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The effect of COVID-19 on a Major Trauma Network. An analysis of mechanism of injury pattern, referral load and operative case-mix

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ABSTRACT

Purpose: The aim of this study was to evaluate changes in both mechanism and diagnoses of injuries presenting to the orthopaedic department during this lockdown period, as well as to observe any changes in operative case-mix during this time.

Methods: A study period of twelve weeks following the introduction of the nationwide "lockdown period", March 23rd – June 14th, 2020 was identified and compared to the same time period in 2019 as a "baseline period". A retrospective analysis of all emergency orthopaedic referrals and surgical procedures performed during these time frames was undertaken. All data was collected and screened using the 'eTrauma' management platform (Open Medical, UK). The study included data from a five NHS Foundation Trusts within North West London. A total of 6695 referrals were included for analysis.

Results: The total number of referrals received during the lockdown period fell by 35.3% (n=2631) compared to the same period in 2019 (n=4064). Falls remained proportionally the most common mechanism of injury across all age groups in both time periods. The proportion sports related injuries compared to the overall number of injuries fell significantly during the lockdown period ($p<0.001$), however, the proportion of pushbike related accidents increased significantly ($p<0.001$). The total number of operations performed during the lockdown period fell by 38.8% (n=1046) during lockdown (n=1732). The proportion of patients undergoing operative intervention for Neck of Femur (NOF) and ankle fractures remained similar during both study periods. A more non-operative approach was seen in the management of wrist fractures, with 41.4% of injuries undergoing an operation during the lockdown period compared to 58.6% at baseline ($p<0.001$).

Conclusion: In conclusion, the nationwide lockdown has led to a decrease in emergency orthopaedic referrals and procedure numbers. There has been a change in mechanism of injuries, with fewer sporting injuries, conversely, there has been an increase in the number of pushbike or scooter related injuries during the lockdown period. NOF fractures remained at similar levels to the previous year. There was a change in strategy for managing distal radius fractures with more fractures being treated non-operatively.

Introduction

In December 2019, an epidemic of a novel coronavirus (COVID-19) emerged, with its geographical epicentre in Wuhan City, China. At present more than 12.5 million cases and more than 560,000 deaths have been recorded worldwide [1]. In Britain social distancing measures were first introduced on March 16th followed by a nationwide lockdown on March 23rd 2020 [2]. Lockdown measures included instructions for individuals to stay at home bar visits out for essential food shopping and limited exercise, closing of non-essential businesses and a ban on social gatherings [2]. The overriding aim of the nationwide lockdown was to the reduce spread

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of the virus and ease the burden on an already stretched National Health Service (NHS). Part of the NHS strategy was to maximise both in-patient and critical care capacity [3] through postponement of all non-urgent elective operations and rapid discharge of all hospital in-patients, who were medically fit to leave. Alongside this, there was mass redeployment of healthcare staff, rapid assessment and triage (RAT) protocols within emergency departments and conversion of surgical theatres into make-shift critical care units [4].

These changes led to several logistical challenges for many trauma and orthopaedic centres. Whilst the overall priority was to maximise resources for managing the COVID-19 outbreak; there remained an ongoing responsibility to ensure that emergency orthopaedic care continued. The British Orthopaedic Association (BOA) released guidelines for the management of traumatic injuries and urgent orthopaedic conditions during the coronavirus pandemic [5]. The overall outpatient strategy was an increased emphasis on managing patients non-operatively whilst minimising outpatient visits, therefore, reducing exposure risk to both clinicians and patients. For those injuries requiring urgent surgery the approach was aimed at avoiding hospital admission where possible, alongside utilisation of day-case facilities and repurposing of elective centres to provide trauma care [5]. With patients self-isolating at home and driving less frequently, lockdown measures were expected to reduce the number of injuries sustained. The pandemic offered a unique insight into injury patterns, trauma workload and the effectiveness of rapid re-modelling of major trauma networks.

The aim of this study was to evaluate changes in both mechanism and diagnoses of the emergency cases presenting to the orthopaedic department during this lockdown period, as well as to observe any changes in operative case-mix during this time. The secondary aim was to observe the impact on emergency orthopaedic referrals and procedure numbers as well as the change in patient flow between the Major Trauma Centres and the Trauma Units within the Network.

Methods

The initial twelve weeks of the "lockdown period" (Mar 23rd – June 14th) were compared to the same time period in 2019 (baseline period) across an urban major trauma network. This included data from five large NHS Trusts; Imperial College Healthcare NHS Trust, London North West University Healthcare NHS Trust, The Hillingdon Hospitals NHS Foundation Trust, Chelsea and Westminster Hospital NHS Foundation Trust and West Hertfordshire Hospitals NHS Trust. Together, these trusts form the North West London trauma network and receive the vast majority of trauma referrals in the region. A retrospective analysis of all emergency orthopaedic referrals and procedures performed during these periods was undertaken. All data was collected and screened using the Pathpoint™ eTrauma platform (Open Medical, UK), a modern cloud-based patient management platform used in all the hospital sites for incoming referrals alongside the documentation and planning of operations. All acute orthopaedic referrals and operations during the study periods were included for further analysis. Exclusion criteria were non-emergency/semi-elective referrals, virtual or other direct fracture clinic referral and any elective operations performed.

For each acute trauma referral; age, mechanism of injury and diagnosis were recorded. For each surgical procedure undertaken; date of injury, date of surgery, diagnosis of injury and operation performed were collected. Across the 2 periods, a total of 6695 orthopaedic referrals met the inclusion criteria and were considered for analysis. Mechanism of injury and diagnoses were coded by the inputting clinician using the Snomed CT vocabulary, the recognised international standard for medical terminology utilised in computer systems.

The study population was determined by the number of eligible patients referred via the eTrauma database and by our pre-defined study periods. Diagnoses of new referrals and type of procedure performed were described in terms of absolute number and percentages. To establish significance of difference between the average number of referrals and average number of procedures performed per week, an unpaired, two tailed t-test was used. Mechanism of injury and operation performed were allocated to subcategories to allow for comparison. To determine changes in diagnosis and mechanism of injury as well as operative case mix, a Fisher's exact test was performed.

To further analyse changes to operative practice, three key injuries were studied in further detail; neck of femur (NOF), distal radius and ankle fractures, with the aim of establishing if there was a change in non-operative versus operative management of these injuries. Ankle injuries were divided into open and closed injuries for further comparison. Injuries sustained as part of polytrauma were excluded in this section of analysis. A p-value of <0.05 was considered statistically significant. All statistical analyses were performed using XL Stat (Addinsoft, New York, USA).

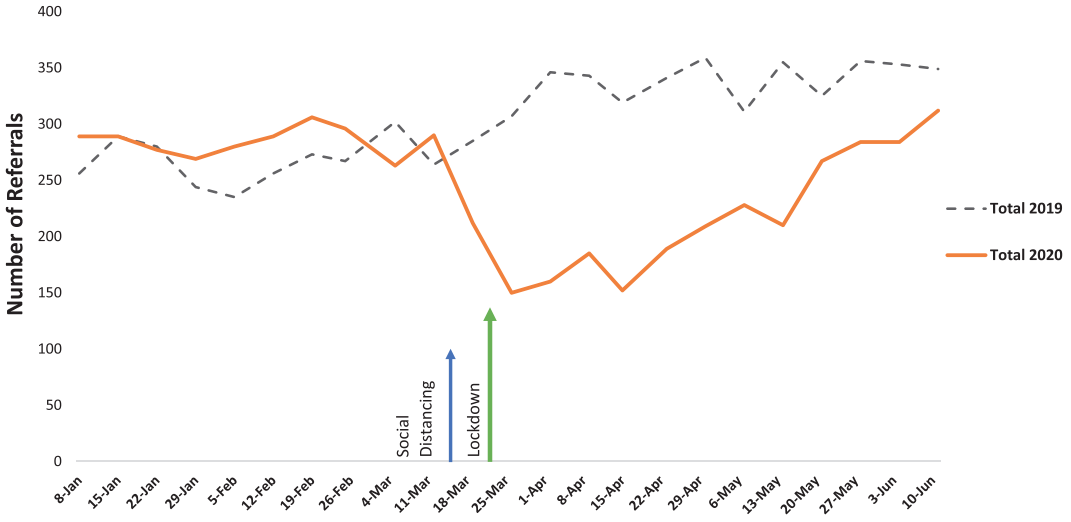

Fig. 1. Week by week comparison of number of referrals received between 2019 and 2020 across combined hospital sites.

Results

Number of referrals

The total number of referrals received during the lockdown period (n=2631) fell by 35.3% compared to the same period in 2019 (n=4064). The average number of referrals per week, across all hospital sites, fell significantly from 339 referrals (SD=18.4) to 219 referrals per week (SD=55.9) during the lockdown period ($p<0.001$). Significant reductions in average number of referrals were seen across all hospital sites. The average age of referrals remained similar between baseline and lockdown periods; with an average age of 53.4 years (SD=27.7) and 53.0 years (SD=28.2), respectively (p=0.412). A week by week comparison of combined referral load between 2019 and 2020 across all hospital sites is displayed in Fig. 1; data from January to March has been included in Figures for schematic purposes. Gradual recovery towards baseline referral figures began approximately after six weeks.

Mechanism of injury

Falls remained proportionally the most common mechanism of injury across all age groups accounting for 42.9% (n=1735) of injuries during the baseline period and 52.8% (n=1379) of injuries during the lockdown period. The proportion of pushbike / scooter accidents significantly increased during the lockdown period to 4.8% of injuries compared to 2.4% at baseline ($p<0.001$). The proportion of sports related injuries also significantly fell during the lockdown period from 6.2% to 3.6% ($p<0.001$). Atraumatic injuries consisting of soft tissue infections, atraumatic joint pain and crystal arthropathies; were proportionally lower during the lockdown at 18.1% compared to 25.2% in 2019 ($p<0.001$). The overall numbers of patients injured by all other mechanisms was reduced during the lockdown; however, no significant difference was found in the overall proportion of injuries between the two study periods. The trends in mechanism of injury sustained between 2019 and 2020 periods are displayed in Table 1.

Looking at paediatric trauma (0-18 years) the number of pushbike/scooter related accidents increased during the lockdown, representing a proportionally significant increase from 4.7% of injuries at baseline to 10.7% of injuries during lockdown ($p<0.001$). The proportion of sports accidents and atraumatic injuries however were significantly lower during the lockdown ($p\leq0.01$).

In younger patients of working age (19-30 years), there was a significant increase in the proportion of pushbike / scooter related injuries from 5.7% at baseline to 10.2% during the lockdown (p=0.039). No other differences were found in mechanism of injury pattern between the two groups. In older patients of working age (31-65 years). In older patients of working age (31-65 years), the number of falls injuries decreased during lockdown (435 in 2019 and 358 in 2020), although its proportion amongst all injuries was significantly higher during the lockdown period (31.7% in 2019 and 40.0% in 2020; $p<0.001$). There was a significant increase in the proportion of pushbike / scooter related injuries from 3.0% at baseline to 5.6% during the lockdown (p=0.003). The proportion of sports accidents injuries however were significantly lower during the lockdown at 3.8% of injuries compared to 7.3% of injuries in 2019 ($p<0.001$). The proportion of atraumatic injuries in this age group significantly decreased from 28.5% of injuries in 2019 to 24.3% of injuries in 2020 (p=0.033).

For the elderly population (over 65 years), again falls remained the most common mechanism with 902 (55.0%) injuries in 2019 and 722 (68.4%) injuries in 2020, which represented a significant increase in the proportion of injuries sustained during the lockdown period ($p<0.001$). The proportion of road traffic accidents during the lockdown was significantly reduced in over 65-year olds

Table 1
Comparison of mechanism of injury by age.

	0-18 years n (%)			19-30 years n (%)			31-65 years n (%)			65+ years n (%)			Total n (%)		
	2019 n=623	2020 n=438	p-value	2019 n=406	2020 n=225	p-value	2019 n=1374	2020 n=896	p-value	2019 n=1640	2020 n=1055	p-value	2019 n=4043	2020 n=2614	p-value
Assault or altercation	2 (0.3)	1 (0.2)	1.000	26 (6)	8 (4)	0.144	28 (2)	25 (3)	0.258	7 (0.4)	2 (0.2)	0.496	63 (2)	36 (1)	0.605
Crush Injury	7 (1)	7 (2)	0.588	5 (1)	2 (0.9)	1.000	15 (1)	10 (1)	1.000	1 (0.1)	4 (0.4)	0.081	28 (0.7)	23 (0.9)	0.392
Fall	307 (49)	238 (54)	0.105	91 (22)	61 (27)	0.207	**435 (32)**	**358 (40)**	**<0.001**	**902 (55)**	**722 (68)**	**<0.001**	**1735 (43)**	**1379 (53)**	**<0.001**
Impact from falling object / projectile	3 (0.5)	3 (0.7)	0.695	8 (2)	2 (0.9)	0.507	7 (0.5)	9 (1)	0.202	3 (0.2)	3 (0.3)	0.685	21 (0.5)	17 (0.7)	0.508
Injury from sharp object	11 (2)	9 (2)	0.820	26 (6)	15 (7)	0.868	51 (4)	26 (3)	0.343	13 (0.8)	5 (0.5)	0.468	101 (2)	55 (2)	0.320
Low energy impact	19 (3)	20 (5)	0.246	13 (3)	9 (4)	0.653	72 (5)	22 (3)	**0.001**	30 (2)	16 (2)	0.648	134 (3)	67 (3)	0.091
Machinery Accident	1 (0.2)	1 (0.2)	1.000	1 (0.2)	2 (0.9)	0.291	4 (0.3)	2 (0.2)	1.000	1 (0.1)	0 (0)	1.000	7 (0.2)	5 (0.2)	1.000
Pushbike / scooter accident	**29 (5)**	**47 (11)**	**<0.001**	**23 (6)**	**23 (10)**	**0.039**	**41 (3)**	**50 (6)**	**0.003**	5 (0.3)	5 (0.5)	0.526	**98 (2)**	**125 (5)**	**<0.001**
Road Traffic Accident	12 (2)	8 (2)	1.000	52 (13)	27 (12)	0.803	98 (7)	61 (7)	0.801	**35 (2)**	**8 (0.8)**	**0.005**	197 (4.9)	104 (4)	0.091
Sports Accident	**93 (15)**	**35 (8)**	**<0.001**	53 (13)	25 (11)	0.529	**100 (7)**	**34 (4)**	**<0.001**	6 (0.4)	0 (0)	0.088	**252 (6)**	**94 (4)**	**<0.001**
Atraumatic	**99 (16)**	**40 (9)**	**0.001**	70 (17)	37 (16)	0.826	**391 (29)**	**218 (24)**	**0.033**	**459 (28)**	**179 (17)**	**<0.001**	**1019 (25)**	**474 (18)**	**<0.001**
Mechanism of injury not specified	40 (6)	29 (7)	0.900	38 (9)	14 (6)	0.226	132 (10)	81 (9)	0.713	178 (11)	111 (11)	0.799	388 (10)	235 (9)	0.413

Fisher's Exact Test performed for all statistical analysis. % values, rounded to nearest decimal place.
Statistically significant results are highlighted in bold.

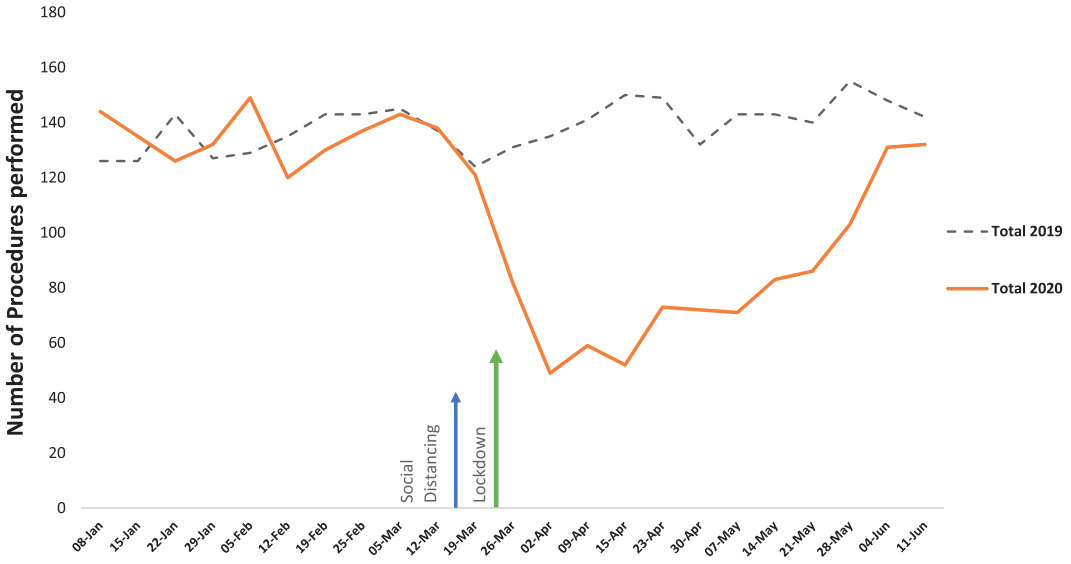

Fig. 2. Week by week comparison of number of operations performed between 2019 and 2020 across combined hospital sites.

Table 2
Comparison of injury pattern of referrals

	2019 n (%)	2020 n (%)	p-value*
Spinal injuries *(including thoracic cage)*	164 (4)	118 (4)	0.456
Upper limb injuries	1050 (46)	709 (27)	0.478
Pelvic injuries	101 (3)	70 (3)	0.752
Neck of femur fractures	410 (10)	327 (12)	0.005
Lower limb injuries	820 (20)	571 (21)	0.218
Open fractures	86 (2)	52 (2)	0.661
Polytrauma *(≥ 2 injuries in ≥ 2 areas)*	9 (0.2)	13 (0.5)	0.079
Compartment Syndrome	6 (0.1)	4 (0.2)	1.000
Other *(soft tissue infections, metalwork etc.)*	1418 (35)	799 (30)	<0.001

*Fisher's exact test performed for all statistical analysis.
Statistically significant results are highlighted in bold.

(2.1% to 0.8%; p=0.005); along with the proportion of atraumatic injuries (28.0% compared to 17.0% at baseline; p<0.001).

Diagnosis of injuries sustained

The number of NOF fractures reduced during the lockdown period (410 in 2019 and 327 in 2020), meaning that the proportion of NOF fractures to total number of injuries sustained increased significantly from 10.1% to 12.3% during the lockdown period (p=0.005). The proportion of "other" non-bony injuries (soft tissue infections, metalwork complications etc) also significantly decreased during the lockdown (34.9% to 30.0%; p<0.001). Polytrauma injury, defined as two or more significant injuries in two or more areas of the body, increased in overall numbers during the lockdown, however, this was not found to be significant (p=0.079). Overall numbers of all other sub-category of injuries were reduced during the lockdown; but no significant changes in proportion of injuries were found. Trends in the diagnosis of injury sustained are outlined in Table 2.

Number of operations

The total number of operations performed during the lockdown period fell by 38.8% (n=1046) compared with the same period in 2019 (n=1732). A week by week comparison of combined number of operations performed between 2019 and 2020 across all hospital sites is displayed in Fig. 2; data from January to March has been included in Figures for schematic purposes. The average number of operations performed each week, across all hospital sites, fell significantly from 144 (SD=7.3) procedures per week in 2019 to 87.2 (SD=27.3) procedures per week in the lockdown period (p<0.001). A total of 31 NOF fracture patients were transferred to an external specialist elective centre that had been repurposed to provide surgical trauma care. Patient repatriation records were analysed to identify the procedure performed and included in overall analysis of number and case-mix of operations performed.

Operative Case-mix

Operative case-mix appears to have varied slightly from the baseline period in 2019. The proportion of NOF fracture operations increased significantly during the lockdown period to 27.2% of operations, up from 21.1% at baseline (p<0.001). There was a significant increase in the proportion of arthroplasty operations performed (p<0.001)(Table 3). There was a significant increase in the proportion of dynamic hip screw operations performed during the lockdown period to 7.1% from 4.7% in 2019 (p=0.011), otherwise, the NOF operative case-mix remained similar between the two study periods. Considering non-NOF related operations, the operative case mix for all other operations remained relatively similar. There were fewer spinal operations performed across all sites during the lockdown at 0.5% of operations; which represented a significant fall from 1.3% of baseline period procedures (p=0.031). The total number of operations performed for all other categories fell over the lockdown period, however, no statistical difference was found in case-mix proportions (Table 3).

Rates of operative management

The proportion of NOF fractures that were managed operatively remained similar; 87.2% of fractures were operated on compared to 89.0% in the same time period in 2019 (p=0.491). The percentage of all acutely referred ankle fractures undergoing operative management was 65.0% at baseline falling slightly to 57.8% during the lockdown period (p=0.168). On further analysis, the proportion of open ankle fractures undergoing operative management remained at 100% during the lockdown period. Operative intervention for closed ankle fractures also remained at similar rates with 62.8% undergoing operative intervention at baseline compared to 54.2% during the lockdown period (p=0.105). A more conservative approach was seen in wrist fracture management with 41.4% of in-

Table 3
Comparison of operative case mix.

	2019 n (%)	2020 n (%)	p-value*
Neck of femur fracture management			
Total	365 (21)	285 (27)	<0.001
Arthroplasty (THR/Hemi)	155 (9)	148 (14)	<0.001
DHS	82 (5)	74 (7)	0.011
IM Nailing	50 (3)	29 (3)	0.907
Cannulated Screws	14 (0.8)	8 (0.8)	1.000
Generic ORIF (subtype not listed)	39 (2.3)	18 (2)	0.408
Operation not specified	25 (1)	8 (0.8)	0.147
Other Operations (excluding neck of femur management)			
Arthroplasty	31 (2)	10 (1)	0.103
ORIF	556 (32)	333 (32)	0.900
IM Nailing	63 (4)	36 (3)	0.833
External Fixation	28 (2)	27 (3)	0.091
Joint washout	53 (3)	27 (3)	0.485
Washout/debridement of soft tissues	88 (5)	47 (5)	0.524
MUA of joint	178 (10)	92 (9)	0.210
Removal of metalwork	61 (4)	50 (5)	0.110
Spinal operations	23 (1)	5 (0.5)	0.031
Fasciotomy	2 (0.1)	0 (0)	0.530
Other *(tendon/ligament repairs, I&D, removal of FB etc.)*	165 (10)	80 (8)	0.098
Operation not specified	119 (7)	54 (5)	0.075

THR, total hip replacement; DHS, dynamic hip screw; IM, intramedullary; ORIF, open reduction internal fixation; MUA, manipulation under anaesthesia; I&D, incision and drainage; FB, foreign body
Fisher's exact test performed for all statistical analysis
Statistically significant results are highlighted in bold

juries undergoing an operation during the lockdown period compared to 58.6% at baseline ($p<0.001$). Operative management of all three injury subsets is shown in Table 4. Note that analysis of ankle and wrist operative management does not include fractures considered stable by initial reviewing clinician and therefore referred directly to fracture clinic without acute orthopaedic referral.

Discussion

This study demonstrates a rapid and profound change in the overall numbers of orthopaedic trauma referrals occurring during the lockdown period. The fall number of acute trauma referrals from 4064 the year before to 2631 represented a 35.3% reduction in total referral load. This likely represents a change in societal behaviour during lockdown; either from a reduction in the number of injuries sustained due to social distancing measures or reduced attendance to emergency departments. According to NHS England data there has been a decrease in overall emergency department admissions, with monthly attendance rates falling between 29.4% to 56.6% between March and June 2020, compared to the same periods last year [6-9]. The main concern regarding this decrease is that individuals may avoid presenting with serious or life-threatening conditions [10], however, this also may mean a reduction in the number individuals presenting with lower energy traumatic injuries.

Falls remained the most common mechanism of injury across all age groups. The largest proportion of falls injuries to overall injuries were seen in the 31-65-year-old and geriatric age groups. This may be due to more elderly individuals continuing to have falls, trips and slips in and around the home, with little effect of social isolation on reducing incidence of such injuries.

The total number of road traffic accidents in our study fell by 47.2% during the nationwide lockdown with the greatest reduction seen in the elderly population. During the coronavirus outbreak the number of road traffic users in the UK has decreased by as much as 73% according to cabinet office data from March 2020 [11]. This decrease in road travel follows the advice from the UK government on avoiding non-essential travel and only travelling for work-based purposes. Alongside this companies and workers have been encouraged to work from home if possible, thus reducing overall road traffic numbers [2]. Despite the government limiting exercise and lower overall road traffic users during the lockdown there was an increase in the number of cycling accidents during the lockdown period. The number of cycling related injuries increased during the lockdown period. The reduced vehicle numbers combined with favourable weather in April and May is likely to have increased the number of cyclists taking to the road. Whilst cycling has been advocated during lockdown periods, as part of our once a day exercise regime, there have been concerns raised regarding cyclist riding excessive distances unnecessarily and the potential burdens of injuries on the NHS [12].

The proportion of sports related injuries fell during in the lockdown period with the greatest reduction seen in under 18-year olds. This likely correlates with the governments closure of schools, gymnasiums and banning of group events leading to fewer physical education activities and no sporting competitions. Previously atraumatic injuries constituted a large proportion of referrals at 25.2% which fell to 18.1% during lockdown. This subcategory of referrals consisted predominantly of soft tissue infections, atraumatic joint pain and crystal arthropathies which often do not require admission to hospital. Significant reductions in the number of atraumatic referrals were seen in the paediatric and elderly populations, which may represent family members avoiding the risk of attending emergency departments, unless deemed absolutely necessary [10]. It may also be the case that a large number of these referrals were managed conservatively within the community or via telecommunications, such as the NHS 111 service.

Upper limb injuries constituted the most common injury pattern both at baseline and during the lockdown period. Lower limb injuries were the second most common injury pattern in both study periods at just over 20% of injuries. There was no significant difference in proportion of injuries for both of these subcategories. NOF fractures are the commonest reason for admission to an orthopaedic trauma ward. The vast majority of these are usually 'fragility fractures' of individuals with underlying bone disease (osteoporosis or osteopenia) [13]. The National Hip Fracture Database reports the average age of individuals sustaining a NOF fracture as >80 years for both men and women. NOF fracture numbers were relatively unaffected by the social distancing measures. As previously mentioned, falls remained the most common mechanism of injury in the elderly population meaning that low energy impacts in patients own homes still resulted in NOF fractures.

There was a 38.8% reduction in the number of procedures performed during the lockdown period. Mass postponement of all non-urgent cases and conversion of surgical theatres into makeshift critical care units [4] has left reduced space for trauma cases across all three sites. Strict infection control guidelines have been implemented for suspected or positive COVID-19 patients with additional cleaning and safety precautions required [14]. Further to this, the anaesthetic time for intubation has increased due to vital safety precautions needed for aerosol generating procedures (e.g. intubation), aiming to reduce the risk of transmission to anaesthetists and their supporting team [15]. These changes overall, have meant a slower and less efficient trauma list during the lockdown period, thus reducing the number of procedures that can be performed.

Alongside this, there is the question of a change in approach to more conservative management strategies. The BOAST guidelines advocated a shift to non-operative management strategies where possible but did outline that some injuries that undergo non-operative management may require later reconstruction [5]. Overall operative case-mix was otherwise similar to 2019, how-

Table 4
Analysis of operative management rates of specific injuries.

	No. of injuries (n)		No. of injuries undergoing operative management (n)		Proportion of injuries undergoing operative management (%)		p-value*
Diagnosis	2019	2020	2019	2020	2019	2020	
Neck of femur#	410	327	365	285	89.0	87.2	0.491
Wrist#	324	210	190	87	58.6	41.4	**<0.001**
Ankle #							
Total	246	154	160	89	65.0	57.8	0.168
Open injuries	15	12	15	12	100.0	100.0	1.000
Closed Injuries	231	142	145	77	62.8	54.2	0.105

#, fracture
Fisher's exact test performed for all statistical analysis unless stated
Statistically significant results are highlighted in bold

ever, there was a significant reduction in spinal surgeries whilst the number of external fixation procedures remained the same. This may represent a delay in non-essential surgeries and prioritisation of limited trauma list space.

The percentage of NOF and ankle fractures undergoing operative intervention remained similar in both study periods. The number of open ankle fractures undergoing intervention remained at 100%. Distal radius fracture saw a significant fall in the number of injuries receiving operative management from 58.6% of injuries at baseline to 41.4% of injuries during the lookdown period. It is not known whether this was related to an increased conservative approach to these fractures as per the BOA guidance.

Limitations and future areas of research

One of the key limitations of this study due to the short study period analysed we were unable to assess the functional outcomes on patients managed non-operatively. Future studies will be needed to assess the morbidity and functional outcomes resulting from this more conservative approach during the lockdown period. A further limitation of our study is its reliance on accurate data coding. Due to the substantial number of referrals and injuries analysed we relied upon data codes for referrals, mechanism of injury and procedure performed making the assumption that these had all been entered correctly by the individual inputting the data.

Conclusion

In conclusion, the nationwide lockdown has led to a decrease in emergency orthopaedic referrals and associated injuries. There has been a change in mechanism of injuries and a reduction in the overall number of acute trauma procedures performed. This study should provide some insights to facilitate policy writing during the recovery phase and may help guide decision making regarding orthopaedic trauma care if lockdown measures are re-instated or similar emergency pandemics are encountered in the future. The impact of the outbreak on elective orthopaedic management and the longer-term impact on NHS services and its staff remains to seen.

Declarations

Exclusive License Statement

Funding

This analysis was carried out independently and did not receive funding.

Patient and Public Involvement

No patients or members of the public were involved in the design, or conduct, or reporting, or dissemination plans of our research.

Data Sharing Agreement

No additional data are available

Conflicts of interest/competing interests

All authors declare no conflicts of interest/competing interests. Senior author PM declares employment as director of Open Medical Ltd. MS declares conflict as non-employed director of Open Medical Ltd.

Authors Contributions

PM, MS and RB conceived the idea for the study and contributed to study design. NF, KD, RB, DN, KS, TS, NS made contributions to acquisition of data for further analysis. BS, PM and MS contributed to data analysis with all authors contributing to the interpretation of results. The manuscript was drafted by BS, PM and MS with all authors contributing to its critical revision and approved the final version to be published.

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