The British Rhinology Society National COVID-19 Study: Resuming Elective Surgery*

Abstract
Background: As elective services resumed in the aftermath of the first wave of the SARS-CoV-2 pandemic, the British Rhinology Society and Juniors Committees carried out a national prospective study in order to assess and optimise safety and efficacy of surgery.

Methodology: Data from 1063 cases was collected from 111 centres in the United Kingdom (excluding Northern Ireland) within the study period (1st June – 14th August 2020), and a three week follow-up period to assess whether there were any cases of SARS-CoV-2 amongst patients and staff.

Results: 89.2% of procedures took place in England. 90.6% of patients had minimal comorbidities (ASA Grade 1 or 2). 98.4% of patients were known to have a COVID negative status prior to surgery, with the majority (99.8%) investigated through Viral PCR alone. The most common form of pre-operative shielding was to self-isolate for 14 days (82.5% of cases). 32.6% of cases were performed in an alternative theatre environment, and in 5.3% the private sector was used for NHS patients. In 21.6% of procedures, unfamiliar anaesthetic teams were used, and in 19.2% unfamiliar theatre teams. There was a higher probability of unfamiliar theatre staff or anaesthetist, when operating in an alternative theatre environment. Trainees were not present in theatre in 24.2% of cases. Full PPE (Personal Protective Equipment) was worn by the operating surgeon in 64.1% of cases. No patients or staff were reported to have developed SARS-CoV-2 in the three week period following surgery. Intra-operative challenges were reported in 19.7% of cases and were primarily associated with impaired communication (8.8%) or impaired vision (6.9%). There was a higher chance of challenges reported when unfamiliar theatre teams were present.

Conclusions: This data suggests that overall, the resumption of rhinological elective services has been performed safely with no cases of SARS-CoV-2 reported in patients or staff. We must consider the challenges of operating in unfamiliar environments togeth-her with surgical and/or anaesthetic teams, as well as the impact on training.

Key words: rhinology, elective surgery, COVID

Introduction
The SARS-CoV-2 pandemic has significantly impacted upon the provision of services in healthcare systems throughout the world. In the United Kingdom, in view of the need to prioritise resources whilst protecting emergency and cancer services during the first wave of the pandemic, cases were initially risk stratified[1,2], and those deemed to be low priority either cancelled or postponed.
Although it has since been confirmed that this was incorrectly reported, an initial case from Wuhan whereby 14 theatre staff members were allegedly infected following transsphenoidal pituitary surgery raised considerable alarm over potential aerosolisation of the virus when performing rhinological surgery. As fatalities began to plateau, reducing the need for reallocation of resources and the waiting times for elective operating increased; there became a stronger emphasis on the resumption of routine elective activity. Simultaneously, our understanding of the disease process continues to improve in order to try and undertake this with minimal risk.

In May 2020, NHS England published their roadmap to safely bring back elective activity. This framework included the need for careful planning, rigorous monitoring and continuous improvement. However, the results of a survey of 1741 surgeons in June 2020 commissioned by the Royal College of Surgeons of England, highlighted significant challenges in re-starting elective surgery, which included a lack of capacity in interdependent services (46%), lack of staff (35%), lack of access to testing, and insufficient PPE (21%).

The British Rhinology Society (BRS) and BRS Juniors’ councils highlighted the need to monitor safety during the recommencement of rhinological operating.

### Aims and objectives
The aim of this study was to collect prospective data to assess the safety and challenges encountered when initiating elective rhinological surgery in the United Kingdom following the first wave of the pandemic. Specific objectives included addressing the following:

- When and where are we performing elective rhinological surgery?
- Documentation of the morbidity and mortality associated with elective rhinology operating during a pandemic
- What is the current practice with respect to:
  - Pre-operative testing
  - Personal protective equipment
  - Use of specific equipment
- How has training been affected?
- What challenges do surgeons face?

### Materials and methods

#### Data collection
A prospective multicentre audit was conducted over from the 1st of June 2020 to 14th August 2020 for all elective rhinological surgery. Involvement was approved at each centre as a quality improvement project and anonymised data was collected by local ENT teams using a predefined data collection tool (Appendix 1). This included patient characteristics, surgical intervention, use of personal protective equipment (PPE), and complications inclusive of post-operative COVID-19 infection up to three weeks in the postoperative period.

### Categorical variable stratification
Surgical operations were classified into 4 categories (Appendix 2): Diagnostic, Functional, Cancer (histologically confirmed), and Other. Meanwhile, ethnic categories were reclassified into Caucasian versus Non-Caucasian due to the small subset of other ethnicities in this category.

### Statistical methodology
Numerical data were tested with the Shapiro-Wilks test to evaluate the data distribution. The Kruskal-Wallis Rank Sum test (kw) was conducted for non-normally distributed data and reported as the median and interquartile range. Categorical data were analysed with the Pearson’s Chi-squared test (χ²) or Fisher’s exact test (f). A p-value of ≤ 0.05 was set as the statistically significant value. Odds ratios were calculated where associations were explored between the variables of interest. The R version 4.0.3 (2020-10-10) software was used with the associated packages: Tidyverse, compareGroup, dplyr, ggplot2, lubridate.

### Results

#### Basic demographics
Overall, 111 centres in 16 regions in the United Kingdom (excluding Northern Ireland) responded. Fifteen centres reported no elective rhinological surgery during the duration of this audit. From the remaining 96 centres, 1063 procedures were captured during the audit period (Table 1, Figure 1); the proforma had been fully completed in 84% of cases.

The median age at time of procedure was 47.0 years (IQR: 31.0; 60.0) with those who underwent surgery for cancer being the oldest; median age of 53.0 years (IQR: 45.5;64.0). Male gender was most predominant (59.8%) and 94.1% of procedures were performed on adults; those aged 17-49 years being the predominant subgroup (49.2%). With regards to ethnicity, there were no statistically significant difference between our cohort of patients and the UK population between Caucasians and non-Caucasians (p=0.06).

The mean number of rhinological procedures performed in the UK on a week-by-week basis was 88.6 ± 45.8 (equivalent to 18.0 cases ± 9.9 per day). The majority of procedures were performed in England (89.2%), followed by Scotland (9.2%) and Wales (1.6%). Figure 2 shows the cumulative workload in each nation and Figure 3 shows the types of procedures performed, with functional procedures the most common.
Comorbidities
The majority of patients (90.6%) had minimal comorbidities and were categorised as either ASA grade 1 and 2 (Table 2) (16). For those with respiratory disease, the odds of having functional procedures were statistically high (OR: 1.89, p<0.001).

Pre-operative COVID-19 status and management
1046 (98.4%) of patients were known to have a COVID negative status prior to surgery, with the vast majority (99.8%) undergoing Viral PCR through a nasal/nasopharyngeal swab. Two further patients also underwent imaging in the form of a chest radiograph (Table 3). In the remaining 17 (1.6%) cases the COVID status was not reported. The most common form of pre-operative shielding was for patients to self-isolate for a 14 day period prior to surgery (82.5%). 83 patients (7.83%) were reported as having not self-isolated, of whom the majority underwent functional (41%) and diagnostic (36.1%) surgery.

No patients or staff tested positive for COVID-19 at the end of the 3-week follow-up period.

Familiarity of surgical environment
Almost one third (32.6%) of operations were carried out in an alternative operating theatre environment, whether this was a different theatre setting within the same hospital (13.8%), or in another hospital altogether (18.8%; Table 4). There were 5.27% of NHS cases being undertaken in the private healthcare system. Whilst 56.4% of functional procedures were carried out in a hospital with a "COVID-free" status (OR: 1.69 [95% CI:1.30;2.19], p<0.001), this was only the case with 39.7% of diagnostic procedures and 20% of cancer surgery. Unfamiliar anaesthetists were...
involved in 21.6% of cases. Meanwhile, 19.2% of cases involved unfamiliar theatre teams. The odds of an unfamiliar anaesthetist (OR: 5.28 [95% CI 3.87;7.26], p<0.001) and theatre teams (OR: 15.7 [95% CI 10.8;23.5], p<0.001) increased significantly if procedures were performed in other places than the usual location.

Personal protective equipment and utilisation of powered instrumentation

Full PPE (defined as using both an FFP3 mask/Powerhood or PAPR (Powered Air Purifying Respirator) in conjunction with eye protection; Table 5) was reported to have been worn in 64.1% of the procedures. Full PPE was used by 44.8% of anaesthetists and 48.6% of theatre teams. With respect to the use of powered instrumentation, a powered microdebrider was used in 38.5% of cases, and a powered drill in 7.62% (Table 5). When powered instrumentation was utilised, the operating surgeons were noted to have worn full PPE in 68.1% of cases. The use of powered instruments did not significantly statistically change over time.

Impact on training

Trainees were not present in theatre for 24.2% of procedures (Table 6). Overall, they were involved in 72% of procedures, of which the largest cohort was part performing the procedure with trainer scrubbed (STS).

Challenges and outcomes reported

Intra-operative challenges were reported in 19.7% of cases, with the largest proportion of issues being communication in theatre (8.84%) followed by impaired vision (6.87%) due to the use of PPE (Table 7). There was a significant increase in challenges reported when the theatre team was unfamiliar (OR: 1.54 [95% CI 1.06;2.21], p<0.023).

There was a total of 63 (5.9%) reported complications in the data set. Complications were divided into separate categories: epistaxis, post-operative infection, orbital injury, cerebrospinal fluid leak and other (Figure 4). The most common complication was epistaxis (n=34), with the requirement for blood transfusion in two cases, and no requirement for further surgical intervention. Infection was reported in 10 cases with one septal abscess returning to theatre for washout. 5 instances of orbital complications were reported, 4 orbital fat exposure, with no visual sequelae reported thereafter, and one case unspecified. 3 cerebrospinal fluid leaks were reported. One case occurred during functional endoscopic sinus surgery for inverted papilloma surgery, and was repaired intra-operatively with no further sequelae. There were two cases following transsphenoidal fenestration of an

| Table 1. Basic demographics. |
|-----------------------------|
| [ALL] | Cancer | Diagnostic | Functional | Other |
| N=1063 | N=20 | N=194 | N=714 | N=135 |
| Gender: | | | | |
| Female | 427(40.2%) | 7(35.0%) | 92(47.4%) | 268(37.5%) | 60(44.4%) |
| Male | 636(59.8%) | 13(65.0%) | 102(52.6%) | 446(62.5%) | 75(55.6%) |
| Age (year old): | | | | |
| 16 | 62(5.83%) | 0(0.00%) | 32(16.5%) | 14(1.96%) | 16(11.9%) |
| 17-49 | 523(49.2%) | 9(45.0%) | 72(37.1%) | 377(52.8%) | 65(48.1%) |
| 50-59 | 199(18.7%) | 3(15.0%) | 41(21.1%) | 136(19.0%) | 19(14.1%) |
| 60-69 | 161(15.1%) | 7(35.0%) | 22(11.3%) | 113(15.8%) | 19(14.1%) |
| ≥70 | 118(11.1%) | 1(5.00%) | 27(13.9%) | 74(10.4%) | 16(11.9%) |
| Ethnic Group: | | | | |
| Caucasian | 915(86.2%) | 18(90.0%) | 171(88.1%) | 617(86.5%) | 109(80.7%) |
| Non-Caucasian | 147(13.8%) | 2(10.0%) | 23(11.9%) | 96(13.5%) | 26(19.3%) |
| Month: | | | | |
| June | 311(29.3%) | 8(40.0%) | 74(38.1%) | 193(27.0%) | 36(26.7%) |
| July | 629(59.2%) | 10(50.0%) | 105(54.1%) | 428(59.9%) | 86(63.7%) |
| August | 123(11.6%) | 2(10.0%) | 15(7.73%) | 93(13.0%) | 13(9.63%) |
| Nation: | | | | |
| England | 948(89.2%) | 14(70.0%) | 153(79.8%) | 657(92.0%) | 124(91.9%) |
| Scotland | 98(9.22%) | 6(30.0%) | 32(16.5%) | 51(7.14%) | 9(6.67%) |
| Wales | 17(1.60%) | 0(0.00%) | 9(4.64%) | 6(0.84%) | 2(1.48%) |
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arachnoid cyst (n=2). Eleven complications were classified as other; restenosis of choanal atresia repair (n=2), neurological complications (n=3), intolerable pain (n=1), suture granuloma (n=1), low sodium (pituitary surgery) (n=1), septal perforation (n=1), nasal crusting (n=1) and migration of nasal packing into the oropharynx (n=1). There was one mortality due to an anaesthetic complication.

Discussion
This national study provides us with data on the initiation of rhinological surgery following the first wave of the SARS-CoV-2 pandemic in the United Kingdom and its impact. Overall, 1063 patients were included from 96 centres. The distribution across England and Scotland is reflective of their respective populations from the Office of National Statistics, with a smaller data catchment noted from Wales (1.6% vs 4.9%, p<0.001) [17].

Patient selection
The high proportion of rhinological surgery that is undertaken for functional reasons (67.17%) is reflected in our data. This would be categorised as lower priority according to national guidance provided by ENTUK [2] and the Federation of Surgical Specialty Associations [18], and was therefore postponed during the height of the pandemic. Throughout the course of the duration of the study, as elective services resume, a higher proportion of functional rhinological surgery occurred (Figure 3). The majority of this (56%) was being performed in COVID free centres.

We also see that the majority of patients (90.6%) who underwent rhinological surgery had minimal comorbidities (ASA grade 1 or 2). A higher proportion (20%) of those undergoing cancer surgery were ASA 3 or 4 with only 7.8% of those undergoing functional surgery being ASA grades 3 or 4. This suggests that patients deemed to be at higher risk were likely to be postponed wherever possible. The association between those undergoing functional surgery and respiratory disease is reflective of the known association between sinonasal disease and asthma [19].

Table 2. Comorbidities.

|                | [ALL] | Cancer | Diagnostic | Functional | Other |
|----------------|-------|--------|------------|------------|-------|
| N=1063         |       | N=20   | N=194      | N=714      | N=135 |
| ASA:           |       |        |            |            |       |
| 1              | 495(47.5%) | 5(25.0%) | 99(52.4%)  | 330(47.1%) | 61(46.2%) |
| 2              | 449(43.1%) | 11(55.0%) | 71(37.6%)  | 316(45.1%) | 51(38.6%) |
| 3              | 95(9.12%) | 4(20.0%) | 19(10.1%)  | 53(7.56%)  | 19(14.4%) |
| 4              | 3(0.29%)  | 0(0.00%) | 0(0.00%)   | 2(0.29%)   | 1(0.76%)  |
| Cardiovascular Disease: |       |        |            |            |       |
| No             | 883(83.1%) | 15(75.0%) | 159(82.0%) | 600(84.0%) | 109(80.7%) |
| Yes            | 180(16.9%) | 5(25.0%)  | 35(18.0%)  | 114(16.0%) | 26(19.3%)  |
| Respiratory Disease: |       |        |            |            |       |
| No             | 908(85.4%) | 18(90.0%) | 179(92.3%) | 593(83.1%) | 118(87.4%) |
| Yes            | 155(14.6%) | 2(10.0%)  | 15(7.73%)  | 121(16.9%) | 17(12.6%)  |
| Previous History of Malignancy: |       |        |            |            |       |
| No             | 1044(98.2%) | 19(95.0%) | 186(95.9%) | 706(98.9%) | 133(98.5%) |
| Yes            | 19(1.79%)  | 1(5.00%)  | 8(4.12%)   | 8(1.12%)   | 2(1.48%)   |
| Diabetes Mellitus: |      |        |            |            |       |
| No             | 1018(95.8%) | 19(95.0%) | 187(96.4%) | 684(95.8%) | 128(94.8%) |
| Yes            | 45(4.23%)  | 1(5.00%)  | 7(3.61%)   | 30(4.20%)  | 7(5.19%)   |

Table 3. COVID status and pre-operative management.

|                | [ALL] | N=1063 |
|----------------|-------|--------|
| Pre-Operative Self-Isolation Period: |   |
| 7-Days         | 30(2.83%) |
| 14-Days        | 875(82.5%) |
| Other          | 72(6.79%) |
| Did Not Self-Isolate | 83(7.83%) |
| Type Of COVID-19 Test: |   |
| Combination    | 2(0.19%) |
| Viral PCR & Imaging | 1044(99.8%) |
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Familiarity of surgical environment
Approximately one third of procedures were performed in an alternative theatre setting, and in one fifth of patients with an unfamiliar anaesthetic and/or theatre team. Unsurprisingly our data shows that it was statistically likely that if surgery occurred in a different theatre setting then one would be operating with a different theatre team. This can impact the surgeon in a number of ways and we have shown there was a significant increase in challenges reported when the theatre team was unfamiliar (OR: 1.54 [95% CI 1.06;2.21], p:0.023). Furthermore, as with every surgical subspecialty, rhinological surgery requires specific anaesthetic considerations during the operative period\(^\text{(20)}\), and this is likely to be at its optimum with an anaesthetist most familiar with the surgical procedure.

Testing, PPE and complications
It was useful to know that the vast majority of patients (98.4%) were assessed to be COVID negative, primarily through Viral PCR and the majority of patients (82.5%) self-isolated for a fourteen day period.

With regards to personal protection in theatre, full PPE was used by 64.1% of surgeons. Adequate PPE is important\(^\text{(21,22)}\). However, full PPE may not be required for all patients. National guidance provided by Public Health England advises that patients should be risk stratified\(^\text{(23)}\), and surgeons undertaking procedures in those who are deemed to be low risk for example can use a surgical mask, and eye protection if necessary. This is particularly important to note due to the challenges reported with the use of PPE (communication issues (8.84%) and visual issues (6.87%)).

There were no reports of shortage of PPE for staff members.

One of the main outcomes of this audit was to assess patient and staff safety regarding elective rhinological operating, specifically with respect to viral transmission. Significantly, there were no reported cases of SARS-CoV-2 in patients or staff members post procedure. This suggests that compliance with the current guidance regarding testing and PPE facilitates safe practice with respect to elective rhinological surgery. Further evidence based guidance as we increase our understanding of the disease process is useful\(^\text{(24,25)}\).

The rate of complications overall was 5.9%. This is comparable to previous literature\(^\text{(26,27)}\), and once again highlights the fact that

### Table 4. Familiarity of surgical environment.

|                          | [ALL] | N=1063 |
|--------------------------|-------|--------|
| **Hospital setting:**    |       |        |
| Usual location           | 716(67.4%) |
| Alternative within same hospital | 147(13.8%) |
| Different hospital       | 200(18.8%) |
| **Service utilization:** |       |        |
| NHS Hospital             | 1007(94.7%) |
| Private hospital         | 56(5.27%) |
| **Hospital COVID-19 free status:** |       |        |
| No                       | 503(47.9%) |
| Yes                      | 547(52.1%) |
| **Operation duration:**  |       |        |
| 60 mins or less          | 467(45.5%) |
| 61-120 mins              | 409(39.9%) |
| 121-180 mins             | 109(10.6%) |
| 181 mins or longer       | 41(4.00%) |
| **Length of stay:**      |       |        |
| 12 hours or less         | 831(79.8%) |
| 13-24 hours              | 121(11.6%) |
| 25-48 hours              | 35(3.36%) |
| 49 hours or longer       | 55(5.28%) |
| Anaesthetist:            |       |        |
| Familiar                 | 819(78.4%) |
| Unfamiliar               | 225(21.6%) |
| **Theatre team:**        |       |        |
| Familiar                 | 845(80.8%) |
| Unfamiliar               | 201(19.2%) |

Figure 4. Complications by category.
Table 5. Personal protective equipment and utilisation of powered instrumentation.

|                          | [ALL] | Cancer | Diagnostic | Functional | Other |
|--------------------------|-------|--------|------------|------------|-------|
|                          | N=1063| N=20   | N=194      | N=714      | N=135 |
| Surgeons mask protection:|       |        |            |            |       |
| Not specified            | 225(21.2%) | 6(30.0%) | 41(21.1%) | 156(21.8%) | 22(16.3%) |
| Surgical mask            | 64(6.02%) | 2(10.0%) | 16(8.25%) | 34(4.76%) | 12(8.89%) |
| FFP2                     | 7(0.66%) | 0(0.00%) | 1(0.52%)  | 6(0.84%)  | 0(0.00%)  |
| FFP3                     | 767(72.2%) | 12(60.0%) | 136(70.1%) | 518(72.5%) | 101(74.8%) |
| Eye protection:          |        |        |            |            |       |
| No                       | 195(18.3%) | 3(15.0%) | 28(14.4%) | 137(19.2%) | 27(20.0%) |
| Yes                      | 868(81.7%) | 17(85.0%) | 166(85.6%) | 577(80.8%) | 108(80.0%) |
| Full PPE:                |        |        |            |            |       |
| Not specified            | 160(15.5%) | 5(26.3%) | 31(16.7%) | 108(15.6%) | 16(11.9%) |
| No                       | 211(20.4%) | 4(21.1%) | 36(19.4%) | 137(19.7%) | 34(25.4%) |
| Yes                      | 662(64.1%) | 10(52.6%) | 119(64.0%) | 448(64.7%) | 84(62.7%) |
| Anaesthetic mask protection:| |        |            |            |       |
| Not specified            | 361(34.0%) | 8(40.0%) | 66(34.0%) | 241(33.8%) | 46(34.1%) |
| Surgical mask            | 43(4.05%) | 1(5.00%) | 12(6.19%) | 8(0.11%)  | 0(0.00%)  |
| FFP2                     | 8(0.75%)  | 0(0.00%) | 1(0.52%)  | 7(0.08%)  | 0(0.00%)  |
| FFP3                     | 651(61.2%) | 11(55.0%) | 115(59.3%) | 448(62.7%) | 77(57.0%) |
| Eye protection:          |        |        |            |            |       |
| Not specified            | 452(42.5%) | 13(65.0%) | 94(48.5%) | 291(40.8%) | 54(40.0%) |
| Yes                      | 611(57.5%) | 7(35.0%) | 100(51.5%) | 423(59.2%) | 81(60.0%) |
| Full PPE:                |        |        |            |            |       |
| Not specified            | 536(50.4%) | 12(60.0%) | 100(51.5%) | 358(50.1%) | 66(48.9%) |
| No                       | 51(4.80%)  | 1(5.00%) | 13(6.70%) | 25(3.50%) | 12(8.89%) |
| Yes                      | 476(44.8%) | 7(35.0%) | 81(41.8%) | 331(46.4%) | 57(42.2%) |
| Theatre team mask protection:| |        |            |            |       |
| Not specified            | 249(23.4%) | 9(45.0%) | 44(22.7%) | 167(23.4%) | 29(21.5%) |
| Surgical mask            | 65(6.11%)  | 0(0.00%) | 15(7.73%) | 41(5.74%) | 9(6.67%)  |
| FFP2                     | 121(11.3%) | 0(0.00%) | 1(0.52%)  | 11(1.54%) | 0(0.00%)  |
| FFP3                     | 737(69.3%) | 11(55.0%) | 134(69.1%) | 495(69.3%) | 97(71.9%) |
| Eye protection:          |        |        |            |            |       |
| Not specified            | 476(44.8%) | 15(75.0%) | 92(47.4%) | 314(44.0%) | 55(40.7%) |
| Yes                      | 587(55.2%) | 5(25.0%) | 102(52.6%) | 400(56.0%) | 80(59.3%) |
| Full PPE:                |        |        |            |            |       |
| Not specified            | 469(44.1%) | 15(75.0%) | 86(44.3%) | 313(43.8%) | 55(40.7%) |
| No                       | 77(7.24%)  | 0(0.00%) | 16(8.25%) | 52(7.28%) | 9(6.67%)  |
| Yes                      | 517(48.6%) | 5(25.0%) | 92(47.4%) | 349(48.9%) | 71(52.6%) |
| Drill:                   |        |        |            |            |       |
| No                       | 982(92.4%) | 17(85.0%) | 192(99.0%) | 653(91.5%) | 120(88.9%) |
| Yes                      | 81(7.62%)  | 3(15.0%) | 2(1.03%)  | 61(8.54%) | 15(11.1%) |
| Microdebrider:           |        |        |            |            |       |
| No                       | 654(61.5%) | 10(50.0%) | 177(91.2%) | 361(50.6%) | 106(78.5%) |
| Yes                      | 409(38.5%) | 10(50.0%) | 17(8.76%) | 353(49.4%) | 29(21.5%) |
| Visual aids:             |        |        |            |            |       |
| Non-endoscopic           | 230(23.9%) | 5(27.8%) | 39(23.2%) | 145(22.3%) | 41(33.1%) |
| Endoscopic               | 731(76.1%) | 13(72.2%) | 129(76.8%) | 506(77.7%) | 83(66.9%) |
despite challenges faced, elective rhinological surgery is being performed safely in the United Kingdom.

**Training and skill retention**
In a quarter of cases, trainees were not present in theatre. This highlights some of the issues surrounding the role of junior doctors during the pandemic. The pressure on the medical workforce during the COVID pandemic, together with increased staff sickness, resulted in many junior doctors being redeployed. Furthermore, the risk of aerosolisation and the need for a quicker turnover of patients due to limited hospital capacity, often resulted in trainees being less involved. This is compounded by the small number of rhinological procedures performed in a day between all three nations (minimum: 1 case a day, median: 17 cases a day, maximum: 39 cases a day) which could potentially impact upon overall exposure to rhinological procedures. The Joint Committee of Surgical Training has published guidance for trainees to maximise the opportunities available.

**Limitations**
This is the largest study performed to investigate the current experience in rhinological procedures during the SARS-CoV-2 pandemic. The limitations of our audit are primarily associated with data collection and its quality. The majority of data was collected by trainees, and this does introduce some bias as some procedures that trainees were not directly involved in may not have been captured. There was a follow-up at three weeks to determine whether patients had acquired COVID-19, however it is likely that such data would have been challenging to assess accurately due to the logistical difficulties associated with following up all members of staff, and the rate of untested, minimally symptomatic, or false negative COVID cases. Hence the possibility that some of this data may not have been included should be taken into account.

**Conclusions and considerations for the future**
This study suggests that the initiation of elective rhinological surgery within the United Kingdom in the aftermath of the first SARS-CoV-2 pandemic has been safe with no significant increase in complications noted. Furthermore, there is no evidence to indicate a high rate of SARS-CoV-2 cases being contracted as a direct result of surgery. The use of pre-operative testing and PPE plays an important role in managing the risk involved. PPE should be used as recommended; however it can pose visual and communication issues. Where possible, it would be useful to perform surgery with familiar anaesthetists and theatre staff with experience in rhinological surgery; however, should capacity in the NHS reduce, there may be better utilisation of the private healthcare setting for less complex surgery, preferably with experienced teams. Lastly, it is important to consider the impact on training posed by the pandemic, and wherever possible, training should be facilitated and other methods of surgical training be explored.

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**Table 6. Trainee involvement.**

| Trainee:                  | [ALL] N=1063 |
|---------------------------|-------------|
| No trainee                | 252(24.2%)  |
| Observed                  | 39(3.74%)   |
| Assisted                  | 139(13.3%)  |
| Supervised scrubbed (STS) | 366(35.1%)  |
| Supervised unscrubbed (STU)| 140(13.4%)  |
| Performed (P)             | 106(10.2%)  |

**Table 7. Intra-operative challenges.**

| Challenges:                  | [ALL] N=1063 |
|------------------------------|-------------|
| No                           | 827(80.3%)  |
| Yes                          | 203(19.7%)  |
| Communication issues:        |             |
| No comments                  | 969(91.2%)  |
| Yes                          | 94(8.84%)   |
| Vision issues:               |             |
| No comments                  | 990(93.1%)  |
| Yes                          | 73(6.87%)   |
concluded.

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# Appendix 1. Questionnaire.

### Patient Demographics

| Name of person entering information: | _________________________ |
| Date of procedure | _________________________________________ |

### Pre-operative management

- **For how long did patient self-isolate prior to surgery?**
  - 1 week
  - 2-3 weeks
  - 4-6 weeks
  - 60+ days
  - Other: Please state ____________

### COVID status

- **Investigations for COVID?**
  - CT scan
  - Blood test
  - Other: Please state ____________

### Intra-operative complications

- **Any changes in anaesthesia/surgical technique/procedure?**
  - Yes
  - No

### Follow-up (12 weeks)

- **Was patient subsequently found to be COVID +ve?**
  - Yes
  - No

### Return to theatre

- **Length of inpatient stay?**
  - 1-2 days
  - 3-5 days
  - 6-10 days
  - 11+ days

### Other

- **PPE Used by other Theatre Staff:**
  - Eye protection Used by other Theatre Staff
  - Self-contained breathing apparatus

### Theatre

- **Anaesthetic equipment used:**
  - Laryngoscope
  - Microscope
  - Other: Please state _______

### Trainee Involvement

- **Was trainee involved in case?**
  - Yes
  - No

### Complications

- **Are you utilizing any additional steps to mitigate against viral transmission?**
  - Yes
  - No

### Length of inpatient stay

- **Length of inpatient stay?**
  - 1-2 days
  - 3-5 days
  - 6-10 days
  - 11+ days

### Durations of general anaesthesia

- **Duration of general anaesthesia:**
  - <30 minutes
  - 31-60 minutes
  - 61-120 minutes
  - 121-180 minutes
  - >180 minutes

### Questionnaire.

| BRS/BRSJ COVID Study 2020 |
|---------------------------|---|
| 1 | 2 |

**Note:** Please feel free to state any further comments:
Appendix 2. Operative procedure categorisation

| Operative procedure category | Type of operation |
|------------------------------|-------------------|
| Diagnostic                   | 1. Examination under Anesthesia  
                              | 2. Biopsies  
                              | 3. Unilateral procedure for diagnostic purposes ie unilateral sphenoidotomy |
| Functional                   | 1. FESS  
                              | 2. Septoplasty or Septorhinoplasty due to obstruction only  
                              | 3. CSF leak repair  
                              | 4. Hypophysectomy for decompression |
| Cancer                       | 1. Confirmed sinonasal or skull-based malignancy |
| Other                        | Other procedures |