



The impact of telephone consultations due to COVID-19 on paediatric neurosurgical health services

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Abstract

Purpose The aim of the study was to evaluate the role of telephone consultations due to the pandemic in the management of paediatric neurosurgical patients and, furthermore, to examine the proportion of patients who eventually needed a face-to-face appointment and assess the underline reasons for that.

Methods This retrospective study included all the paediatric neurosurgical patients who had a telephone appointment during a 3-month lockdown period. Overall, 319 patients (186 males and 133 females) aged 8.36 ± 4.88 (mean \pm SD) had a consultation via telephone. Two hundred fifty-one (78.7%) patients had a follow-up assessment and 68 (21.3%) were new appointments.

Results Patients were divided between two main groups. Group A included 263 patients (82.4%) whose consultation was adequate via telephone, and Group B included 56 patients (17.6%) who required a complementary face-to-face appointment. Patients who were more likely to require a supplementary appointment were patients with either dysraphism or ventriculomegaly and benign enlarged subarachnoid spaces (BESS) (43.3% and 36.4%, respectively). Interestingly, most children with hydrocephalus who underwent a cerebrospinal fluid (CSF) diversion procedure and children with Chiari I malformation were appropriately assessed via telephone (85.1% and 83.3%, respectively). Finally, children aged < 2 years (55.2%) were better managed with face-to-face appointments. No difference was noticed regarding follow-up and new appointments.

Conclusion Although telemedicine was not unknown to neurosurgical services, the actual application of telephone or video consultations remained quite limited. It was COVID-19 pandemic who reinforced the use of telemedicine, and taking into consideration its promising results, we can safely assume that it can be incorporated into neurosurgical health care even once the pandemic crisis has resolved.

Keywords Telephone consultations · COVID-19 pandemic · Paediatric neurosurgery

Introduction

Telemedicine is the practice of medicine using technology to deliver care at a distance. Whether provided by physicians or nurses, refers to a wide variety of health services including clinical care services, education for both patients and providers and public health or healthcare administrative services. Even though it has seen a substantial growth in the past 20 years due to significant technological advancements, its role in neurosurgical health services still remains limited [1].

On March 11, 2020, the World Health Organization (WHO) declared COVID-19 a pandemic, followed by multiple restrictions and regulations as an attempt to keep the spread under control [2]. In the era of this pandemic, UK, as most countries worldwide, has employed extremely strict social distancing measures in order to restrict the spread of the virus, including a ban on unnecessary visits to hospitals. As a result, all consultations concerning outpatients were converted to either telephone or video ones.

In view of that change, it was crucial to evaluate whether telemedicine can serve as a means of ensuring the safety of both patients and frontline providers, promoting continuity of care and maintaining the final outcome.

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Materials and methods

A 3-month time period from 18/03/20 to 18/06/20 was reviewed. The study included all patients who had either a new or a follow-up telephone consultation in Consultant Outpatient Clinic, Hydrocephalus Nurse Review Clinic and Head Injury Clinic. Acute reviews and patients who required a predefined face-to-face appointment due to, e.g. wound review or 1st post-op appointments, were excluded. The use of video consultations was very limited, due to multiple technical difficulties at the time; thus, they were also excluded.

Overall, 319 patients (186 males and 133 females) aged 8.36 ± 4.88 (mean \pm SD) had a consultation via telephone. Two hundred fifty-one (78.7%) patients had a follow-up assessment, and 68 (21.3%) were new appointments. Patients' underlying health conditions covered the whole spectrum of neurosurgical paediatric diseases. Eighty-seven patients (27.3%) had undergone a CSF diversion procedure, 54 (16.9%) had a Chiari I malformation, 30 (9.4%) had spinal dysraphism, 22 (6.9%) had ventriculomegaly or benign enlargement of subarachnoid spaces, 19 (5.9%) had suffered a traumatic brain injury, 16 (5%) had spinal syrinx, 15 (4.7%) had craniosynostosis, 15 (4.7%) had an arachnoid cyst, 14 (4.4%) had a vascular disease,

10 (3.1%) were oncology patients, 9 (2.8%) were patients with achondroplasia, and 28 (8.8%) were patients with other issues (Fig. 1).

The data collection was performed using the existing electronic patient record system. Statistics performed using SPSS data analysis.

Results

Patients were divided between two main groups. Group A included 263 patients (82.4%) whose consultation was adequate via telephone, and Group B included 56 patients (17.6%) who required a complementary face-to-face appointment in order for the consultation to be integrated (Fig. 2).

Among Group B, 13 patients (23.2%) had undergone a CSF diversion procedure, 13 (23.2%) had a spinal dysraphism, 9 (16.1%) had a Chiari I malformation, 8 (14.3%) had ventriculomegaly or benign enlargement of subarachnoid spaces (BESS), 4 (7.1%) had craniosynostosis, 3 had sustained brain injury (5.3%), 2 (3.6%) had an arachnoid cyst, 2 (3.6%) had a dermoid cyst, 1 (1.8%) was a patient with achondroplasia, and 1 (1.8%) was a patient with encephalocele.

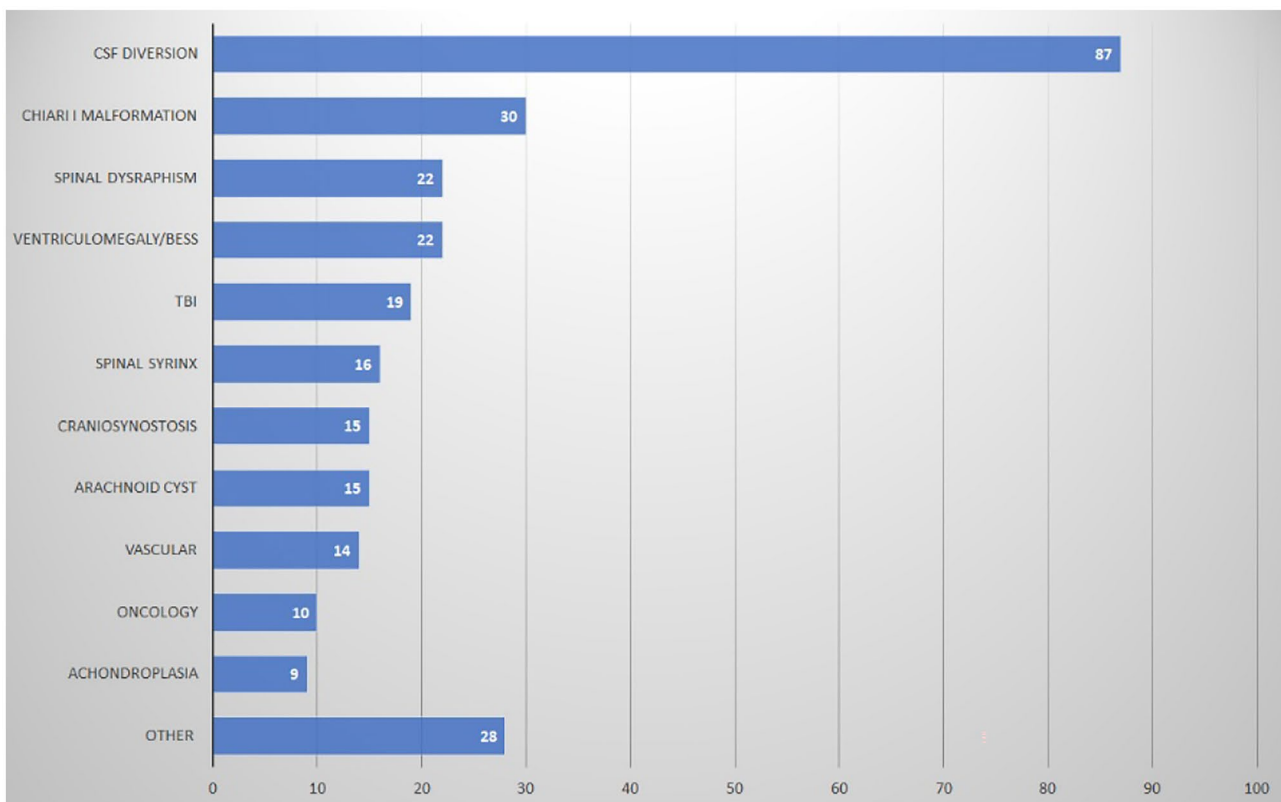


Fig. 1 Patient's underlying pathologies

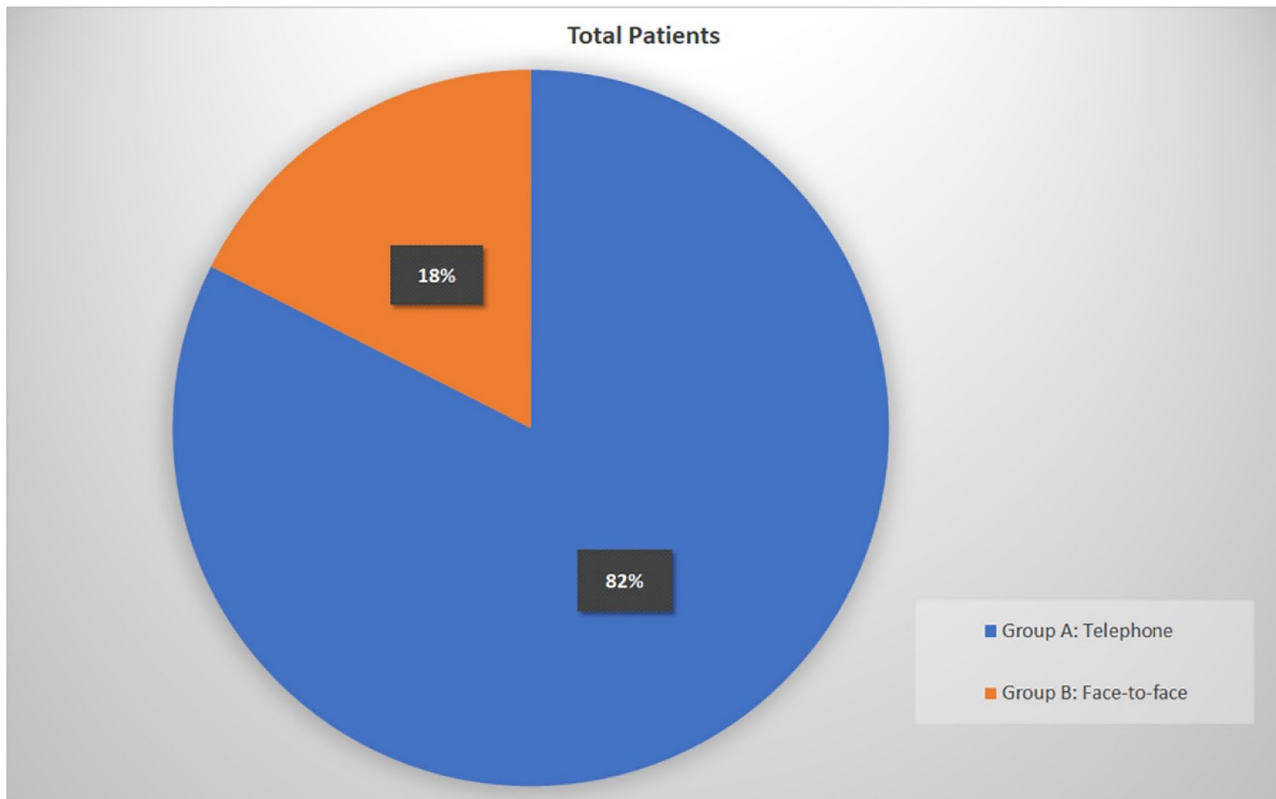


Fig. 2 Summary of consultations

Statistical analysis regarding patients with either dysraphism or ventriculomegaly and BESS suggested that these patients were more likely to require a supplementary appointment. Thirteen out of 30 patients with spinal dysraphism needed a physical examination (43.3%), and 8 out of 22 patients with ventriculomegaly or BESS needed a head measurement (36.4%) (Fig. 3).

Findings regarding patients with other underlying pathologies suggested that telephone consultations were adequate. More specifically, two of the most common paediatric neurosurgical pathologies were examined. The results showed that children with hydrocephalus who underwent a CSF diversion procedure and children with Chiari I malformation were more likely to be appropriately assessed via telephone (Fig. 4).

Furthermore, patients' appointments divided into follow-up and new ones. A comparison was made with regard to whether the appointment was a face-to-face or a telephone one. Overall results were in favour of telephone consultations (85.7% and 70.6%, respectively, $p < 0.05$) (Fig. 5).

Finally, patients further divided into two different subgroups regarding their age. The first group included 67 children < 2 years old (21.1%) and the second one 252 children > 2 years old (78.9%). The results showed that 37 patients aged < 2 years (55.2%) and 226 patients

aged > 2 years (89.7%) had an adequate consultation via telephone, suggesting that younger children are more likely to require a complementary face-to-face appointment ($p < 0.05$) (Fig. 6).

Discussion

COVID-19 pandemic had an impact on neurosurgical services worldwide with varied practices among neurosurgeons and a possible lack of implementation of uniform policies [3]. Multiple studies have been reported mainly focused on the changes to the surgical planning and the special measures adopted to facilitate that [4–8]. Outpatient clinics were subsequently inevitably affected, resulting in several postponed or cancelled appointments, either due to the restrictions themselves or to patients' unwillingness to visit [9].

As a result, telemedicine clinics have been rapidly adopted by both the adult and paediatric neurosurgical communities, even though this model was not unknown to previous neurosurgical practice [10]. Barriers and challenges of this evolving practice have been recently evaluated and reported, leading to very promising results. The use of telehealth has proven to be a very important tool in caring

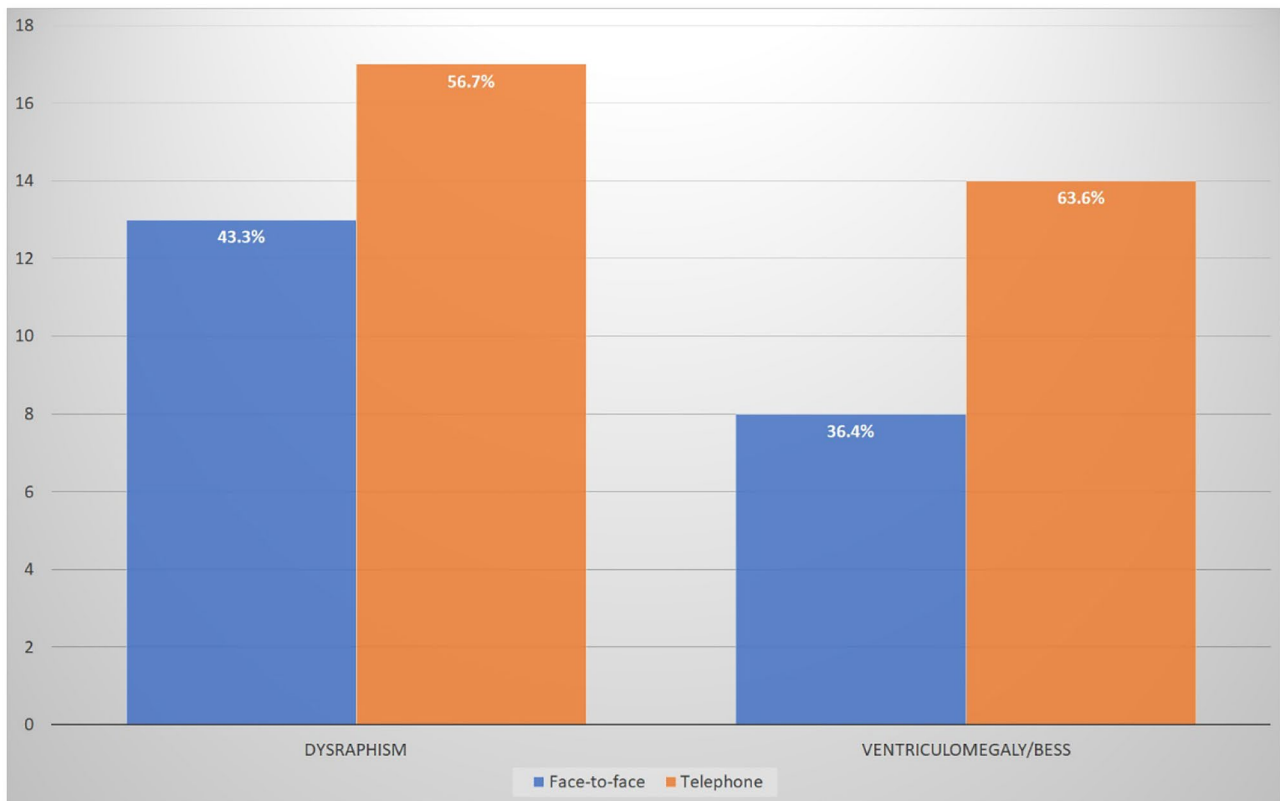


Fig. 3 Patients with ventriculomegaly/BESS and spinal dysraphism who had either telephone or face-to-face consultations

services while keeping patients and health providers safe [11–14].

Our results were in agreement with current literature suggesting that it is feasible to maintain a high volume of outpatient practice via telehealth and appropriately triage which patients need to be seen in person [15, 16]. Here, we present our experience with adopting telemedicine, only in the form of telephone appointments, during the early stages of the pandemic.

Consultations via telephone were competent enough in terms of diagnostic purposes, patients' management, treatment options, or even just reassurance. The majority of patients had a successful telephone consultation without needing a secondary face-to-face appointment. In addition, a pattern in terms of underlying pathologies was observed among patients who required a supplementary consultation. Children with spinal dysraphism were more likely to require a face-to-face physical examination in order to be properly assessed. Those patients' neurological status is highly depending on clinical examination of muscle strength, sensation, and reflexes and cannot be conducted over the telephone.

Interestingly, patients with Chiari I malformation and patients who were under follow-up after CSF diversion procedures were managed successfully by

telephone consultations. Both conditions need a long-term follow-up, but if no new concerns arise by either patients or their families, face-to-face appointments could be withheld.

Furthermore, children with either ventriculomegaly or benign enlargement of subarachnoid spaces were also more prone to face-to-face appointments. These are usually younger patients and more specifically under 2 years old and are more difficult to be assessed over the telephone so more likely to require a face-to-face appointment. The rationale of that is because head circumference is a valuable index of brain growth, and its disturbances can indicate several underlying pathologies. Therefore, the measurement of OFC (occipitofrontal circumference) and the assessment of the anterior fontanelle are of the utmost importance to adequately complete the clinical examination. The role of parental education in head measurements could be proven significant and possibly contribute, when necessary, to limitation of face-to-face appointments, but further studies should be conducted in order to provide strong evidence for confidence in parental measurements.

To our knowledge, patients' and families' perception regarding telemedicine was deemed successful and should not be disregarded despite the very limited existing literature [17, 18].

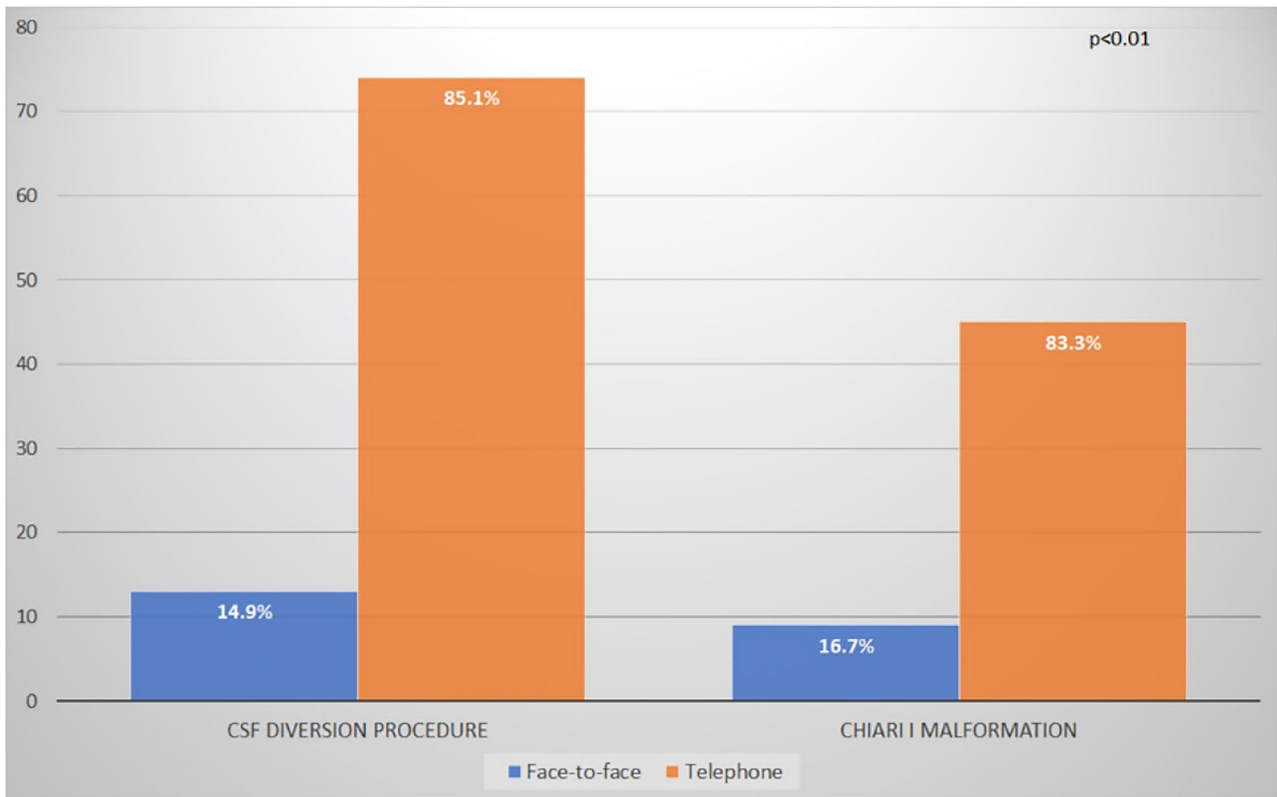


Fig. 4 Patients who underwent CSF diversion procedures and patients with Chiari I malformation who had either telephone or face-to-face consultations

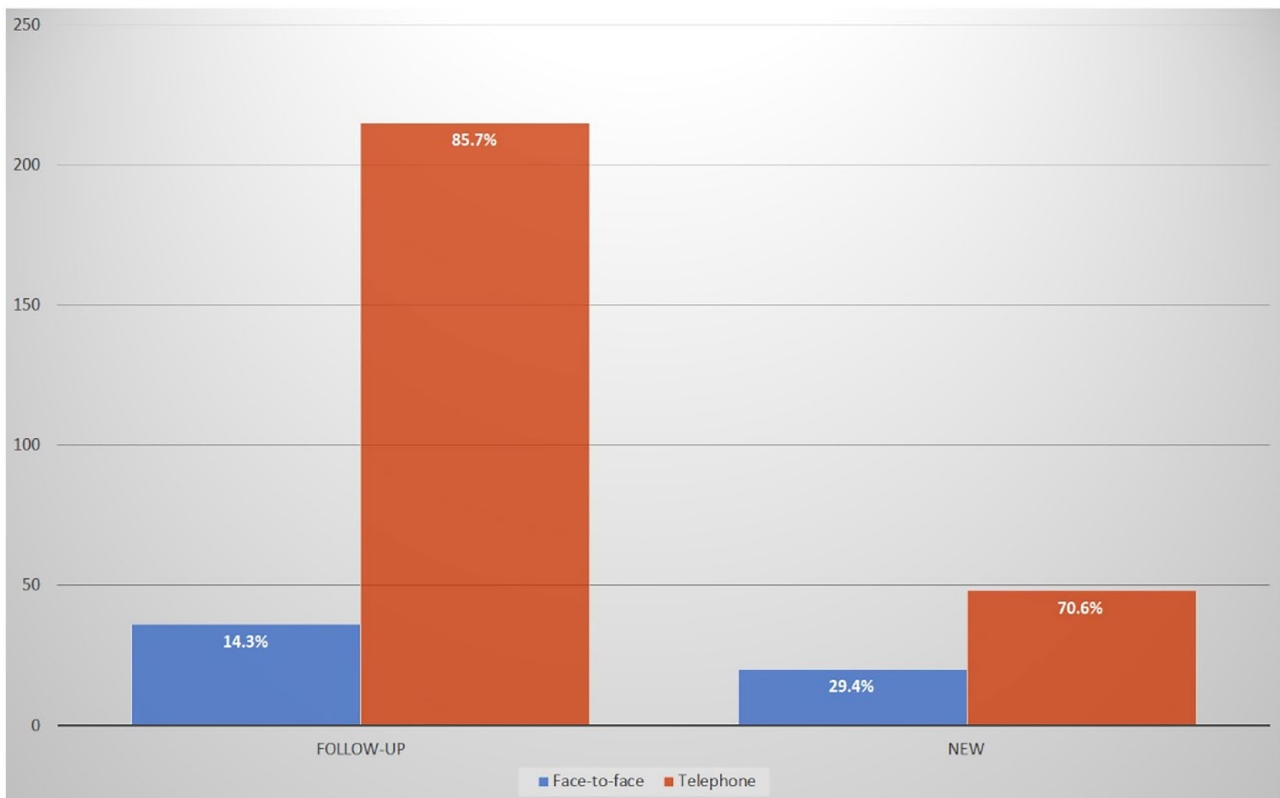


Fig. 5 Summary of follow-up and new appointments

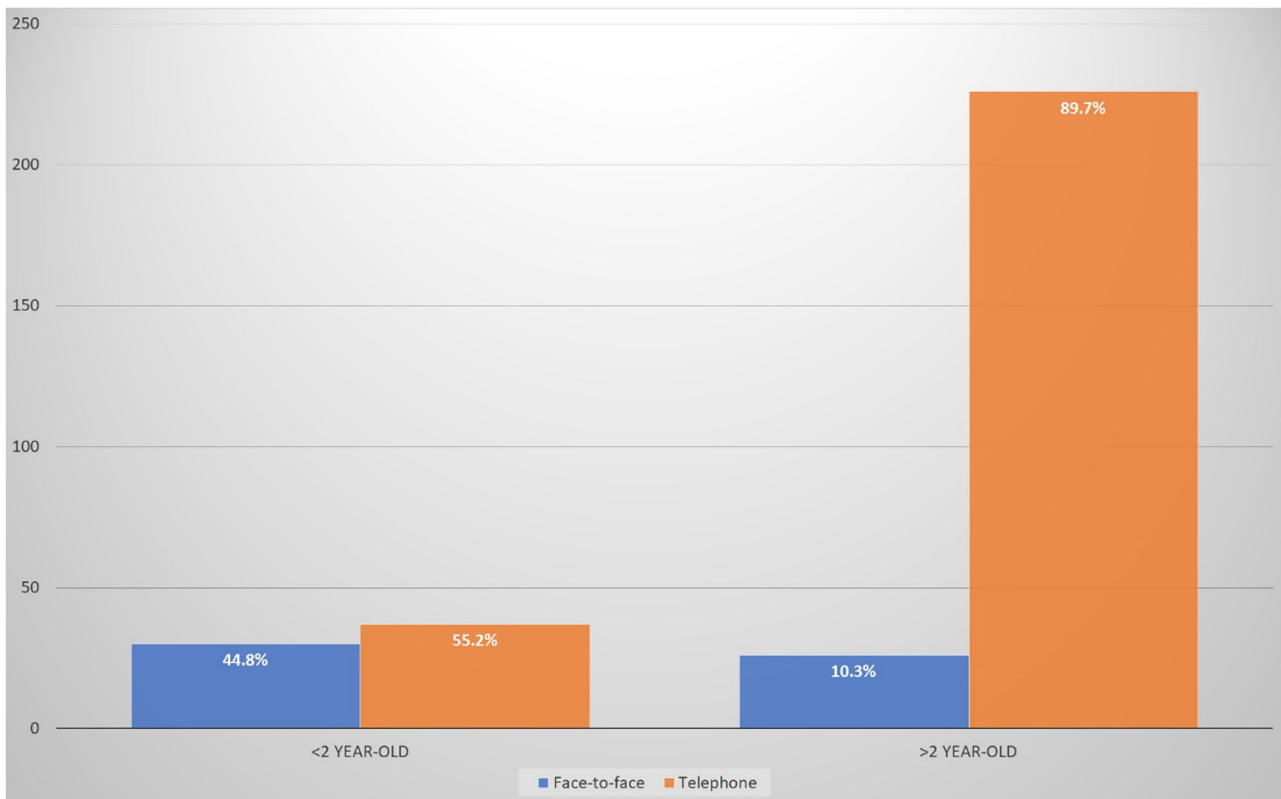


Fig. 6 Summary of results in different age groups

Conclusions

This study presents a single centre's experience regarding the impact of COVID-19 pandemic on the neurosurgical outpatient services and evaluates the role of telephone consultations on the management of paediatric patients. Despite the fact that an accurate and comprehensive neurologic examination can be challenging without a face-to-face appointment, the majority of consultations were adequate via telephone. Telemedicine encounters appear to be promising; thus, we can safely assume that they can be incorporated into neurosurgical health care even after the pandemic crisis resolves.

Author contribution KA and OE were responsible for data collection, analysis and writing the manuscript. PDL, HZ, JMM and SU were responsible for data interpretation and manuscript revision. All authors critically reviewed the manuscript and declare no disputes in publication.

Availability of data and materials The authors confirm that the data supporting the findings of this study are available within the article.

Declarations

Ethics approval and consent to participate Not applicable.

Consent for publication Not applicable.

Conflict of interest The authors declare no potential conflicts of interest with respect to research, authorship and/or publication of this article.

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