Covid-19 and orthopaedic trauma: Quantification of orthopaedic trauma workload and staff resource allocation during a global pandemic-related lockdown

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\textbf{A B S T R A C T}

\textbf{Introduction:} Healthcare systems across the world have struggled as a result of the Covid-19 pandemic. Most specialties have redeployed their staff and resources to deal with the pandemic whilst ceasing their planned elective activity. However acute specialties such as Trauma and Orthopaedics still have a significant emergency caseload that must be safely managed, even in a pandemic. The aim of this study was to investigate the change in Orthopaedic Trauma caseload in a Trauma Unit and a Major Trauma Centre during a pandemic compared to pre-pandemic levels and the associated staffing requirements.

\textbf{Methods:} The data presented was collected from a Trauma Unit and a Major Trauma Centre in the United Kingdom. We compared the number of accident and emergency referrals, fracture clinic appointments, inpatient admissions and operations during the six weeks of the first lockdown from 23rd March to 3rd May, 2020, to the same time period in 2019.

\textbf{Results:} The results showed that the orthopaedic trauma caseload was approximately half that of pre-pandemic levels, reducing by an average of 54.2%.

\textbf{Conclusion:} A significant orthopaedic trauma caseload still remains to be safely managed during a pandemic and appropriate resources must be allocated. Staff allocation must take into account sick cover and staff wellbeing. A proportion of staff may need to be ring fenced from redeployment to facilitate this.

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1. Introduction

The Covid-19 pandemic has adversely affected healthcare systems across the world. Many countries, even those with well-established healthcare systems, are buckling under the weight of this new disease.\textsuperscript{1,2} Most hospital resources are being directed to deal with Covid-19 patients. Surgeons from every specialty are being redeployed to staff the Emergency Department [ED], general medicine and critical care as they bear the brunt of caring for Covid-19 affected patients.\textsuperscript{3,4} New surgical specialty specific guidance has been issued by the relevant governing bodies to efficiently treat their patients while conserving resources for Covid-19, such as the British Orthopaedic Association, British Association of Plastic, Reconstructive and Aesthetic Surgeons, British Society of Hand Surgeons and Royal College of Surgeons.\textsuperscript{5–8} Non operative management is implemented where possible to reduce the operative burden and infection risk in low resource settings.\textsuperscript{9,10} However, despite this “stripped back” approach, orthopaedic trauma still accounts for a significant number of ED attendances and requires subsequent perioperative care. This paper aims to quantify the change in Trauma and Orthopaedic [T\&O] workload during a global pandemic lockdown and ascertain how many Orthopaedic Surgeons can be redeployed to aid in a pandemic.

2. Methods

We collected data pertaining to total ED referrals to T\&O, inpatient admissions, trauma operations and fracture clinic attendances across two hospitals from 23rd March – 3rd May in 2019 and 2020.
The dates chosen reflect a period of six weeks from the implementation of a nation wide lockdown in the UK from March 23, 2020 due to the Covid-19 pandemic. We also collected additional data pertaining to the types of injuries [neck of femur fractures, ankle fractures, wrist fractures, infections, paediatric injuries, complex trauma and tertiary referrals], loss of orthopaedic staff members due to sickness due to Covid-19 and daily peak temperature during the study period.

We included two hospitals from two different parts of the United Kingdom [UK] in this study, a Major Trauma Centre [MTC] in London, Royal London Hospital [RLH] and a referring busy Trauma Unit [TU] in Essex, Princess Alexandra Hospital [PAH]. Both hospitals are under the purview of the UK National Health Service [NHS].

The Princess Alexandra Hospital is a 501-bed multi-specialty busy TU located in Harlow Town, Essex. 3500 staff members across three sites serve a population of 500,000. The Trauma and Orthopaedic department is staffed by 15 Consultants [6 hip and knee, 1 hand, 3 spine, 2 upper limb, 1 paediatric, 1 foot and ankle and 1 complex trauma surgeon], 12 registrars and 10 junior doctors [house officers and senior house officers]. A routine week involves 13 all day elective operating lists, 4 half-day day surgery lists and 7 all day trauma operating lists with ad-hoc lists added as needed.

During the Covid-19 pandemic, the orthopaedic department at PAH suffered multiple staff sickness during the study period. Two senior house officers, four registrars and two consultants missed work due to Covid-19 infections for 7–14 days each. Four doctors [40%] were rostered to work in medicine, ED and ITU, which further reduced orthopaedic staff resources. To reduce exposure and protect staff, the following measures were taken:

- All elective clinics were conducted virtually or cancelled where possible.
- All fractures were screened via a virtual fracture clinic, followed by a combination or virtual or face to face follow up.
- All trauma operating was done in the day surgery unit and from 18/3/20 exclusively facilitated through emergency operating list [main theatre recovery was used as clean ITU, paediatric theatre and recovery was used as COVID ITU extension]
- From March 30, 2020 to May 3, 2020 all consultants and registrars were put on an emergency work roster. The junior registrars covered the oncalls, the senior registrars, fellows and consultants were divided into three groups [on site, standby and rest] to cover on calls, theatre lists and clinics.

The data recorded was tabulated, compared and analysed to ascertain patterns relating to types of injuries, temporal variations and changes in weather.

3. Results

The data at PAH showed an overall proportional decrease in total ED referrals to T&O, inpatient admissions, trauma operations and fracture clinic attendances in 2020 compared to 2019 [See graph 1]. Total referrals reduced by 50.7%, inpatient admissions by 58.1%, trauma operations by 50.6% and fracture clinic attendances by 41.2%.

Comparison of individual year data to peak daily temperature across the same time period showed an almost eerie correlation between total ED referrals to T&O and peak daily temperature in 2020 but no such relation in 2019. Each spike or fall in ED referrals to T&O in 2020 was associated with rising or falling temperatures respectively in the previous 24–48 h. No such relation was noted in 2019 [See Graphs 2 and 3].

Sub group analysis showed a comparative decrease in most variables in 2020 compared to 2019 [neck of femur fractures, ankle fractures, wrist fractures, infections, paediatric injuries and tertiary referrals]. There was a slight increase in complex trauma referrals and operating in 2020. We believe this is because some complex trauma remained at PAH as the local MTC [RLH] was struggling with capacity treating Covid-19 patients as well as taking on tertiary referrals from an increased catchment area. [See graph 4].

During the Covid-19 pandemic, the orthopaedic department at RLH suffered multiple staff sickness during the study period. Six junior doctors, 13 registrars and seven consultants missed work due to Covid-19 infections for 7–14 days each. All junior doctors and three registrars were rostered to work in medicine, ED or ITU, which further reduced orthopaedic staff resources. To reduce exposure and protect staff, the following measures were taken:

- All elective clinics were conducted virtually or cancelled where possible.
- All fractures were screened via a virtual fracture clinic, followed by a combination or virtual or face to face follow up.
- All trauma operating was done in the day surgery unit and from 18/3/20 exclusively facilitated through emergency operating list [main theatre recovery was used as clean ITU, paediatric theatre and recovery was used as COVID ITU extension]
- From March 30, 2020 to May 3, 2020 all consultants and registrars were put on an emergency work roster. The junior registrars covered the oncalls, the senior registrars, fellows and consultants were divided into three groups [on site, standby and rest] to cover on calls, theatre lists and clinics.

The data recorded was tabulated, compared and analysed to ascertain patterns relating to types of injuries, temporal variations and changes in weather.

### Abbreviations

| Abbreviation | Description |
|--------------|-------------|
| PAH          | Princess Alexandra Hospital |
| RLH          | Royal London Hospital |
| T&O          | Trauma and Orthopaedics |
| TU           | Trauma Unit |
| MTC          | Major Trauma Centre |
| UK           | United Kingdom |
| SHO          | Senior House Officer |
| ED           | Emergency Department |
| ITU          | Intensive Treatment Unit |

The Royal London Hospital is a 845-bed multi-specialty busy MTC located in Whitechapel, London serving a population of 2,600,000 across three sites. The Trauma and Orthopaedic department is staffed by 33 Consultants [12 hip and knee, 2 hand, 4 spine, 5 upper limb, 4 paediatric, 3 foot and ankle, 2 limb reconstruction and 1 complex trauma surgeon], 7 sub-specialty fellows, 22 registrars and 8 junior doctors [house officers and senior house officers]. A routine week involves 14 all day elective operating lists, 5 half-day day surgery lists and 9 all day trauma operating lists with ad-hoc lists added as needed.

Graph 1. Comparison of overall data in 2019 and 2020 at PAH.
The data at RLH also showed a similar overall proportional decrease in total ED referrals to T&O, inpatient admissions, trauma operations and fracture clinic attendances in 2020 compared to 2019 [See Graph 5]. Total referrals reduced by 63.7%, inpatient admissions by 59.1% and trauma operations by 52%.

Comparison of data with temperature once again showed a correlation between improved weather and increase in referrals in 2020. Each spike or fall in ED referrals to T&O in 2020 was associated with rising or falling temperatures respectively in the previous 24–48 h. No such relation was noted in 2019 [See Graph 6 and 7].

Sub group analysis showed a comparative decrease in most variables in 2020 compared to 2019 [neck of femur fractures, ankle fractures, wrist fractures, infections, paediatric injuries and tertiary referrals] except for incoming tertiary referrals, which slightly increased in 2020. This is line with the fact that the Royal London is a tertiary referral centre and many DGHs had scaled down their trauma operating, referring an increased number of cases to RLH. [See Graph 8].

4. Discussion

The Covid-19 pandemic has significantly changed the way our society functions and how we practice medicine. Some of these changes may stay and there is much to learn from the whole experience. Perhaps the most important lesson is that we were unprepared for this unprecedented global pandemic. However, the next time we are faced with a similar situation, we can use our experience to be better prepared. We believe this is the first paper to study the change in orthopaedic trauma workload during a global pandemic at a trauma unit and major trauma centre.

The data in our study from PAH and RLH shows that the orthopaedic trauma workload reduces roughly by half during a global pandemic.
The timing of the pandemic must also be taken into account. The Covid-19 pandemic worsened towards the end of winter and beginning of spring and as seen in Graph 2, total referrals from A&E to T&O peaked on days with improved weather in the preceding 24–48 h. This suggests that people were routinely breaking the lockdown protocols and putting themselves in harm’s way. This must be taken into account and more staff can be allocated as needed.

We chose a period of six weeks for data collection as it is a period of time long enough to evade any short-term trends. Additionally, the UK lockdown was relaxed on May 10, 2020 and an increased influx of people out of their homes would adversely affect the conditions of data collection.

A safe service requires doctors at all levels [consultants, registrars and junior doctors] and work roster planning can be tailored to each individual hospital’s resources and needs. The roster must take into account staff on standby at home to provide sick cover or additional support at short notice. In addition to providing clinical care, the roster must also allocate time to provide continued education, planning the return of elective services and administrative duties.12–14

Compliance with ethics standards

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Declaration of competing interest

There are none to declare.

References

1. O’Reilly-Shah VN, Van Cleve W, Long DR, et al. Real-time Assessment of COVID-19 Impact on Global Surgical Case Volumes. 2020. medRxiv. May 8.
2. Priyadarshini I, Mohanty P, Kumar R, et al. Analysis of Outbreak and Global Impacts of the COVID-19. Healthcare [Basel]. 2020. May 29;8[2].
3. Placella G, Salvato D, Delmastro E, Bettinelli G, Salini V. CoViD-19 and ortho and trauma surgery: the Italian experience. Injury. 2020;51(6):1403–1405.
4. Haddad FS. COVID-19 and orthopaedic and trauma surgery. Bone Joint J. 2020. Apr 30;102-B[5]:545–6.
5. BOA. BOAST - management of patients with urgent orthopaedic conditions and trauma during the coronavirus pandemic [Internet]. [cited 2020 May 12]. Available from: https://www.boa.ac.uk/resources/covid-19-boasts-combined.html.
6. COVID-19 advice for members | BAPRAS [Internet]. [cited 2020 May 12]. Available from: http://www.baprax.org.uk/professionals/about/member-resources/covid-19-advice-for-members.
7. COVID-19 resources for members | the British society for surgery of the hand [Internet]. [cited 2020 May 12]. Available from: https://www.bssh.ac.uk/about/resources/covid-19-advice-for-members.
8. COVID-19 advice for members | BAPRAS [Internet]. [cited 2020 May 12]. Available from: http://www.baprax.org.uk/professionals/about/member-resources/covid-19-advice-for-members.
9. Chan Y, Banza L, Jr CM, Harrison WJ. Essential fracture and orthopaedic equipment lists in low resource settings: consensus derived by survey of experts in Africa. BMJ Open. 2018; e023473. Sep 1;8[9].
10. Coimbra R, Edwards S, Kurihara H, et al. European Society of Trauma and Emergency Surgery [ESTES] recommendations for trauma and emergency surgery preparation during times of COVID-19 infection. Eur J Trauma Emerg Surg. 2020. Jun;46[3]:505–10.
11. Guo X, Wang J, Hu D, et al. Survey of COVID-19 disease among orthopaedic surgeons in Wuhan, People’s Republic of China. J Bone Joint Surg Am. 2020. Apr 8.
12. Kogan M, Klein SE, Hannon CP, Nolte MT. Orthopaedic education during the COVID-19 pandemic. J Am Acad Orthop Surg. 2020. Jun 1;28[11]:e456–64.
13. de Caro F, Hirschmann TM, Verdonk P. Returning to orthopaedic business as usual after COVID-19: strategies and options. Knee Surg Sports Traumatol Arthrosc. 2020. Jun;28[6]:1699–704.
14. Iyengar XP, Jain VC, Vaish A, Vaishya R, Maini L, Lal H. Post COVID-19: planning strategies to resume orthopaedic surgery -challenges and considerations. J Clin Orthop Trauma. 2020. May 4.