

The Impact of the COVID-19 Pandemic on the Provision of Minor Orthopaedic Trauma Procedures in Ireland

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: The Covid-19 pandemic has affected healthcare systems worldwide including a reduction in the volume of non-essential procedures and treatments. This study explores the impact on the provision of minor orthopaedic trauma procedures from public hospitals in Ireland during the first wave of the Covid-19 pandemic.

Methods: Administrative data from 2018-2020 on hospital episodes with minor orthopaedic trauma procedures were obtained and grouped into six categories of index procedures. The Covid-19 pandemic was defined from 29th February 2020 when the first case was registered in Ireland until 30th September 2020. The number of admissions, percentage of day cases, and the average length of stay for inpatients were compared with similar periods in 2018 and 2019.

Results: There were 1433 (-27.0%) fewer admissions for the index procedures during the first 30 weeks of the Covid-19 pandemic than during the similar weeks of 2018 and 2019. The proportion of day cases remained largely unchanged (37.7% vs 38.1%) while the average length of stay for inpatients reduced significantly ($p=0.006$) from 3.1 to 2.7 days during the pandemic.

Conclusion: During the first wave of the Covid-19 pandemic, there was a substantial reduction in the volume of minor orthopaedic trauma procedures and a reduction in the average inpatient length of stay for patients with minor orthopaedic injuries.

Keywords: Ambulatory trauma; day-case surgery; management; COVID-19.

1. INTRODUCTION

With ever-increasing pressure on inpatient beds in hospitals, day-case procedures in all branches of surgery are becoming more common and proving to be cost-effective and, most importantly, safe for the patient [1,2,3]. Trauma and orthopaedic surgery present the greatest volume of surgical procedures in district general hospitals [4], and thus the healthcare system is under increasing pressure to provide a greater proportion of this surgical care in the form of day-case surgery [1,5]. The ongoing Covid-19 pandemic has provided even further stress to the system and the crisis has led to change in management projects to facilitate the urgent need for surgery using a day-case surgery model [6,7].

It has been shown that ambulatory surgery is cost-effective [3], decreases the demand on inpatient beds, has increased patient satisfaction, has low postoperative complications and lower general infection rates [2,8,9,10,11], as well as has a low risk of contracting Covid-19 [12]. With the increased theatre and anesthetic precautions, along with the requirement for personal protective equipment (PPE), procedures are taking up to 65-80% longer thereby reducing theatre capacity [13] and increasing the burden on orthopaedic services in the long term.

Previous estimates have shown that 50-60% of elective surgical procedures can be done on an ambulatory basis [11]. A large proportion of musculoskeletal injuries can wait several days for surgery hence ambulatory trauma is an increasingly important option in the delivery of orthopaedic services. Theoretically, those procedures that can be done under regional anesthesia may reduce the risk of exposure to respiratory droplet spread to both staff and patients whilst shortening the length of hospital stay [14]. Further compounding the future waiting lists, during the peak three months of the pandemic it was estimated that over 28 million operations worldwide were suspended [12]. There is now overwhelming pressure on the hospital system to provide regular, safe, efficient, and prompt day-case surgical care to deal with the growing waiting lists.

The National Quality Assurance Improvement System (NQAIS) was introduced in 2016¹⁴ by the

Health Intelligence Unit of the Health Service Executive (HSE) to capture data on medical patients to deliver further efficiencies. It is an online interactive application that analyses the hospital inpatient inquiry (HIPE) data to provide detailed feedback to clinical managers. NQAIS's primary focus is to optimize the length of stay for safe patient care in all publicly funded Irish hospitals. Using data from the NQAIS application, this study aimed to perform a prospective study of minor orthopaedic trauma cases to analyze the impact of the Covid-19 pandemic on the provision of a set of index procedures in Ireland in terms of the number of cases being carried out and to ascertain the potential role of elective/ambulatory centers in delivering trauma care on an ongoing basis.

2. METHODS

Using data from NQAIS in an iterative process based on inspections of primary procedure codes, the authors identified clinically meaningful groups of minor orthopaedic procedures. The final grouping of procedures is shown in Supplementary Material 1 and includes the following groups: Achilles tendon repairs, fractures of the olecranon, clavicle fractures, fractures of the hand, ankle fractures, and distal radius fractures. These are injuries whose operative management is appropriate for day case surgery.

Based on these categories of patient admissions, descriptive analysis was conducted of the categorical variables related to sex, age, ASA-score [15], Charlson Comorbidity Index [16], mean length of stay, mean length of pre-and post-operative stay, length of intensive care stay, readmissions within 7 and 30 days (see Supplementary Material 2).

The weekly number of admissions is presented graphically for the pre-Covid-19 period from 1st January 2018 to 29th February 2020 and the Covid-19 period from 1st March 2020 until 30th September 2020. The Covid-19 pandemic first wave was defined as week 10 to week 39 inclusive of 2020 and the hospital admissions from the same weeks of 2018 and 2019 were used for comparison.

The difference in weekly numbers of admissions during the periods in question was compared using an independent t-test with the weekly

number of admissions, the proportion of day cases, and the average length of stay as the independent variable. Analyses were conducted for all procedures combined and then separately for each group of procedures.

The difference for the Covid-19 period was analyzed using *Student's* t-tests. The day case percentage and the average length of stay were compared for the Covid-19 period and the pre-Covid-19 period and differences were expressed as percentage points.

Stata version 16.1 was used for data management and analysis [17]. The user-written procedure "base table" was used for the descriptive analysis [18].

3. RESULTS

During the period from 1st January 2018 to 30th September 2020, there were 22,411 admissions

for the enumerated orthopaedic procedures in public hospitals in Ireland. Descriptive analysis of patient characteristics appears in Supplementary Material 2.

Fig. 1 shows the weekly number of admissions and smoothed weekly numbers during the pre-Covid-19 and the Covid-19 periods.

The weekly number of admissions for each group of procedures during the first 30 weeks of the Covid-19 pandemic (week 10-39 of 2020) and for the same weeks in 2018 and 2019 are shown in Table 1. Aggregated over the 30 weeks there were 3,868 admissions in 2020 for the index procedures compared with 5,369 and 5,234 admissions for the same periods in 2018 and 2019 respectively. Thus, there were 1,501 (-28.0%) and 1,466 (-26.1%) fewer admissions during the early phase of the Covid-19 pandemic compared with the same period in 2018 and 2019.



Fig. 1. A weekly number of admissions with specific orthopaedic procedures (January 2018 - September 2020). The blue and red lines show the weekly numbers for the pre-Covid-19 and Covid-19 periods

Table 1. Number of admissions during week 10-39 in 2018, 2019, 2020, day case percentage and average length of stay for inpatients

	Number of admissions			Day case percentage			Avg. length of stay		
	2018	2019	2020	2018	2019	2020	2018	2019	2020
Achilles tendon	209	166	103	43.5	44.6	45.6	1.6	1.7	1.7
Olecranon	222	215	160	14.9	16.3	22.5	4.3	4.0	2.8
Clavicle	129	140	118	27.1	33.6	46.6	1.9	2.3	1.8
Hand	1141	1056	582	63.2	65.2	66.8	1.8	1.8	2.1
Ankle	1286	1276	1097	11.5	13.2	13.6	4.1	4.6	3.6
Distal radius	2382	2381	1808	38.6	43.4	44.2	2.3	2.6	2.0

3.1 Sub-Categories by Location of the Injury

3.1.1 Achilles tendon repair

For Achilles tendon repairs, there was a mean of 6.3 carried out weekly during weeks 10-39 of the calendar year in 2018 and 2019, and 3.7 in 2020 during the Covid-19 pandemic (Fig. 2). For the first 30 weeks of the Covid-19 pandemic (week 10-39 of 2020), there was a 41.1% reduction in Achilles tendon repairs carried out compared with the same period in 2019. Neither the day case percentage nor the average length of stay changed substantially.

3.1.2 Olecranon fractures

In respect of isolated fractures of the olecranon, there was a mean of 7.3 procedures carried out weekly during weeks 10-39 of the calendar year in 2018 and 2019, and 5.5 in 2020 (Fig. 3). This included closed reduction as well as open reduction and internal fixation (ORIF). For the first 30 weeks of the Covid-19 pandemic (week 10-39 of 2020), there was a 24.2% reduction in olecranon fracture procedures carried out compared with the same period in 2019. There was a change from 17.2% to 25.8% in the percentage of day cases which corresponds to an increase of 50%. The average length of stay for inpatients reduced from 3.9 to 2.6 days (33%) during the Covid-19 period.

3.1.3 Clavicle fractures

In terms of open reduction and internal fixation of fractures of the clavicle, there was a mean of 4.6 carried out weekly during weeks 10-39 of the calendar year in 2018 and 2019, and 4.4 in 2020 (5.8% reduction). For the first 30 weeks of the Covid-19 pandemic (week 10-39 of 2020), there was an increase in clavicle fracture fixation carried out as day cases as compared with the same period in 2018 and 2019 (25.5% vs 40.3%). The average length of stay was similar before and after Covid-19 (Fig. 4).

3.1.4 Hand (phalanges/metacarpals)

For procedures treating fractures of the hand (Fig. 5), there was a mean of 36.6 carried out weekly during weeks 10-39 of the calendar year in 2018 and 2019, and 19.4 in 2020. This is a reduction of 17 weekly procedures and a reduction of 47%. The procedures included are closed or open reduction of the distal, middle & proximal phalanx +/- internal fixation, as well as closed or open reduction of fractures of the metacarpals +/- fixation. For the first 30 weeks of the Covid-19 pandemic (week 10-39 of 2020), there was a slight increase in the day case percentage from 64% before Covid-19 and 68% during Covid-19. The average length of stay rose from 1.8 to 2.2 days (16.6%).

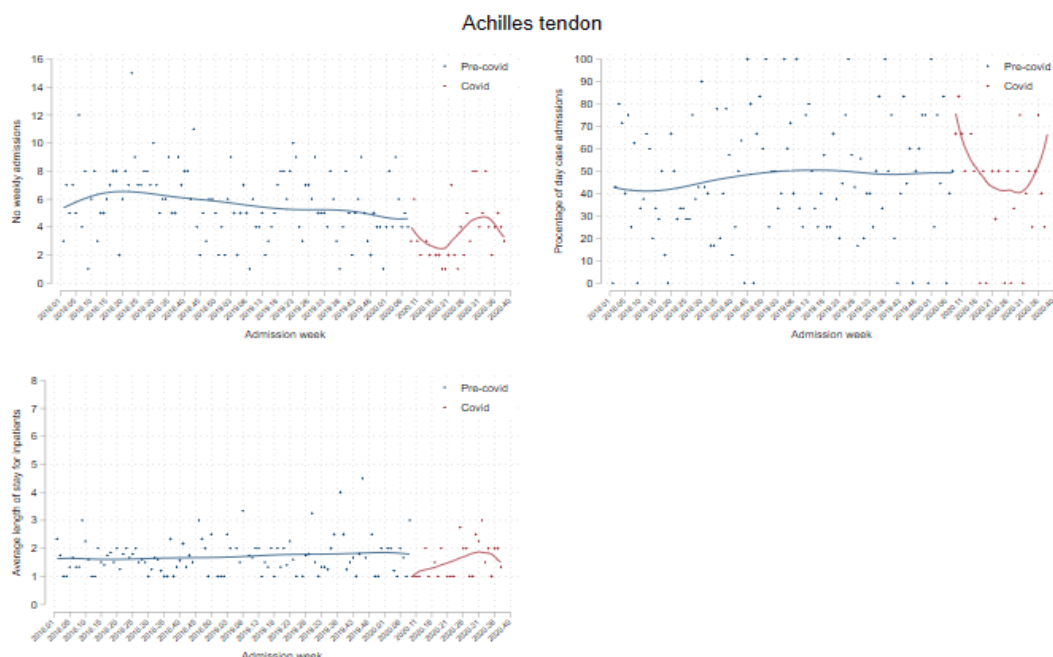


Fig. 2. Weekly number of admissions before and during the Covid-19 pandemic, day case percentage, and average length of stay for patients with Achilles tendon repair surgery

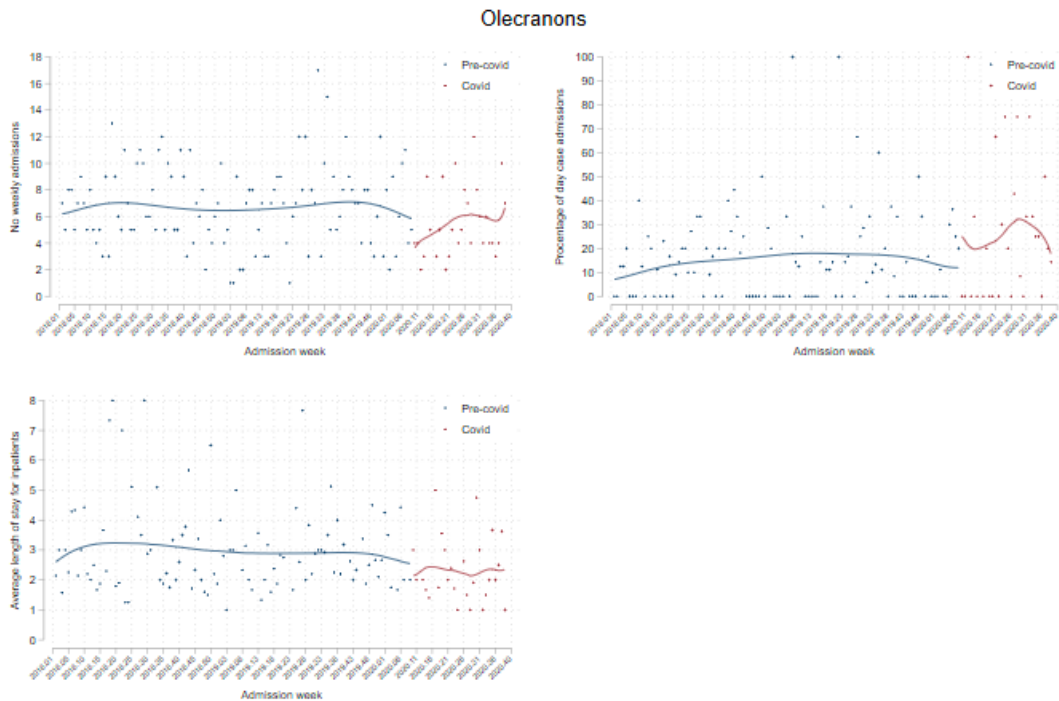


Fig. 3. Weekly number of admissions before and during the Covid-19 pandemic, day case percentage, and average length of stay for patients with olecranon fractures

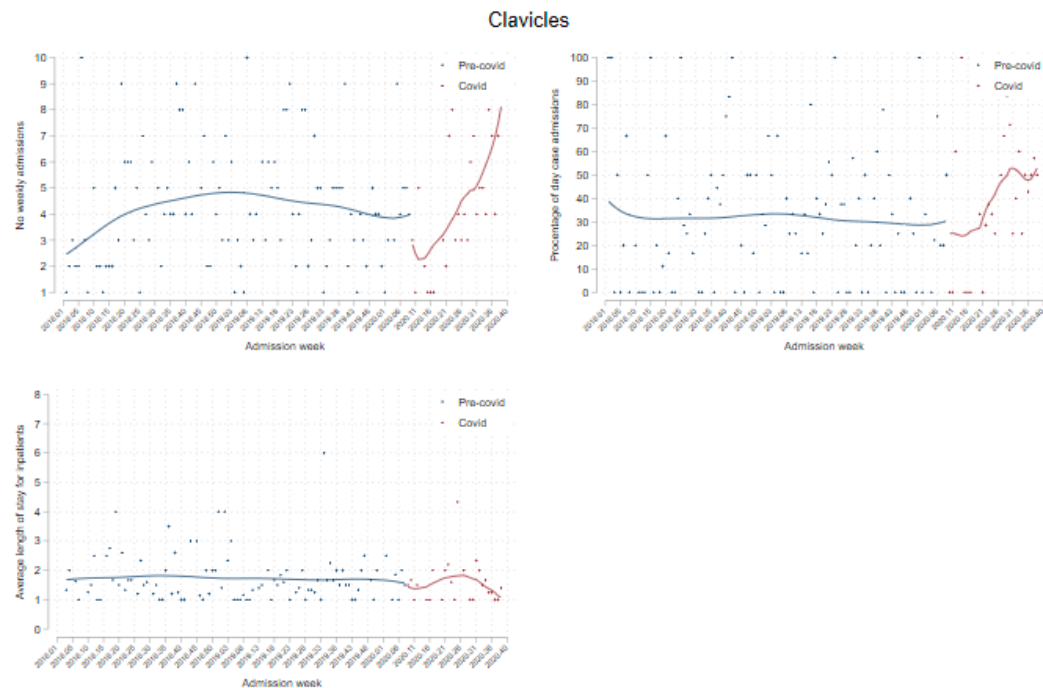


Fig. 4. Weekly number of admissions before and during the Covid-19 pandemic, day case percentage, and average length of stay for patients with clavicle fractures

3.1.5 Ankle

Concerning the surgical management of fractures of the ankle (Fig. 6), there was a mean

of 42.7 procedures carried out every week during weeks 10-39 of 2018 and 2019, and 36.6 in 2020 (14% fewer). This included closed and open reduction of ankle fractures +/- internal fixation.

There was a similar percentage of day cases (12-13%), and a reduction in the average length of stay for inpatients from 4.3 to 3.6 days (16.2%).

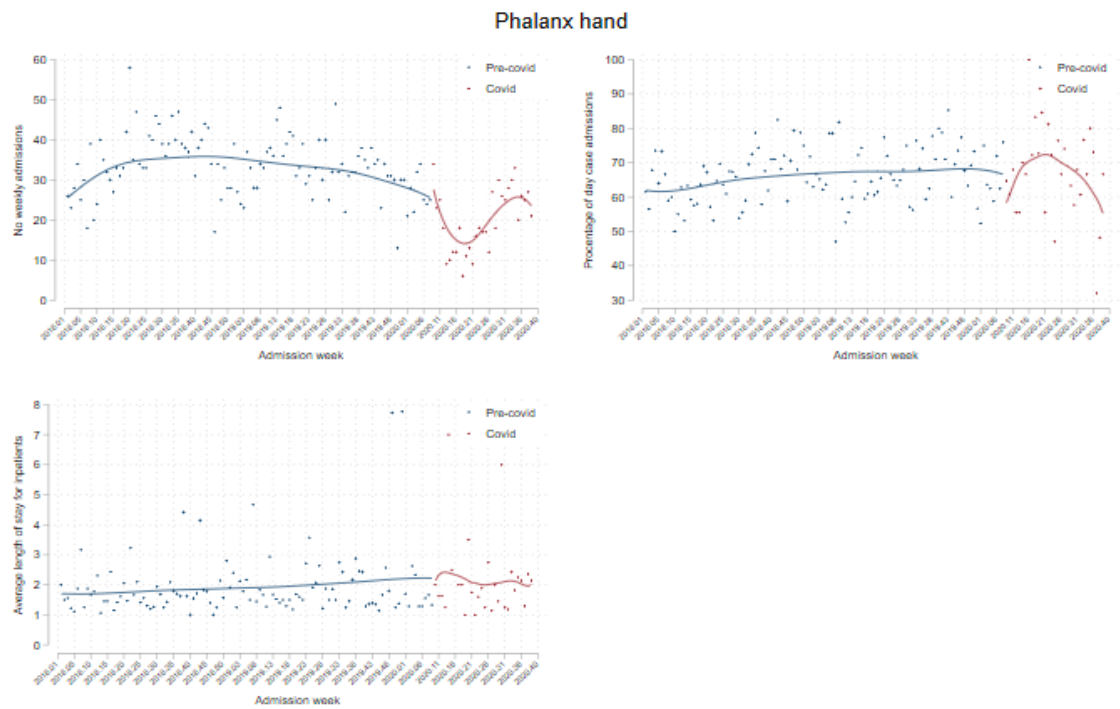


Fig. 5. Weekly number of admissions before and during the Covid-19 pandemic, day case percentage, and average length of stay for patients with hand (phalanges/ metacarpals) surgery

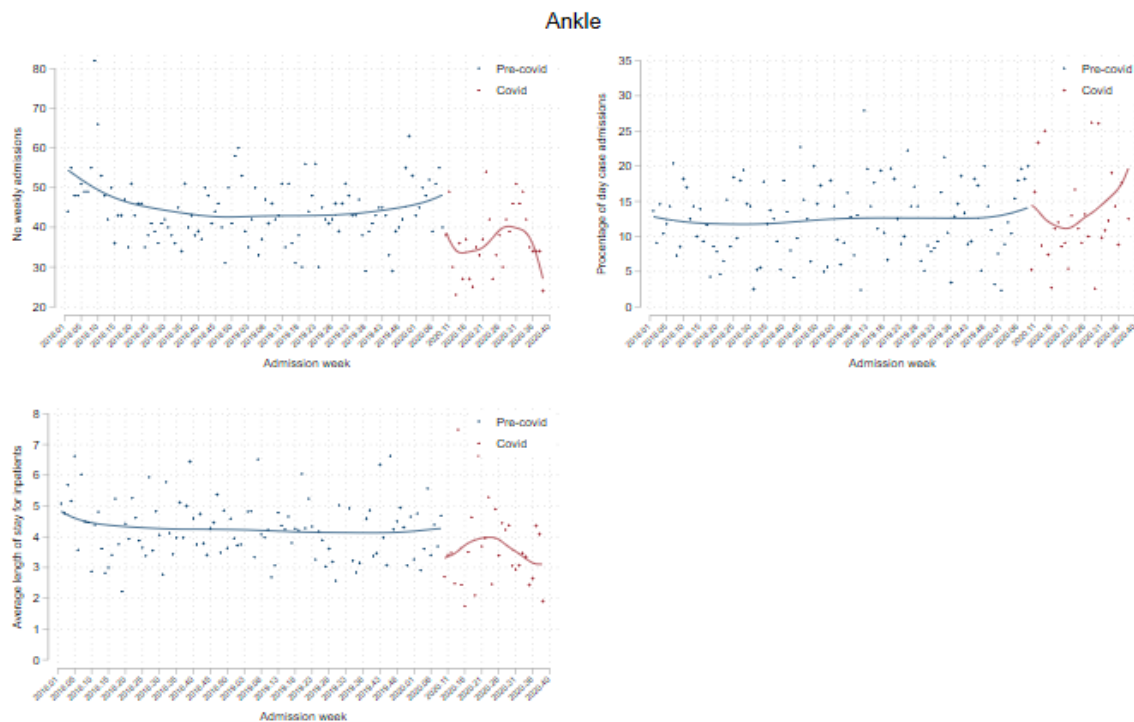


Fig. 6. Weekly number of admissions before and during the Covid-19 pandemic, day case percentage, and average length of stay for patients with ankle surgery

3.1.6 Distal radius

Analysis of the surgical management of fractures of the distal radius (Fig. 7) revealed a mean of 79.4 carried out weekly during weeks 10-39 of 2018 and 2019, and 60.3 in 2020 (24% less). This included closed or open reduction of the distal radius or ulna +/- internal fixation. For the first 30 weeks of the Covid-19 pandemic (week 10-39 of 2020), there was a slight increase in day-case percentage (41.0% vs 45.4%) and a 21.8% reduction in the average length of stay for inpatients.

4. DISCUSSION

Whilst the success of day-case surgery for elective procedures has been well documented in the literature, the evidence is far scarcer with regards to its application in acute orthopaedic surgical problems. This study has analyzed the impact of the Covid-19 pandemic on the provision of specific minor orthopaedic trauma procedures being carried out in Ireland. There was a 27% decrease in admissions during the early phase of the pandemic compared with the two preceding years with a notable reduction in admissions being seen for fractures of the hand and distal radius.

For the six minor orthopaedic trauma procedures that are regularly carried out on a day-case basis, there was a 37.2% and 39.8% decrease when compared with the same periods in 2019 and 2018 respectively. The mean length of stay for inpatient admissions during weeks 10-39 in 2018 & 2019 was 2.7 days compared with a length of stay of 2.3 days for the same period during the Covid-19 period in 2020. Whilst not reaching statistical significance, it is noteworthy that the mean length of stay for olecranon fractures reduced to 2.8 days compared with 4.2 days in preceding years. This information is important to the orthopaedic community to ascertain the potential role of implementing elective or ambulatory centers in delivering trauma care. Busy trauma unit resources and bed supply are commonly overwhelmed, so the implementation of day surgery or dedicated ambulatory trauma lists is a desirable entity as it would decrease pressure on both orthopaedic and hospital services.

It is not uncommon for trauma patients to wait several days either in the hospital or at home for definitive fracture fixation with planned procedures being shown to be more convenient and enhance overall patient experience [19-22]. Multiple studies have reported on treating

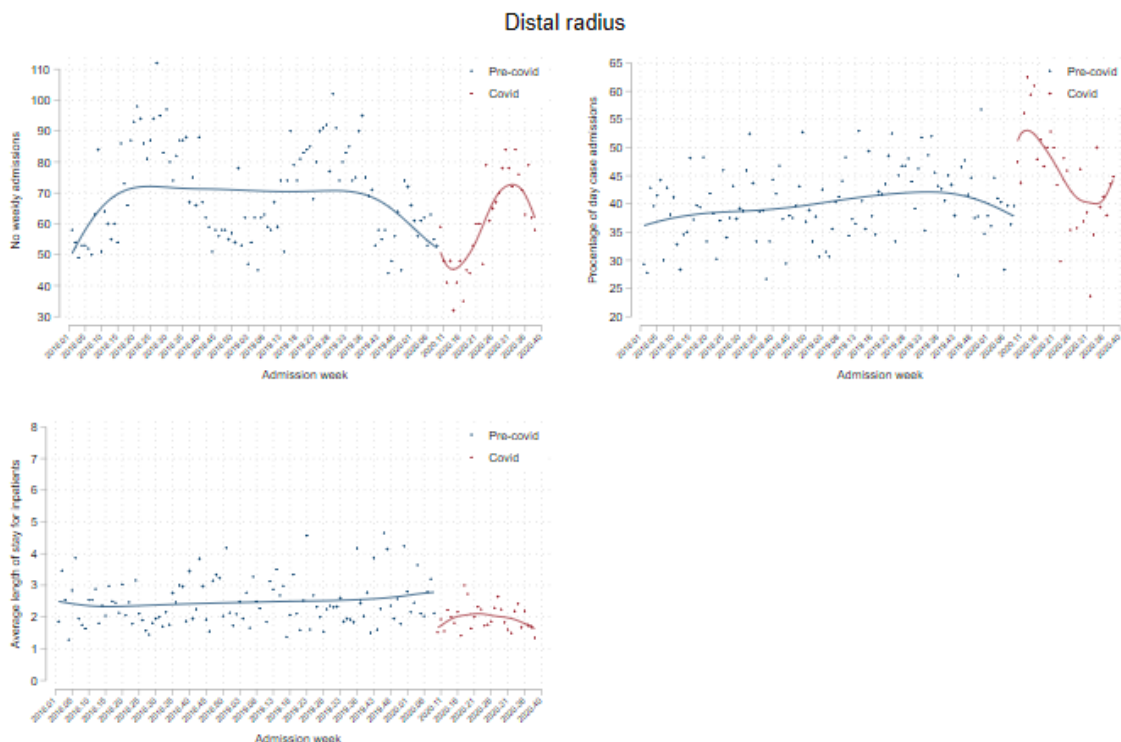


Fig. 7. Weekly number of admissions before and during the Covid-19 pandemic, day case percentage, and average length of stay for patients with distal radius surgery

clavicle fractures, Achilles tendon ruptures, and injuries of the hand as day-cases showing good outcomes [19-21]. This study focused on procedures where it is feasible to be discharged on the same day with four of the six procedures involving the upper limb which is to be expected considering the post-operative physiotherapy requirements in lower limb surgery. Prior studies have shown a high incidence of patient satisfaction following day-case ankle fracture surgery [1,22] providing evidence that day-case trauma surgery should not be limited to procedures of the upper limb.

Ambulatory trauma is significantly cheaper than inpatient surgery [1,3,23] further supporting its utility to increase health system efficiency. It is worth noting that lower limb day-cases should be done earlier on the list to allow enough time for physiotherapy review, neurovascular observations, and adequate analgesia regimens permitting same-day discharge¹. Previous studies have shown that day-case trauma surgery is a feasible entity but must have a suitable case mix as well as a collaborative multi-disciplinary approach involving anaesthetics, orthopaedics, radiology, theatre, and ward nursing staff as well as physiotherapy input¹.

For those with multiple medical comorbidities, anaesthetic colleagues should be consulted before listing them to be done on an ambulatory basis. Athar et al previously showed that only 2.6% of their ambulatory trauma patients needed to be kept overnight with half of these being for pain control, an issue that can be avoided with pre-emptive collaboration with anaesthetics and the use of standardized analgesia packs or nerve blocks [24]. To ensure its successful implementation, a dedicated protocol or pathway should be drawn up to determine which patient groups are suitable for day surgery.

Previous studies have shown the feasibility of these pathways with the majority of pre-selected trauma patients being young and medically fit (ASA I or II), undergoing procedures of less than 1-hour duration and ideally having someone to escort them home following discharge¹³. It was also shown in the same study that most of the patients undergoing ambulatory trauma procedures preferred to go home and return for their procedure on the day of surgery [11].

This study shows that there was a decrease in admissions for orthopaedic trauma procedures by 27.4% in comparison to the previous year due

to the Covid-19 pandemic. The question of whether this was in part due to a decreased number of injuries being sustained due to the constraints of lockdowns imposed on the Irish population or because more orthopaedic injuries were being treated conservatively to decrease the risk of nosocomial virus transmission was beyond the scope of this study and was an issue that was not evaluated.

Studies have shown that the current Covid-19 outbreak has refocused orthopaedic doctrine on managing many injuries conservatively, which would have otherwise been managed with operative fixation [25]. It has also been reported that staying home during the pandemic decreased trauma frequency by 32% as well as a reduction in length of hospital stay for those that were admitted which is in line with these findings [26].

The vision for elective/ambulatory daycare has been drawn up in the Irish Department of Health's "Slaintecare" Action plan 2019 and has proposed the introduction of new dedicated ambulatory elective-only hospital facilities being introduced in Dublin, Galway, and Cork [27]. These facilities would facilitate high volume, low complexity procedures such as the 6 studied orthopaedic procedure groups on a day-case basis. The authors believe that performing orthopaedic trauma procedures as day-cases enhances service delivery for both practitioners and patients whilst maximizing hospital resources with increased productivity and decreased length of stay without compromising patient satisfaction or outcome [28-32].

Limitations of the study include it being retrospective, a bias for suitability of day-cases, as well as failure to account for why exactly caseloads decreased during the Covid-19 pandemic. In addition, the available data does not register the 213 cases that were performed in private hospitals on behalf of two of the larger trauma units during the study period.

5. CONCLUSION

The results of this study show there were 27.4% and 25.8% fewer admissions for the selected minor orthopaedic trauma cases during the early phase of the Covid-19 pandemic compared with the same periods in 2018 and 2019. The mean length of stay for patients for inpatient admissions for minor orthopaedic trauma fell to a mean of 2.3 days from 2.7 days in previous

years. With a lower threshold to treat these injuries conservatively as well as to reduce the risk of contracting Covid-19 whilst in hospital, these findings support the potential role of elective/ambulatory centers in delivering trauma care and should help further trauma strategies into the future.

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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