

The Impact of the COVID-19 Pandemic on Surgical Emergencies

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Abstract

Aims

The COVID-19 pandemic has had an enormous impact on elective surgical activity worldwide; however, its effect on emergency surgical referrals and admissions is not well documented. Understanding the volume and nature of such presentations is key to future resource allocation and guideline creation.

Methods

Surgical handovers from a 9-week period from the commencement of the first government restriction of non-essential travel (March 8th–May10th 2020) were studied. A corresponding time period of usual surgical activity (March 10th-12th May 2019) was studied for comparison.

Results

During the pandemic period, 447 referrals (mean age 54, 4.9% COVID-19 positive) were received representing a 16.5% decrease compared to 2019 (n=521). The most common referral in each period was abdominal pain (n=255 vs 259). The duration of symptoms prior to admission and overall number of traumas did not differ between the periods. Fewer referrals for traumatic brain injuries and polytraumas and more symptomatic hernias, cellulitis and blocked/dislodged lines/tubes were seen during the pandemic.

Conclusion

The volume of surgical referrals and admissions was significantly decreased during the first wave of the COVID-19 pandemic. Traumas and abdominal pain were unaffected. An increase in several referrals for which patients would typically visit their general practitioner or have an expedited hospital appointment was seen.

Keywords: COVID19, SARS-CoV-2, emergency surgery, surgical admissions, general surgery, coronavirus

Introduction

The global Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2, COVID-19) pandemic began in China in 2019, reached Europe in early 2020 and Ireland in March 2020. Through a quick government response, the majority of businesses began closures the week of March 9th. Concomitantly, multiple international guidelines to inform elective surgery were drafted in response to the crisis. Several European hospitals, including our academic medical centre, ceased elective surgical activity shortly thereafter. The worldwide decrease in elective surgery that followed was expected and is well documented.

Due to the nature of emergency surgical presentations, the required response during the pandemic was far less predictable. Guidelines such as the European Society of Trauma and Emergency Surgery (ESTES) guidelines for trauma and emergency surgery preparation were created to inform perioperative procedures and the allocation of resources during the pandemic.¹ Out of necessity, all such emergency surgery statements and guidelines were drafted based upon an unknown quantity of incoming patients. In the present study, we aimed to determine the impact of the pandemic on the number and nature of emergency surgical referrals. Understanding the volume and nature of presentations during a pandemic is key to future resource allocation and guideline planning.

Methods

Daily electronic surgical sign out handovers from a nine-week period encompassing the commencement of the government-imposed restriction of non-essential travel and two bank holidays (March 8 to 10th May 2020) were reviewed. Our institution distributes secure daily surgical electronic handovers to all members of the Department of Surgery.² All Emergency Department referrals to the Surgical Service were identified on the handovers and analysed. Outcomes recorded included: number of daily admissions, patient demographics, nature of presentations, duration of symptoms before presentation and procedures/operations performed. A second corresponding time period (March 10 to 12th May 2019) was studied for comparison. As these data were retrospective and observational and no change to patient care was made, formal Research Ethics Committee approval was not required. Approval was received from the Tallaght University Hospital Clinical Audit Registry. All data were stored securely on a hospital computer in a locked room, behind a hospital IT firewall.

Descriptive and inferential statistical analyses were performed using the jamovi project version 1.2.22 (www.jamovi.com; 2020) using R 4.0.0 Arbor Day (The R Foundation for Statistical Computing, Vienna, Austria). Measures of central tendency are presented as mean+/-standard deviation (s.d), range or median (i.q.r.) values. Comparisons were made with the χ^2 test or ANOVA, as appropriate. An α significance level of 0.05 was used throughout.

Results

During the 2020 pandemic study period 447 patients (mean age 54, range 17-91 years) were referred to the Surgical service. Males and females were referred equally (46.3 vs 53.7% of referrals, NSD, Table 1). Of the patients referred, 4.9% were confirmed COVID positive on admission. A time-dependent trend in referrals was noted, with a statistically significantly lower number of referrals received during the first three weeks of containment measures (March 9-28 2020) compared with the equivalent three week period in 2019 (41.7 ± 8.39 versus 75.3 ± 5.03 ; median=46, 39 – 46.5 versus 76, 73–78. t (df) = -4.52 (2), $p = .046$). The number of referrals recovered to normal levels in weeks 4-9. No difference was detected. In the comparison, during the 2019 surgical activity time period, 521 referrals were received. This represents a 16.5% greater number of referrals compared to 2020. Median patient age in the 2020 and 2019 cohorts was 52 and 54 years respectively ($p = 0.149$). In both study periods the majority of referrals were received directly from the Emergency Department (80.5% in 2020 vs 98.8% in 2019, Table 2). A significant increase in inbound inter-hospital transfers was seen during the pandemic (10 in 2020 vs 1 in 2019, $\chi^2 = 9.39$, $p = .0022$). In the 2020 cohort, 56.1% of referrals resulted in admission vs 64.2% in 2019. There was no difference in mean symptom duration prior to presentation (8.45 ± 30.3 days for 2020 vs 9.00 ± 25.54 days for 2019, $p = \text{NSD}$). In the cohort of patients presenting with abdominal pain, symptom duration was also the same (8.45 ± 21.09 days for 2020 vs 9.12 ± 25.00 days for 2019, $p = \text{NSD}$).

Table 1: Demographics (age, sex) between patients referred in 2019 (usual activity) versus 2020 (COVID-19 pandemic). No significant difference was seen in the male:female ratio of 5:3 ($n = 968$, $\chi^2 = 0.161$, $df = 1$, $p < .688$), nor in median (iqr) age at presentation ($t = 1.14$, $df = 961$, $p < .256$).

Sex	Year*		Total
	2019 n=521	2020 n=447	
Male	248 (47.6%)	207 (46.3%)	455 (100%)
Female	273 (52.4%)	240 (53.7%)	513 (100%)
Total	521 (100%)	447 (100%)	968(100%)
Age (years)	54 (17 – 91)	52 (17 – 95)	53 (36 – 70)

Table 2: Referral Source, comparing 2019 (usual activity) with 2020 (COVID-19 pandemic). Significantly greater overall activity was seen in 2019. A greater proportion of cases in 2020 utilized the Acute Surgical Assessment Unit pathway (n = 968, $\chi^2 = 92.9$, df = 2, p < .001).

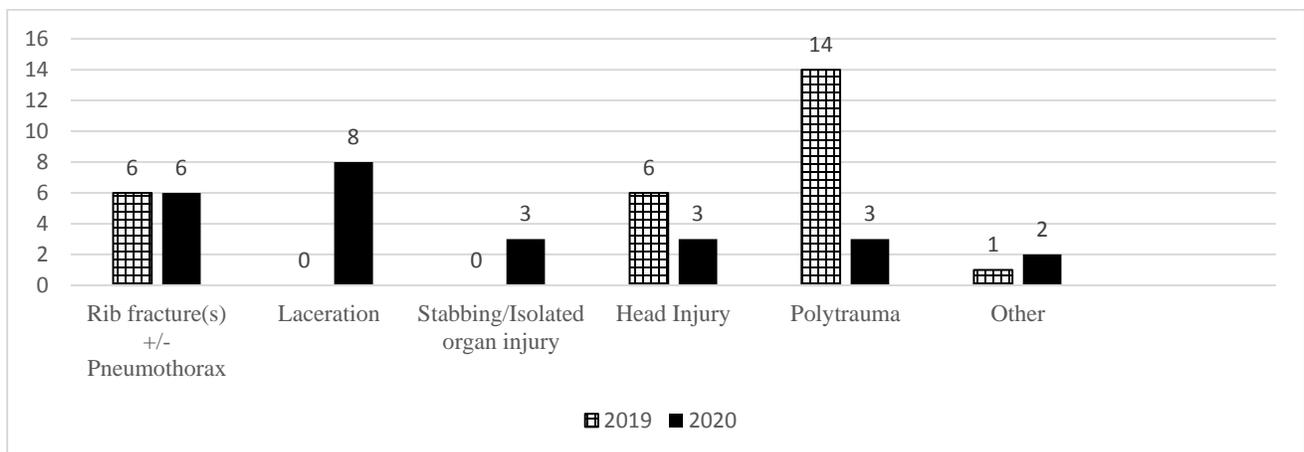
Referral Source	Year		Total
	2019	2020	
Emergency Department	515 (98.8%)	360 (80.5%)	875 (90.4%)
Acute Surgical Assessment Unit	5 (1.0%)	77 (17.2%)	82 (8.5%)
Transfer from outside hospital	1 (0.2%)	10 (2.2%)	11 (1.1%)
Total	521 (100%)	447 (100%)	968 (100%)

The most common referral in each study period was abdominal pain (n=255/59.7% of referrals in 2020 vs 259/49.7% in 2019, Table 3). In 2020, the second most common referral was skin abscesses including pilonidal and perianal abscesses (7.5% of presentations vs 4.5% in 2019). In 2020, trauma and gastrointestinal bleeding were the 3rd and 4th most common presentation (6.6% and 4.9% respectively). The overall number of traumas did not differ between the time periods (27 vs 28 traumas, Table 3) Although the numbers are relatively low, fewer referrals for traumatic brain injuries and polytraumas were seen in 2020 (Figure 1). Additionally, although not significantly different, more symptomatic hernias, cellulitis and blocked or dislodged intravascular access lines, intraabdominal drains and gastrostomy or jejunostomy tubes were reviewed in 2020.

Table 3: Most Common Presenting Complaints in 2019 (usual activity) with 2020 (COVID-19 pandemic).
 **No significant difference was seen in any complaint, NSD)

Presentation	Year	N(%)
Trauma	2019	27 (5.1%)
	2020	28 (6.6%)
Abdominal pain	2019	259 (49.7%)
	2020	255 (59.7%)
Gastrointestinal bleed	2019	19 (3.6%)
	2020	21 (4.9%)
Skin abscess	2019	21 (4.3%)
	2020	32 (7.5%)
Symptomatic hernia	2019	13 (2.5%)
	2020	19 (4.4%)
Cellulitis	2019	13 (2.5%)
	2020	20 (4.7%)
Food bolus/ingested foreign body	2019	12 (2.3%)
	2020	12 (2.8%)
Perianal pain	2019	15 (2.9%)
	2020	14 (3.3%)
Blocked or Displaced tube/stent/line	2019	11 (2.1%)
	2020	18 (4.2%)

Figure 1: Traumas 2020 during the COVID-19 Global Pandemic vs 2019 (usual activity).



Discussion

During this unprecedented crisis in modern Europe, the creation of emergency surgery guidelines presented an extreme challenge. In the early stages of the pandemic, The American College of Surgeons issued a statement on the importance of maintaining the emergency care system during the pandemic.³ Journals such as the Annals of Surgery swiftly created online collections of COVID-19 related resources for surgeons.⁴ In this study, we aimed to analyse our referrals and activity to provide important data for the drafting of future pandemic guidelines and allocation of resources.

We hypothesised that only a small decrease in the number of surgical referrals would be seen throughout the crisis. The decrease of 16% was greater than expected. Abdominal pain remained the most common presentation. This encompasses a myriad of pathologies and is historically the mainstay of surgical referrals. The overall numbers of trauma presentations were similar between the 2 periods; however, in 2020, less traumatic brain injuries and polytraumas were seen. This was likely due to government travel restrictions. The majority of the traumatic brain injuries and pneumothoraces were due to falls from heights including ladders and scaffolding in those performing work in their own homes.

Surprisingly, the numbers of symptomatic hernia presentations increased. The majority (>96%) were reduced in the acute setting and discharged home. When questioned, the majority of patients cited difficulty with access to their community physician (general practitioner, GP) and/or advice from their GP to bypass their services and attend the Emergency Department. Similarly, potentially for the same reason, we saw more skin abscesses requiring drainage during the pandemic. In fact, an overall increase in patients presenting directly to the hospital without first seeing their GP was noted. This is for several reasons including reduced GP face-to face patient hours due to policy changes and/or staff sickness, increased GP phone consultations precluding physical examination and patients' concern about 'double potential COVID exposure' where they believed that the GP would see them and ultimately refer them to the Emergency Department anyway. During this time, hospital outpatient appointments were also cancelled. As a result, patients who could have been seen urgently in an expedited clinic appointment for an exacerbation of a known condition or mild to moderate new symptoms requiring physical examination and further investigations were frequently told to attend the Emergency Department. However, despite these factors, an overall decrease in surgical referral numbers was seen.

We saw a marked increase in uptake in our Acute Surgical Assessment Unit (ASAU) utilisation. Our ASAU, previously purposed as a review clinic attached to the Emergency Department, was re-designated in March 2020 for rapid triage and assessment of patients with surgical pathologies. Two routes of referral are permitted: direct GP access and 'direct from nurse-led triage' ED referral, using documented referral criteria. We saw an increase in both. The ASAU provided a key service to decrease footfall in GP surgeries and in the ED which was experiencing a reduction in overall physical space due to re-allocation of rooms and cubicles for COVID-19 confirmed and suspected cases.

The numbers would have been much higher; however, a predetermined number of referrals to the ASAU are allowed per day due to a lack of physical space and, at present, the ASAU operating hours are limited to Monday to Friday from morning until early evening.

A significant increase in the number of inbound patient transfers in from surrounding rural hospitals was demonstrated. No patient had a diagnosis of COVID-19 on transfer. The increased inflow was secondary to policy changes in rural hospitals with smaller intensive care units (ICUs) in order to create ICU beds availability for COVID-19 positive admissions.

Of the patients referred, 4.9% were confirmed COVID positive on admission. Overall, only 38.7% of patients were tested. This number is representative of early hospital policy of only swabbing patients who were symptomatic with cough or fever. The number of patients swabbed subsequently increased to 100% by the last week of the study period as the policy changed to include all admissions in accordance with national guidelines. The cohort of COVID-19 positive surgical referral patients represents: 1) dual pathologies (ie both COVID-19 and a surgical pathology) and 2) the asymptomatic presence of COVID-19 in patients presenting with a surgical pathology.

The SARS outbreak in 2003 is the only recent global pandemic to provide a platform to compare our data with. Chen *et al* investigated the impact of the 2003 SARS outbreak on a urban emergency department in Taiwan.⁵ Analysing total number of presentations, not exclusively surgical patients as in our study, they found that after the first date of hospital associated transmission the number of ED patients declined 33.4%. Heiber *et al* studied the effect of the SARS outbreak on visits to an emergency department in a Toronto community hospital over a 4-week period and documented a 21% decline over the study period.⁶

Our results represent a single academic medical institution in an urban setting with a catchment area which includes nearby rural areas providing a mix of patients. The data was derived from retrospective review of detailed electronic handovers written by and for the surgeons at our hospital. Details of patient medications and fine details on comorbidities are not provided. Our paediatric service was moved off site during the start of the pandemic to create more physical space for adult COVID-19 patients. Therefore, our results are representative of an adult population only. Our trauma numbers in both time periods are under representative of all traumas presenting to the ED as traumas with orthopaedic injuries only or neurosurgical injuries requiring immediate transfer to a neurosurgical unit are not captured in this data.

In the current study, we did not address other aspects of surgical care during the pandemic including delaying surgery, medical management of traditionally surgical pathologies such as appendicitis, resource reorganization or the use of technology in response to the pandemic.⁷ We believe these are all important topics and warrant further study. Additionally, a comparison between these initial data and data from the current peak is warranted. The effects of prolonged lockdown, the possibility that patients may have become more willing to attend ED over time and the effects of the vaccination programme on referrals are all pertinent topics for future study.

Overall, we saw a marked decrease in surgical referrals during the COVID-19 global pandemic when compared to the same time period the previous year. There was no change in the rate of abdominal pain or trauma referrals. However, there was an increase in pathologies for which patients would likely visit their general practitioner or an expedited surgical outpatient appointment. These results demonstrate the persistence of the most common, classic surgical referral of abdominal pain during a pandemic, the effect of decreased GP contact and the importance of vigilance for concomitant viral infection and surgical pathology.

Declaration of Conflicts of Interest:

All authors have no financial disclosures and no conflicts of interest.

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