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Review

The positive impact of GIRFT (getting it right first time) on arthroplasty services in times of COVID-19

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ABSTRACT

Background: This observational study evaluates the trends in arthroplasty services across National Health Services (NHS) following the COVID-19 pandemic about GIRFT (Getting it Right First Time) guidelines concerning National joint registry data (NJR data).

Introduction: Since the advent of the COVID-19 crisis sustainability of elective arthroplasty services have become a burning question in NHS. Capacity crisis, unknown COVID-19 infection status, lack of ring-fenced beds, winter crisis, and unprecedented trauma have aggravated the situation further leading to severe impairment in quality of life and service provision. GIRFT guidelines have suggested a few solutions to this crisis and one of them is dividing the hospitals into Hot (trauma) and cold (elective) sites.

Objectives: To review NJR data for pre and post COVID era along with the service structure of the hospital and test the hypothesis that whether redistribution of services into hot and cold sites is a possible solution for sustainable arthroplasty service across NHS.

Methodology: A search was made into the NJR data from 2019, 2020, and 2021. The First 7 months were taken from each year i.e. From 1st January to 31st of July. A review of entries for arthroplasty was considered for all hospitals across England and Wales. Hospitals in Scotland, Ireland, and Isles of Man and major trauma centers were excluded.

Any hospital that was recording at least 15 arthroplasty cases for 4 out of 7 months in 2021 was considered for review. A brief evaluation of their service structure was made, and hospitals were divided into Elective Centres (EC), Urgent Care Centres (UCC), and District General Hospitals (DGH) with in-house emergency services based on the information provided on their official website. In NJR data "completed operations by submission date" column was considered as a reference for data collection. A total of 1807, 1800, and 1810 were identified for 2019, 2020, and 2021 respectively.

However, after applying inclusion criteria total number of entries was reduced to 120 hospitals. Data analysis and selection of hospitals were reviewed twice by two authors (MMK and AP) at different times to avoid any bias and reduce the chances of human error that can affect the outcome. A sub-analysis of data for the last 3 months (May, June, and July) was also performed for the respective years to get a better picture of arthroplasty trends and reduce the flaws of data interpretation.

Ethical approval and data consideration: A formal approval was taken from the NJR team in the UK before the data processing was initiated. The data source being used was available for public review on the NJR website. The team was happy for us to process and evaluate the data as per needs of our study. However, they requested a disclaimer and appreciation note for the members of the NJR team and hospital personnel across the UK that have made the provision of data and subsequent analysis leading to this study feasible.

Results: 18 EC were included. The mean number of cases recorded per center was 427, 68, 348 for 2019, 2020, and 2021 respectively.

20 UCC were identified. The mean number of cases performed were 213, 24, and 195 in 2019, 2020, and 2021 respectively.

Similarly, 60 DGH with emergency services were included and the average number of cases recorded were 194, 27, and 166 for 2019, 2020, and 2021 respectively. Compared to 2019 out of 148 DGH in 2019 only 60 can

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provide a sustainable arthroplasty service signifying a drop of 40% in 2021 in the number of DGH which are contributing to elective services.

Conclusions: The overall productivity of theatres in terms of arthroplasty services has decreased since the re-initialization of services in 2021. There is a need of hour to divide the services into hot and cold sites in terms of A/E and elective centers to provide safe and uninterrupted provision of arthroplasty services and address long waiting times for patients. Provisional of ring-fenced beds and arthroplasty wards is more technically feasible in centers that are not providing in-house emergency admission pathways or are specialist, dedicated elective centers.

1. Introduction

The outbreak of COVID-19 has had a significant impact on health services across the globe. Since the start of the first wave in March 2020, there has been a significant disruption of surgical services throughout the National Health Service (NHS) with elective orthopedic services, in particular, being adversely affected [1].

Literature published all over the world has discussed various aspects of this issue and different guidelines are being published as to how to deal with this unprecedented health crisis. Although there have been various suggestions with regards to kick-starting elective services based on expert recommendations and available evidence. However, it is hard to predict the right answer firstly due to poor quality evidence, secondly, the unpredictable nature of the disease which presents with waxing and waning characters and new variants does make the entire situation more complicated.

Like health services all across the globe National Health Services (NHS) in UK has been tested to its limit in terms of elective and emergency services and looking after COVID patients. Rather than going for approaches based on the expert consensus we have conducted this observation study considering GIRFT (Getting it Right First Time) guidelines and to find a co-relation we have evaluated NJR (National Joint Registry) data. We have evaluated the trends using the total number of arthroplasty cases being registered in 2019, 2020, and 2021.

In 2012, a pilot was initiated by Professor Tim Briggs (then head of the British Orthopedic Association) in order to determine the reason for geographical variances noted in patient outcomes post arthroplasty. This developed into GIRFT program, with its first publication in 2015 highlighting key areas for improvement for arthroplasty services [2]. One of these areas included the recommendation for healthcare trusts to provide “hot” and “cold” sites for orthopedic surgery. Hot sites were defined as sites dealing with trauma, with cold sites being considered solely solely for elective work, with the hope that elective services may be performed to a higher level and be less impacted by winter pressure for beds, which is most likely to be seen at a hot site.

One of the ways in which hospitals have met this challenge is to create a “green pathway” for elective services. This pathway ensures a separation of COVID and non-COVID areas, with elective services being provided within the non-COVID pathway. Interestingly, this is a similar concept to GIRFT’s hot and cold site recommendation, showing that this form of service provision may indeed be feasible.

Therefore, the stoppage of elective orthopedic services in the UK during the height of the COVID pandemic has given trusts a unique opportunity, with time to re-organize service provision into designated hot and cold sites. At the time of the last GIRFT report, 33.7% of trusts were already using a designated cold site, with a further 41.1% have agreed to consider a cold site. As elective services re-open, our expectation is that more trusts will follow the GIRFT hot and cold site recommendation [3].

The aim of our study is to use the NJR data to determine the trend of arthroplasty service provision in the UK during the pre-COVID, COVID, and immediate post-COVID periods, in terms of the type of hospital where the service provision was possible. We have also analyzed the service structure of each included hospital as per the hospital’s official NHS website.

To the best of our knowledge and search of the literature, this is the first study that has considered the use of “hot and cold site” as per GIRFT guidelines and tried to consolidate this concept by reviewing NJR data and discussing the enforced changes by COVID pressure in different hospitals across NHS. We believe that this paper will prove the value of GIRFT guidelines in this unprecedented crisis and will also help the policymakers to dedicate funds and restructure services in a much better way.

1.1. Objectives

To review NJR data for pre and post COVID era along with the service structure of the hospital and test the hypothesis that whether redistribution of services into hot and cold sites is a possible solution for sustainable arthroplasty service across NHS.

1.2. Hypothesis

Re-distribution of services into hot and cold sites will lead to better and sustainable arthroplasty services.

2. Methodology

A search was made into the NJR data from 2019, 2020, and 2021. The First 7 months were taken from each year i.e. From 1st January to 31st of July. A review of entries for arthroplasty was considered for all hospitals across England and Wales. Hospitals in Scotland, Ireland, and Isles of Man and Major Trauma Centers were excluded. The rationale for exclusion was based on the fact that COVID has hit different areas of the UK differently and to get a general idea of the impact of COVID across the country we focused on the hospital in the mainland and Wales. Moreover, it was easy for us to compare and access data from the NJR for these regions of the UK.

Sustainability of service was being considered so it was agreed that any hospital that was registering at least 15 arthroplasty cases for 4 out of 7 months in 2021 was considered for review. The concept of 4 out of 7 months under consideration was used as an indicator to judge the sustainability of service.

The reference for the sustainability of services was considered from 2021 as this was the time of post COVID era and we are interested in looking into trends, changes, and contributions in post COVID era following the resumption of arthroplasty services.

A brief evaluation of their service structure was made, and hospitals were divided into Elective Centre (EC), Urgent Care Centres (UCC), and District General Hospitals (DGH) with in-house emergency services based on the information provided on their official website. In NJR data “completed operations by submission date” column was considered as a standard for documentation of several procedures. A total of 1807, 1800, and 1810 were identified for 2019, 2020, and 2021 respectively.

However, after applying inclusion criteria total number of entries was reduced to 120 hospitals. Data analysis and selection of hospital was reviewed twice by two authors (MMK and AP) at different times to avoid any bias and reduce the chances of human error that can affect the outcome of the study. A sub-analysis of data for the last 3 months (May, June, and July) was also performed for the respective years to get a

better picture of arthroplasty trends and address the inaccuracies of data interpretation. The reason for this sub-analysis was the fact that we observed that many elective centers did not restart their elective work till March 2021. Thus, sub-analysis will remove the bias out of the equation. Another agreement was the exclusion of trauma centers. There are few designated trauma centers in NHS and in terms of capacity, staffing, and workload they are different cattle of fish. Moreover, looking at the NJR the contribution made by specialist trauma centers has not been substantial in our view. Moreover, it is hard to figure out whether the arthroplasty was performed as part of an indication for trauma or was it a planned elective procedure. We are looking for a trend here that can support and address the whole issue of NHS by considering the cohort of hospitals that contribute or were contributing maximum to elective work before the pandemic. All the data was entered into excel sheet after applying inclusion and exclusion criteria. This was followed by calculation of mean number of cases for each subtype of hospital and data was plotted in the form of bar charts.

Useful definitions in terms of understanding of terminologies being used in the paper are as under:

2.1. Elective Centres (EC)

Centres that do not have emergency services and are considered as elective specialist orthopedic institutes for arthroplasty and other planned procedures like RJAH (Robert Jones Agnes Hunt Hospital). In the current context of COVID 19 and GIRFT, they can be labeled as the hospital with a green pathway (know COVID negative patients).

2.2. Urgent Care Centres (UCC)

Centres that do provide planned day case procedures as well as arthroplasty services. They have an urgent treatment center that can deal with walk-in patients with minor injuries. On the hospital website, they are described as “urgent care centers/Urgent treatment centers, walk-in treatment centers”. In the current context of COVID 19 and GIRFT, they can be labeled as hospitals with a green pathway (know COVID negative patients).

2.3. District General Hospitals (DGH)

Centres that have 24 hours inpatient emergency services where A/E is divided into majors and minors unit, and they provide in-patient admission for unwell patients that need surgical intervention. (In the current context of GIRFT these hospitals will be accepting patients with amber, red and green pathways. I.e., patients with unknown COVID status I.e., Amber with someone how is known positive I.e., red, and green patients as mentioned above.

2.4. Ethical approval and data consideration

A formal approval was taken from the NJR team in the UK before the data processing was initiated. The data source being used was available for public review on the NJR website. Thus, the team was happy for us to process and evaluate the data as per the needs of our study. However, they requested a disclaimer and appreciation note for the members of the NJR team and hospital personnel across the UK that have made the provision of data feasible.

E-mail trail and approval from the National Joint Registry is being provided with this manuscript for clarification with a disclaimer as per their request is mentioned at the end of this manuscript.

3. Results

Based on the criteria above the hospitals were segregated into three categories. A total of 18 EC, 20 UCC, and 60 DGH met the inclusion criteria (See Fig. 1).

For the 18 EC the mean number of cases recorded were 427, 68, 348 for 2019, 2020, and 2021 respectively. For 20 UCC mean number of cases performed were 213, 24, and 195 in 2019, 2020, and 2021 respectively. Similarly, for 60 DGH the average number of cases recorded were 194, 27, and 166 for 2019, 2020, and 2021 respectively. These case numbers were recorded for the first seven months of the year (see Fig. 2).

As mentioned above we also performed a sub-analysis of the data that was evaluated to reduce bias in our finding and to determine the accurate picture of post COVID era following the resumption of arthroplasty services. In the last 3 months of the study period (May to July), the number of cases registered by EC were 135, 72, 89 in 2019, 2020, and 2021 respectively. Similarly, for UCC the number of cases performed were 74, 34, and 64 for 2019,2020, and 2021 respectively. Looking at numbers for the last 3 months for DGH they were 62, 30, and 44 respectively in 2019,2020, and 2021 (See Fig. 3).

Compared to 2019 out of 148 DGH in 2019 only 60 can provide a sustainable arthroplasty service signifying a drop of 40% in 2021 in the number of DGH which are contributing to elective services (See Fig. 4).

In the last 6 months for EC compared to 2019, the percentage drop in the number of cases was found to be 18.5%, 8.45% for UCC and 14.4% for DGH compared to 2021.

A sub-analysis of data for the last 3 months (May to July) EC had a drop of 34.07%, UCC 18.91% and DGH was 29.03% compared to same time frame in 2019.

4. Discussion

COVID 19 has affected elective services in orthopedics across the globe. Since the crisis, the drive for sustainable safe elective service has promoted research and expert consensus across the globe with possible solutions to this complex multifactorial issue. GIRFT has been under

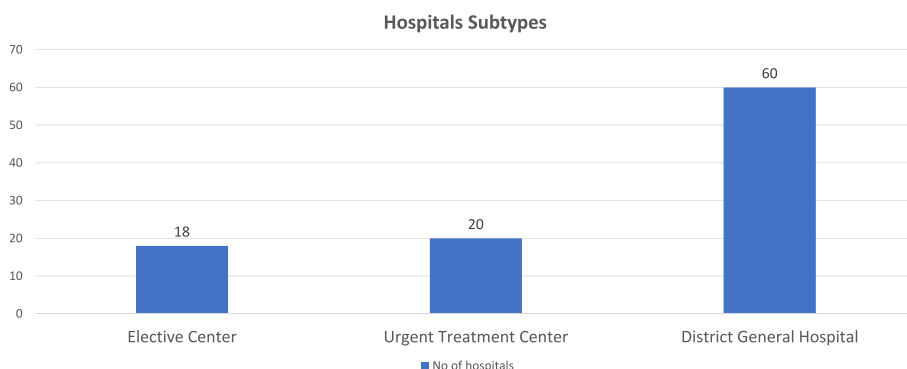


Fig. 1. Hospital subtype.

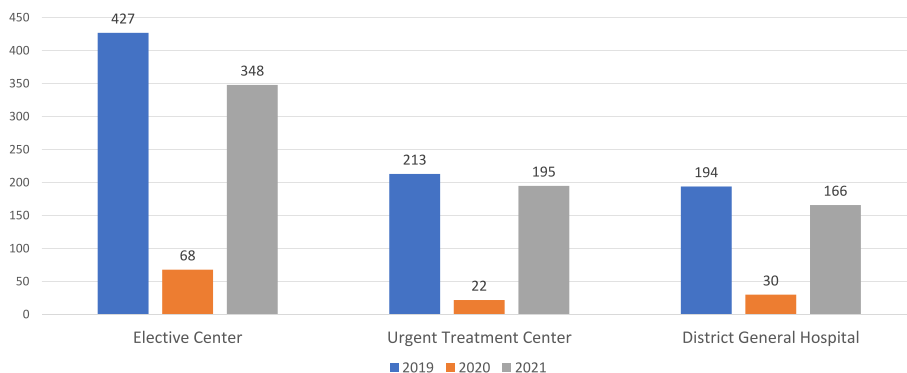


Fig. 2. Mean Number of cases performed (First 7 months).

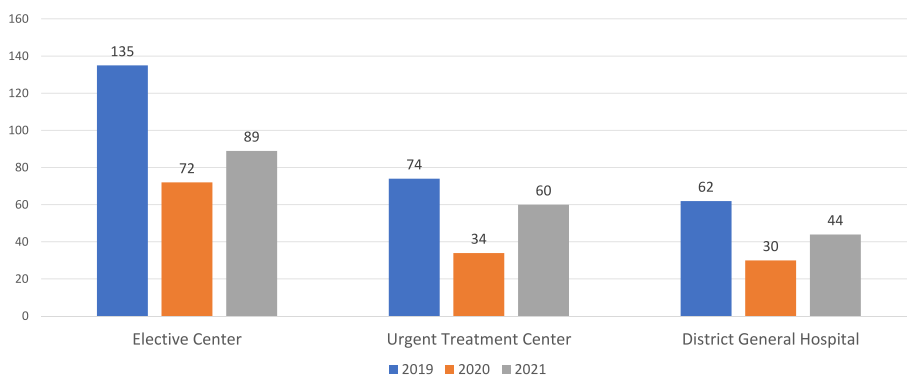


Fig. 3. Mean Number of case last 3 months of study period.

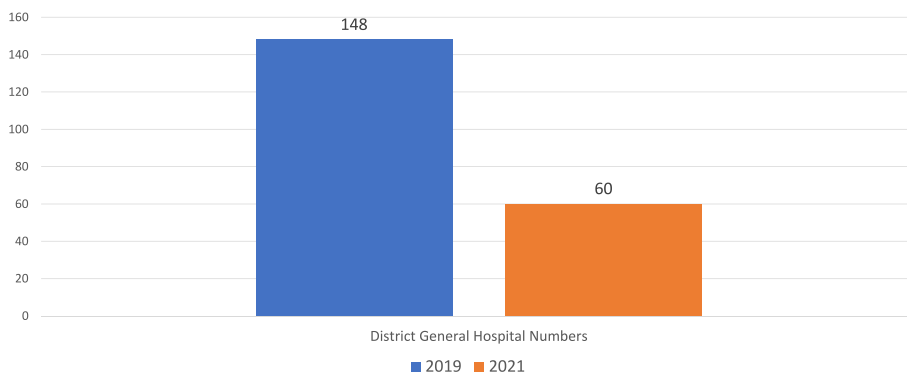


Fig. 4. District General Hospital Contributions.

discussion and provides a framework of uniformity and high quality of service across NHS. However, these guidelines have not been tested entirely in times of COVID crisis especially with the concept of hot and cold sites and assigning elective services to one geographical area of Trust. We have tried to review NJR data and have drawn an interesting conclusion in terms of the drop in the number of district general hospitals contributing to sustainable arthroplasty services I.e., a drop of 40% compared to 2019.

However, this data also shows a reduced number of cases across all types of hospitals as theatre efficacy has significantly reduced in post COVID world for both elective and trauma cases. This concept of hot and cold sites has been strengthened to some extent by our interpretation of NJR data and it can be a source of light at the end of the dark tunnel from a managerial point of view in terms of sustainable elective services in these unprecedented circumstances. Moreover, this concept of specialized centers also provides a positive patient experience in terms of

reduced morbidity, mortality, and improved patient turnover in terms of shorter inpatient stay.

A systemic review published in the literature suggested that high volume centers for arthroplasty have demonstrated superior outcomes in terms of patient satisfaction and also high turnover thus leading to a shorter hospital stay. Not only low volume centers were associated with prolonged inpatient hospital stay but there was an increased risk of surgical site infection as well. The possible reason narrated in the paper was that high-volume hospitals might be enjoying superior infection control measures [4].

This is again supported by GIRFT which supports an MDT pathway along with a formal link to regional centers in terms of complicated cases. It also suggests collaboration between high and low-volume surgeons for improved outcomes [2].

Thus, again literature along with GIRFT does support redirecting services so that funds and resources are dedicated to specialized elective

centers to reduce the risk of poor patient outcomes in terms of morbidity and mortality. Considering prolonged waiting list is a burning issue that is getting worse day by day this issue does need active intervention and out of box thinking with a high priority. Reviewing the literature in terms of the effects of delay in elective surgery there is evidence of significant morbidity and impaired quality of life for patients both deterioration in physical and mental health.

As per a study conducted on the US population delay in TKA (total knee replacement) is associated with poor functional outcome post-operatively. In cases of delay, there was a negative impact on health-related quality of life and functionality when surgery was postponed for more than 6 months. Results of this study do suggest that there was 50% greater odds of worse results when surgery was deferred for more than 6 months. Similarly, the prevalence of depression in patients with axial pain has been reported to be 89%. For TKA clinical depression has been reported to be as high as 60%. These variables were associated with poor functional outcomes and persistent pain after TKA [5].

Focusing back on the waiting list in the UK study conducted by university college London suggested that there will be 1.4 million people on the elective orthopedic waiting list in England by November 2020 approximately 3 times the pre-COVID average. By August 2020 estimated deficit of hip and knee arthroplasty was 44.8% and 38.6% respectively compared to the same period in August 2019. As per this study, the cost to clear this backlog would be 198,811,335 pounds [6].

These stats are quite alarming as there is a lot of money at stake. However, it is essential that the funds and efforts are being directed in the right direction so that this challenge can be addressed appropriately.

A complete shutdown was observed in many hospitals across the UK regarding elective work and return to full capacity was not achieved after 12 weeks as predicted by the COVID surge group [6].

This finding is reflected in our data analysis where 40% of DGH has fallen out of the equation and EC and UCC are unable to perform at the pre-COVID level. The last 3 months' sub-analysis of the study period does show a drop in arthroplasty numbers across all types of the hospital which is hard to explain based on the interpretation of data alone. We have to admit here that the situation on ground is far more complex and variable in different hospitals where factors like variable capacity, different priorities, and accessibility to funds and capacity should be considered along with fluctuation in infection rate in terms of COVID along with local outbreaks in wards leading to further delay in discharge and more limitation in terms of available bed capacity. Staff sickness and a variable load of trauma can be another contributing factor.

However, there was a drive to address acute trauma patients in EC to cope with trauma load at the height of the pandemic till the acute hospitals were cleared off COVID patients. It is hard to consider this explanation around May to July time of the data collection as most of the EC were gearing to go back to their business as usual during this time frame.

Whatever the underlying reason for this reduced number is, patients have been on the receiving end and as per the referred study 12% and 19% of patients waiting for TKA and THR (total hip replacement) respectively have labeled their quality of life as "state worse than death" [6].

However, the waiting list crisis for elective surgery is not just confined to the UK and NHS alone. As per one study published in the US cessation of elective arthroplasty led to 77,000 (worse case primary) THA and TKA cases that require rescheduling. This workload can be cleared off between 9 and 35 months (best or worse case) based on the prediction model of this study [7].

Another study conducted by Saint Mary's Hospital was used which conducted a survey to interview 111 patients regarding the effect on the quality of life of patients from delay in arthroplasty service. 71.2% of patients reported a further deterioration in their condition while waiting and 6.3% evaluated their health as "worse than death" [8].

There is another aspect of this issue that comes in terms of compromise of elective exposure to trainees thus leading to poor

surgical training experience and compromise of future care. We believe the concept of dedicated EC can provide a more predictable and constant exposure of arthroplasty leading to improvement in skill level and realistic expectations from the training program.

As per evidence published in the literature required number of learning hours was still maintained for trainees due to the use of online platform. Senior trainees were unable to get adequate elective exposure. However, this issue was partially addressed by VR surgical simulator. Reduction in both surgical and clinical cases has resulted in many residents that are unable to meet the mandatory requirement for learning program in terms of required competencies [9].

As per ESSKA guidelines regarding COVID-19 and resumption of arthroplasty service COVID negative clinical pathway should be established to elective, urgent, or somewhat elective surgery. This can be achieved either in a separate part of the same institute, a separate building or by the creation of additional space [10].

Thus, these guidelines also agree with the idea of a elective centres for arthroplasty. Although the concept of the hot and cold site as a pilot program to deal with bed crisis during winter pressure has been described in GIRFT recent report but in our view extension of this concept at times of COVID can help NHS in coping with the uncertainty of elective work in a much better way.

5. Limitations of the study

This is a retrospective study that has tried to address the complex issue around COVID problems by using NJR data. However, the NHS health system is a complex entity and elective work, and dedicated centres involve a lot of resources, manpower, and reshaping of service at a massive level.

Although a lot of information can be inferred from an extensive review of data. However, interpretation of data is subjective, and we believe that this data does somehow reflect and support the guidelines of GIRFT and the initiation of elective services in a sustainable way. However, drop in number of cases for elective centres and UCC does not support our hypothesis of hot and cold site/amber green pathway concept based on COVID status of patients. In short, everything cannot be explained in terms of black and white based on a review of NJR data.

6. Strengths of study/impact

Review of NJR data and interpretation in terms of guidelines provided by arthroplasty services across the globe.

This paper will provide policymakers with some degree of evidence based on data from NJR regarding the redirection of resources for sustainable and safe arthroplasty services.

7. Conclusion

1. The overall productivity of theatres in terms of arthroplasty services has decreased since the reinitialization of services in 2021.
2. There is a need of hour to divide the services into hot and cold sites in terms of A/E and elective centres to provide safe and uninterrupted provision of arthroplasty services and address long waiting times for patients.
3. Provisional of ring-fenced beds and arthroplasty wards is more technically feasible in centres that are not provided in-house emergency admission pathways or are dedicated elective centres.

Disclaimer as requested by NJR team

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reflect those of the National Joint Registry Steering Committee or the Healthcare Quality Improvement Partnership (HQIP) who do not vouch for how the information is presented.

Ethical approval

The study was approved by all the consultants of the department of Princess Royal Hospital Telford. Approval was also taken from NJR team, and their requested disclaimer is attached with the manuscript.

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Author contribution

Muhammad Murtaza Khan: First and corresponding author, Manuscript writing, Literature search, Data collection, Haseeb Khawar, Peer review, Data analysis, Ralph Perkins, Expert opinion, Peer review, Asif Pardiwala, Peer review, Data review, Main Idea.

Registration of research studies

Name of the registry: research registry.

Unique Identifying number or registration ID: 7694.

Hyperlink to your specific registration (must be publicly accessible and will be checked): <https://www.researchregistry.com/browse-the-registry#home/>

Guarantor

I being the corresponding author take full responsibility of this work. I have been involved in data collection, manuscript writing and review along with finding relevant studies to support the literature. To the best of my knowledge the information provided here is correct.

Consent

There is no patient identifier attached to this study.

Provenance and peer review

Not commissioned, externally peer reviewed.

Declaration of competing interest

Being the corresponding author, I can confirm that there is no conflict of interest associated with this study.

References

- [1] S. Simon, B.J.H. Frank, A. Aichmair, P.P. Manolopoulos, M. Dominkus, E. S. Schernhammer, J.G. Hofstaetter, Impact of the 1st and 2nd wave of the COVID-19 pandemic on primary or revision total hip and knee arthroplasty-A cross-sectional single center study, Mar 18, *J. Clin. Med.* 10 (6) (2021) 1260, <https://doi.org/10.3390/jcm10061260>. PMID: 33803721; PMCID: PMC8003209.
- [2] V. Takwale, T. Briggs, G. Lomax, Post-covid elective surgery recovery & transformation - GIRFT [Internet], [cited 2021Dec21]. Available from: <https://www.gettingitrightfirsttime.co.uk/GIRFT.program>, 2021 <https://www.gettingitrightfirsttime.co.uk/wp-content/uploads/2021/04/GIRFT-Hip-and-Knee-replacement-pathway-2020-v7.1.pdf>.
- [3] T. Briggs, D. McBride, Getting it right first time - GIRFT [Internet]. Getting It Right First Time - GIRFT. GIRFT, [cited 2021Dec21]. Available from: <https://gettingitrightfirsttime.co.uk/>, 2020.
- [4] S.H. Mufarrih, M.O.A. Ghani, R.S. Martins, N.Q. Qureshi, S.A. Mufarrih, A.T. Malik, S. Noordin, Effect of hospital volume on outcomes of total hip arthroplasty: a systematic review and meta-analysis, Dec 27, *J. Orthop. Surg. Res.* 14 (1) (2019) 468, <https://doi.org/10.1186/s13018-019-1531-0>. PMID: 31881918; PMCID: PMC6935169.
- [5] A.F. Cisternas, R. Ramachandran, T.L. Yaksh, A. Nahama, Unintended consequences of COVID-19 safety measures on patients with chronic knee pain forced to defer joint replacement surgery, Oct 12, *Pain Rep* 5 (6) (2020) e855, <https://doi.org/10.1097/PR9.0000000000000855>. PMID: 33134751; PMCID: PMC7553566.
- [6] S. Oussedik, S. MacIntyre, J. Gray, P. McMeekin, N.D. Clement, D.J. Deehan, Elective orthopedic cancellations due to the COVID-19 pandemic: where are we now, and where are we heading?, Feb, *Bone Jt Open* 2 (2) (2021) 103–110, <https://doi.org/10.1302/2633-1462.22.BJO-2020-0161.R1>. PMID: 33573397; PMCID: PMC7925214.
- [7] J.M. Wilson, A.M. Schwartz, K.X. Farley, J.R. Roberson, T.L. Bradbury, G. N. Guild 3rd, Quantifying the backlog of total hip and knee arthroplasty cases: predicting the impact of COVID-19, Nov 4, *HSS J.* 16 (Suppl 1) (2020) 1–7, <https://doi.org/10.1007/s11420-020-09806-z>. Epub ahead of print. PMID: 33169071; PMCID: PMC7640577.
- [8] J.A. Morris, J. Super, D. Huntley, T. Ashdown, W. Harland, R. Anakwe, Waiting lists for symptomatic joint arthritis are not benign: prioritizing patients for surgery in the setting of COVID-19, Aug 26, *Bone Jt Open* 1 (8) (2020) 508–511, <https://doi.org/10.1302/2633-1462.18.BJO-2020-0112.R1>. PMID: 33215146; PMCID: PMC7659628.
- [9] Z.G.W. Ow, C.K. Cheong, Y.H. Chin, B.Z. Chin, A look at the global impact of SARS CoV-2 on orthopedic services, Jan, *J Clin Orthop Trauma* 12 (1) (2021) 33–39, <https://doi.org/10.1016/j.jcot.2020.10.052>. Epub 2020 Nov 7. PMID: 33191995; PMCID: PMC7648525.
- [10] C. Mouton, M.T. Hirschmann, M. Ollivier, R. Seil, J. Menetrey, COVID-19 - ESSKA guidelines and recommendations for resuming elective surgery, May 13, *J Exp Orthop* 7 (1) (2020) 28, <https://doi.org/10.1186/s40634-020-00248-4>. PMID: 32405872; PMCID: PMC7220621.