Methodology - Design

A REDCap (Research Electronic Data Capture) questionnaire was designed and employed to collateresponses and associated data via its web application. A 13-item survey questionnaire was constructed according to previously published guidelines for robust survey design and conduct. In order to ensure optimal question design and to facilitate any necessary refinement, so as to achieve desired respondent interpretation, members of the COVIDSurg-HN writing group undertook both pre-testing and pilot testing evaluation of the questionnaire prior to survey distribution. This process provided assurance of both face and content validity. In the context of the evolving pandemic and in the absence of a gold standard to measure against, no further validity measures were possible.

A subsequent follow up response was requested from all respondents, to clarify both the size of the respective surgical centres (number of patients treated per annum) for which responses were attained and also personal COVID experience of participant surgeons.

Setting and Participants

The survey was distributed electronically to the existing COVIDSurg-HN collaborative network; a wide group which had previously contributed to the collection of more than 5000 head and neck cancer treatments carried out between March-June 2020. Additionally, to maximise scope of response, invitations to participate were disseminated both through social media platforms and through the memberships of major international Head & Neck specialty associations and collaborative research/clinical trial networks. Respondents were requested where possible to provide a single response on behalf of their hospital or head and neck cancer multidisciplinary team.

Given the cross-specialty approach to survey dissemination, acquisition of duplicate responses within the dataset was anticipated and, where this occurred, averaging of duplicates was undertaken to provide the best (combined) estimate for any given centre prior to subsequent analysis. Each participating hospital's data referred to the management of adult patients undergoing head and neck cancer surgery with curative intent. Surgery was defined as a procedure performed by a surgeon in an operating theatre either under general or local anaesthesia. Head and neck cancer was defined as any malignant diagnosis above the clavicle although this excluded localized non-melanoma skin cancer, haematopoietic malignancies, intra-ocular and primary brain malignancy.

Main Outcome Measures

The survey data capture was conducted within the first week of February 2021 (1st - 7th February 2021). Other than encouragement of individuals to contribute to a better understanding of the impact of COVID-19 on Head & Neck services, there were no incentives to respond. Completion of the survey by respondents was requested to include estimated metrics of head and neck cancer service. Three distinct timepoints were defined:

- prior to the COVID-19 pandemic (nominally February 2019);
- during the initial stages of COVID-19 infections (March – June 2020);
- at the time of survey completion (1st week of February 2021).

The entry fields represented either percentage estimates, defined response criteria or direct yes/no responses. Responses were classified as required fields for continuation and completion of the survey in all instances. Additional detail of the geographical location of the hospital (country), SARS-CoV-2 testing of patients and staff, usage of Personal Protective Equipment (PPE; FFP3 or equivalent mask usage for H&N operating) and levels of vaccination against COVID-19 was requested from all respondents.

Subsequent to completion and analysis of survey outcomes, all respondents were requested to provide evidence of the size and nature of their respective unit (number of new HN cases treated per annum and COVID pathway designation) and detail of their personal experience of COVID in terms of COVID infection, vaccination and PPE usage.

Applied Metrics

International variation in population-level incidence of COVID-19 has been evident since the initial outbreak of disease in late 2019 and throughout the pandemic 2020. The community SARS-CoV-2 incidence within each participating hospitals' locality was extracted from World Health Organisation statistics. Community SARS-CoV-2 incidence was calculated for the 1st February 2021, the midpoint of the March-June 2020 survey period (15th April) and an average of those 3 months. Hospitals were classified as being in communities witheither low (≤25 cases per 100,000 population) or high(>25 cases per 100,000 population) SARS-CoV-2 incidence.

World Bank descriptors of national income and World Health Organisation (WHO) Healthcare system attainment and performance status were applied respectively.

Statistical Methodology

Direct comparisons of overall differences between March-June 2020 and February 2021 were performed using paired t-test. Further analyses of data were performed using Analysis of Covariance (ANCOVA) techniques, analysing the February 2021 data whilst including March-June 2020 data. The COVID designation of reporting site (Hot vs Cold; COVID "Hot" sites and those sites without a specific COVID designation yet accepting acute admissions via an Emergency Department (ED) versus COVID "Cold" Sites and those undesignated centres without an ED), Community SARS-CoV-2 incidence (on 1st Feb 2021) and World Bank Income status are also included as covariates.

P-values for the impact of income status are derived from these analyses.

Income Status of Counties with Responding Head & Neck Centres

List of countries from which responses were provided and corresponding World Bank Income Classification groupings and reported population level SARS-CoV-2 infection incidence at specific defined time points. Incidence above 25/100,000 highlighted

**Average community SARS-CoV-2 incidence March-June 2020*

Country	World Bank Country Income Group	COVID-19 Cases/100,000 population March-June 2020*	COVID-19 Cases/100,000 population 15th April 2020	COVID-19 Cases/100,000 population 1st Feb 2021
Argentina	upper middle	5.02	0.23	18.44
Australia	high	0.55	0.24	0.02
Belgium	high	4.00	12.5	20.5
Brazil	upper middle	9.99	0.82	33.7
Canada	high	1.88	3.43	11.15
Colombia	upper middle	6.57	0.3	20.56
Croatia	high	1.36	1.39	11.85
Egypt	lower middle	0.53	0.13	0.54
Ethiopia	low	0.25	0.004	0.53
France	high	2.67	17.8	31.77
Germany	high	1.59	3.66	12.95
Ghana	lower middle	0.77	0.15	2.6
Greece	high	0.54	0.42	7.52
Guatemala	upper middle	2.25	0.07	3.86
India	lower middle	1.45	0.07	0.91
Ireland	high	3.17	18.73	24.8
Israel	high	7.34	4.53	83.06
Italy	high	2.41	6.08	20.01
Libya	upper middle	1.10	0.06	10.68

Malaysia	upper middle	0.16	0.42	14.21
Mexico	upper middle	2.53	0.3	9.44
Morocco	lower middle	0.92	0.29	1.85
Nepal	lower middle	0.74	0.003	0.59
Netherlands	high	2.32	6.37	23.99
Nigeria	lower middle	0.14	0.01	0.64
Pakistan	lower middle	0.73	0.16	0.64
Poland	high	0.97	0.99	14.15
Portugal	high	3.09	6.93	109.26
Saudi Arabia	high	4.93	1.2	0.75
Serbia	upper middle	1.95	4.53	24.56
Spain	high	5.38	8.99	67.84
Sweden	high	4.54	4.92	27.84
Switzerland	high	2.65	5.04	18.56
Syrian Arab Republic (Syria)	low	0.09	0.01	0.31
Turkey	upper middle	1.74	5.28	8.58
Uganda	low	0.04	0.001	16.4
United Arab Emirates	high	3.86	3.9	35.39
United Kingdom	high	2.71	6.33	34.4
United States of America	high	9.89	8.97	42.74

Supplementary Table A

Influence of Population level COVID-19 Incidence on metrics of COVID-safe surgery

	Mar-Jun 2020 (3 month average)	**Feb 2021** (single day incidence 1/2/2021)		
	All Hospitals	**All Hospitals**	**Low COVID Incidence¥**	**High COVID Incidence¥**
% receiving pre-op COVID test*	76%	89%	82%	96%
% surgical procedures with PPE	68%	62%	55%	71%
% centres with routine staff testing†	14%	29%	15%	45%
Est. % of staff vaccinated§	N/A	71%	58%	85%

** within 72 hours of surgery*

† testing at least weekly

§ at least 1 dose of SARS-CoV-2 vaccine

¥Low COVID Incidence (≤25/100,000 population)

High COVID Incidence (>25/100,000 population)

Supplementary Table B

COVID-19 Testing & PPE use by individual hospital size and COVID designation.

	n= (%)	% using pre-op COVID-19 testing (range)*		% centres with routine staff testing†		% surgical procedures with PPE		Est. % of staff vaccinated§
		Mar-Jun 2020	Feb 2021	Mar-Jun 2020	Feb 2021	Mar-Jun 2020	Feb 2021	Feb 2021
Head & Neck Surgical Unit Size (new H&N cases per annum)								
<100 patients/yr	49 (28)	78	88	18	21	74	70	62
100-399 patients/yr	94 (53)	75	88	14	32	66	61	71
400-799 patients /yr	21 (12)	85	91	13	26	54	38	73
>800 patients /yr	12 (7)	68	91	18	30	65	75	86
COVID Designation of Hospital Services								
Designated COVID "Cold"	21 (12)	87%	88%	14%	18%	61%	55%	61%
Undesignated<u>without</u> Emergency Department	8 (5)	68%	89%	9%	23%	74%	53%	75%
Designated COVID "Hot"	87 (49)	78%	88%	19%	34%	62%	59%	74%
Undesignated<u>with</u> Emergency Department	60 (34)	73%	88%	13%	23%	75%	70%	65%
TOTAL	**176 (100)**	**77 (0-100)**	**88 (0-100)**	**15%**	**28%**	**68 (0-100)**	**62 (0-100)**	**70%**

** within 72 hours of surgery*

† testing at least weekly

§ at least 1 dose of SARS-CoV-2 vaccine

yr - year

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