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# Lessons from lockdown: Virtual Clinics and service reorganisation in fracture management during COVID 19 experience of an Irish Regional Trauma Unit



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## ARTICLE INFO

### Article history:

Received 17 August 2020  
Received in revised form  
18 November 2020  
Accepted 9 February 2021  
Available online 4 March 2021

### Keywords:

Covid-19  
Coronavirus  
Trauma  
Orthopaedics  
Virtual clinics  
Trauma assessment clinic  
Service reorganisation

## ABSTRACT

**Background:** Trauma places a burden on healthcare services accounting for a large proportion of Emergency Department presentations. COVID-19 spread rapidly affecting over 30 million worldwide. To manage trauma presentations the Department of Trauma & Orthopaedic Surgery reorganised service delivery.

**Aim:** To assess the impact of service reorganisation and Virtual Clinics on patients in a Regional Unit in Ireland.

**Methods:** A retrospective review of trauma activity following introduction of Virtual Fracture Clinics and Theatre COVID Pathways for a 10 week period in comparison with the same 2019 period. All patients underwent both nasopharyngeal and oropharyngeal swabs PCR testing prior to operations. Theatre and outpatient activity were evaluated. Clinic data were accumulated using the Integrated Patient Management System.

**Results: Theatre Activity:** 242 patients underwent surgery in our trauma unit (mean 2.98 per list) during the COVID-19 period. 29 cases were performed in repurposed elective hospital giving a total of 271 during the 2020 study period. 371 cases were performed in the same 2019 period (mean 4.58 per list). **Outpatient Activity:** We noted a 25.86% fracture clinic referral reduction during the COVID 19 period compared to 2019. There was a 150.77% increase in patients managed through Trauma Assessment Clinic. 639 patients were managed through the Virtual Fracture Clinic Pathway during COVID 19 period.

**Conclusions:** Over one in four fracture clinic patients can be managed virtually. A new dedicated Acute Fracture Unit within our institution permitted streamlining of care and social distancing. The “Non-COVID” pathway for ambulatory trauma was essential in managing the growing presentations of these injuries.

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## Introduction

Twenty six hospitals in the Republic of Ireland (ROI) receive trauma, each serving an adjusted population of 176,538. Sixteen of these Hospitals have a Trauma & Orthopaedic Department.<sup>1</sup> Trauma is the principle cause of approximately 232,000 fatalities within the European Union (EU) per annum and accounts for over 5.3 million hospital admissions

annually, it is estimated it costs EU member states in excess of 80 billion euro a year.<sup>2</sup> In Ireland, trauma accounts for at least 8.5% of hospital admissions. There are 1.3 million presentations to Irish Emergency Departments (ED) annually with a further 89,000 presenting to Local Injury Units (LIUs).<sup>3</sup>

Our Hospital Group comprises of 6 hospitals, the principle tertiary hospital, with an onsite trauma and orthopaedic service is the region's Model 4 hospital, with two Model 2 hospitals, one Model 2 S and two speciality hospitals; an elective

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<https://doi.org/10.1016/j.surge.2021.02.006>

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Orthopaedic Hospital and the University Maternity Hospital.<sup>4</sup> The population served by the trauma and orthopaedic service is approximately 472,500 people.<sup>5</sup> Trauma services for the region were reorganised in 2010, with 1 ED and 3 LIUs consulting with the Department of Trauma & Orthopaedic Surgery. There are approximately 72,000 presentations to our ED per year with a further 33,000 LIU attendances.<sup>6</sup>

To date there have been multiple international publications detailing the varied experiences of COVID-19 in trauma units internationally.<sup>7–11</sup>

With this in mind our study aims to assess the impact of trauma service reorganisation and Virtual Fracture Clinics (VFC) on trauma patient care in a Regional Trauma Unit in the ROI.

### COVID-19 in Ireland

A National Public Health Emergency Team (NPHE) was established in the ROI on 27/01/2020 in the Department of Health (DoH) in an effort to provide public health advice to the Irish Government.<sup>12</sup> All NPHE recommendations were announced through daily press releases.<sup>13</sup> The first case of COVID 19 was reported in the ROI on 29/02/2020 in the Midwest Region.<sup>14</sup> The first death from a case of COVID 19 in the ROI was reported on 11/03/2020.<sup>15</sup> The Irish Government in conjunction with the DoH imposed a series of lockdown measures coupled with social distancing on 12/03/2020 initially closing schools, colleges and social gatherings,<sup>16</sup> followed by a closure of all nonessential businesses on 24/03/2020.<sup>17,18</sup> On the 27/03/2020 all 'nonessential' travel was banned and those over the age of 70 required to 'cocoon' indoors.<sup>18</sup>

### Virtual fracture clinics

VFCs were first described by the Glasgow Royal Infirmary Group in 2011<sup>19</sup> and have been implemented with great success in a number of institutions.<sup>20,21</sup> Many forms of the VFC have been implemented with the unifying characteristic of patient's clinical notes and radiographic images being reviewed by an Orthopaedic consultant in the outpatient setting. In the ROI VFCs have been rebranded as Trauma Assessment Clinics (TAC).<sup>22</sup> Kelly et al. reported a 22% decrease in new fracture clinic appointments following introduction of Connolly Hospital TAC,<sup>21</sup> while O'Reilly et al. reported a 35.2% direct TAC discharge rate with a further 37.5% discharged directly to physiotherapy.<sup>20</sup> The Tullamore group reported a 97% patient satisfaction rate with the TAC process.<sup>20</sup>

### Trauma theatre during COVID-19 pandemic

The Theatre Department introduced a structured patient flow pathway in an effort to protect patients and staff in the week commencing 16/03/2020. This pathway involved a nurse and porter collecting the patient on the ward in full personal protective equipment (PPE) including Filtering Facepiece 2 (FFP2) mask, Visor/Goggles, surgical gown and gloves. The patient was transferred directly from the ward to the operating room for anaesthesia. The anaesthetic room was converted to an antroom for transfer of required

equipment, implants and sets that were required during the case and the point for donning and doffing of PPE by staff prior to entering the operating theatre. All equipment except the anaesthetic equipment and required sets for each case were removed from the operating room. The Department of Anaesthesia made a concerted effort to perform spinal anaesthesia and regional blocks over general anaesthesia where appropriate to minimise patient intubation. Patients with long bone trauma, American Society of Anaesthesiologist score of 3 or greater, or those who were suspected to have COVID-19 were managed through this pathway, termed the "COVID Pathway". All patients in the COVID pathway underwent COVID testing on admission to the Hospital with Polymerase Chain Reaction (PCR) of both nasopharyngeal and oropharyngeal swabs. These PCR tests were performed in the hospital lab.

With associated cessation of elective operations during COVID-19, our orthopaedic elective hospital was repurposed to provide surgical facilities for ambulatory trauma. The first scheduled ambulatory trauma list was on 08/05/2020. Initially providing two lists per week progressing to four lists by June, allowing for development of a "Non-COVID pathway". All patients considered for the "Non-COVID pathway" met strict inclusion criteria, developed to screen for COVID-19 symptoms coupled with presence of a negative swab 48 hours before surgery. These COVID swabs were a combination of community swabs, analysed in the national viral reference lab, and swabs taken in either orthopaedic clinic or in the Hospital's ED. The "Non-COVID pathway" was extended to include the trauma theatre on the 05/06/2020 provided patients passed the same criteria and had a negative admission swab.

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## Methods

Ethical approval for this study was granted by our institution's Research Ethics Committee, REC reference number 039/2020. This is a retrospective review of the trauma service data in our institution; evaluating theatre and outpatient activity for the period 16/03/2020 until 05/06/2020 and the corresponding period in 2019 (16/03/2019 until 05/06/2019). Data from our repurposed elective hospital's ambulatory trauma lists was collated and appraised following the first scheduled trauma list 08/05/2020 until 05/06/2020. Data was collated from theatre lists including injury pattern, site of injury and type of surgery. A Radiographic review of peri-operative imaging was performed to corroborate the theatre records.

To streamline patient care, the Trauma & Orthopaedic Department in our institution, introduced a VFC service alongside the pre-existing TAC. The TAC in our institution was established by the senior author and Trauma and Orthopaedic Advanced Nurse Practitioner in 2017, seeing a mean of 9.6 patients per week, covering 9 defined fracture patterns. The unique feature of our TAC is the Orthopaedic Advanced Nurse Practitioner operates independently within a governance structure reviewing TAC referrals from LIUs. In response to the COVID-19 Pandemic an extra referral source of a third LIU within the group was added.

Following introduction of COVID-19 restrictions all patients referred to the Acute Fracture Unit (AFU) for further orthopaedic opinion on their injury were diverted to a VFC. The clinical notes and radiographs were reviewed by an Orthopaedic Consultant, Trainee or the Advanced Nurse Practitioner. The first VFC was scheduled on 18/03/2020. The aim of this virtual assessment was to establish if patients should attend for essential clinical review or if their injury was suitable for conservative management for a definitive period in cast or splint with outpatient physiotherapy and discharge to their General Practitioner (GP) or delayed clinic review in AFU.

This change in service delivery coincided with opening of the AFU, a designated department designed for the management of out-patient fracture care or musculoskeletal injury. The AFU consists of three segregated zones with separate plaster room and dressing room. The AFU is also equipped with a radiology suite and a large open space waiting area, permitting social distancing.

The AFU activity incorporating Clinic Attendances, VFC reviews and TAC reviews for the study period were evaluated referencing the Integrated Patient Management System (IPMS).

## Results

### Trauma theatre activity

A total of 242 patients had surgical intervention in trauma theatre during the COVID-19 study period (16/03/2020–05/06/2020) with a mean number 2.98 cases per day. This is in

contrast to the corresponding time period in 2019 (16/03/2019–05/06/2019) where 371 cases were performed in UHL Trauma theatre, some undergoing more than one procedure, with a mean caseload of 4.58 per day.

### Repurposed elective orthopaedic hospital ambulatory trauma lists

29 patients had surgical intervention via the ambulatory trauma list during the COVID-19 study period. The first list was performed on the 08/05/2020, with a total of 8 lists facilitated during the study period. The mean number of cases per list was 3.62.

When considered with trauma theatre activity for the COVID-19 study period a total of 271 trauma theatre cases were performed representing a mean of 3.04 cases per list. [Figure 1](#) shows a comparison between the trauma caseload for the COVID-19 study period in comparison with the corresponding period in 2019.

### Outpatient activity

#### Fracture clinic attendances

During the COVID-19 study period there was a total of 3070 fracture clinic referrals including TAC. In comparison to the same period in 2019 where a total 4076 referrals were received. Of the 3070 referrals from 2020, 2268 (73.88%) physically attended clinic, in contrast with the 2019 period where 4076 (98.43%) physically attended fracture clinic. In 2020 clinics there were 1198 new referrals (39.02% of clinic appointments including TAC) compared to 1532 in 2019 (38.56% of fracture

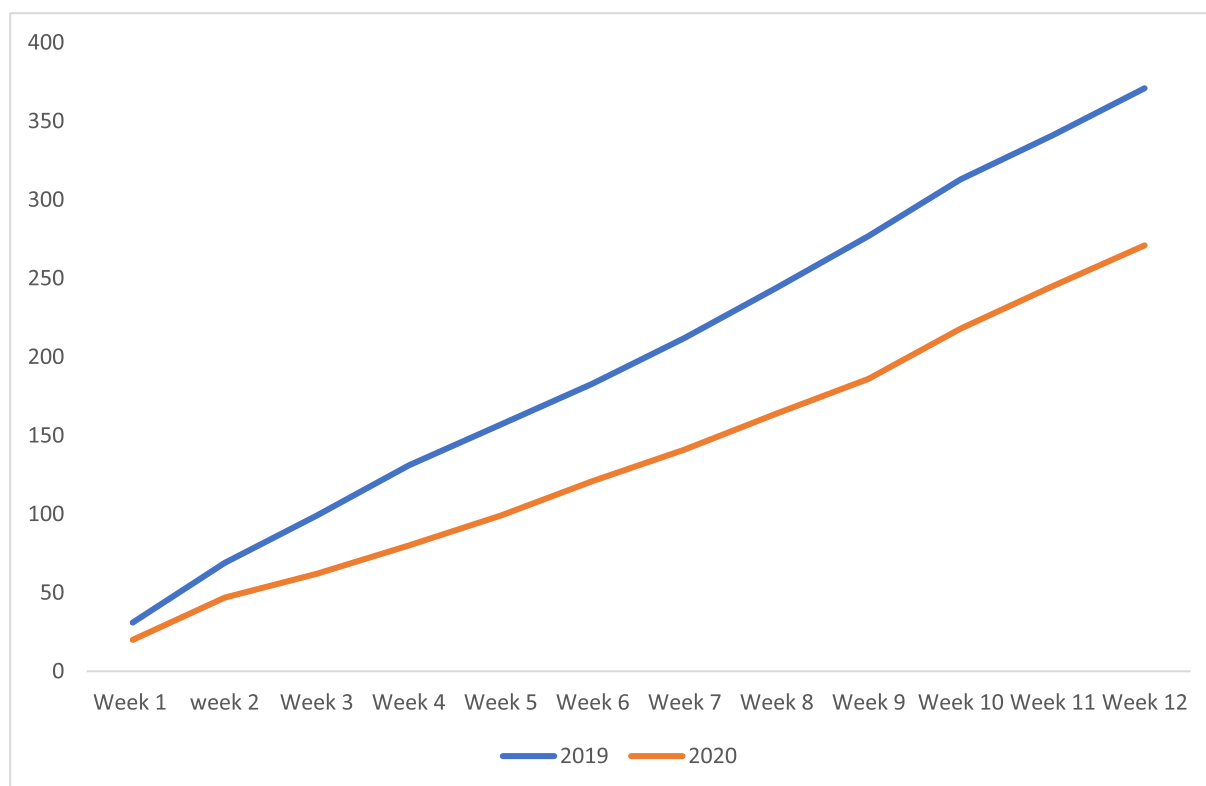


Fig. 1 – Operative Trauma Cases for COVID 19 study period (2020) compared to 2019 period showing total number of cases.

clinic appointments). A comparison between 2019 and 2020 clinic attendances can be seen in [Table 1](#) and [Fig. 2](#).

#### Virtual fracture clinic attendances

All ambulatory trauma patients, not meeting TAC criteria, were referred to the virtual fracture clinic. All 639 patients received a telephone call from the clinical team and were then either referred to physio or to their general practitioner. All patients were given the option of a face to face review. The first VFC took place on the 18/03/2020, during the COVID-19 study period 639 patients were reviewed through the VFC representing a mean of 53.25 per week. There was a mean of 21.33 new VFC patients and 31.92 VFC return patients per week. This assisted reducing attendance at the hospital for patients who were cocooning and reduced the risk of spread of COVID-19. Verbal feedback from patients was positive.

#### Trauma Assessment Clinic appointments

The TAC continued to run weekly during the COVID-19 pandemic with an additional referral source of a third LIU. During the COVID-19 study period 163 patients were reviewed in this clinic, in the 2019 period 65 were reviewed. This represents an increase in clinic assessments of over 150%.

## Discussion

It was expected that COVID-19 restrictions would reduce the number of trauma presentations to EDs with people confined to their homes and minimal amount of travel. However, previous studies have noted 37% of trauma occurs within the home with over 50% of trauma resulting from low falls, of less than 2 m.<sup>23</sup> The limited reduction in trauma cases performed reflects this, with a change in trauma pattern as well as volume seen.

#### Trauma theatre activity

During the COVID-19 study period there was a 34.8% decrease (129 less patients) in the number of surgical patients brought to trauma theatre, if we include ambulatory cases performed in the repurposed elective hospital a 26.9% decrease was noted overall in comparison with the period in 2019.

**Table 1 – Numbers of patients in UHL Fracture Clinics in 18/03 to 09/06 2019 and 2020.**

| Fracture Clinic Numbers     | 16/03 – 05/06/2019 | 16/03–05/06/2020 |
|-----------------------------|--------------------|------------------|
| Physical Clinic Attendances | 4076               | 2268             |
| Virtual Fracture Clinic     | 0                  | 639              |
| Trauma Assessment Clinic    | 65                 | 163              |
| <b>Total</b>                | <b>4141</b>        | <b>3070</b>      |
| New Fracture Clinic         | 1597               | 1198             |
| Returns Fracture Clinic     | 2544               | 1872             |
| Non-Attendances             | 406                | 394              |

Interestingly we noted a 42% decrease in wrist and ankle fractures brought to theatre which may reflect the modification of the activity levels within the population and in the case of distal radius fractures may also represent a tendency towards conservative treatment in the face of the pandemic.

The overall volume of hip fractures remained similar (73 versus 72), potentially reflecting the fact over 80% of these fractures occur in the domicile setting with roughly 10% occurring in nursing homes or long term care facilities.<sup>24</sup> This number remained similar despite almost half of Ireland's COVID-19 deaths occurring in nursing home residents.<sup>25</sup>

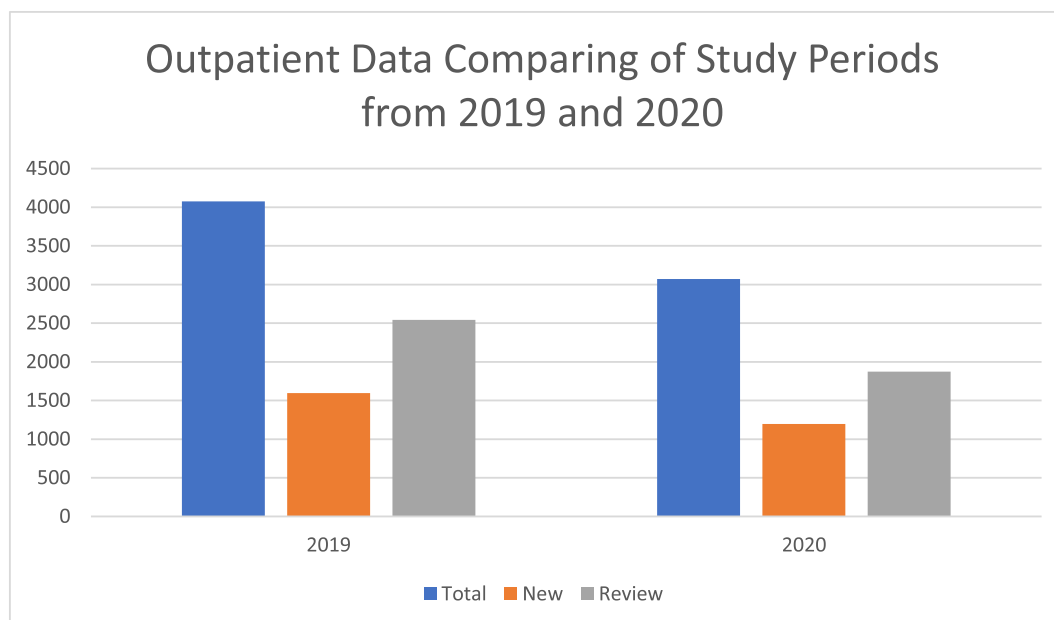
Following the introduction of the “COVID pathway” in trauma theatre on 16/03/2020 there were changes to service delivery with a focus on patient and staff protection. While these modifications contributed to the protection of staff, there were significant theatre delays between cases ultimately limiting volume of cases performed daily. This is evident with the mean number of cases per day during this period of 2.98 (Range 2–6) compared to 4.58 (range 2–8) for the corresponding 2019 period. A spread in the range of case numbers was noted during the COVID-19 study period, attributed to the availability of supplementary theatres and staff. With the COVID-19 precautions previously outlined 2 cases were possible in one theatre per day, 3 cases when alternating between two theatre rooms with the same staff and 4 cases if two rooms and separate theatre teams were available.

We noted higher volumes of ambulatory trauma than anticipated as the lockdown period progressed, potentially reflecting an increase in DIY injuries.<sup>30</sup> In an effort to address the increased volume of presentations in the face of a decreased theatre capacity, the regional elective orthopaedic hospital was repurposed to provide ambulatory lists. This facility provided an opportunity to create a “COVID pathway” and “Non-COVID pathway”. To gain eligibility to the “Non-COVID pathway” ambulatory trauma patients were required to complete a questionnaire at three time points; (i) At the time of ED presentation, (ii) the night before surgery and (iii) the morning of surgery. This questionnaire assessed the presence of COVID-19 symptoms and potential exposure to COVID-19 cases. A COVID-19 swab was then performed 48 h preoperatively and patients were instructed to cocoon until the morning of theatre. On arrival to the elective orthopaedic hospital, patients had a temperature check. If patients failed any stage they were diverted to the “COVID pathway” and admitted for surgery in the tertiary hospital. Interestingly no patients failed the preoperative assessment for the “Non-COVID pathway” potentially reflecting success of public health measures introduced by NPHET and the DoH.

As a result of these COVID and Non-COVID pathways and precautions we were able to limit risk to ourselves and patients. No patients in the Non-COVID pathway were diagnosed with COVID-19 to our knowledge in the post-operative period. As all appropriate precautions were taken with patients in the COVID pathway no members of the surgical team were required to isolate as a result of contact precautions.

#### Outpatient activity

There was a 44.23% reduction in patients physically attending the Fracture Clinic over the periods of our study with a



**Fig. 2 – Number of New, Review and Total Fracture Clinic Appointments in the 2019 and 2020 study periods.**

decrease from 4067 in the 2019 period to 2268 patients during the COVID-19 period. Of this reduction, 639 patients were diverted to the VFC, therefore the VFC contributed to a significant decrease in fracture clinic attendances. As previously mentioned the results of similar initiatives have been well documented in literature. This volume of patient reviews in VFC was possible due to elective theatre and outpatient curtailment, therefore increasing the availability of Orthopaedic Consultants and Registrars in VFCs, this may not be reproducible once elective practice recommences. Regarding patients physically attending for clinic appointments, those who attended the AFU had a streamlined experience, with patients triaged prior to arrival to ensure the most appropriate sequence of presentation. There was also an effort to use soft casts and removable splints to limit unnecessary clinic appointments. All patients were advised to arrive no more than 10 mins before their appointment time and people accompanying the patient were asked to remain outside to reduce unnecessary contact between the clinical team and the general public. This resulted in a marked decrease in the volume of patients in the waiting room at any one time and an overall reduction in time required for patients to remain in the fracture clinic. Patients and staff were encouraged to wear face masks and maintain social distancing where possible, while each clinical space was cleaned following each patient interaction in an effort to decrease the potential transmission of COVID-19.

COVID-19 has spread across the world at an alarming rate, grinding economies to a halt and placing a significant burden on healthcare services. Worldwide there have been 31,664,104 confirmed cases and 972,221 deaths.<sup>26</sup> Over 69% of cases are in either Europe or the Americas with developed countries having a high caseload.<sup>26</sup>

At the time of writing this we are currently in phase 3 of Ireland's exit from lockdown. The initial 5 step exit strategy had been accelerated and reduced to 4 phases as a result of

encouraging figures related to the number of new cases and deaths.<sup>27</sup> To date there have been 33,440 confirmed cases of COVID-19 in Ireland with 3548 requiring hospital admission (10%) and 1537 deaths among confirmed cases (4.6%).<sup>28</sup>

The effects of COVID-19 on Trauma and Orthopaedic surgery have been seen worldwide. There have been widespread cancellations of elective surgeries in most countries and in Germany a decreased access to beds for orthopaedic patients nationally of roughly 45%.<sup>8</sup> While in many centres there was an overall reduction in presentations, the rates of hip fractures have remained similar, in keeping with our results.<sup>29</sup> Our experience is in keeping with those of our international and domestic colleagues, highlighting the many challenges faced by Orthopaedic Surgeons worldwide. We hope to build on our experiences from this period by further increasing the number of fracture clinics from the current 8 clinics per week to 10, as well as potentially increasing the Acute Fracture Unit clinic working day from an 8 hours working day (9 am to 5 pm) to a 12 hours working day (8 am to 8 pm) thereby potentially creating further fracture clinics to assist with adequate social distancing and meet recommendations. There are plans for an ambulatory trauma theatre in the region's elective hospital, which is undergoing redevelopment at present, to continue as well as the potential for VFCs for hip fracture patients with our Orthopaedic Clinical Nurse Specialist at 6 weeks post-operatively in place of their traditional review appointment thereby further decreasing the number of physical attendances required.

## Conclusion

We have shown that over one in four traditional fracture clinic patients, such as paediatric buckle fractures, undisplaced distal radius fractures, mallet fingers and routine appointments for removal of casts or splints can be managed through

VFCs or TACs, this is a safe practice allowing treatment for appropriate patients. The introduction of a dedicated AFU within our institution permitted streamlining of patient care and compliance with social distancing. We also noted that introduction of a “Non-COVID pathway” for ambulatory trauma was instrumental in managing the growing presentations of injuries and may provide a template for the recommencing of elective orthopaedic services. We believe our approach to Trauma care in our institution during this pandemic has been pragmatic, patient centred and is grossly reproducible however the long-term effects on patient outcomes remain to be seen.

### Declaration of competing interest

The authors of this paper have no conflicts of interest and no financial grants or aids were received from any source for work on this article.

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