BMJ Paediatrics Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Paediatrics Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or payper-view fees (<u>http://bmjpaedsopen.bmj.com</u>).

If you have any questions on BMJ Paediatrics Open's open peer review process please email <u>info.bmjpo@bmj.com</u>

# The Initial Impact of COVID-19 on Paediatric Spinal Services across Scotland.

Journal:	BMJ Paediatrics Open
Manuscript ID	bmjpo-2020-000826
Article Type:	Original research
Date Submitted by the Author:	31-Jul-2020
Complete List of Authors:	Newman, Matthew; RHSC, Garrido, Enrique; RHSC Tsirikos, Athanasios; RHSC
Keywords:	Adolescent Health, Health services research, Information Technology





I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our <u>licence</u>.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which <u>Creative Commons</u> licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

for Review Only

The Initial Impact of COVID-19 on Paediatric Spinal Services in Scotland Study conducted in the Scottish National Spine Deformity Centre Royal Hospital for Sick Children-Edinburgh, UK Matthew Newman, MBCHB; Enrique Garrido, MD (Consultant Orthopaedic and Spine Surgeon); Athanasios I. Tsirikos, MD, FRCS, PhD (Consultant Orthopaedic and Spine Surgeon) Corresponding Author: Matthew Newman Corresponding Author Address: Paediatric Intensive Care Unit, RHSC, 9 Sciennes Rd, Edinburgh EH9 1LF. Corresponding Author Email Address: Mattynewman87@gmail.com Abstract word count: 252 Word Count (not including references): 2,479 Funding: This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors. Conflict of Interest: All authors declare that we have no conflicts of interest. Author contributions: M.N conceived the topic for research and approached E.G and A.I.T for supervision. A.I.T and E.G helped M.N expand on the idea and offered guidance as to where to draw data from. A.I.T verified the analytical methods. A.I.T encouraged M.N. to collect data or orthotist referrals and activity. Both A.I.T and E.G supervised the findings of this work. All authors discussed the results and contributed to the final manuscript. R. O. 

## The Initial Impact of COVID-19 on Paediatric Spinal Services in Scotland

## What is known about the subject?

- Covid-19 has had a significant impact upon many NHS services throughout the first half of 2020.
- Some centres have published results of what impact the pandemic has had on their departments.
- There has been speculation that children are suffering indirectly as a consequence of the pandemic, despite it rarely affecting them directly.

## What this study adds:

- Our study illustrates how during the pandemic, paediatric spinal services across the whole of Scotland had to decline
- It shows the extent to which children have had delays to the diagnosis and treatment of serious spinal pathologies.
- It discusses what these delays can mean for our patients, and what NHS services can do to mitigate these detrimental effects.

## Abstract

**Background:** The COVID-19 pandemic has meant a significant decline in the activities of the paediatric spinal services in Scotland.

**Methods:** All referrals to the Scottish paediatrics spinal service from 1<sup>st</sup> January 2020 to 30<sup>th</sup> June 2020 were analysed. Comparison was made to the same period in 2019. All orthotist initial consultations and all paediatrics spinal theatre activity in Scotland from 1<sup>st</sup> March 2020 to 30<sup>th</sup> June 2020 was analysed and compared to the previous year.

**Results:** There was a 64.3% decline in referrals during the pandemic in Scotland to the paediatric spinal service. The mean wait time to be seen in 1<sup>st</sup> clinic for a new referral was 6.56 weeks in 2020 compared to 10.94 in 2019. There were however 60 patients still waiting to be seen. The number of paediatric spinal operations declined by 34% during March to June 2020 when compared to the same months in 2019 There was a reduction of 50% of new paediatric patients seen by orthotists from March – June 2020 when compared to 2019

**Conclusion:** COVID-19 has had a significant effect on paediatric spinal services in Scotland. This is likely due to a combination of service delivery factors and patient factors. This is likely to result in delays to children getting the care they require for their spinal condition. There will also likely be a back-log of

patients requiring to be seen when services start to re-establish themselves. There are several things

departments should do to optimise efficiency such as video consultants and streamlining referral systems.

### Introduction

Throughout the first half of 2020, COVID-19, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), spread rapidly around the world. This led to the World Health Organisation calling it a global pandemic on 11<sup>th</sup> March 2020. The first case in Scotland was reported on the 1<sup>st</sup> March 2020 and the first death occurred on the 13<sup>th</sup> March 2020. On the 23<sup>rd</sup> March 2020, a 'Stay at Home' order was announced by the UK government which severely limited movement of the population in an attempt to stop transmission of the virus. This was known as 'lockdown'. As hospitals prepared for the pandemic, resources and staff were re-allocated to ensure the national healthcare system was adequately prepared for the expected influx of COVID-19 patients (1).

COVID-19 does not appear to affect children in the same was as it does adults, however as one senior paediatrician commented, children are perversely suffering for the benefit of adults. This can be through abuse, loss of education, and worsening health outcomes in other domains (2). Paediatric spinal conditions can cover a wide range of conditions such as idiopathic/congenital/neuromuscular/syndromic scoliosis, kyphosis and spondylolishesis with the outcomes of these conditions being dependent on timely intervention.

The aim of this paper is to describe the impact of COVID-19 on the Scottish National Spine Deformity Service (SNSDS) and to discuss what could be done to try to mitigate this detrimental effect in the future.

### Methods

The study examined the flow of children and adolescents referred to the SNSDS from across the whole of Scotland. The SNSDS is based at the Royal Hospital of Sick Children (RHSC) in Edinburgh and is the only NHS spinal service operating in Scotland and therefore takes referrals from all fourteen of the Scottish NHS Trusts serving a population of approximately 1.5 million children. There are 3 consultant spinal surgeons operating in this service.

We reviewed all new paediatric referrals to our service between the 1<sup>st</sup> January and the 30<sup>th</sup> June 2020 and compared them to the same period from 2019. We looked at the number of referrals and calculated the average waiting times between our service receiving the referral to the patient being seen in the first

#### **BMJ** Paediatrics Open

assessment clinic. We calculated the number of patients still waiting to be seen in clinic for each month at the point of data collection. Data were collected on the 3<sup>rd</sup> July 2020.

Furthermore, we looked at the number of new paediatric patients our orthotists saw in their clinics from March through to June 2020 and compared this to the same period in the previous year. We finally looked at how many paediatric spinal operations were performed from the 1<sup>st</sup> March through to the 30<sup>th</sup> June 2020 and again compared this to the same period in 2019.

Data were obtained from a computerised notes database and analysed by the authors. There were no exclusion criteria; all paediatric patients were included.

### Patient and Public Involvement Statement:

There was no patient or public involvement in the formulation of this method.

### Results

Analysis of our data revealed a significant decline in the number of referrals received during the COVID-19 pandemic. During the period January to June 2020, our service received a total of 155 referrals which was a decrease from 238 referrals from the same period in 2019. Of these, 40 referrals to our service came in the months April, May and June 2020. This compares to 112 referrals during the same period in 2019. This represents a 64.3% decline in referrals comparing April, May and June 2020 to the same period in 2019.

The pandemic had an effect on our average waiting times for paediatric patients to be first seen by a Spinal Surgeon (**Figure 1**). Prior to the pandemic, our average waiting time for a new patient to be seen in our outpatient clinic was 10.84 weeks. During the first half of 2020, this waiting time was reduced to 6.56 weeks. However, at the time of data collection on the 3<sup>rd</sup> July 2020 there were still 60 children waiting to be seen in our outpatient clinic who had been referred to the SNSDS within 2020 (**Figure 2**). The breakdown of these 60 patients and when they we received their referral to our service can be seen in **Table 1**.

[FIGURE 1 (MEAN WAIT TIME TO BE SEEN IN CLINIC)] [FIGURE 2 (NUMBER OF REFERRALS RECEIVED AND NUMBER OF PATIENTS STILL WAITING TO BE SEEN)]

	Total number of referrals for the month	Number of patients who had been seen in clinic by 3 <sup>rd</sup> July 2020	Number of patients still waiting to be seen by 3 <sup>rd</sup> July 2020
January	43	31	12
February	39	28	11
March	33	17	16

https://mc.manuscriptcentral.com/bmjpo

Page	6	of	1	4

April	18	9	9
May	12	6	6
June	10	4	6

The pandemic and subsequent lockdown caused a significant reduction in both our surgical activity and orthotic treatment. The number of our paediatric spinal operations declined by 34% during March to June 2020 when compared to the same months of the previous year (**Figure 3**), and there was a decrease of 50% of new paediatric patients seen by our orthotists from March to June 2020 when compared to March to June 2019 (**Figure 4**).

[FIGURE 3 (NUMBER OF PAEDIATRIC SPINAL OPERATIONS PERFORMED....)] [FIGURE 4 (NUMBER OF NEW PAEDIATRIC PATIENTS SEEN BY ORTHOTISTS...)]

### Discussion

Our study shows a 64.3% reduction in paediatric referrals to the SNSDS since the 1<sup>st</sup> April 2020. The recent lockdown has also meant that there are 60 patients still waiting to be seen for their first clinical appointment despite the majority of these being referred to our service prior to the COVID-19 pandemic. Interestingly, of those patients who were able to be seen in clinic, the waiting times dramatically declined. The mean waiting times for May 2019 compared to 2020 were 8.78 weeks and 2.33 weeks respectively and for June 2019 compared to 2020 the mean waiting times for first clinical review were 10.6 weeks and 2 weeks respectively. This can be misleading though, as the vast majority of patients who are still waiting to be seen will have been waiting longer than our average of 10.84 weeks. The true mean waiting time for patients referred to our service during 2020 will not be known until all patients referred have been seen in clinic.

The patients who were able to be seen during the pandemic had uncomplicated spinal deformities, such as idiopathic scoliosis or Scheuermann's kyphosis. Due to shielding advice from the UK government, the more complex patients with severe syndromic or neuromuscular conditions either have not been offered a clinical appointment in the first place, or likely have postponed their appointment themselves in order to avoid exposure to the risk of contracting COVID-19. Therefore, unfortunately the patients who are most disadvantaged and will have to wait the longest for their initial appointments, are the most complex patients.

There are several factors that could account for the decline in the number of patients being referred to our service. Although some areas of the NHS prepared quickly for the pandemic and COVID-19 patients (3), other areas were all but arrested in an attempt to re-allocate resources and keep non-emergency patients out of hospital. This was naturally not unique to the Scottish NHS and other outpatient surgical services across

#### **BMJ** Paediatrics Open

the world experienced similar re-allocation of resources and staff in an attempt to prepare for COVID-19 patients (4).

In normal non-COVID-19 times, nearly all of the paediatric referrals to the SNSDS come from consultants from other specialities, such as paediatric orthopaedic surgeons, paediatricians and neurologists. We also receive some referrals directly from general practitioners. However during the pandemic in Scotland, most outpatient appointments for all services were cancelled. With a reduced number of outpatient clinics, fewer patients were seen by the primary referring services, and therefore fewer children were sent for assessment and treatment to the SNSDS.

There are also likely to be several patient related factors affecting referrals. Often paediatric spinal conditions are first noticed by a teacher, sports instructor, friend or other adults who are in contact with the child (5). As lockdown was implemented and society's focus moved to staying at home to protect the NHS, children had fewer interactions with adults other than their immediate family. It therefore follows that paediatric spinal conditions may have gone unnoticed during lockdown leading to reduced referrals from primary care.

Furthermore, during the era of COVID-19, patients' perception of front-line services changed from being places of safety to places of danger (6)(7). Public health messages largely focused on the COVID-19 morbidity and mortality with daily news briefings, a daily mortality count and very little emphasis on other health conditions within the population. This COVID-19 weighted coverage likely nurtured a perception of excessive risk by visiting a hospital or GP. This will have encouraged avoidance of hospitals by patients or their families (7), leading to a lesser propensity to seek help for other health conditions.

The increase in waiting time for first assessment can be explained due to a reduction in service delivery. Normally, the SNSDS has 3 whole-day clinics per week run by 3 consultant surgeons. Once lockdown was announced and the Scottish NHS prepared for COVID-19, these clinics were reduced to just 2 half-day clinics a week. Even as we started to increase the number of clinics per week towards the end of June, we were allowed much fewer patient appointments per clinic due to the imposed hospital social distancing guidelines. As an example, in a whole-day clinic we now only see 14 patients, whereas prior to the pandemic each clinic at our service would have space for 40 consultations.

Our data shows that the orthotists did not see any patients during the entire month of April 2020. The NHS facility where our orthotists operate was designated as the rehabilitation hospital for adult COVID-19 patients. Therefore, any staff and patient services which were not involved in adult rehabilitation for COVID-19 ceased. Similarly, for surgical activity, our data shows a significant decline in paediatric spinal operations during the months of April, May and June 2020 when compared to 2019. Only emergency

surgery was undertaken in our service during April, such as one patient who was neurologically compromised with a high grade dysplastic lumbosacral spondylolisthesis.

A delay in treatment for paediatric spinal conditions can have a hugely consequential effect. Expert consensus is that waiting times for scoliosis surgery should not exceed 6 months, however some authors have suggested that surgery within 3 months could potentially lead to better outcomes for the patient and the health service (8). Delaying surgery can lead to a reduced quality of life for the patient, increased operative time, increased blood loss, longer fusion levels and the need for combined procedures (9)(10), which can all lead to unwarranted higher surgical risks and increased cost to the health service.

Spinal bracing by orthotists is an important treatment option for patients with scoliosis (11). For those patients with an adolescent idiopathic scoliosis of 20-40 degrees, bracing can delay and often avoid surgery with reported one patient not requiring scoliosis correction for every three who embark on a bracing programme (12). It is clearly vital to have a robust bracing programme available for not only our patients, but also for the effectiveness of our service. Our data has shown a significant decline in the number of patients our orthotists have been able to see during the pandemic when compared to a similar time in the previous year. An area of follow-up for this study would be to discern for how many patients bracing is no longer an effective treatment option for their scoliosis, and therefore they require surgical correction.

The senior author of this paper is a member of British Scoliosis Society Executive Group. Throughout the pandemic, there have been continuous discussions as to when elective deformity surgery should re-start. On the basis on these discussions, we re-established surgical activity in the paediatric side of our service sooner than any other spinal deformity unit in the UK. One of the reasons why we have been able to do this is because we have a dedicated paediatric hospital for our outpatient and surgical activities. Other services across the UK are run within mixed paediatric and adult hospitals which increased the number of inpatients with active COVID-19 infections. It should therefore, be expected that other paediatric spinal services across the UK will be faced with even greater clinical pressures in regard to both inpatient and outpatient activity when they restart clinical work.

Once the dust has settled from the pandemic and health services start to return to something that resembles normal operating procedure, a monumental effort will be required to compensate for the back log of referrals and treatment required to ensure any harm done is minimised. Digital health technology could be embraced to bring increased efficiency to the NHS. There has traditionally been some opposition to video and telephone consultations in the NHS, however during the pandemic the benefits have been too strong to ignore. Other specialties have had good initial outcomes and good patient satisfaction for video consultations (13). Video consultations may not be appropriate for paediatric spinal care, or not least for

#### **BMJ** Paediatrics Open

initial patient consultation due to the importance of imaging and neurological examination, however other surgical services across the NHS would do well to embrace this technology where possible.

Services should also review their patient journey from GP referral to outpatient clinic, in order to determine if this can be more streamlined and reduce the burden on patients needing to attend clinical visits (14). Since the establishment of the SNSDS in 2004, we have spent time educating referrers, and creating strict referral criteria which have allowed our referral system to keep up with increasing demands on the healthcare system. E-triage and e-referral systems are further areas that could increase efficiency and avoid overloading the outpatient clinics. Other specialties within medicine have shown promising results from trials of etriaging, leading to improved patient care, whilst reducing the burden on outpatient resources and decreasing costs (15).

It has been correctly noted that spinal surgery is resource heavy and centres should ensure they are prepared to re-embark on a full operating schedule again (16). Blood supply is of concern and as spinal surgery often requires a blood transfusion, this should be considered before re-embarking on a full operating theatre load (17). PICU bed availability should also be considered (16). On the other hand, delaying spinal surgery results in more complex operations leading to greater utilisation of healthcare resources (18). We may find ourselves in a situation where our patients are requiring operations of increased complexity and greater resource utility due to the delays of the pandemic, but resources themselves are scarcer also due to the lingering effects of the pandemic. Centres must therefore plan their resources diligently and resume elective surgery mindfully. E.

### **Conclusions**

This study supports the evidence that there has been both a decline in referrals for, and a delay in treating serious paediatric health conditions. As National Health Services return to normal there is an expectation that the demand placed on the NHS will be significantly higher than normal operating procedure. Despite the pandemic, we need to ensure that we are treating our patients in a safe and timely manner in order to guarantee the best possible clinical outcomes. This can be done through encouraging services that need support to receive it by improving both NHS infrastructure and efficiency through information technology. Our study suggests that even though children and young people are less affected by COVID-19, they suffer indirect consequences of the pandemic due to lack of clinical resources that can accommodate their health needs.

### References:

1 2

3 4 Spinelli A, Pellino G. COVID-19 pandemic: perspectives on an unfolding crisis. Br J Surg. 2020; 1. 5 6 2. Green P. Risks to children and young people during covid-19 pandemic. BMJ [Internet]. 2020 Apr 7 28;m1669. Available from: http://www.bmj.com/lookup/doi/10.1136/bmj.m1669 8 9 Adamson J, Bird C, Edgworth K, Hartshorn S, Jamalapuram K, Kanani A, et al. Not just little adults: 3. 10 11 preparing a children's emergency department for COVID-19. Emerg Med J. 2020; (March): 2019–21. 12 4. Teoh JYC, Ong WLK, Gonzalez-Padilla D, Castellani D, Dubin JM, Esperto F, et al. A Global 13 14 Survey on the Impact of COVID-19 on Urological Services. Eur Urol. 2020; 15 16 5. Adobor RD, Riise RB, Sørensen R, Kibsgård TJ, Steen H, Brox JI. Scoliosis detection, patient 17 18 characteristics, referral patterns and treatment in the absence of a screening program in Norway. 19 Scoliosis. 2012;7(1). 20 21 Laura E. Wong; MD; PhD; Jessica E. Hawkins; MSEd; Simone Langness; Karen L. Murrell; Patricia 6. 22 23 Iris; MD & Amanda Sammann; MPH. Where Are All the Patients? Addressing Covid-19 Fear to 24 Encourage Sick Patients to Seek Emergency Care. NEJM Catal [Internet]. 2020;(Figure 1):1-12. 25 26 Available from: https://catalyst.nejm.org/doi/full/10.1056/CAT.20.0193 27 28 Deerberg-Wittram J, Knothe C. Do Not Stay at Home: We Are Ready for You. NEJM Catal. 2020;1-7. 29 30 7. 31 Ahn H, Kreder H, Mahomed N, Beaton D, Wright JG. Empirically derived maximal acceptable wait 32 8. 33 time for surgery to treat adolescent idiopathic scoliosis. CMAJ. 2011 Jun 14;183(9). 34 35 9. Sait M FS. The Effect of Waiting for Surgery on Patients with Adolescent Idiopathic Scoliosis. J 36 37 Spine. 2015;04(02). 38 Calman R, Smithers T, Rowan R. Impact of surgical waiting time on paediatric spinal deformity 10. 39 40 patients. ANZ J Surg. 2013;83(12):929-32. 41 42 Weinstein SL, Dolan LA, Wright JG, Dobbs MB. Effects of bracing in adolescents with idiopathic 11. 43 scoliosis. N Engl J Med. 2013;369(16):1512-21. 44 45 Gomez JA, Hresko MT, Glotzbecker MP. Nonsurgical management of adolescent idiopathic 12. 46 47 scoliosis. J Am Acad Orthop Surg. 2016;24(8):555-64. 48 49 HL L, YC C, JX H, SW C. Pilot study using telemedicine video-consultation for vascular patients' 13. 50 care during the COVID-19 period. Ann Vasc Surg [Internet]. 2020 Jun; Available from: 51 52 https://linkinghub.elsevier.com/retrieve/pii/S0890509620305240 53 54 Liew I, Dean F, Anderson G, Murray O. Requesting spinal MRIs effectively from primary care 14. 55 56 referrals. Eur Spine J [Internet]. 2018;27(10):2436–41. Available from: 57 https://doi.org/10.1007/s00586-018-5578-0 58 59 15. Bennett K, de Boisanger L, Moreton F, Davenport R, Stone J. The safety of using active triage to 60 provide advice rather than a face-to-face neurology outpatient appointment. J R Coll Physicians Edinb. 2019;49(3):193-8.

#### **BMJ** Paediatrics Open

- Wilson LA, Zhong H, Poeran J, Liu J, Memtsoudis SG. Recommendations for resuming elective 16.
- 17.
- 18.







Page 15 of 14



https://mc.manuscriptcentral.com/bmjpo

#### The Initial Impact of COVID-19 on Paediatric Spinal Services in Scotland

Journal:	BMJ Paediatrics Open
Manuscript ID	bmjpo-2020-000826.R1
Article Type:	Original research letter
Date Submitted by the Author:	24-Sep-2020
Complete List of Authors:	Newman, Matthew; RHSC, Garrido, Enrique; RHSC Tsirikos, Athanasios; RHSC
Keywords:	Adolescent Health, Health services research



BMJ



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which <u>Creative Commons</u> licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

https://mc.manuscriptcentral.com/bmjpo

## The Initial Impact of COVID-19 on Paediatric Spinal Services in Scotland

Study conducted in the Scottish National Spine Deformity Centre Royal Hospital for Sick Children-Edinburgh, UK

#### Matthew Newman, MBCHB; Enrique Garrido, MD (Consultant Orthopaedic and Spine Surgeon); Athanasios I. Tsirikos, MD, FRCS, PhD (Consultant Orthopaedic and Spine Surgeon)

Corresponding Author: Matthew Newman

Corresponding Author Address: Paediatric Intensive Care Unit, RHSC, 9 Sciennes Rd, Edinburgh EH9 1LF.

Corresponding Author Email Address: Matthew.newman@doctors.org.uk

Abstract word count: 100 Word Count (not including references): 635

Funding: This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Conflict of Interest: All authors declare that we have no conflicts of interest.

Keywords: Spine, Surgery, Pandemic, Referrals, Waiting times.

Author contributions:

M.N conceived the topic for research and approached E.G and A.I.T for supervision. A.I.T and E.G helped M.N expand on the idea and offered guidance as to where to draw data from. A.I.T verified the analytical methods. A.I.T encouraged M.N. to collect data or orthotist referrals and activity. Both A.I.T and E.G supervised the findings of this work. All authors discussed the results and contributed to the final manuscript.

L.C.Z.O.J.

47

## The Initial Impact of COVID-19 on Paediatric Spinal Services in Scotland

## Abstract

COVID-19 has affected many NHS Scotland services. Our aim is to describe this impact on the Scottish National Spine Deformity Service (SNSDS). All referrals to the SNSDS from 1st January 2020 to 30th June 2020 were analysed and compared to the same period in 2019. There was a 64.3% decline in referrals during the pandemic to the SNSDS. The mean waiting time to be seen in 1st clinical appointment for a new referral was 6.56 weeks in 2020 compared to 10.94 in 2019. There were 60 patients still waiting to be seen at the end of the study period.

## Main text:

As hospitals prepared for COVID-19, resources and staff were re-allocated to ensure the NHS was adequately prepared for the expected influx of patients (1). The risk of COVID-19 for children appears to be lower than it is for adults, however as one senior paediatrician commented, children are perversely suffering for the benefit of adults. This can be through abuse, loss of education, and worsening health outcomes in other domains (2).

The Scottish National Spine Deformity Service (SNSDS) takes referrals from all fourteen of the Scottish NHS Trusts serving a population of approximately 1.5 million children. We analysed the number of new referrals to the SNSDS, and the average wait time to be seen during the initial period of the COVID-19 pandemic.

From January to June 2020, our Service received a total of 155 referrals; a decrease from 238 referrals from the same period in 2019. Of these, 40 referrals to our Service came in the months April, May and June 2020. This compares to 112 referrals during the same period in 2019. This represents a 64.3% decline in referrals comparing April, May and June 2020 to the same period in 2019. (Figure 1)

The pandemic had an effect on our average waiting times for paediatric patients to be first seen by a Spinal Surgeon. Prior to the pandemic, our average waiting time for a new patient to be seen in our outpatient clinic was 10.84 weeks. During the first half of 2020, this waiting time was reduced to 6.56 weeks. (Figure 2). However, at the time of data collection on the 3rd July 2020 there were still 60 patients waiting to be seen in our outpatient clinic who had been referred to the SNSDS within 2020.

There are several factors that could account for the decline in the number of patients being referred to our service. As some sectors in national health services prepared quickly for the pandemic and COVID-19 patients (3), other areas were all but arrested (4). The vast majority of SNSDS referrals come from other specialities, such as orthopaedic surgeons or general paediatricians. With a reduced number of outpatient clinics, fewer patients were seen by the primary referring services, and therefore fewer children were referred to the SNSDS.

Often paediatric spinal conditions are first noticed by a teacher, sports instructor, friend or other adults who are in contact with the child (5). As lockdown was implemented and society's focus moved to staying at home to protect the NHS, children had fewer interactions with adults other than their immediate family. It therefore follows that paediatric spinal conditions may have gone unnoticed during lockdown leading to reduced referrals from primary care.

Furthermore, patients' perception of front-line services changed from being places of safety to places of danger (6). Public health messages focused on the COVID-19 morbidity and mortality with very little emphasis on other health conditions within the population. This weighted coverage nurtured a perception of excessive risk by visiting a hospital or GP which will have encouraged avoidance of hospitals (6), leading to a lesser propensity to seek help for other health conditions.

Our data shows a reduction in the mean waiting times for first clinical review. This is misleading as, at the time of data collection, there was still 60 patients awaiting to be seen. The patients who were able to be seen during the pandemic had uncomplicated spinal deformities. Due to shielding advice from the UK government, complex patients with severe syndromic or neuromuscular conditions either have not been offered a clinical appointment in the first place, or likely have postponed their appointment themselves in order to avoid exposure to the risk of contracting COVID-19. Therefore, unfortunately the patients who will have had to wait the longest for their initial appointments, are the most complex patients whose spinal treatment is disadvantaged.

### **References:**

ର୍ଷ୍ଣ 8

**2** 

<del>39</del> 

 $1_{46}^{45}$ 

**f7** 

**43** 

1<u>5</u>0

**P** 

Spinelli A, Pellino G. COVID-19 pandemic: perspectives on an unfolding crisis. Br J Surg. 2020; 1. 2. Green P. Risks to children and young people during covid-19 pandemic. BMJ [Internet]. 2020 Apr 28;m1669. Available from: http://www.bmj.com/lookup/doi/10.1136/bmj.m1669 3. Adamson J, Bird C, Edgworth K, Hartshorn S, Jamalapuram K, Kanani A, et al. Not just little adults: preparing a children's emergency department for COVID-19. Emerg Med J. 2020; (March): 2019–21. Teoh JYC, Ong WLK, Gonzalez-Padilla D, Castellani D, Dubin JM, Esperto F, et al. A Global Survey on the 4. Impact of COVID-19 on Urological Services. Eur Urol. 2020; Adobor RD, Riise RB, Sørensen R, Kibsgård TJ, Steen H, Brox JI. Scoliosis detection, patient characteristics, 5. referral patterns and treatment in the absence of a screening program in Norway. Scoliosis. 2012;7(1). Deerberg-Wittram J, Knothe C. Do Not Stay at Home: We Are Ready for You. NEJM Catal. 2020;1–7. 6.









#### The Initial Impact of COVID-19 on Paediatric Spinal Services in Scotland

Journal:	BMJ Paediatrics Open
Manuscript ID	bmjpo-2020-000826.R2
Article Type:	Original research letter
Date Submitted by the Author:	19-Oct-2020
Complete List of Authors:	Newman, Matthew; RHSC, Garrido, Enrique; RHSC Tsirikos, Athanasios; RHSC
Keywords:	Adolescent Health, Health services research





I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our <u>licence</u>.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which <u>Creative Commons</u> licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

## The Initial Impact of COVID-19 on Paediatric Spinal Services in Scotland

Study conducted in the Scottish National Spine Deformity Centre Royal Hospital for Sick Children-Edinburgh, UK

#### Matthew Newman, MBCHB; Enrique Garrido, MD (Consultant Orthopaedic and Spine Surgeon); Athanasios I. Tsirikos, MD, FRCS, PhD (Consultant Orthopaedic and Spine Surgeon)

Corresponding Author: Matthew Newman

Corresponding Author Address: Paediatric Intensive Care Unit, RHSC, 9 Sciennes Rd, Edinburgh EH9 1LF.

Corresponding Author Email Address: Matthew.newman@doctors.org.uk

Abstract word count: 100 Word Count (not including references): 635

Funding: This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Patient and Public Involvement statement: not required

Conflict of Interest: All authors declare that we have no conflicts of interest.

Keywords: Spine, Surgery, Pandemic, Referrals, Waiting times.

Author contributions:

M.N conceived the topic for research and approached E.G and A.I.T for supervision. A.I.T and E.G helped M.N expand on the idea and offered guidance as to where to draw data from. A.I.T verified the analytical methods. A.I.T encouraged M.N. to collect data or orthotist referrals and activity. Both A.I.T and E.G supervised the findings of this work. All authors discussed the results and contributed to the final manuscript.

\$0 

4 

6<del>2</del> 

<del>3</del>9 

<del>44</del> 

74§

<u></u>

## The Initial Impact of COVID-19 on Paediatric Spinal Services in Scotland

### Abstract

COVID-19 has affected many NHS Scotland services. Our aim is to describe this impact on the Scottish National Spine Deformity Service (SNSDS). All referrals to the SNSDS from 1st January 2020 to 30th June 2020 were analysed and compared to the same period in 2019. There was a 64.3% decline in referrals during the pandemic to the SNSDS. The mean waiting time to be seen in 1st clinical appointment for a new referral was 6.5 weeks in 2020 compared to 10.9 in 2019. There were 60 patients still waiting to be seen at the end of the study period.

## Main text:

As hospitals prepared for COVID-19, resources and staff were re-allocated to ensure the NHS was adequately prepared for the expected influx of patients (1). The risk of COVID-19 for children appears to be lower than it is for adults, however as one senior paediatrician commented, children are perversely suffering for the benefit of adults. This can be through abuse, loss of education, and worsening health outcomes in other domains (2).

The Scottish National Spine Deformity Service (SNSDS) takes referrals from all fourteen of the Scottish NHS health boards serving a population of approximately 1.5 million children. We analysed the number of new referrals to the SNSDS, and the mean wait time to be seen during the initial period of the COVID-19 pandemic.

From January to June 2020, our Service received a total of 155 referrals; a decrease from 238 referrals from the same period in 2019. Of these, 40 referrals to our Service came in the months April, May and June 2020. This compares to 112 referrals during the same period in 2019. This represents a 64.3% decline in referrals comparing April, May and June 2020 to the same period in 2019. (Figure 1)

The pandemic had an effect on our mean waiting times for paediatric patients to be first seen by a spinal surgeon. Prior to the pandemic, our mean waiting time for a new patient to be seen in our outpatient clinic was 10.8 weeks. During the first half of 2020, this waiting time was reduced to 6.5 weeks. (Figure 2). However, at the time of data collection on the 3rd July 2020 there were still 60 patients waiting to be seen in our outpatient clinic who had been referred to the SNSDS within 2020, so it will be some time before we know what the true mean wait time for a new patient is during 2020.

There are several factors that could account for the decline in the number of patients being referred to our service. As some sectors in national health services prepared quickly for the pandemic and COVID-19 patients (3), other areas were all but arrested (4). The vast majority of SNSDS referrals come from other specialities, such as orthopaedic surgeons or general paediatricians. With a reduced number of outpatient clinics, fewer patients were seen by the primary referring services, and therefore fewer children were referred to the SNSDS.

https://mc.manuscriptcentral.com/bmjpo

Often paediatric spinal conditions are first noticed by a teacher, sports instructor, friend or other adults who are in contact with the child (5). As lockdown was implemented and society's focus moved to staying at home to protect the NHS, children had fewer interactions with adults other than their immediate family. It therefore follows that paediatric spinal conditions may have gone unnoticed during lockdown leading to reduced referrals from primary care.

Furthermore, patients' perception of front-line services changed from being places of safety to places of danger (6). Public health messages focused on the COVID-19 morbidity and mortality with very little emphasis on other health conditions within the population. This weighted coverage nurtured a perception of excessive risk by visiting a hospital or GP which will have encouraged avoidance of hospitals (6), leading to a lesser propensity to seek help for other health conditions.

Our data shows a reduction in the mean waiting times for first clinical review. This could be misleading however, as at the time of data collection, there was still 60 patients awaiting to be seen. The patients who were able to be seen during the pandemic had uncomplicated spinal deformities. Due to shielding advice from the UK government, complex patients with severe syndromic or neuromuscular conditions either have not been offered a clinical appointment in the first place, or likely have postponed their appointment themselves in order to avoid exposure to the risk of contracting COVID-19. Therefore, these particularly vulnerable patients and possibly those with the greatest need for surgical input, will unfortunately be the patients who will have to wait the longest for their initial appointments, and therefore be further disadvantaged due to the COVID-19 pandemic.

### References:

1. Spinelli A, Pellino G. COVID-19 pandemic: perspectives on an unfolding crisis. Br J Surg. 2020;

Green P. Risks to children and young people during covid-19 pandemic. BMJ [Internet]. 2020 Apr 28;m1669.
Available from: http://www.bmj.com/lookup/doi/10.1136/bmj.m1669

3. Adamson J, Bird C, Edgworth K, Hartshorn S, Jamalapuram K, Kanani A, et al. Not just little adults: preparing a children's emergency department for COVID-19. Emerg Med J. 2020;(March):2019–21.

4. Teoh JYC, Ong WLK, Gonzalez-Padilla D, Castellani D, Dubin JM, Esperto F, et al. A Global Survey on the Impact of COVID-19 on Urological Services. Eur Urol. 2020;

5. Adobor RD, Riise RB, Sørensen R, Kibsgård TJ, Steen H, Brox JI. Scoliosis detection, patient characteristics, referral patterns and treatment in the absence of a screening program in Norway. Scoliosis. 2012;7(1).

6. Deerberg-Wittram J, Knothe C. Do Not Stay at Home: We Are Ready for You. NEJM Catal. 2020;1–7.

86





