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A comparative review of 1,004 orthopaedic trauma patients before and during the COVID-19 pandemic

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Aims

COVID-19 necessitated abrupt changes in trauma service delivery. We compare the demographics and outcomes of patients treated during lockdown to a matched period from 2019. Findings have important implications for service development.

Methods

A split-site service was introduced, with a COVID-19 free site treating the majority of trauma patients. Polytrauma, spinal, and paediatric trauma patients, plus COVID-19 confirmed or suspicious cases, were managed at another site. Prospective data on all trauma patients undergoing surgery at either site between 16 March 2020 and 31 May 2020 was collated and compared with retrospective review of the same period in 2019. Patient demographics, injury, surgical details, length of stay (LOS), COVID-19 status, and outcome were compared.

Results

There were 1,004 urgent orthopaedic trauma patients (604 in 2019; 400 in 2020). Significant reductions in time to theatre and LOS stay were observed. COVID-19 positive status was confirmed in 4.5% (n = 18). The COVID-19 mortality rate was 1.8% (n = 7). Day-case surgery comprised 47.8% (n = 191), none testing positive for COVID-19 or developing clinically significant COVID-19 symptoms requiring readmission, at a minimum of 17 days follow-up.

Conclusion

The novel split-site service, segregating suspected or confirmed COVID-19 cases, minimized onward transmission and demonstrated improved outcomes regarding time to surgery and LOS, despite altered working patterns and additional constraints. Day-surgery pathways appear safe regarding COVID-19 transmission. Lessons learned require dissemination and should be sustained in preparation for a potential second wave or, the return of a "normal" non-COVID workload.

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Keywords: COVID-19, Trauma, Day surgery

Clinical Relevance

- Segregation of COVID-19 suspicious or confirmed cases from the remainder of the trauma workload minimises opportunity for transmission.
- Well-structured day surgery pathways appear safe regarding COVID-19 transmission, with important ramifications for the reintroduction of planned surgical care.
- A consultant delivered service (at the expense of planned surgical care) is effective at minimizing the burden on hospital infrastructure.

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Introduction

The coronavirus disease 2019 (COVID-19) pandemic has necessitated radical changes to health and social care.[1] The 'lockdown' measures central to the public health response were introduced nationally on 23 March 2020.[2] There has been a gradual relaxation across the UK, with Wales and Scotland pursuing a more restrictive easing than England. The impact of these unprecedented times on trauma services is yet to be fully understood.

Planned non-urgent orthopaedic surgery in our region was stopped early in the

Table I. Cohort demographics.

Demographic	2019 (n = 604)	2020 (n = 400)
Paediatric cases (< 16 yrs), n (%)	154 (25.5)	56 (14)
Adult cases (≥ 16 yrs), n (%)	450 (74.5)	344 (86)
Median age, yrs (IQR)	44 (16 to 71)	55 (29 to 75)
Sex, n (%)	339:265	
Male	339 (56.1)	189 (47.3)
Female	265 (43.9)	211 (52.7)
Operating site		
UHW	568 (94.04)	185 (46.25
UHL	0 (0.00)	207 (51.75)
CHFW	36 (5.96)	8 (2.00)
Sub-cohorts		
FFF	113 (18.7)	121 (30.2
Median age, yrs (IQR)	82 (73.5 to 88)	83 (73 to 88)
Male	41 (36.3)	36
Female	72 (63.7)	85
Non-FFF (including paediatric cases)	491	279
Median age, yrs (IQR)	32 (13 to 59)	38 (21 to 58)
Male	298 (60.7)	153
Female	193 (39.3)	126

CHfW, Children's Hospital for Wales; FFF, femoral fragility fractures; ;IQR, interquartile range; UHL, University Hospital Llandough; UHW, University Hospital of Wales.

pandemic (13 March 2020), prioritising trauma care and protecting against unnecessary viral exposure. The British Orthopaedic Association (BOA) have produced guidelines that promote the use of alternative non-surgical treatments where possible to further reduce risk.[3] Additional methods to reduce in-hospital transmission for patients requiring emergency surgery were necessary. Cardiff and Vale University Health Board (CAVUHB) has three hospital sites: University Hospital of Wales (UHW), University Hospital Llandough (UHL) and the Children's Hospital for Wales (CHfW). UHW is a tertiary referral trauma centre and imminently becoming the Major Trauma Centre for Wales. The UHW site houses the stand-alone CHfW. UHL is geographically distinct, and houses our planned elective service.

In anticipation of the COVID-19 surge, we predicted an overall reduction in trauma surgery caseload. However, the need to treat trauma cases while protecting patients and staff from transmission would necessitate increased theatre time.[4-6]

The trauma service was divided across the sites. Polytrauma and spinal injuries were managed at UHW, along with any symptomatic, suspected or confirmed cases of COVID-19. The remaining adult trauma were primarily treated at UHL. Paediatric trauma relocated to the CHfW on shared CEPOD theatre lists. Provision at UHL comprised one seven-day, 12-hour trauma theatre, with acute trauma and rehabilitation wards. A segregated Trauma Ambulatory Care Unit (TACU) consisting of four day-surgery chairs, two trolleys and a dedicated local anaesthetic theatre was available 7 days per week. UHW had access to three COVID-19 positive CEPOD theatres and a COVID-19 free trauma theatre, with one spinal and two general trauma wards. Halted elective surgery enabled split-site staffing with resident consultant delivered care 24 hours per day at each site.

This study aims to understand the demographic of trauma patients requiring surgical intervention during the pandemic; understand how our trauma service adjustments maintained safe delivery of care, and compare these outcomes with a cohort from 2019.

Methods

All patients undergoing surgery in the operating theatre from 16 March 2020 to 31 May 2020 were prospectively reviewed (2020 cohort). Retrospective review using our electronic theatre database permitted capture of cases performed in the comparative weeks for 2019 (2019 cohort). Only patients undergoing procedures in theatre were included for analyses, excluding those performed in the emergency department. There were no elective lists in 2020 and thus cases performed on an elective list for subacute trauma in 2019 were excluded from analysis.

Patient demographics, surgical details, anaesthetic details, and length of stay (LOS) were recorded (Table I). COVID-19 status and virology investigations for suspected COVID-19 were recorded for the 2020 cohort. Injuries were classified by anatomical region (Table II). Patients with femoral fragility fractures (FFFs), defined clinically and including periprosthetic hip, femoral neck and distal femoral fractures, were considered separately.[7]

Theatre records were cross-referenced with electronic hospital records, identifying all inpatient and community investigations, including COVID-19 virology swabs or additional hospital attendances. Importantly, this system is shared by all hospital sites in surrounding health boards, General Practice, and community Public Health Wales testing sites. Any patient undergoing swab testing or admission at any of these sites would be detectable.

Analysis was performed in SPSS v. 25 (IBM, Armonk, New York, USA). The Shapiro-Wilk test for normality dictated non-parametric analysis using Mann-Whitney U test and Kruskal-Wallis test for categorical data, with frequencies assessed using chi-squared tests.

Results

There were 1,004 patients identified as having undergone urgent orthopaedic/trauma surgery, 400 in 2020 and 604 in 2019 (Table I).

Overall, age was significantly lower in 2019 ($p < 0.001$, Mann-Whitney U test). However, excluding the paediatric cases, there was no significant difference ($p = 0.222$, Mann-Whitney U test). Paediatric cases decreased by 64% in 2020, compared to a 24% reduction in adult

Table II. Injuries by anatomical region.

Region	2019, n (%)	2020, n (%)
Foot	33 (5.5)	14 (3.5)
Ankle	48 (7.9)	20 (5.0)
Leg	42 (7.0)	12 (3.0)
Knee	43 (7.1)	34 (8.5)
Upper leg	19 (3.1)	12 (3.0)
Hip	127 (21.0)	126 (31.5)
Spine	34 (5.6)	7 (1.8)
Shoulder	17 (2.8)	9 (2.3)
Elbow	26 (4.3)	13 (3.3)
Forearm	22 (3.6)	16 (4.0)
Hand and wrist	166 (27.5)	119 (29.8)
Polytrauma	27 (4.5)	18 (4.5)
Fragility femoral fractures	113 (18.7)	121 (30.1)

Table III. Comparison of surgical timing and seniority of lead surgeon.

Category	2019	2020	Chi-squared test	p-value
Total FFF, n	**113**	**121**		
Time to theatre, n (%)				< 0.001*
< 1 day	68 (60.2)	103 (85.1)		
2 days	32 (28.3)	11 (9.1)		
≥ 3 days	13 (11.5)	7 (5.8)		
Surgeon seniority			$\chi^2(2) = 23.43$	< 0.001†
Consultant (led/ supervised Supervised Trainer Scrubbed (STS) / Supervised Trainer Un-Scrubbed (STU))	50 (44.2)	92 (76.0)		
Non-consultant	63 (55.8)	29 (24.0)		
Total non-FFF, n	**491**	**279**		
Time to theatre, n (%)				< 0.001*
< 1 day	372 (75.7)	243 (86.7)		
2 days	23 (4.7)	8 (2.9)		
≥ 3 days	96 (19.6)	28 (10.4)		
Surgeon seniority			$\chi^2(2) = 17.12$	< 0.001†
Consultant (led/ supervised STS/STU)	351 (71.5)	237 (84.9)		
Non-consultant	140 (28.5)	42 (15.1)		

*Kruskal-Wallis test.
†Chi-squared test.
FFF, femoral fragility fractures; STS, consultant supervised trainer scrubbed; STU, consultant supervised trainer unscrubbed in theatre.

cases. There was a greater proportion of males treated in 2019 (χ^2 (2) = 7.604, p = 0.007, chi-squared test) (Table I).

Collectively hand and wrist plus FFFs comprised 60% of all trauma cases in 2020, compared to 46% in 2019 (Table II). Although a similar number of FFFs were treated across both years, there was a significant reduction in the time to surgery. In 2020, 85% of FFF patients received surgery within 24 hours of admission, compared to 60% in 2019 (Table III). There was a statistically significant increase in consultant led surgery (Table III) and an increased use of spinal, regional and local anaesthesia in 2020 (Table IV).

Table IV. Comparison of anaesthetic choice between 2019 and 2020.

Administered anaesthetic	2019	2020	Chi-squared test	p-value
GA	463 (76.7)	289 (72.3)	$\chi^2(2) = 2.26$	0.133
GA + regional Block	28 (4.6)	23 (5.8)	$\chi^2(2) = 0.41$	0.522
Regional Block	3 (0.5)	6 (1.5)	$\chi^2(2) = 2.72$	0.171
SA	69 (11.4)	28 (7)	$\chi^2(2) = 4.90$	0.027
LA	41 (6.8)	54 (13.5)	$\chi^2(2) = 11.88$	< 0.001

*Chi-squared test.
GA, general anaesthetic; SA, spinal anaesthetic; ;LA, local anaesthetic.

Inpatient LOS significantly reduced in 2020 for injuries within most anatomical regions (Table V). Analysis of the FFF patients demonstrated a significant reduction in LOS, allowing for some patients who remain as inpatients at the time of analysis (Table V). LOS did not reduce for spinal or polytrauma patients in 2020.

Day-case or '23:59' single overnight stay rates increased by 8% (n = 191 in 2020, n = 240 in 2019) (Table VI). A total of 40 patients (20.9%) receiving < 24 hour stay treatment underwent COVID-19 swabs. None were positive or required readmission at a minimum follow-up duration of 17 days following surgery.

There were 142 COVID-19 swabs performed. Overall, 18 patients (4.5%) were confirmed positive (Table VII). The 30-day mortality, including all COVID-19 deaths was 4% (n = 16), an increase from 1.2% (n=7) in 2019 (χ^2(2) = 7.45; p = 0.006, chi-squared test). Excluding patients with COVID-19, mortality rates were 2.3% (n = 9) in the 2020 cohort, a statistically non-significant increase from 2019 (χ^2(2) = 1.2; p = 0.273, chi-squared test) (Table VIII).

Seven patients (1.8%) with confirmed COVID-19 positive swabs subsequently died. All had relevant comorbidities and a median age of 92 years (median 20; interquartile range (IQR) 75 to 95) (Table IX).

Discussion

Implementation of a split-site trauma service permitted segregation of confirmed and suspected COVID-19 cases. This service model has been shown to be successful elsewhere and our study supports this.[8] Paediatric cases were segregated from adult trauma as the perception in the early stages of the pandemic was that children were considered asymptomatic carriers. [9,10]

The 34% comparative reduction in trauma surgery seen in 2020 is likely multifactorial. The extensive public health intervention of "Stay at Home, Protect the NHS, Save Lives" was crucial for limiting the opportunity to sustain injury. This was assisted by school closures,

Table V. Comparison of length of stay between 2019 and 2020.

Injured anatomical region	Median length of stay, days (IQR)		p-value
	2019	2020	
Foot	8 (0.5 to 44.5)	0 (0 to 3.25)	0.012
Ankle	2 (0.25 to 7.5)	2 (1 to 7.75)	0.497
Leg	5 (1 to 16)	6.5 (1 to 25.75)	0.418
Knee	4 (1 to 18)	1.5 (0 to 7.25)	0.042
Upper leg	8 (1 to 13)	3 (1.25 to 40)	0.968
Fragility factures†	26 (11.5 to 40)	12 (7 to 20)	< 0.001
Fragility fractures#	26 (11.5 to 40)	13 (7 to 26)	< 0.001
Spine	8 (4.75 to 25.25)	24 (6 to 46)	0.569
Shoulder	3 (1 to 5.5)	0 (0 to 1)	0.004
Elbow	1.5 (1 to 3.25)	1 (0 to 1.5)	0.067
Forearm	1 (0 to 9)	0 (0 to 0.75)	0.009
Hand and wrist	0 (0 to 2)	0 (0 to 0)	0.006
Polytrauma	6 (1 to 28)	32 (8 to 41)	0.470

*Mann-Whitney U test.
†2020 cohort excluding patients not discharged as of 12 June 2020.
‡2020 cohort including patients not discharged as of 12 June 2020. For this data set we consider 12 June 2020 as the date of discharge.

Table VI. Breakdown of day-case surgery

Variable	2020	2019
Total	191 (47.8*)	240 (40*)
Median age, yrs (IQR)	31 (14 to 55)	36 (13 to 67.75)
Sex, M:F	103:88	139:101
Hospital		
UHW	65 (34)	214 (34)
CHfW	6 (3.1)	26 (3.1)
UHL	120 (62.8)	0 (62.8)
Anaesthetic		
GA	132 (69.1)	207 (69.1)
GA + regional	0 (0)	0 (0)
LA	50 (26.2)	15 (26.2)
Regional	6 (3.1)	0 (3.1)
Spinal	3 (1.6)	18 (1.6)
Anatomical region		
Foot	10 (5.2)	10 (5.2)
Ankle	6 (3.1)	22 (3.1)
Leg	4 (2.1)	11 (2.1)
Knee	17 (8.9)	16 (8.9)
Upper leg	2 (1)	6 (1)
Hip	9 (4.7)	16 (4.7)
Spine	0 (0)	2 (0)
Shoulder	8 (4.2)	5 (4.2)
Elbow	10 (5.2)	13 (5.2)
Forearm	14 (7.3)	13 (7.3)
Hand and wrist	111 (58.1)	124 (58.1)
Pelvis and acetabulum	0 (0)	2 (0)
COVID-19 status		
Not swabbed/asymptomatic	151 (79)	N/A
Negative	40 (20.9)	N/A
Positive	0 (0)	N/A
Subsequent readmission (with minimum 17 days follow-up)	0 (0)	N/A

UHW, University Hospital Wales; UHL, University Hospital Llandough; CHfW, Children's Hospital for Wales.
*Percentage of overall total.
GA, general anaesthetic; LA, local anaesthetic; N/A, not applicable.

Table VII. COVID-19 status (2020 cohort only).

COVID-19 status	2020 cohort
Not tested/asymptomatic, n (%)	258 (64.5)
Tested negative, n (%)	124 (31.0)
Tested positive, n (%)	18 (4.5)
UHW	14 (3.5)
UHL	4 (1.0)
Time to first positive swab, n (% positive swabs/% overall cohort)	
PA	1 (5.6/0.3)
DOA	2 (11.1/0.5)
Day 2	1 (5.6/0.3)
Day 3	0 (0/0)
Day 4	1 (5.6/0.3)
Day 5	3 (16.6/0.8)
Day 6	1 (5.6/0.3)
Day 7	1 (5.6/0.3)
> Day 7	8 (44.4/2)

DOA, day of admission; PA, preadmission.

cancellation of sporting activities, reduced socialising, and abandoned mass gatherings often compounded by alcohol and illicit substance use.[6]

Generally, injured patients were able to safely receive treatment along pre-COVID-19 decision-making. However, the BOA guidance during the initial period of lockdown recommended greater efforts to manage conditions nonoperatively.[3] Due to this uncertainty, some injuries, which could have been amenable to either operative or nonoperative management, tended to be treated non-surgically, and managed through the fracture clinic.[11] The details or rate of this decision making are not the focus of this study, although we acknowledge a review could reveal important information for the future. The decision to pursue nonoperative management was the result of a risk benefit discussion between the treating

Table VIII. Summary of 30-day mortality in 2019 and 2020. Last recorded death in 2020 has been 3 June 2020. This is accurate as of 18 June 2020.

Overall inpatient mortality*, n (%)	2019	2020	Chi-squared test	p-value*
Including COVID-19-positive cases	7 (1.2)	16 (4.0)	$\chi^2(2) = 7.45$	0.006
Excluding COVID-19-positive cases	7 (1.2)	9 (2.3)	$\chi^2(2) = 1.20$	0.27
Fragility femoral fracture	6 (0.9)	14 (3.5)		
Diabetic foot	1 (0.2)	1 (0.3)		
Polytrauma	0 (0)	1 (0.3)		
COVID-19-positive	N/A	7 (1.75)		
UHW	N/A	6 (1.5)		
UHL	N/A	1 (0.25)		
Tested negative	N/A	5 (1.25)		
Not tested	N/A	4 (1.00)		

Last recorded death in 2020 was on 3 June 2020. This is accurate as of 18 June 2020.
*Chi-squared test.

consultant and the patient. Anecdotally, many patients appeared reluctant to undergo surgery, even if this was strongly advised. A general fear of hospitals and anaesthesia was particularly prevalent among patients during the first few weeks of lockdown.

There was a slight decrease in the proportion of males treated. Female to male ratios were 1:1.3 in 2019 and 1:0.9 in 2020. This may reflect the impact of lockdown preferentially altering the occurrence of injuries typically sustained by males.[12] However, the reasoning behind this is beyond the scope of this paper.

The significant increase in local anaesthetic reflects an active effort to reduce the number of patients receiving GA. This reduces the number of aerosol generating procedures and serves to preserve personal protective equipment (PPE). [13]

Increased consultant presence during decision making at diagnosis has minimized time spent by patients in hospital prior to undergoing treatment and contributed to a reduction in admissions. There has been a paradigm shift to questioning why a patient requires admission, rather than why a patient is not fit for discharge.

Overall LOS reduced between 2019 and 2020. In 2019, lack of theatre availability or specialist surgeon input often led to increased preoperative hospital stay. The TACU opened in November 2019, increasing our day-surgery trauma capabilities. The TACU, as part of a wider change in ambulant trauma pathways and improved day-surgery operating capacity, has facilitated an 80% reduction in admission rate for ambulant trauma patients. The currently unpublished pre-COVID-19 data for TACU shows a similar but smaller trend. LOS has not been reduced in spinal or polytrauma patients. We suspect this reflects a reduced overall number of cases, with an increased proportion of higher energy injuries requiring prolonged inpatient treatment. We accept the possibility some cases may have been miscategorised in the retrospective 2019 cohort, where data collection relies purely on electronic records.

Increased consultant availability due to halted elective activity ensured subspecialty consultant input every day of the week. This served to eliminate delays, even for nonambulant patients. Common sense would suggest that reduced LOS is paramount in minimising potential exposure to COVID-19 as well as other important hospital related infections. In a time where NHS expenditure has increased, interventions minimising LOS while maintaining or improving patient safety will carry important cost implications.[14,15] Scheduled day-case surgery is an efficient use of hospital resources, preventing repeated cancellations, admissions and starvation periods.

The improved day-surgery pathway has streamlined the service requiring less interaction between clinicians and other allied health-professionals. Given the likelihood that social distancing will remain for the foreseeable future, coupled with a desire to minimize hospital patient-staff contact, these changes will need to persist into the post COVID-19 world. During the study period no formal local guidance was available with regard to day-case trauma surgery and follow-up. No restrictions were deemed necessary or implemented locally for postoperative care, and patients were followed-up in line with normal practice. It was left to senior surgeon discretion whether to recall and with what timeframe but, any follow-up was face-to-face.

LOS is a key performance indicator in the National Hip Fracture Database (NHFD) and reduced by more than 56% in the fragility femoral fracture cohort.[16-18] Reasoning is likely multifactorial and is perhaps due to an observed reduction in time to theatre,[19] and relocation to an established arthroplasty unit known for its accelerated rehabilitation and discharge driven care. Additionally, the overall reduced burden of trauma and changes in working patterns have permitted daily consultant orthogeriatric preoperative optimisation and daily consultant orthopaedic and orthogeriatric review. There has been an increase in out of hours support, with a resident 24 hour consultant workforce across most medical and surgical specialties, and seven-day availability of allied health professionals, abolishing the widely debated "weekend effect".[20] The improved availability of specialist hip arthroplasty surgeons due to cancelled planned care has been crucial in shortening delays to theatre. Finally, the overriding mentality of staff, patients, and relatives has altered with an increased appreciation that inpatient hospital stays are associated with risk. This new fragility fracture pathway has demonstrated positive effects for this vulnerable group of patients and as we return to a 'normal' service we aim to maintain this new pathway.

Table IX. Breakdown of COVID-19 mortality.

Age	Sex	Operation	DOA to DOS, days	DOA to DPS, days	DPS to DOD, days	Comorbidities
75	M	Hip hemiarthroplasty	0	7	11	Dementia
95	F	Hip hemiarthroplasty	0	12	9	Angina
92	F	Open reduction and internal fixation distal femoral fracture	0	5	8	Dementia
						AS
						PPM
						T2DM
95	M	Dynamic hip screw	1	6	21	Prostate cancer
						TIA
						HTN
96	M	Intramedullary nail for proximal femoral fracture	0	4	4	T2DM
						AAA
						CKD
						IHD
						ILD
57	M	Ray amputation	5	8	12	Alcoholic liver cirrhosis
						T1DM
87	M	Intramedullary nail for proximal femoral fracture	1	0	8	IPT
						TIA
						Prostate cancer
						Diverticulosis with hemicolectomy

AAA, abdominal aortic aneurysm; AS, aortic stenosis; CKD, chronic kidney disease; DOA, date of admission; DOD, date of death; DOS, date of surgery; DPS, date of positive swab; HTN, hypertension; IHD, ischaemic heart disease; ILD, interstitial lung disease; IPT, idiopathic thrombocytopenic purpura; PMH, past medical history; PPM, pacemaker for heart block; T2DM, Type 2 diabetes mellitus; TIA, transient ischaemic attack; T1DM, Type 1 diabetes mellitus.

During this period routine testing was limited nationally. There were no formal streams established and testing was limited to symptomatic patients only. Despite this we have observed a zero rate of clinically significant COVID-19 infection after day-surgery or 23:59 short-stay surgery.[21,22] We define clinically significant COVID-19 as infection requiring testing or admission. We accept that some patients may have developed symptoms compatible with COVID-19 infection during their postoperative course, remaining sufficiently well to not require medical attention and confirmatory testing. We deem the risk of loss to follow-up minimal, given the unique geographical restrictions presented by lockdown. Thus, we consider the use of COVID-19 swab testing or admission or attendance to secondary care facilities as surrogate markers for clinically significant COVID-19 infection as a valid assumption. This suggests the risk of contracting COVID-19 from a short hospital attendance is minimal. This may provide support for the reintroduction of carefully structured, planned day-surgery operating ensuring to balance clinical priority and risk for each individual case. [23]

Overall, 18 patients (4.5%) tested positive for COVID-19, with only four testing positive at our 'clean' (UHL) site. Upon demonstrating signs of potential infection, these patients were isolated, before being moved to a COVID-19 ward once the test confirmed a positive status. Across both sites, 45% (n = 8) of the positive patients became positive within five days of admission. With the varying literature concerning incubation period, it is impossible to determine exactly when and where the disease was contracted, with a possibility of community transmission and latent in-hospital incubation.[9,24] Those testing positive later during their admission suggests in-hospital acquisition despite the preventative measures in place.

With the rapidly evolving COVID-19 literature, information regarding surgical risk and outcome remains ever-changing.[8,25-28] An international, multicentre, observational study demonstrated high mortality rates in patients undergoing emergency surgery who developed COVID-19 perioperatively.[25] In our cohort there were seven deaths among patients testing positive for COVID-19 (Table VIII) – a mortality of 38.9%. Six of these patients were admitted with fragility femoral fractures (FFFs), a group with a known risk of perioperative mortality. The seventh patient had significant presurgery medical pathology.

While there are many potential confounding variables, a comparison of our inpatient mortality, regardless of COVID-19 status, demonstrates an overall mortality in 2019 of 1.2% (n = 7) compared with 4% (n = 16) in 2020. Considering the FFFs only, the mortality was 1% (n = 6) in 2019, 3.5% (n = 14) in 2020 including COVID-19 positive patients and 2% excluding COVID-19 positive patients. This significant increase in mortality due to COVID-19 emphasises the susceptibility of the elderly comorbid community.[9,25] This is an area which warrants

further, larger scale work, as we have shown that patients continue to sustain FFFs even during lockdown. In the event of another COVID-19 surge, active injury prevention in this area may reduce unnecessary surgically related deaths. However, these measures are unlikely to have quick dramatic effects and coexisting methods need to be in place for ongoing protection of these patients on admission. We propose it will be most suitable to isolate asymptomatic patients until confirmed negative. This will entail a multitude of challenges related to set up that will vary from unit to unit. These should be pursued and developed within each individual departments' capabilities to protect the most vulnerable members of our communities.

The COVID-19 pandemic has led to a change in the pattern and frequency of adult and paediatric orthopaedic trauma services across Cardiff and Vale University Health Board. Working pattern adaptations utilizing split site working, reallocation of theatres, a consultant led service and a focus on shortened hospital stay have facilitated a safe and effective service. At-risk patient groups remain at-risk during admission and the mortality seen in this group is high. This should inform orthopaedic trauma care in the event of a second surge of COVID-19 infection.

Our zero rate of positive COVID-19 cases suggests that day-surgery or 23:59 trauma operating is safe if the injury allows. The apparent safety of day-surgery care could be carefully extrapolated to the return of planned orthopaedic care, thus giving patients and clinicians more information about risk of transmission.

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