

Impact of the COVID-19 pandemic on acute otolaryngology inpatient activity at a tertiary referral centre: A retrospective analysis

Praveena Deekonda  | Adal Hussain Mirza  | Huw Jones 

Department of Otolaryngology,
Southampton General Hospital, University
Hospital Southampton NHS Trust,
Southampton, UK

Correspondence

Huw Jones, Consultant ENT Surgeon,
Southampton General Hospital, University
Hospital Southampton NHS Trust,
Tremona Road, SO16 6YD, Southampton,
UK.

Email: huw.jones@uhs.nhs.uk

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Abstract

Objective: To determine the impact of the COVID-19 pandemic on acute admissions and inpatient activity at a tertiary referral centre.

Design: Retrospective review of coding-based inpatient electronic records.

Setting: An otolaryngology and head and neck surgery department at a major UK trauma and tertiary referral centre.

Participants: Otolaryngology patients admitted as an emergency over a period of 10 months pre-COVID19 (01/04/2019-23/01/2020) and 10 months post-COVID19 (01/04/2020-23/01/2021).

Main outcome measures: Baseline characteristics, admission rates, length of stay (LoS), overall mortality and 30-day mortality.

Results: A total of 1620 records were reviewed; (1066 pre-COVID19, 554 post-COVID19). Admissions across all age groups were reduced, with an increase in mean age from 39.88 to 47.4 years ($p = .018$). LoS remained unchanged (3.85 vs 3.82 days, $p = .160$). Infection remained the most common presentation, followed secondly by epistaxis which entailed an increased LoS compared to the pre-COVID19 cohort. GP referrals reduced from 18.3% to 4.2% ($n = 195$ vs $n = 23$, $p < .001$) and ED referrals proportionally increased from 71.9% to 85.9% ($n = 766$ vs $n = 476$, $p < .001$). Critical care admissions were higher in the post-COVID19 cohort (OR 1.78 (1.07-2.98) [95% CI], $p = .027$).

There was no significant difference in overall mortality between groups ($n = 60$, 5.6% vs. $n = 33$, 6.0%; $p = .844$). Thirty-day mortality increased from 0.9% ($n = 12$) pre-COVID19 to 2.3% ($n = 13$) post-COVID19 ($p = .039$).

Conclusions: This study demonstrates significant changes and a reduction in acute otolaryngology presentations. Our findings may suggest that sicker, frailer patients were admitted during the pandemic. This study reports the observational effect that the pandemic has had on acute otolaryngology admissions, which may be relevant in addressing unmet care needs in the post-pandemic period.

KEYWORDS

acute, admissions, coronavirus, COVID-19, emergency

1 | INTRODUCTION

The coronavirus (COVID-19) pandemic has resulted in a unique challenge to healthcare systems since the SARS-COV2 strain was isolated in Wuhan, Hubei province, China in December 2019. Efforts to curtail the spread of COVID-19 resulted in considerable impact upon health service provision across the United Kingdom (UK), including the cancellation of elective surgical operations, resulting in an elective operating waiting list of 4.7 million people.¹ Many healthcare consultations were amended to virtual or telephone formats, and non-essential care was postponed. On 24 March 2020, the UK announced a nationwide lockdown, closing schools and non-essential businesses and requiring people to stay at home in order to alleviate the pressures on the National Health Service (NHS).

Sars-CoV2 primarily infects the upper aerodigestive tract, and a higher concentration or viral load is also found within the sino-nasal cavity and middle ear.^{2,3} Additionally, a number of common otolaryngology interventions such as nasopharyngoscopy, tracheostomy and powered drilling of the temporal bone generate aerosol – which further disperses viral particles.⁴ Thus, otolaryngology practice represents a high-risk specialty with notable risk of coronavirus transmission to healthcare staff. As such, clinical activity within Ears, Nose and Throat (ENT) had unique challenges and ENT UK guidance during the initial stages of the pandemic advised to avoid admission unless absolutely necessary.⁵ A recent review by the Institute for Fiscal Studies⁶ found a 21.4% reduction in non-COVID-related emergency admissions, with variations between geographical regions and hospital specialties. Although the impact of the pandemic on acute general surgical presentations has been described^{7,8}; to date, there has been no similar review within an Otolaryngology setting in the UK. An appreciation of this impact is important in addressing unmet clinical needs that may arise due to delayed presentation as part of a post-pandemic recovery response.

The UK national lockdown, announced on 24 March 2020, may have been a key factor in changing the general public attitude towards utilising the NHS during the COVID-19 pandemic.

Objectives: This study aims to examine the effect of the COVID-19 pandemic on acute otolaryngology admissions at a tertiary referral centre in the UK.

2 | METHODS

For the purposes of data analysis, we defined the 'start' of the COVID-19 pandemic to be April 2020. Hospital electronic patient records coded with an acute admission to otolaryngology between a 10-month period from 01/04/2019 to 23/01/2020 (defined as the 'pre-COVID19' group) and 10-month period from 1/4/2020 to 23/01/2021 (defined as the 'post-COVID19' group) were retrospectively reviewed. Identical timeframes were reviewed pre- and

Key Points

- Health service provision changed drastically during the COVID-19 pandemic, and admission avoidance was practised in order to prevent the spread of coronavirus. Additionally, public behaviour and government guidance impacted public usage of the National Health Service.
- An overall reduction in admission numbers was observed during the pandemic to our otolaryngology department. Mean age of admitted patients increased; however, there was no significant difference in length of stay (LoS) or overall mortality.
- LoS was higher for patients admitted with epistaxis, which may have been due to less severe cases being ambulated – suggesting that there may be scope to ambulate patients and reduce or shorten admissions in routine otolaryngology practice.
- Overall mortality remained unchanged by the pandemic; however, survival analysis demonstrated a shorter survival in the period post-discharge.
- A significant increase in critical care admissions and 30 days mortality post-COVID19 suggests that the cohort of patients presenting to otolaryngology were likely more comorbid, frail and appropriate for inpatient admission.

post-COVID19 to account for the seasonal nature of some emergency ENT presentations. No age criteria were applied.

2.1 | Exclusion criteria

Outpatient otolaryngology consultations and same-day emergency clinic consultations without an associated unplanned admission to an inpatient ward were excluded. Patients admitted for elective procedures were also excluded.

All patients who were coded as having been admitted as an 'emergency' during the aforementioned dates were retrieved and pooled into a dataset provided by business analyst services at our centre. Key information from each admission episode, including diagnosis, admission and discharge dates, and whether an admission also included a critical care stay were also retrieved from electronic patient records. Diagnosis data were imported from the coded diagnosis on hospital discharge summary letters written by clinicians at the end of a patient's hospital admission. Coded mortality data, including overall mortality (defined as death due to any cause, at any point post-discharge from ENT) and 30-day mortality (defined as death due to any cause, within 30 days of discharge from ENT) for the patients included in this dataset were also obtained.

2.2 | Main outcome measures

Baseline characteristics, admission rates, reason for admission, length of stay (LoS), overall mortality and 30-day mortality were examined. Diagnoses were multiple (being in excess of 250 individual diseases or presenting symptoms, reflecting the breadth of acute presentations to otolaryngology) and therefore were subsequently grouped into broad categories by the authors (Table 1).

2.3 | Statistical analyses

Categorical data were cross-tabulated and assessed using Chi-squared test. For continuous data, an independent *t* test or Mann-Whitney test was used, depending on normality of distribution. Kruskal-Wallis tests were used to determine the presence of significant differences between multiple strata.

Binary logistic regression models were performed for LoS (<4 days, >4 days). Overall and 30-day mortality was analysed using Cox regression. Survival analysis was plotted using Kaplan-Meier charts with log-rank analysis. All statistical analyses were performed using SPSS for Macintosh (IBM Corp. Version 27).

2.4 | Ethical considerations

Ethical approval and patient consent were not required for this review. All data were handled according to Good Clinical Practice (GCP) guidelines.

3 | RESULTS

3.1 | Overall numbers and admission trend

A total of 1620 patient records were coded with an emergency admission to ENT during the designated dates. Of these, 1066 (male = 534 [50.1%]) were pre-COVID19 and 554 (male = 282 [50.9%]) were post-COVID-19. A sharp decline in acute admission numbers was noted from February 2020 to April 2020 before a subsequent increase thereafter (Figure 1). However, admissions (expressed as numbers per month) did not return to pre-pandemic levels at any point during the studied dates.

3.2 | Baseline characteristics

Age and gender between the pre-COVID19 and post-COVID19 cohorts were compared. A reduction in admissions across all age groups (Figure 2) was found. Mean age was 39.88 years and 47.4 years for the pre-COVID19 and post-COVID19 groups respectively; with an overall increase in mean age of admitted patients ($p = .018$).

TABLE 1 Coded diagnoses were grouped into the above broad categories encompassing the most common emergency presentations to ENT

	Pre-COVID-19		Post-COVID-19		Total	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
<i>Airway</i>	36	3.4	14	2.5	55	3
<i>Cancer</i>	28	2.6	28	5.1	60	3.2
<i>COVID</i>	0	0	5	0.9	5	0.3
<i>Dizziness</i>	11	1.0	3	0.5	17	0.9
<i>Epistaxis</i>	166	15.6	130	23.5	335	18.1
<i>Foreign Body</i>	77	7.2	23	4.2	109	5.9
<i>Fracture</i>	7	0.7	11	2.0	19	1.0
<i>Infection</i>	569	53.4	222	40.1	915	49.5
<i>Medical</i>	66	6.2	51	9.2	135	7.3
<i>Other</i>	13	1.2	6	1.1	20	1.1
<i>Surgical Complication</i>	75	7.0	47	8.5	141	7.6
<i>Trauma</i>	18	1.7	14	2.5	36	1.9

Male-to-female ratio was 1:1 and there was no significant difference in gender between cohorts.

3.3 | Referral source

Prior to the pandemic, the most common referral sources were primary care and the emergency department (ED) ($n = 195/1066$; 18.3% and $n = 766/1066$; 71.9% respectively) (Figure 3). However, in the post-pandemic period, primary care referrals were reduced from 18.3% to 4.2% ($n = 233$ vs $n = 23$, $p < .001$) and referrals resulting in admission from ED proportionally increased from 71.9% to 85.9% ($p < .001$). Emergency admissions from outpatient clinics and transfers from regional/district general hospitals were a smaller subset of admissions and were largely unaffected.

3.4 | Length of Stay (LoS)

Mean LoS was 3.85 days in the pre-COVID19 cohort, and 3.82 days in the post-COVID19 cohort, demonstrating no significant change ($p = .160$). However, LoS in epistaxis patients was significantly longer in the post-COVID19 cohort (hazard ratio 1.42(95% CI 1.13–1.78), $p = .003$).

3.5 | Diagnosis

A total of 276 independent diagnoses were listed in the dataset, which were grouped into broader descriptive categories encompassing common presenting complaints and conditions seen

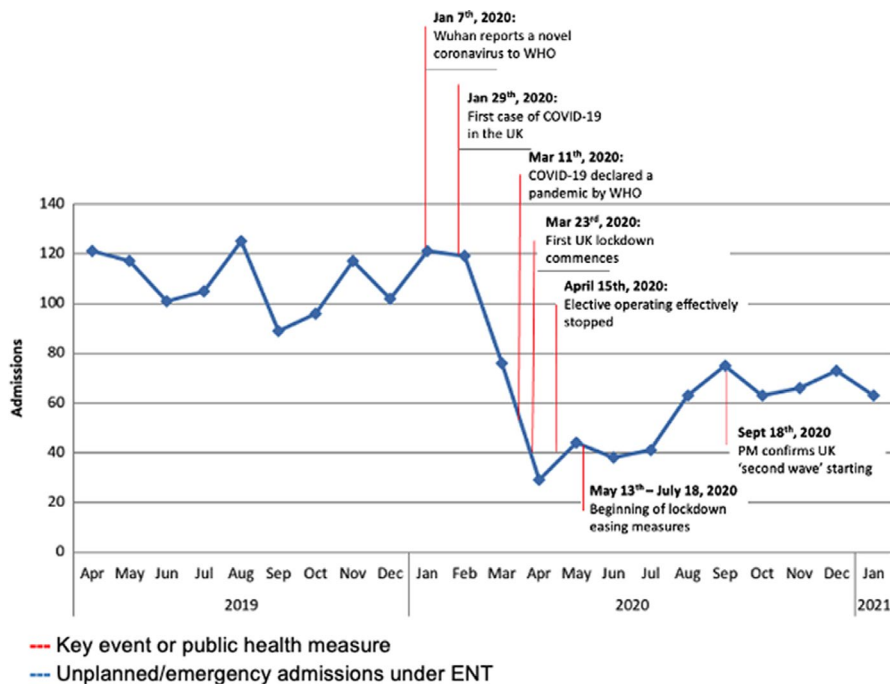


FIGURE 1 A timeline of the COVID-19 pandemic and emergency admissions to ENT at our centre

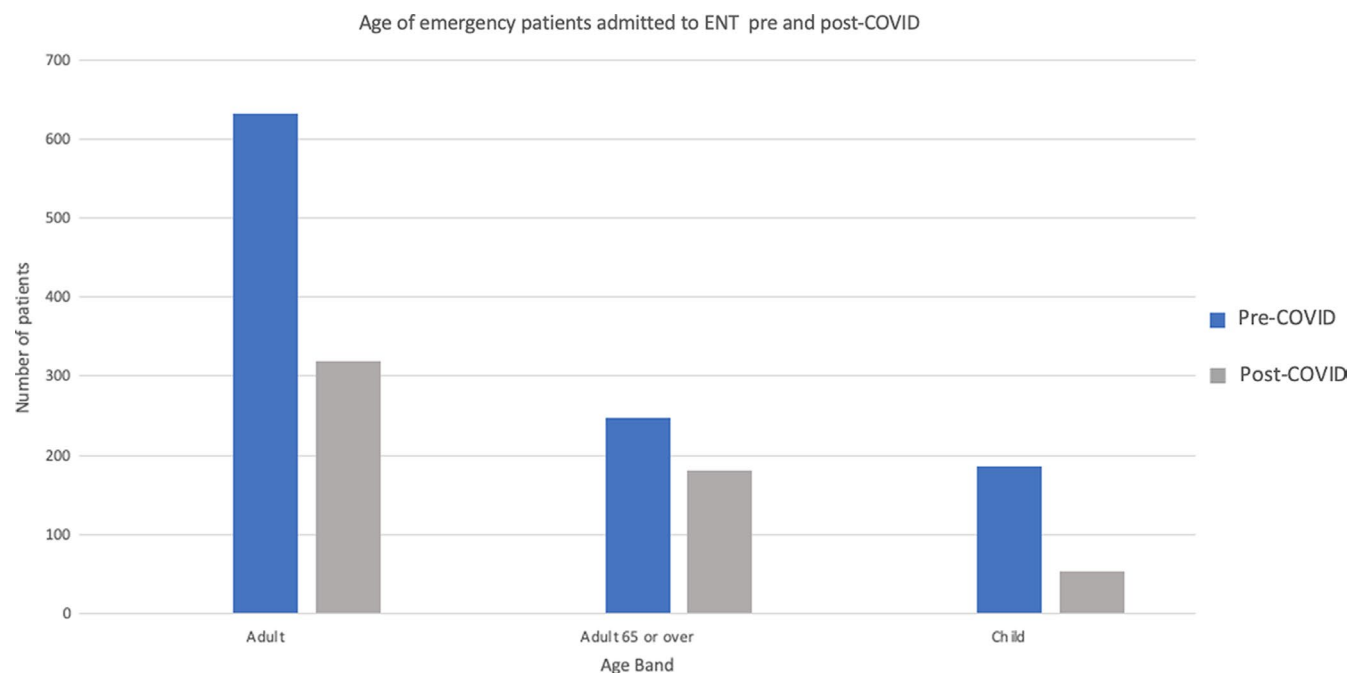


FIGURE 2 Age of patients admitted to ENT as an emergency, pre-COVID-19 and post-COVID-19

in otolaryngology (Figure 4). A reduction in all conditions post-COVID19 occurred, with epistaxis and infection (including tonsillitis, quinsy, supraglottitis and deep neck space infections) remaining the most common diagnoses resulting in admission.

3.6 | Critical care admissions

Logistic regression was performed to evaluate likelihood of critical care admission (defined as any stay in an intensive care setting (general, neurological, cardiac or paediatric)). Thirty two out of 1066

patients (3%) in the pre-COVID19 cohort required a critical care bed during their admission, compared to 29/551(5.26%) in the post-COVID19 cohort, demonstrating an increased odds ratio of 1.78 (1.07%–2.98 [95% CI], $p = .027$).

3.7 | Mortality

In terms of all-cause overall mortality, no significant difference in incidence of death between cohorts was detected; 5.62% pre-COVID-19 ($n = 60/1066$) and 5.98% post-COVID19 ($n = 33/554$).

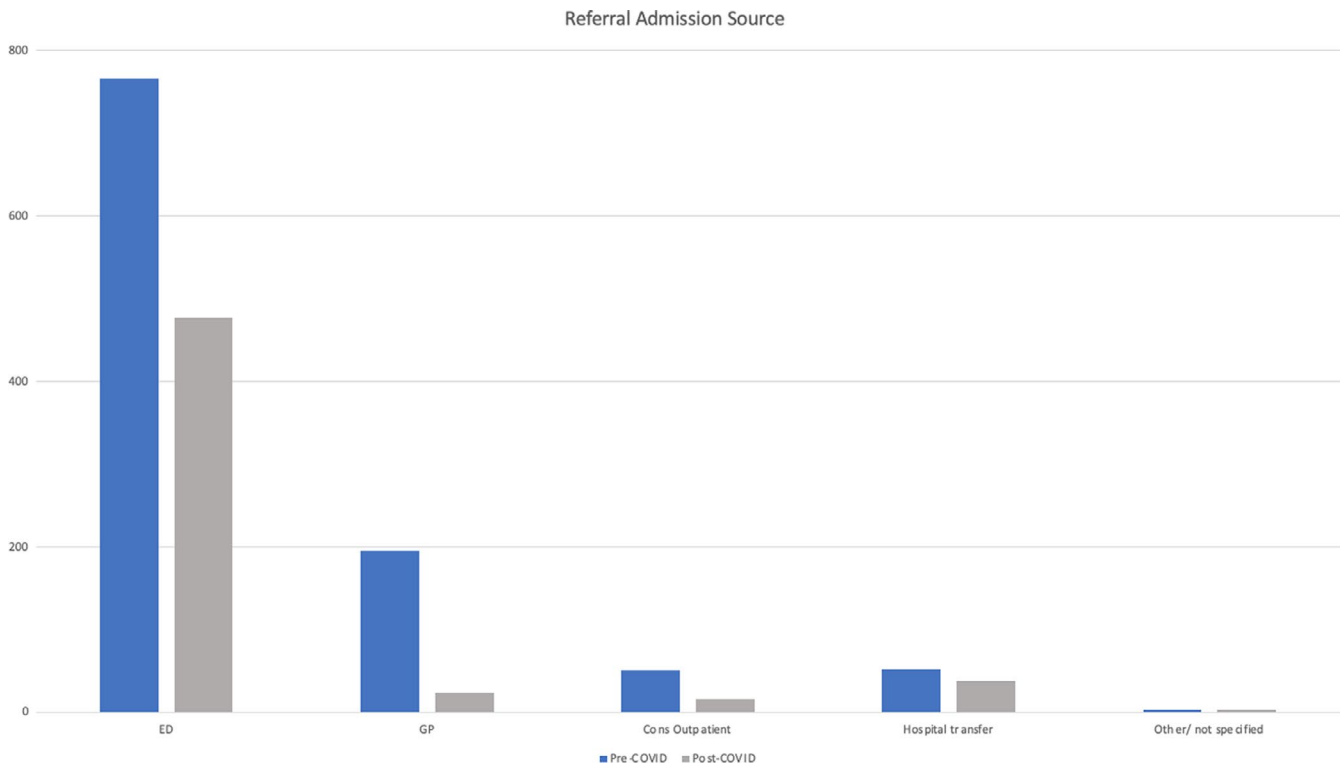


FIGURE 3 Referral source of patients admitted as an emergency, pre-COVID-19 and post-COVID19

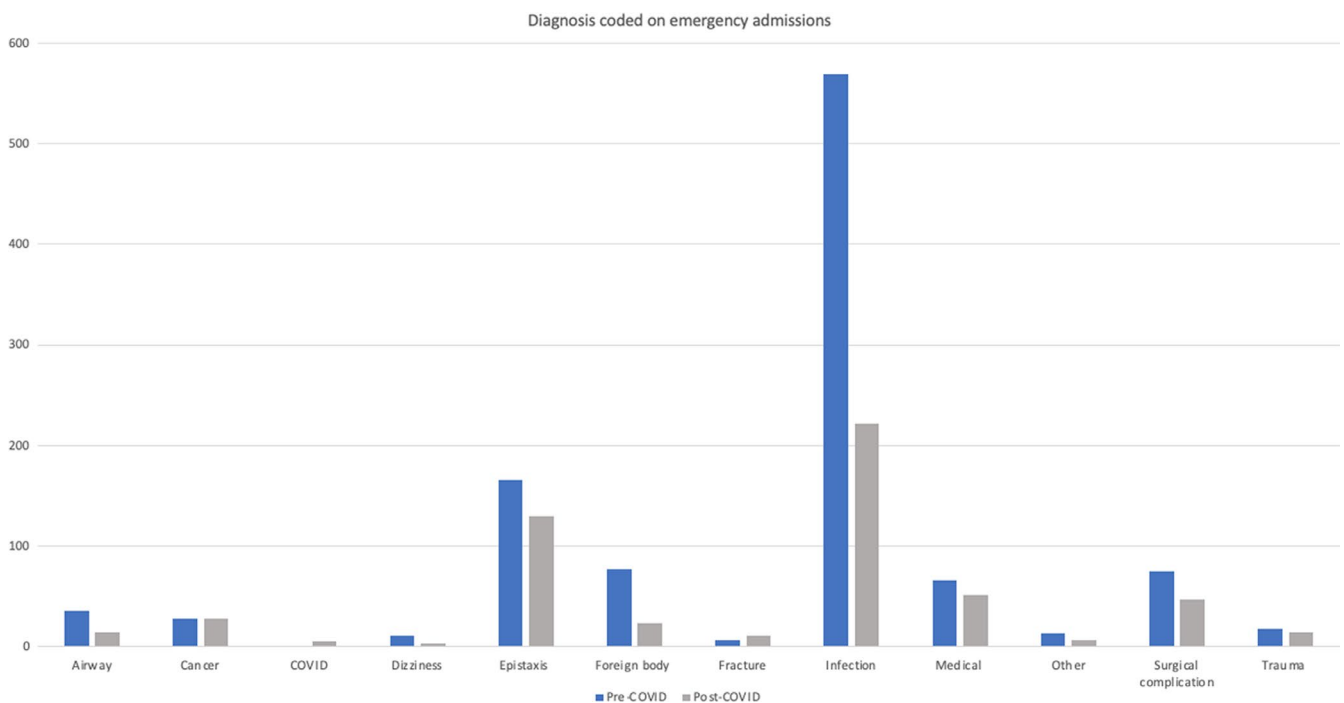


FIGURE 4 Categories encompassing the most common diagnoses and presenting complaints to ENT, pre- COVID19 and post-COVID-19

Kaplan-Meier survival analysis was performed on patients who died (Figure 5), indicating that time to event, i.e., days from discharge to death was significantly less ($p < .001$) in the post-COVID19 cohort.

An increase in 30-day all-cause mortality was observed, from 1.12% ($n = 12$) in the pre-COVID-19 cohort to 2.36% ($n = 13$) in the post-COVID-19 cohort which was statistically significant ($p = .039$). Cox-multivariate regression analysis demonstrated an

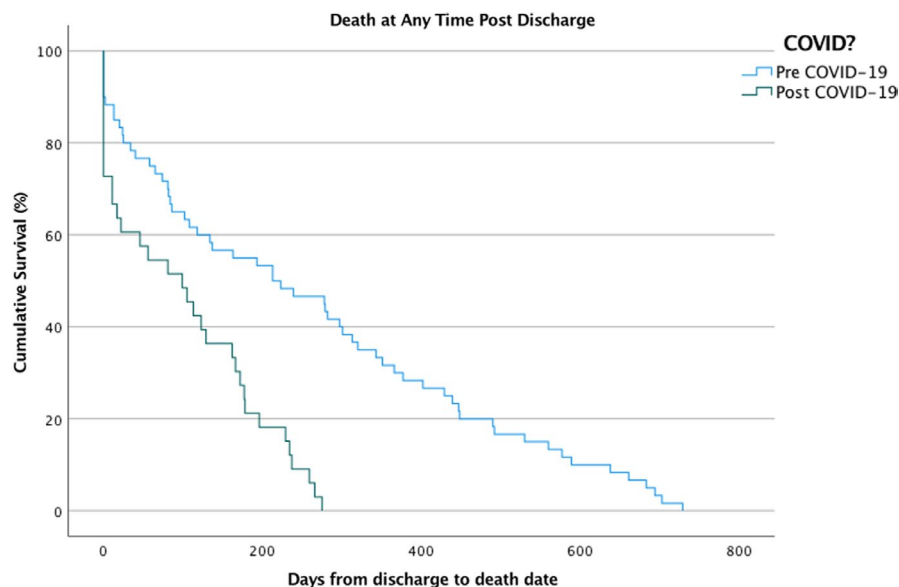


FIGURE 5 Kaplan-Meier survival analysis on cohort of patients who died post-discharge from ENT, demonstrating a significantly shorter survival period in the post-COVID-19 cohort ($p < .001$)

increased association between ICU admission and 30 days mortality (hazard ratio 4.61, 95% CI 1.42–14.91, $p = .011$) in the pre-COVID19 cohort.

4 | DISCUSSION

Our data show a clear and substantial reduction in emergency admissions to a busy otolaryngology department, in keeping with national political and public health measures during the COVID-19 pandemic (Figure 1). Of note, the decrease in unplanned admission numbers was observed from late February 2020 onwards – perhaps reflecting the growing concerns from the public and their subsequent reluctance to attend healthcare environments.

This overall reduction in patients admitted, regardless of age or diagnosis, is in keeping with larger reports on inpatient hospital activity.^{6,9} National guidance from ENT UK⁵ and pathways developed in part by local consultant expertise were implemented and aimed to reduce unnecessary admissions for management of common conditions. This, alongside public behaviour, may account for reduced admissions observed in this study. Patients who were managed on such pathways are not easily identifiable, as these pathways are not distinctly coded or recorded uniformly on the electronic patient records and reflect discretion of the individual admitting clinician. Therefore, linking with outcomes such as LoS and readmission rates was not possible. Stansfield et al. used similarly modified pathways which demonstrated a reduction in emergency admissions,¹⁰ adding to the evidence that admission avoidance in conditions such as epistaxis can be a lesson applied to ENT practice after the pandemic.^{11,12}

Many otolaryngology conditions, such as otitis externa and tonsillitis, for example, often present to primary care in the first instance, before being referred on to ENT if required. In early March 2020, general practice surgeries were instructed by NHS England to reduce face-to-face services and operate on telephone triage systems as much as possible.¹³ Additionally, due to concerns about

risk of transmission, examination of the oropharynx was advised against¹⁴ unless unavoidable – adding to the diagnostic and referral dilemma for primary care clinicians. Unsurprisingly, our data show that our centre received far fewer referrals from primary care compared to the preceding year, and the majority of patients who were admitted were via the emergency department.

LoS in our centre for acute admissions was approximately 4 days on average and remained unchanged by the pandemic. Of note, this was shorter than the average emergency admission inpatient stay in UK hospitals of 7.5 days,¹⁵ perhaps reflecting the large turnover of patients in otolaryngology and pathophysiology of acute conditions. There was an increased LoS in post-COVID19 patients admitted with epistaxis, and this finding may highlight an inclination to only admit those with an increased need for medical intervention, increased frailty, higher risk of rebleeding and those unsuitable for discharge with nasal packing. It is possible that LoS for epistaxis increased, given the change in guidance¹⁴ in managing epistaxis and a practice of discharging patients with nasal packing, i.e., ‘ambulating’ rather than admitting. Although our study does not offer direct evidence of the impact of these measures on length of stay or outcomes, other observational studies such as the INTEGRATE epistaxis audit¹¹ have reported similar findings. Learning from the acute adaptations to emergency ENT practice, and the effect on LoS, may serve as a useful lesson post-pandemic in shortening admissions and ambulating more patients where appropriate. This may provide bed capacity for other services.

Another finding, supporting the more comorbid nature of the post-COVID19 cohort is the significantly increased likelihood of admission to critical care during the pandemic. The post-COVID19 cohort were 80% more likely to be admitted to a critical care bed during their acute ENT admission, a likely reflection on the increasingly morbid nature of patients admitted to our department; however, our dataset on which this finding is based on is relatively small. ITU admission was associated with an increase in 30-day mortality in the pre-COVID19 cohort; however, neither increased LoS or ITU

admission was associated with all-cause 30-day mortality in the post-COVID19. Our study was likely underpowered to detect an association between these comparators.

Previous studies have shown all-cause mortality for epistaxis, which forms a high percentage of emergency otolaryngological admissions, to be as high as 9.8%.^{16,17} Although all-cause overall mortality remained unchanged between our cohorts (5.7% pre-COVID19 vs. 6.0% post-COVID19), the survival period was significantly shorter in the post-COVID19 group, possibly indicating that cause of death was more likely to have been related to their hospital admission; and the post-COVID19 cohort were likely more morbid overall. The increase in 30-day all-cause mortality may also support this theory; however, our numbers were not sufficient to definitively assess this observational finding. These findings are perhaps unsurprising, considering there is overwhelming evidence of all-cause excess deaths during the pandemic.¹⁸

4.1 | Limitations

Information has been extracted via coded data from local electronic systems, beginning at the translation of clinical information into administrative code and back once again into clinical information for the purposes of this study. This can introduce coding-related subjectivity, variability and error. Additionally, it is possible a small subset of patients were missed during coding retrieval due to inaccuracies on discharge summaries or other coding outcomes. Due to the informal, unrecorded nature of referrals which are largely made via a bleep system/telephone calls between primary and secondary care and ENT clinicians, we do not hold any data on how number of patients referred changed pre- and post-COVID-19. As such, any detailed analyses on this or further exploration of why the fall in emergency admission numbers were observed is not possible. Lastly, our centre, like many others in the UK, had revised pathways for managing patients largely geared towards avoiding high-risk examinations/procedures and avoiding admissions. As our dataset is based on coding retrieval rather than paper notes review, we are unable to identify which patients were managed on these pathways and what effect these pathways had on outcomes such as length of stay.

5 | CONCLUSION

Our findings demonstrate a significant reduction in acute admissions to otolaryngology during the COVID-19 pandemic, across all age groups, with an increase in mean age of patients admitted. This likely reflects both our drive to adhere to national COVID19 admission guidance, and also public reticence in presenting to healthcare services. Mean LoS for emergency admissions to ENT remained unchanged by the pandemic, whereas epistaxis was associated with an increased mean LoS. Thirty-day mortality was significantly worse in

the post-COVID19 cohort; however, this was not associated with an increased LoS or ITU admission.

We postulate that these findings likely reflect the more morbid nature of patients admitted during the pandemic, and the strong selection pressure to discharge or ambulate patients where possible. Understanding the effect that the COVID-19 pandemic has had on acute presentations may be a useful exercise in identifying unmet care needs as part of a post-pandemic recovery response in otolaryngology practice.

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CONFLICTS OF INTEREST

All authors declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

AUTHOR CONTRIBUTION

PD wrote the first draft of the manuscript, helped design the methodology and collected data. AHM designed the methodology, performed the statistical analysis and revised the manuscript. HJ provided the initial concept for the project, oversaw the project and revised and approved the manuscript. All authors discussed the results and approved the final manuscript.

PRESENTATIONS

None.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ORCID

Praveena Deekonda  <https://orcid.org/0000-0001-7838-4321>

Adal Hussain Mirza  <https://orcid.org/0000-0003-3003-4984>

Huw Jones  <https://orcid.org/0000-0003-3329-2145>

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