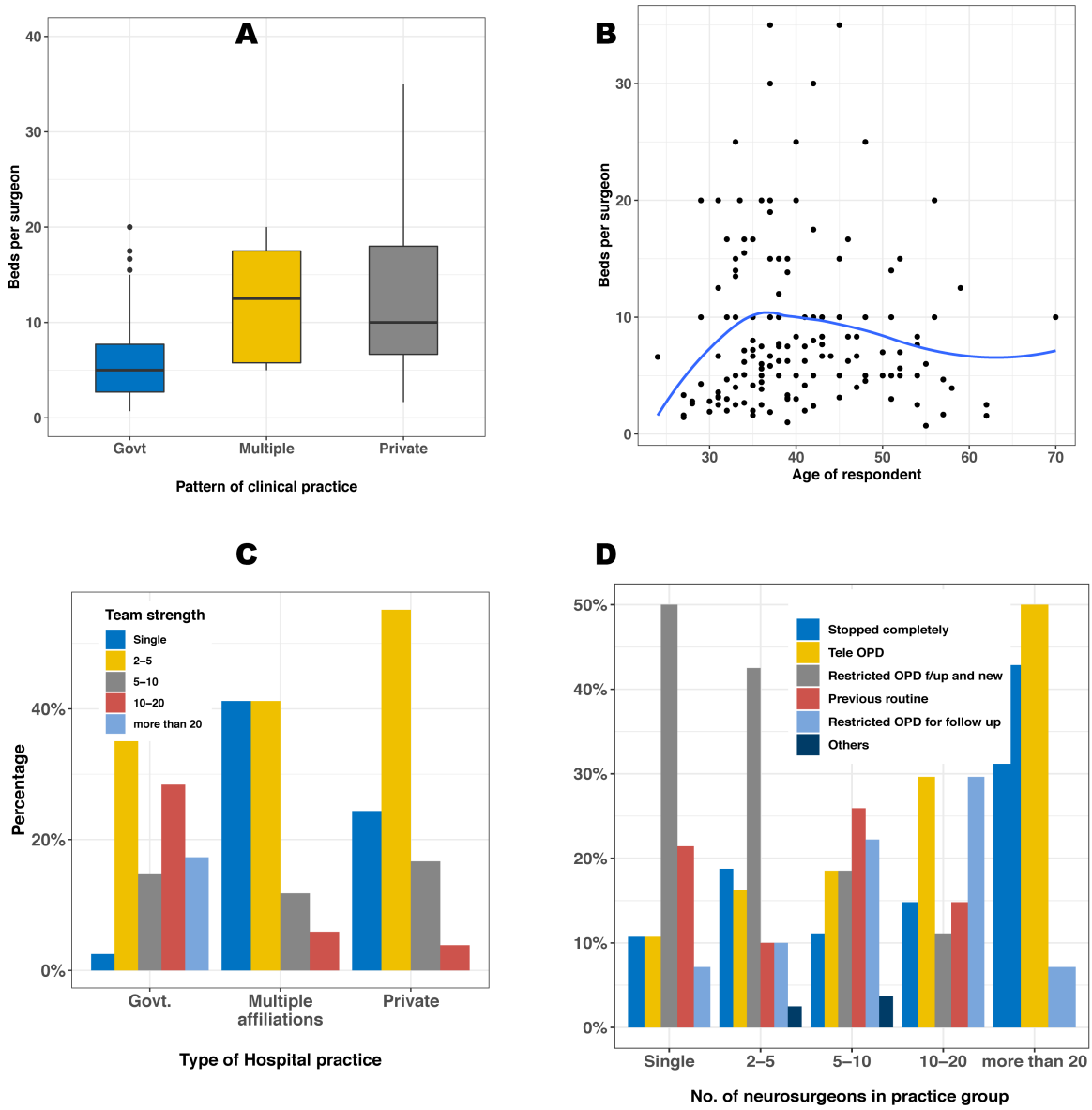
Frequency of receiving threatening messages on social media			
	Govt	Multiple affiliations	Private
Everyday	11(13.6)	1(5.9)	4(5.1)
Once a month	7(8.6)	1(5.9)	4(5.1)
Once in 3months	4(4.9)		2(2.6)
Rarely if ever	15(18.5)	3(17.6)	14(17.9)
Never	44(54.3)	12(70.6)	54(69.2)

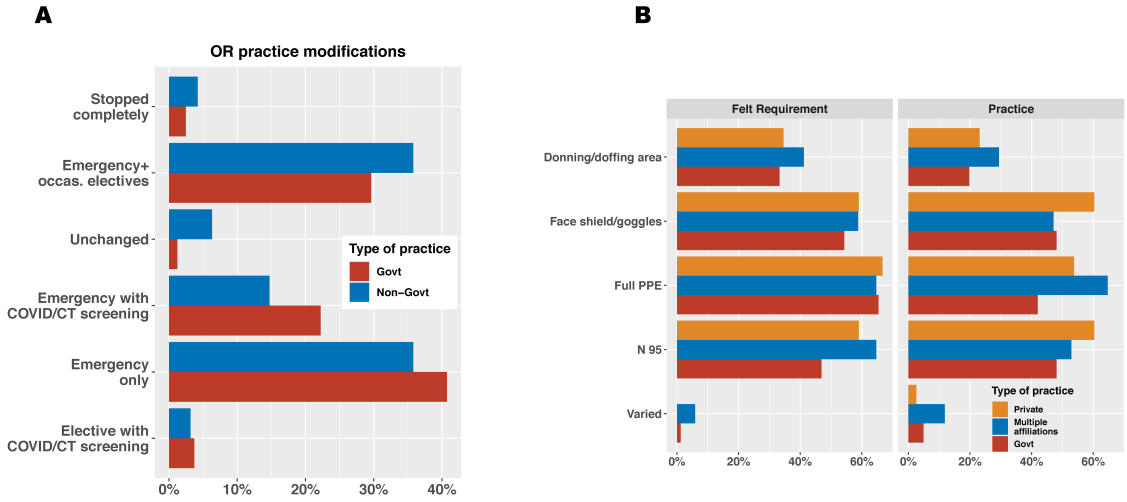
Do you find webinars useful?		**Utility of telemedicine in post-COVID practice**	
Yes	85(48.3)	Not useful	58(33)
May be	54(30.7)	Undecided	54(30.7)
No	19(10.8)	Useful	64(36.4)
Can't exactly say	18(10.2)	Not useful	58(33)

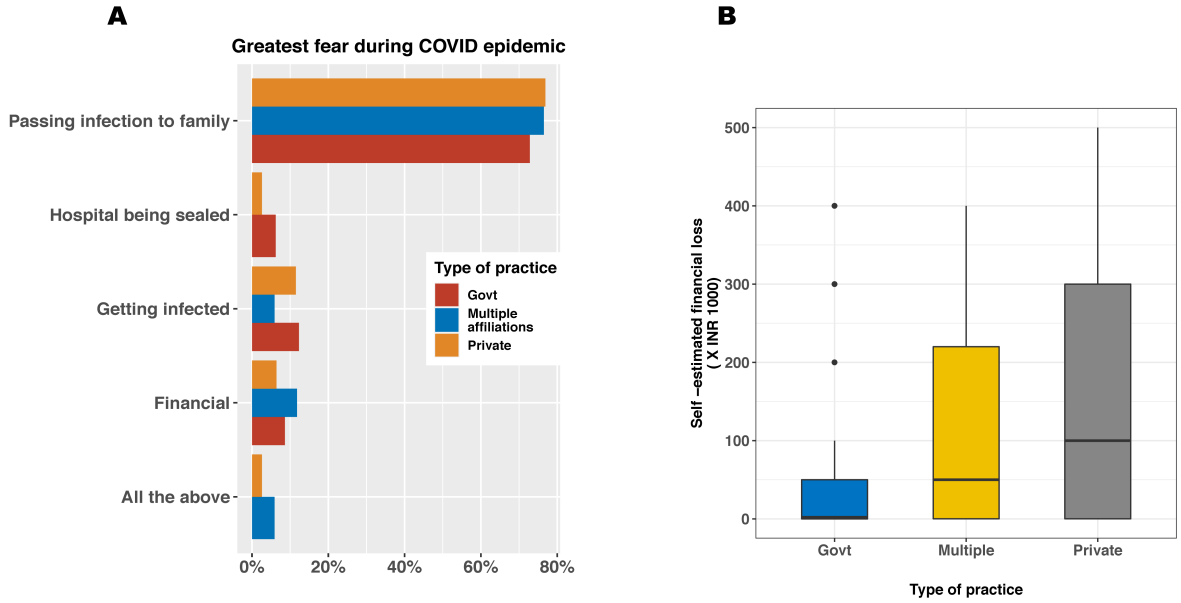
Table 4: Emotional aspects, resumption of practice, social media use and e-learning. Figures in n(%).

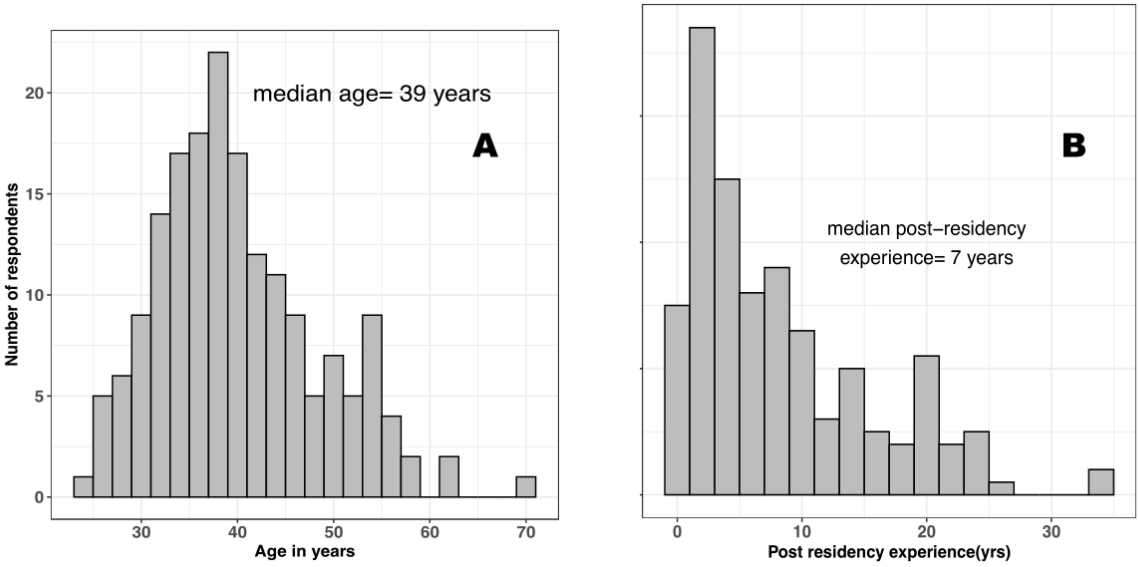
Encountered false information on social media		**Discussed COVID prophylaxis on social media**	
Daily	142(81.1)	Daily	68 (38.8)
Rarely	18(10.3)	Rarely if ever	47(26.9)
Once a month	11(6.3)	Never	30(17.1)
Never	3(1.7)	Once a month	21(12)
Once a week	1(0.6)	Occasionally	9(5.1)
Awareness of neurological manifestations		**Utility of social media in deciding workflow**	
Yes	113(64.2)	Somewhat useful	78(44.6)
No	38(21.6)	Very useful	32(18.3)
Maybe	25(14.2)	Rarely useful	49(28)
		Not useful	16(9.1)

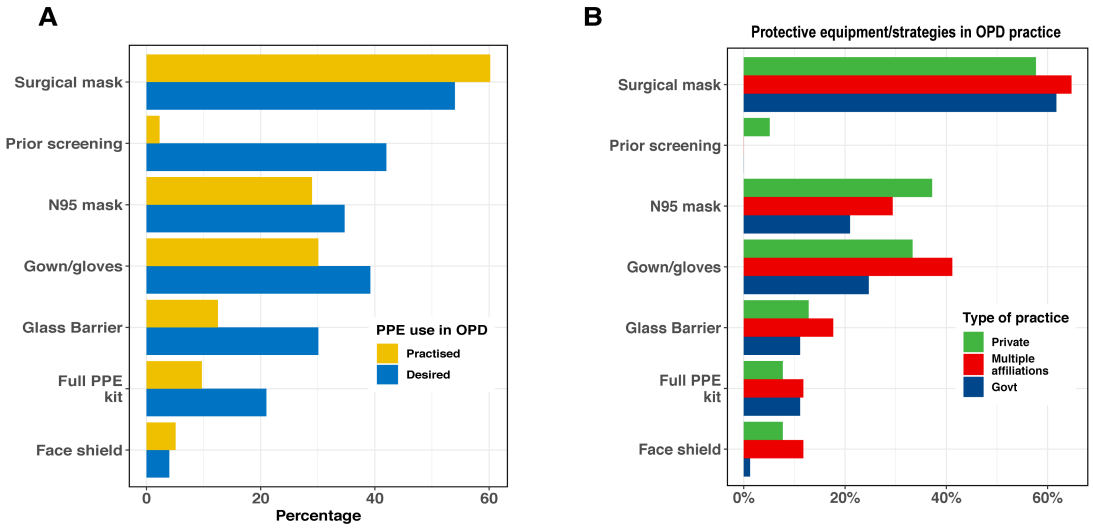
Table 5: Queries regarding social media use and awareness of neurological manifestations of COVID19. Figures in n(%)


A
Beds per surgeon
40
30
20
10
0
Govt
Multiple
Private
Pattern of clinical practice
B
Beds per surgeon
30
20
10
0
30
40
50
60
70
Age of respondent
C
Percentage
40%
20%
0%
Team strength
Single
2–5
5–10
10–20
more than 20
Govt.
Multiple affiliations
Private
Type of Hospital practice
D
50%
40%
30%
20%
10%
0%
Stopped completely
Tele OPD
Restricted OPD f/up and new
Previous routine
Restricted OPD for follow up
Others
Single
2–5
5–10
10–20
more than 20
No. of neurosurgeons in practice group




A
Greatest fear during COVID epidemic
Passing infection to family
Hospital being sealed
Getting infected
Financial
All the above
0%
20%
40%
60%
80%
Type of practice
Govt
Multiple affiliations
Private
B
Self –estimated financial loss (X INR 1000)
500
400
300
200
100
0
Govt
Multiple
Private
Type of practice




A
Surgical mask
Prior screening
N95 mask
Gown/gloves
Glass Barrier
Full PPE kit
Face shield
0
20
40
60
Percentage
PPE use in OPD
Practised
Desired
B
Protective equipment/strategies in OPD practice
Surgical mask
Prior screening
N95 mask
Gown/gloves
Glass Barrier
Full PPE kit
Face shield
0%
20%
40%
60%
Type of practice
Private
Multiple affiliations
Govt

ABBREVIATIONS

COVID-19: Coronavirus disease 2019
OPD: Out Patient services
OT: Operation theatre
PPE: Personal Protective equipment

Contribution details (CREDIT AUTHOR STATEMENT:

	Contributor 1-3	Contributor 4-5	Contributor 6-7	Contributor 8-11
Concepts	yes	yes		
Design	yes	yes		
Definition of intellectual content	yes	yes	yes	yes
Literature search	yes	yes	yes	yes
Clinical studies	yes	yes	yes	yes
Experimental studies				
Data acquisition	yes	yes		
Data analysis	yes	yes	yes	yes
Statistical analysis				
Manuscript preparation	yes	yes	yes	yes
Manuscript editing	yes	yes	yes	yes
Manuscript review	yes	yes	yes	yes
Guarantor		yes		

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