Perioperative antibiotic practices amongst Otorhinolaryngologists (Ear, Nose & Throat Surgeons) in South Africa

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Abstract:

Background:
The primary goal of perioperative antibiotics is to reduce the rate of surgical site infections (SSI); however, in certain surgical procedures, the use of perioperative antibiotics has been shown to have no impact on the rate of SSI. Inappropriate use of antimicrobials not only comes at increased cost and risk of side effects to the patient, but also promotes antibiotic resistance. Antibiotic resistance is arguably one of the greatest current and future threats the health sector faces globally; accounting for approximately 700 000 deaths in 2016, which is projected to rise to 10 million by 2050. In otorhinolaryngology, multiple evidence-based guidelines have been developed to guide decision-making regarding antibiotic prophylaxis in ear, nose and throat (ENT), and head and neck surgery. This study aims to provide insight into the adherence of South African ENT surgeons to available evidence-based international guidelines.
Methods:
An electronic survey was sent to practising ENT Surgeons in South Africa. Surgeons were asked to indicate their personal antibiotic prescribing practise for general and subspecialty procedures.
Results: A total of 92 members of the South African ENT society completed the survey. Respondents indicated that they utilize the following resources to guide their decisions regarding perioperative antibiotic prescribing: anecdotal evidence 27 % (25/92), practices of the surgeon's postgraduate training unit 28% (26/92), published international guidelines 28% (26/92), recommendation of their local hospital's microbiologists 14% (13/92), attending anaesthetists discretion 0 % (0/92). Respondents indicated they take the following factors into consideration to guide decisions regarding perioperative antimicrobial use: 48% (35/92) duration of surgery, 85% (78/92) degree of contamination of the surgical field, 8% (7/92) patient's age, 8% (7/92) degree of blood loss, 22% (20/92) HIV status of patient, 32% (20/92) patient's access to hospital. 35% (32/92) of respondents indicated they audit their own rate of wound complications. For paediatric tonsillectomies, 35% (32/92) routinely prescribe perioperative antibiotics. For insertion of tympanostomy tubes, 50% (46/92) prescribe systemic perioperative antibiotics and 77 % (61/92) use ototopicals.
Conclusion: There is significant heterogeneity in the use of perioperative antibiotic prescribing practices and variable adherence to international consensus guidelines amongst ENT surgeons in South Africa. In light of the global increase in antibiotic resistance, this study highlights the need for increased awareness regarding the principles of antibiotic stewardship, pre-existing evidence-based guidelines and the need for a locally-generated South African Otorhinolaryngology consensus guideline that promotes safe and rational use of perioperative antibiotic prophylaxis.

Introduction:

The primary goal of perioperative antibiotic therapy is to reduce the rate of surgical site infections (SSI), defined as a local infection that occurs within 30 days of surgical incision or organ manipulation during surgery, or within a year of prosthetic implantation[1]. However, in certain surgical procedures the use of perioperative antibiotic therapy has been shown to have no impact on the rate of SSI. Irrational and inappropriate use of antimicrobials not only comes at increased cost and increased risk of side effects to the patient, but also promotes antimicrobial resistance (AMR). AMR is, arguably, one of the greatest current and future threats the health sector faces globally, accounting for approximately 700 000 deaths in 2016, projected to rise to 10 million by 2050 [2]. Further to the commonly quoted potential side effects of antibiotics (e.g., gastrointestinal, anaphylaxis, candidiasis), more recent associations with antibiotic overuse reported in the literature include increased risk of obesity, diabetes, inflammatory bowel disease and asthma [3-6].

The universally recognised philosophy of "antibiotic stewardship" should be considered prior to making any decisions regarding antimicrobials; the ethos of which is defined as 'the optimal selection, dosage, and duration of antimicrobial treatment that results in the best clinical outcome for the treatment or prevention of infection, with minimal toxicity to the patient and minimal impact on subsequent resistance'[7]. In otorhinolaryngology multiple evidence-based guidelines have been developed to help decision-making regarding antibiotic prophylaxis in ear, nose and throat (ENT), and head and neck surgery, that include those produced by the American Academy of Otolaryngology Head and Neck Surgery (AAO-HNS), the International Federation of Otorhinolaryngological Societies (IFOS)[3, 8], as well as multiple universal surgical guidelines [9-13]. The majority of these guidelines across surgical disciplines are based on variations of the World Health Organisation (WHO) classification of surgical wounds; which divides wounds into four groups, '*clean', 'clean-contaminated', 'contaminated'* and '*dirty or infected' [9]. 'Clean'* refers to an uninfected operative wound, in which no inflammation is encountered, and the respiratory, alimentary, genital, or uninfected urinary tracts are not entered. Generally, such procedures do not require antibiotic prophylaxis. '*Clean-contaminated'* refers to operative wounds in which the respiratory, alimentary, genital, or urinary tracts are entered under controlled conditions, and without unusual contamination or a major break in sterile technique. From an ENT surgical perspective, this theoretically includes operations involving the oral cavity, oropharynx, paranasal sinuses, middle ear, larynx, and hypopharynx. In '*clean-contaminated*' surgical procedures, a single dose of antibiotics, active against potential pathogens most likely to be encountered, is required within 60 minutes of the surgical incision. '*Contaminated'* refers to open, fresh, accidental wounds, as well as operations with major breaks in sterile technique, and incisions in which acute, non-purulent inflammation is encountered, including necrotic tissue without evidence of purulent drainage (e.g., dry gangrene). '*Dirty'* or '*infected'* includes old traumatic wounds with retained devitalized tissue, and those that involve existing clinical infection or perforated viscera, suggesting that the organisms causing postoperative infection were present in the operative field prior to the surgery. In '*contaminated'* or '*infected'* wounds, typically a course of therapeutic antibiotics is recommended rather than prophylaxis.

Despite the available guidelines, only a few international studies assessing adherence amongst ENT surgeons have been published. In 2015 *Tulio et al*, assessed the antibiotic practices

amongst 448 ENT surgeons in the United States, and revealed that 42% of respondents used antibiotics routinely for tonsillectomies[14]. A similar rate of 31% was reported in an Australasian study conducted in 2019 by *Ahmadzada et al*, amongst 137 ENT surgeons[15]. Both studies have higher than expected antibiotic uses for tonsillectomy, despite a 2008 Cochrane Review that revealed no evidence to support the routine use of antibiotics in tonsillectomy [16].

In South Africa and other developing nations, no studies have been conducted specifically assessing perioperative antibiotic practices amongst ENT surgeons. Furthermore, the developing world presents additional challenges when compared to developed world environments, where previous studies have been conducted, that include a higher rate of malnutrition, an increased burden of HIV and other infectious diseases, limited resources and poor access to health care and follow-up[17-19].

This study provides insight into the adherence of local ENT surgeons to available evidence-based international guidelines and may also provide further unique information within our South African context.

Methods:

The study was approved by the Human Research Ethics Committee of the University of Cape Town (HREC Reference 211/2020) and the ENT Society of South Africa. A prospective cross-sectional study of the current trends of perioperative antimicrobial prescribing amongst ENT surgeons in South Africa was performed via an online survey that was distributed by email to all Otorhinolaryngologists registered with the South African Society of Otorhinolaryngology Head and Neck Surgery. The survey was generated using Survey Monkey (Survey Monkey Inc. San Mateo, California, USA). The respondents were requested to indicate their antimicrobial practices in multiple commonly performed ENT procedures across all subspecialties. Participation was voluntary and respondents remained anonymous. The South African Society of Otorhinolaryngology Head and Neck Surgery's email database was used as it is the largest directory of ENT surgeons in South Africa to which the majority of both actively practicing and retired ENT surgeons in South Africa belong. Inclusion criteria, therefore, were all ENT surgeons that were members of the South African Society of Otorhinolaryngology Head and Neck Surgery who voluntarily responded to the email request to complete the electronic survey. Exclusion criteria were ENT surgeons who are not registered with the South African Society of Otorhinolaryngology Head and Neck Surgery.

Results:

The survey was sent to 364 ENT surgeons in South Africa, 92 responded (25,3% response rate). Table 1 illustrates the geographic and demographic profile of the respondents.
The majority of the respondents 57/92 (62%) practice exclusively in the private sector, 27/92 (29%) respondents work in the government sector, the remaining 8/92 (9%) work in both sectors.

Table 1: Demographic characteristics of respondents:

Characteristic	Respondents No.	%
A. Geographical distribution per province:		
Western Cape	39	42
Gauteng	24	26
KwaZulu-Natal	17	18
Free State	5	5
Eastern Cape	3	3
Northern Cape	2	2
North-West	1	1
Limpopo	1	1
Mpumalanga	0	0
B. Health Sector:		
Private sector	57	62
Government / state sector	27	29
Both sectors	8	9
C. Duration of practice post qualification		
< 5 years	15	16
5 – 15 years	26	28
15 – 30 years	30	33
> 30 years	21	23
D. Scope of practice or subspecialty interest		
General ENT	60	65
Otology / neurotology	15	16
Paediatric otolaryngology	20	22
Rhinology / anterior skull base	20	22
Head and neck	12	13
Facial plastics	3	3

Figure 1: Factors taken into account with perioperative antibiotic use

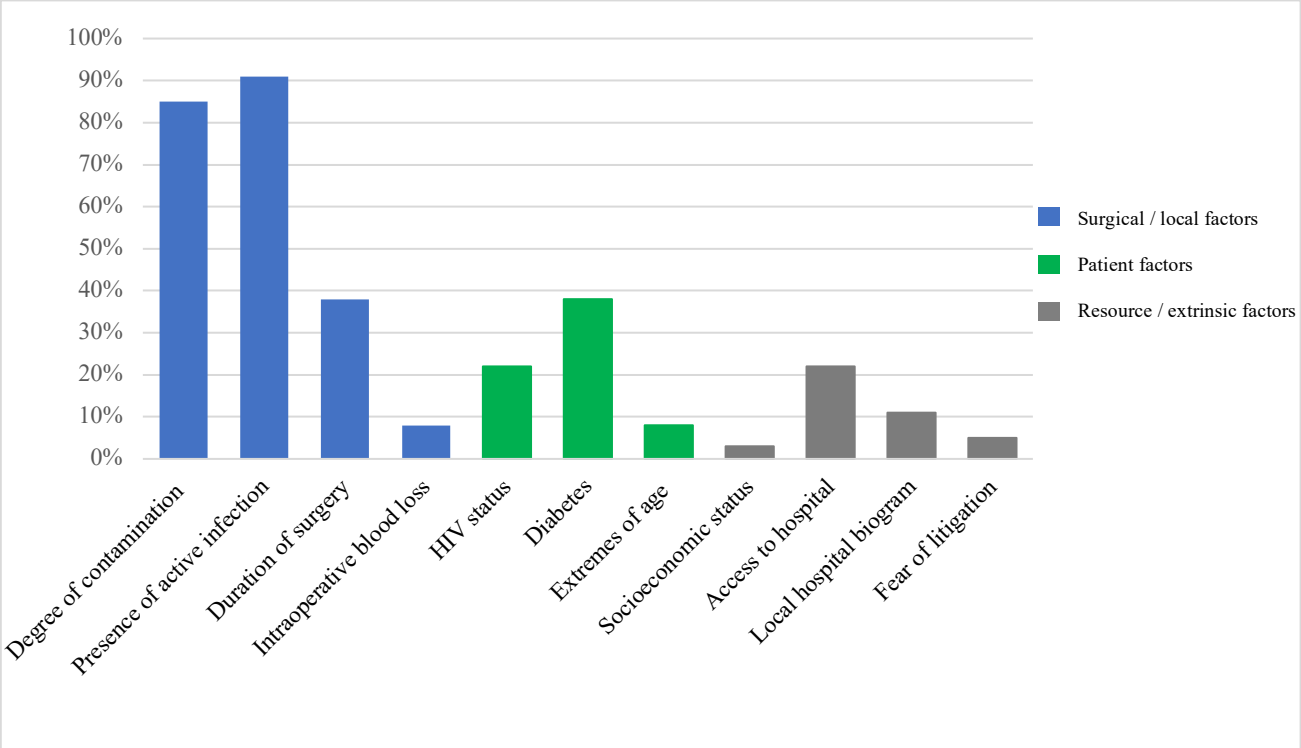

Figure 1. Illustrates the relative factors respondents indicated they took into consideration to guide decisions regarding perioperative antimicrobial use.

Respondents indicated that they utilised the following resources to guide their decisions regarding perioperative antibiotic prescribing: practices of surgeon's postgraduate training unit 26/92 (28%); published international guidelines 26/92 (28%); personal experience/anecdotal evidence 25/92 (27%); recommendation of the local hospital's microbiologists 13/92 (14%); attending anaesthetist's discretion 0 (0%). Respondents were able to choose a combination of multiple factors for this question.

Thirty-two (35%) respondents indicated that they audit their own rates of wound sepsis or wound complications. Of those who audited their rates of wound sepsis 23/57 (40%) worked in the private sector, and 7/27 (26%) in the state sector.

Figure 2: Prescribing practices for common ENT surgical procedures

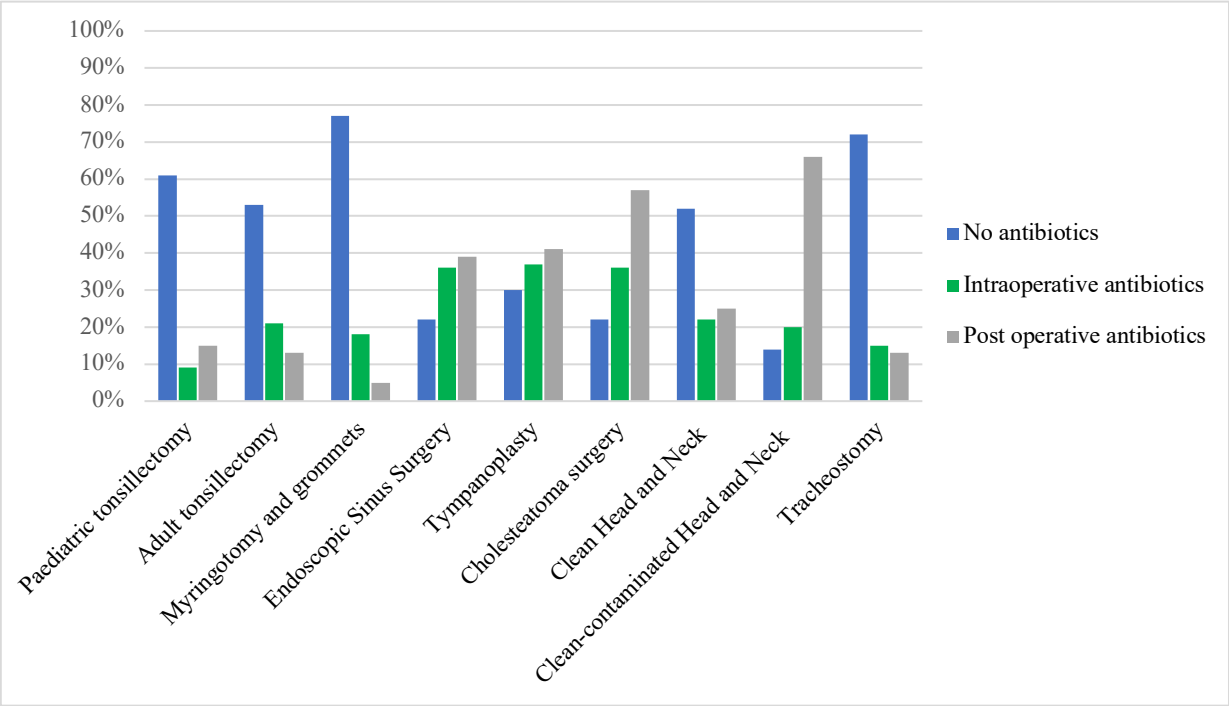

Figure 2. Illustration of respondents' prescribing practices for 8 common ENT procedures, specifically the relative percentage of respondents for each procedure who gave no antibiotics, intraoperative antibiotics only or postoperative antibiotics.

For elective paediatric tonsillectomy, 32/92 (35%) routinely prescribe perioperative antibiotics in all tonsillectomies, 56/92 (61%) do not prescribe any antibiotics, 4/92 (4%) prescribe only in tonsillectomies performed for recurrent tonsillitis. Of the 32/92 respondents who routinely prescribe antibiotics 21% prescribe a single dose at the time of induction, 9% prescribe for less than 48 hours postoperatively, 33% prescribe an extended course for more than 48 hours postoperatively, and 47% did not indicate. Most commonly prescribed antimicrobials included Co-amoxiclav (47%), Cefazolin (13%) and Azithromycin (6%).

In clean elective head and neck surgery (no breach of upper aerodigestive tract or active infection that includes thyroidectomy; parotidectomy; excision of thyroglossal duct cyst; neck dissection), 46/92 (52%) do not prescribe any antibiotics, 20/92 (22%) prescribe induction dose of antibiotics only, 15/92 (17%) prescribe antibiotics for more than 48 hours postoperatively, 7/92 (8%) prescribe for less than 48 hours postoperatively. Most commonly prescribed antibiotics included Cefazolin (31%) and Co-amoxiclav (45%).

For clean-contaminated elective head and neck surgery (breach of the upper aerodigestive tract that includes wide local excision of an oral cavity or oropharyngeal tumour; laryngectomy); 12/92 (14%) do not prescribe any antibiotics; 17/92 (20%) prescribe a single induction dose; 32/92 (39%) prescribe a prolonged course of antibiotics for more than 48 hours post operatively; 22/92 (27%) prescribe a short course for less than 48 hours postoperatively. Most commonly prescribed antibiotics included Cefazolin (22%); Co-amoxiclav (59%); Clindamycin (1,2%) and Azithromycin (1,2%).

Table 2: Mitigating factors for routinely prescribing perioperative antibiotics: Subgroup analysis in paediatric tonsillectomy:

	Yes no. (%)	No no. (%)
Duration of practice		
< 5 years	5 (33%)	10 (67%)
5-20 years	10 (27%)	24 (65%)
> 20 years	17 (42%)	22 (55%)
Health Sector		
Private	24 (42%)	30 (53%)
Government / State	4 (15%)	22 (81%)
Both	4 (50%)	4 (50%)
Declared subspecialty / special interest		
Paediatric	8 (40%)	12 (60%)
Other ENT subspecialties	28 (39%)	44 (61%)

Table 3: Summary comparing the use of antibiotics in common ENT procedures from our respondents with previously conducted surveys identified in the literature (results reflected in percentages)

				Tonsillectomy	Myringotomy +- Tympanostomy tubes	Endoscopic Sinus Surgery	Tympanoplasty	Mastoidectomy	Neck dissection	Laryngectomy
Study	**Geographical location**	**No.**	**Prescribed antibiotic therapy**							
White et al 2022	South Africa	92	-Perioperative	37	77 (ototopical) 18 (systemic)	75	56	53	58	85
			-None	57	14	22	43	22	52	14
Ahmadzada et al 2019 [7]	Australia & NZ	137	-Perioperative	30	49 (ototopical)	58	53	67	78	94
			-None	64	52	31	47	33	22	6
Valdez et al 2015 [6]	USA	442	-Perioperative	42	12 (not specified)	73	52	63	75	91
			-None	58	88	27	48	37	25	9
Al -Qahtani 2017 [20]	Saudi Arabia	139	-Perioperative	89	50 (not specified)	100	100	100	-	-
			-None	11	51	0	0	0	-	-
Chiesa-Estomba et al 2021 [21]	International	435	-Perioperative	-	-	-	-	-	61	92
			-None	-	-	-	-	-	39	8

Discussion:

Our survey is the first of its nature conducted within Africa and the developing world context, and where 85% of the world's population lives in low and middle-income countries (LMIC) [22]. As illustrated in Table 3, it is reassuring to note that our local prescribing practices are comparable, if not more in line with international guidelines than those of high income countries (HIC), as reflected in the studies from the United States, Australasia and Saudi Arabia[14, 15, 20] . Furthermore, the incidence of SSI has been shown to be higher in LMIC compared to HIC[23], posing additional strain on already struggling health economies. Notwithstanding current evidence that suggests that in clean elective surgery, SSI rates appear to be declining in HICs at 1-4%; concerningly, this decreasing trend has not been reflected in LMICs, remaining high at 8-30% [24], and is likely related to the social determinants of health that plague LMICs. The WHO identified that global antibiotic use increased by 39% from

2000-2015, reportedly fuelled by increasing use predominantly in LMICs[25]. Globally, it is projected that AMR will account for 10 million deaths per year and cost approximately 100 trillion US dollars per annum by 2050 [2] . Data on AMR patterns in the LMICs are limited but suggest alarmingly high rates of resistant isolates [26, 27], resulting in a potentially disproportionate burden of disease in already struggling health systems. Inappropriate antimicrobial prescribing to prevent SSI is fortunately one of the key areas identified in global strategies to reduce AMR.

Multiple evidence-based guidelines have been developed to guide decisions regarding antibiotic prophylaxis in ENT, Head and Neck surgery, including ENT specific guidelines such as those produced by the AAO-HNS and IFOS[3, 8], as well as universal surgical guidelines applicable across surgical disciplines [9-13]. Although evidence-based clinical guidelines are not practice mandates, they do aim to reduce variation and limit inappropriate deviations in medical care. Only 26/92 (28%) of our study's respondents based their prescribing practices on any form of local or international guidelines. While concerning, how does this compare to the other studies that assessed the use of clinical guidelines within ENT surgery communities? *Padia et al* performed a study to assess the impact of the AAO-HNS 2011 guidelines against routine antibiotic use in a case series of 15 950 paediatric tonsillectomies. Prior to the publication of the guideline, 27 of 74 (36%) surgeons routinely gave antibiotics, whilst post publication, this was reduced to 19 (26%) of surgeons[28]. While 67% of non-adherent surgeons remained non-adherent, whether surgeons were unaware of guidelines or just dismissed their recommendations, was not elicited. In contrast, *Milder et al* conducted a similar study in the United States between 2009-2012, finding a dramatic and sustained reduction of 86,5% ($p < 0.001$) in perioperative antibiotic use post publication of the AAO-HNS guidelines in 2011. Reassuringly, rates of postoperative visits and re-hospitalisation did not increase with the reduction in use of antimicrobials [29]. In a 2012 European survey of 440 Dutch ENT surgeons, a 45% average non-compliance with general ENT guidelines was found [30]. In 2015 *Valdez et al* found in their survey that the majority of ENT surgeons felt there was insufficient evidence to support the use of perioperative antibiotics for all the common otolaryngological surgeries, specifically with 67% of respondents feeling there was insufficient evidence to support or refute antibiotic use in tonsillectomy[14].

In a South African study by *Gason et al*, investigating antibiotic prescribing practices and adherence to guidelines in primary care centres in Cape Town, an overall guideline adherence rate of 45,1% was revealed. The main reasons for non-adherence cited included undocumented diagnosis (30,5%); antibiotic not indicated (21,6%); incorrect dose (12,9%); incorrect antibiotic (11,5%) and incorrect duration of therapy (9,5%) [31]. In 2020 *Schuster et al* prospectively assessed clinicians compliance with surgical antibiotic prophylaxis (SAP) guidelines in 192 surgical cases conducted at a tertiary academic hospital in Cape Town, South Africa. SAP was administered in 149 /192 cases, overall 156/192 cases should have received SAP as per guideline recommendations. Where SAP was administered the choice of antibiotic was correct in 121 (77,6%) of cases, the correct dosage was given in 110 (70,5%) of cases and the timing of antibiotics was appropriate in 87 (55,8%) of cases. With an absolute compliance of 80/180 (44,4%)[32]. In a systematic review of 76 studies, assessing barriers to clinicians' adherence to clinical practice guidelines in medicine, 7 categories of barriers were identified namely; barriers affecting physician knowledge (lack of awareness or lack of familiarity); attitudes (lack of agreement, lack of self-efficacy, lack of outcome expectancy, or the inertia of previous practice); or behaviour (external barriers including environmental and resource limitations)[33].

Several factors have been studied in the surgical literature to assess their impact on SSI rates, in an attempt to stratify risk and to guide decisions regarding the need and duration of antibiotic prophylaxis. Postulated factors with varying degrees of supporting evidence can be divided into 3 domains: surgical or wound related factors, patient related factors and resource dependent or extrinsic factors. Surgical factors include the presence of active infection, degree of wound contamination, breaks in surgical sterility, degree of intraoperative blood loss, requirement for blood transfusion, surgical duration, the use of implantable surgical prosthesis and microvascular free flap reconstruction. Patient-related factors include nutritional status, immunosuppression, tobacco use, alcohol use, adjuvant radio/chemotherapy, patient age, diabetes mellitus, anaemia and peripheral vascular disease [34, 35]. Resource-related or extrinsic factors include the patient's socioeconomic status, access to hospital, access to clean water, access to sterile theatre facilities and equipment, access to a microbiologist with data on the profile of the local hospital's microbiome and pathogens. Many of these factors are largely theoretical, each with varying degrees of supporting evidence, and there is no clear consensus on the particular significance each one of these factors carries. Figure 1 summarises the relative factors local respondents take into consideration when prescribing antibiotics perioperatively. Unique perhaps to our South African LMIC context was the consideration of the patient's retroviral status 20/92 (22%) and the patient's access to health care 20/92 (22%). The impact of HIV infection on surgical outcomes is controversial with variable outcomes reported in the literature. Consensus suggests that HIV-infected patients without AIDS-defining criteria have a similar surgical course and outcomes to non-infected patients [36]. However, patients with low CD4 counts (<50-200 cells/µl), high viral loads (>30 000 copies/ml), associated malnutrition and opportunistic infections may be at higher risk for postoperative complications including SSI [37-39]. Antibiotic prophylaxis purely on the basis of the HIV status of the patient is therefore not strongly indicated but should rather be considered in conjunction with other associated risk factors and biochemical markers of immunosuppression. The impact of access to health care is an interesting concern raised by respondents in our study, reportedly out of concern that should postoperative infection arise, patients may not have timeous access to appropriate wound care and antimicrobial therapy. Despite no studies directly assessing the impact of access to care, Tod et al. demonstrated a statistically significant increase in SSI rates with lower income levels ($P< 0.0001$ for trend). Reasons for this disparity remain speculative, but the authors suggest this may be related to level of education; access to healthcare and the extent of disease at the time of treatment [39]. A patient's socioeconomic status or lack of access to health care in isolation, can therefore not be a recommended indication to prescribe perioperative antibiotics. Perhaps an empiric course of antimicrobials in the event of the patient recognising signs and symptoms of SSI during the postoperative period, is a consideration, should there be potential challenges in access to a health care facility identified prior to discharge. The literature also supports an expanding role for telemedicine for surveillance of postoperative wounds and identification of SSI as an alternative where logistically feasible [40].

An interesting observation was that 5/92 (5,4%) respondents in our study, all who worked exclusively in the private sector, indicated that they were influenced by a concern of potential litigation by patients should SSI arise if an antibiotic was not prescribed perioperatively. This highlights an increasingly concerning phenomenon of defensive medicine; a practice in which, through perceived fears of potential litigation, clinicians adopt defensive behaviours which deviate from practice guidelines to mitigate the risk of litigation or to ensure a form of defence in the case of malpractice claims. This includes tendencies to over-prescribe medications and investigations. In an international survey conducted amongst specialists in infectious diseases and clinical microbiology, 21.2% (164/774) of respondents said they never worried about

medicolegal liability, 45.1% (349/774) sometimes worried and 28,6% (221/774) frequently worried when prescribing antibiotics. With the majority of the respondents 85% (525/618) acknowledging some defensive behaviour in antibiotic prescribing[41]. Practices of defensive medicine would likely be expected to potentially be higher in ENT surgery as it has been found to be more commonly practiced in surgical specialties and other specialties considered at high risk for malpractice liability[42].

In a systematic review and meta-analysis in 2018, *Patel et al* evaluated the role of perioperative antibiotic use in common ENT surgeries. It was concluded that level 1a evidence does not support the routine use of antibiotic prophylaxis for tonsillectomy; simple septorhinoplasty; endoscopic sinus surgery; clean otological surgery (tympanostomy tube insertion, tympanoplasty, stapedectomy, mastoidectomy) and clean head and neck surgery. However there were variable levels of evidence to support the routine use of antibiotic prophylaxis for complex septorhinoplasty, skull base surgery (anterior and lateral), clean-contaminated otologic surgery (cholesteatoma, purulent otorrhoea), and clean-contaminated head and neck surgery (violation of aerodigestive tract)[3].

Tonsillectomy is one of the most frequently performed surgeries globally, and the second most common paediatric surgery performed in the United States where more than 500 000 tonsillectomies are performed annually [43]. While our results indicate that at 57%, the majority of ENT surgeons in South Africa are compliant with established guidelines and do not prescribe antibiotics in tonsillectomies, 36,5% however, continue to routinely use antibiotics in tonsillectomies, despite no supporting evidence for its routine use, [16] in addition to AAO-HNS guidelines strongly recommending against their routine use[44] [45]. Furthermore, *Dihwaker et al* in the Cochrane systematic review reported that the use of antibiotics did not significantly reduce postoperative pain, nor did it have any impact on the rate of post tonsillectomy haemorrhage. Our local findings are comparable to similar surveys conducted in the United States and Australasia which revealed routine antibiotic prescription rates in tonsillectomy of 26-42%.[14, 15, 28].

If we compare the rate of antibiotic prescribing between the state and private sector using the prescription of antibiotics in tonsillectomy as an indirect surrogate marker, we find an appreciably higher rate of antibiotic prescribing in the private sector at 42% vs 15%. This is in line with prior studies which have raised concern regarding suboptimal compliance with evidence-based guidelines in the use of antimicrobials within the private sector. In a 2019 study conducted in a private hospital in South Africa, *Jacob et al* found that only 46,2% of empiric antibiotics prescribed were appropriate for drug choice, dose, and duration. Of the antimicrobials prescribed for surgical prophylaxis only 39,5% were deemed appropriate[46]. *Van der Sandt et al* retrospectively compared surgical antibiotic prophylaxis (SAP) use for common paediatric procedures between a state academic hospital and a private hospital, finding the overall use of SAP at 32,3% vs 47,3% respectively [47]. The discrepancy in prescribing practices is of further concern as previous local and international studies have demonstrated exponentially higher tonsillectomy rates in the private sector. *Crowson et al*, through an international database analysis, including 31 countries, found a tonsillectomy rate of 159,1 in the private sector vs 131,1 per 100 000 citizens (p=0,002) in the state sector [48]. *Douglas Jones et al* reported an alarmingly high tonsillectomy rate in the South African private healthcare sector at 1888/100 000 citizens which is more than double the highest national tonsillectomy rate in the literature[49]. The authors attribute this high rate to differences in training and clinical practice of clinicians, as well as social and family factors.

In our study the rate of antibiotic use in tonsillectomy was found to be appreciably higher amongst ENT surgeons who had been in practice for more than 20 years at 42%, vs 30% (see Table 2). These findings are consistent with prior literature revealing a higher compliance rate with international guidelines amongst younger, less experienced health professionals [30, 33]. Our study showed similar compliance rates to tonsillectomy guidelines between ENT specialists with a subspecialty interest in paediatrics when compared to those with no declared subspecialty interest at 8 (40%) vs 28 (39%) respectively.

In 2019, the South African ENT private sector was shown to have one of the highest global tympanostomy tube (grommet) insertion rates. The authors also raised concern regarding the compliance of local ENT surgeons to recognise international best practice guidelines for recurrent acute otitis media and otitis media with effusion[50]. Reassuringly, local compliance with perioperative guidelines on antimicrobial use in tympanostomy tube insertion is relatively high, with only 8/92 (8,7%) of respondents routinely using systemic antibiotics perioperatively, 6 of which were from the private sector. Antimicrobial use in myringotomy and tympanostomy tubes is unique in that antibiotics can be administered both systemically or locally as ototopical preparations. 71/92 (77%) of our respondents indicated that they routinely use ototopical preparations perioperatively for tympanostomy tube insertion. In the recent 2022 clinical practice guideline, the AAO-HNS strongly recommends against the routine use of systemic perioperative antibiotics and postoperative ear drops after tympanostomy tube placement[51]. The AAO-HNS does however acknowledge that antibiotic drops may potentially be beneficial in patients with recurrent acute otitis media or in patients at high risk for postoperative tympanostomy tube otorrhoea.

In summary multiple studies have explored the role of perioperative antimicrobials in head and neck surgery. Current guidelines based on systematic reviews and multiple RCTs advise that in the absence of other confounding factors, no perioperative antibiotics are required in clean head and neck procedures, whilst antibiotics are recommended for clean-contaminated procedures (a breach of the aerodigestive tract) [3, 8, 10, 52, 53], however duration of antibiotics for clean-contaminated procedures was not standardised. *Villa et al* reported no difference in SSI rates between systemic antibiotic prophylaxis given for 1 vs 5 days[52]. Our survey illustrated a comparatively high rate of compliance with evidence-based guidelines in head and neck, with 46 (52%) respondents not prescribing antibiotics for clean head and neck procedures. This compared favourably to previous international surveys, at 22-39%[14, 15, 20, 21]. For clean-contaminated head and neck procedures, 85% of respondents routinely prescribed perioperative antibiotics compared to 91-94% internationally[14, 15, 21]. Of the respondents, 12/92 declared a subspecialty interest in head and neck surgery. There was a 100% compliance rate with guideline recommendation for clean-contaminated procedures from these respondents.

A response rate of 25,3%, although low, compared favourably to prior international surveys 7-29% [14, 15, 20]. We acknowledge the inherent limitation of response bias associated with a survey-based study design, including the self-reporting nature of the study. The electronic survey format introduces selection bias. The authors acknowledge that not all surgeons may have email or computer access. Notwithstanding, the use of the electronic format was invaluable for ease of distribution, response time, data collection, delivery of reminders, maintenance of confidentiality and ultimately working within the constraints of a COVID-19 pandemic where annual in person congresses, were suspended. Perhaps our response rate may have been improved through additional distribution of the survey telephonically, physically via

the postal service, or by obtaining a list of ENT surgeons who are members of the Colleges of Otorhinolaryngologists of South Africa. Our study was distributed only to members of the South African Society of Otorhinolaryngology Head and Neck Surgery, we therefore acknowledge that not all practicing ENT surgeons in South Africa are members and therefore may limit the generalizability of our results. However, the survey link was sent to ENT-related WhatsApp groups that would have included these outliers. We further recognise that not all the respondent surgeons routinely performed the listed procedures, however respondents were given the option to opt out of questions, where deemed inappropriate to their personal practice.

Conclusion:

There is significant heterogeneity in the use of perioperative antibiotics prescribing practices and variable adherence to international consensus guidelines amongst ENT surgeons in South Africa. Considering the global increase in antibiotic resistance, this study highlights the need for increased awareness regarding the principles of antibiotic stewardship, pre-existing evidence-based guidelines and the need for a locally generated South African Otorhinolaryngology consensus guideline that promotes safe and rational use of perioperative antibiotic prophylaxis.

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Addendum 1: Original ethics approval

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room G50 -G Floor
Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 650 1236
Email: hrec-enquiries@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

17 July 2020

HREC REF: 211/2020

Dr Shazia Peer
Division of Otorhinolaryngology
H-53, Old Main Building
Groote Schuur Hospital
Anzio Road
Observatory
Email: Shazia.peer@uct.ac.za
Student Email: matthewwhite86@yahoo.com

Dear Dr Shazia Peer

PROJECT TITLE: PERIOPERATIVE ANTIBIOTIC PRACTICES AMONGST OTORHINOLARYNGOLOGISTS (EAR, NOSE & THROAT SURGEONS) IN SOUTH AFRICA (MMeD Candidate-Dr MATTHEW WHITE)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study subject to:

- Adding our HREC Contact Details to the Informed Consent Form.

This approval is subject to strict adherence to the HREC recommendations regarding research involving human participants during COVID-19, dated 17 March 2020.

Approval is granted for one year until the 30 July 2021.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

The HREC acknowledge that the following student Mr Matthew White will also be involved in this study.

Please also note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please quote the HREC REF in all your correspondence.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE
Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938
This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Convention on Harmonisation Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2006), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines.
The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

HREC REF 211/2020 SC

Addendum 2: Extension of ethics approval

UNIVERSITY OF CAPE TOWN

HUMAN RESEARCH ETHICS COMMITTEE
20 MAY 2021
HEALTH SCIENCES FACULTY

FACULTY OF HEALTH SCIENCES
Human Research Ethics Committee

FHS016: Annual Progress Report / Renewal

HREC office use only (FWA00001637; IRB00001938)			
This serves as notification of annual approval, including any documentation described below.			
☑ Approved	Annual progress report	Approved until/next renewal date	30.5.2022
☐ Not approved	See attached comments		
Signature Chairperson of the HREC/ Designee		Date Signed	21/5/21

Note: Please note that incomplete submissions will not be reviewed.
Please email this form and supporting documents (if applicable) in a combined pdf-file to hrec-enquiries@uct.ac.za.
Please clarify your plan for research-related activities during COVID-19 lockdown

Comments to PI from the HREC

Principal Investigator to complete the following:

1. Protocol information

Date (when submitting this form)	19th May 2021		
HREC REF Number	211/2020	Current Ethics Approval was granted until	31st July 2021
Protocol title	**Perioperative Antibiotic Practices Amongst Otorhinolaryngologists (Ear, Nose & Throat Surgeons) In South Africa. (MMed Candidate-Dr Matthew White)**		
Protocol number (if applicable)			
Are there any sub-studies linked to this study?	☐ Yes X No		
If yes, could you please provide the HREC Ref's for all sub-studies? **Note:** A separate FHS016 must be submitted for each sub-study.			
Principal Investigator	A/Prof Shazia Peer		
Department / Office Internal Mail Address	Shazia.Peer@uct.ac.za		

1.1 Does this protocol receive US Federal funding?	☐ Yes	X No

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

Addendum 3: Original Survey

Perioperative antibiotic practices amongst Otorhinolaryngologists (Ear, Nose & Throat Surgeons) in South Africa

Investigators: Dr M White, Dr S Peer, Dr J McGuire.
Department of Otolaryngology UCT

Dear Colleague,

You are invited to participate in the above study assessing perioperative antibiotic practices amongst ENT surgeons in South Africa. It is an online survey (SurveyMonkey Inc. San Mateo, California, USA). Participation in the survey is voluntary, your identity and responses will remain confidential and be protected on a password-controlled computer which only the primary investigators have access to.

The study is an assessment of perioperative antibiotic prescribing practices amongst ENT surgeons in South Africa. We would greatly appreciate your participation and opinion regarding perioperative antibiotics. Using your insight we aim to generate a locally relevant South African guideline for antimicrobial use in ENT surgery.

The survey has 29 short questions and takes 10 minutes to complete. Your participation or lack of participation in the study will not impact your relationship with the investigators or the University of Cape Town. In the event that the data generated is used as part of a publication, the participants' details will remain confidential. Results from this study will be used in conjunction with current evidence to guide practices and hopefully establish future protocols in ENT surgery in South Africa.

Should you have any questions regarding the research, please contact any of the investigators below:

Dr Matthew White (matthewwhite86@yahoo.com)

Dr Shazia Peer (shazia.peer@uct.ac.za)
Dr Jessica McGuire (jkmcguire2@gmail.com)

By clicking the 'OK' button, you hereby certify that you have read the above information and understand the nature and implications of the study, and give consent to participate in the study. You also give permission for the use of data generated through your participation in the above study.

OK

1. ***In which sector do you practice the majority of your ENT?***

- State/Government Sector
- Private Sector
- Equal time spent practicing in both state and private sectors

2. In which province do you practice the majority of your ENT?

- Western Cape
- Gauteng
- Eastern Cape
- Free State
- KwaZulu-Natal
- Limpopo
- Mpumalanga
- North West
- Northern Cape

3. How long have you been working in ENT (as a trainee or specialist)?

- < 5 years
- 5-10 years
- 10-15 years
- 15-20 years
- 20-30 years
- >30 years

4. Which of the following best describes your current practice or field of interest? (multiple fields can be selected)

- Registrar/Resident/medical officer
- General otolaryngology
- Otology/neurotology
- Paediatric otolaryngology
- Rhinology and skull base surgery
- Head and Neck
- Facial Plastics

5. Please indicate which of the following factors you take into account when prescribing peri-operative antibiotics (multiple factors can be indicated)?

- Duration of surgery
- Surgical blood loss
- Degree of contamination of the surgical field
- Presence of active infection in the surgical field
- HIV status of the patient
- Diabetes
- Extremes of age <5y/o, >70 y/
- Pressure from the patient (i.e. fear of potential litigation if a post-operative wound sepsis were to occur)
- Socioeconomic status of the patient
- Patient's access to the hospital/ability to follow up in the event of a complication
- Local hospital biogram

6. Which of the following sources do you base your decisions on with regards to peri-operative antibiotic prescribing?

- Personal/anecdotal experience
- The practises of your post graduate training unit
- International guidelines, i.e AAOHNS, IFOS, NICE guidelines
- At your attending anaesthetist's discretion
- Your hospital's microbiologist or infectious diseases unit's guidance/recommendation
- Other (please specify)

7. Do you, or the unit you work in, audit your rate of wound complications and post-operative sepsis?

- Yes
- No

8. Regarding peri-operative antibiotic prescribing in elective paediatric tonsillectomy (<13 years old), which of the following best describes your practice?

- I prescribe antibiotics in all tonsillectomies
- I don't prescribe any antibiotics prior to, during or after tonsillectomy
- I prescribe antibiotics only in tonsillectomies for recurrent tonsillitis
- I prescribe antibiotics only in tonsillectomies for sleep disordered breathing/obstructive sleep apnoea

9. If you prescribe antibiotics for paediatric tonsillectomy which of the following best describes your practice?

- Single induction dose only at the time of anaesthetic
- Short course antibiotics, i.e. systemic (oral or intravenous) for less than 48 hours post operatively
- Extended course of antibiotics, i.e. systemic antibiotics for more than 48 hours post operatively
- Other (please specify)

10. If you prescribe antibiotic prophylaxis in paediatric tonsillectomy, which of the following best describes your antibiotic of choice, presuming no underlying history of drug allergy exist?

- Cefazollin (Kefzol)
- Co-Amoxiclav (Augmentin)
- Azithromycin (Zithromax)
- Clindamycin
- Ciprofloxacin (Ciprobay)
- Other (please specify)

11. Regarding antibiotic prescribing in adult tonsillectomy (>13 years old), which of the following best describes your practice?

- I routinely prescribe antibiotics in all tonsillectomies
- I don't prescribe any antibiotics prior to, during or after tonsillectomy
- I prescribe antibiotics only in tonsillectomies for recurrent tonsillitis
- I prescribe antibiotics only in tonsillectomies for sleep disordered breathing/obstructive sleep apnoea

12. If you prescribe antibiotics for adult tonsillectomy which of the following best describes your practice?

- Single induction dose only at the time of anaesthetic

- Short course of antibiotics, i.e. systemic (oral or intravenous) for less than 48 hours post operatively
- Extended course of antibiotics, i.e. systemic antibiotics for more than 48 hours post
- Other (please specify)

13. If you prescribe antibiotic prophylaxis in adult tonsillectomy, which of the following best describes your antibiotic of choice, presuming no underlying history of drug allergy exists?

- Cefazolin (Kefzol)
- Co-amoxiclav (Augmentin)
- Azithromycin (Zithromax)
- Clindamycin
- Ciprofloxacin (Ciprobay)
- Other (please specify)

14. Regarding antibiotic prescribing in paediatric grommets (<13 years old), which of the following best describes your practice?

- I prescribe antibiotics in all grommet surgeries
- I don't prescribe any antibiotics prior to, during or after grommet surgery
- I prescribe antibiotics in grommet surgery only in the presence of a purulent middle ear effusion
- I prescribe antibiotics only in grommet surgery if done in combination with an adenoidectomy or a tonsillectomy

15. If you prescribe antibiotic prophylaxis in paediatric grommets, which best describes your practice?

- Single induction dose of antibiotics at the time of anaesthetic
- Extended duration, beyond 24 hours of systemic oral or intravenous antibiotics
- Topical antibiotics only, i.e. ciprofloxacin based ototopical or equivalent
- Both ototopical antibiotics and systemic antibiotics post operatively

16. Regarding peri-operative antibiotic prescribing in elective Functional Endoscopic Sinus Surgery for chronic rhinosinusitis (including ethmoidectomy and/or maxillary antrostomy and/or frontal sinusotomy and/or sphenoidotomy), which best describes your practice?

- Single induction dose only at the time of anaesthetic
- Short course antibiotics, i.e. systemic (oral or intravenous) for less than 48 hours post operatively
- Extended course antibiotics, i.e. systemic antibiotics for more than 48 hours post operatively
- I do not prescribe antibiotics routinely in FESS for chronic rhino sinusitis
- Other (please specify)

17. If you prescribe prophylactic antibiotics in Functional Endoscopic Sinus Surgery for chronic rhinosinusitis (including ethmoidectomy and/or maxillary antrostomy and/or frontal sinusotomy and/or sphenoidotomy), which of the following best describes your antibiotic of choice, presuming no underlying history of drug allergy exists?

- Cefazolin (Kefzol)
- Co-amoxiclav (Augmentin)
- Azithromycin (Zithromax)
- Clindamycin
- Ciprofloxacin (Ciprobay)
- Ceftazidime (Tazicef)
- Other (please specify)

18. Regarding antibiotic prescribing in elective tympanoplasty/myringoplasty (for chronic otitis media active or inactive) which best describes your practice?

- I do not routinely prescribe antibiotics peri-operatively in tympanoplasty/myringoplasty surgery
- I prescribe antibiotics in all tympanoplasty/myringoplasty surgery
- I prescribe antibiotics in active chronic otitis media only (i.e. active ottorhoea/wet ear)
- I prescribe antibiotics only if done in conjunction with ossiculoplasty

19. If you prescribe antibiotic prophylaxis in elective tympanoplasty/myringoplasty surgery (for chronic otitis media active or inactive), which best describes your practice?

- Single induction dose only at the time of anaesthetic
- Short course antibiotics, i.e. systemic (oral or intravenous) for less than 48 hours post operatively

- Extended course of antibiotics, i.e. systemic antibiotics for more than 48 hours
- Other (please specify)

20. If you prescribe antibiotic prophylaxis in tympanoplasty/myringoplasty surgery, which of the following best describes your antibiotic of choice, presuming no underlying history of drug allergy exists?

- Cefazolin (Kefzol)
- Co-amoxiclav (Augmentin)
- Azithromycin (Zithromax)
- Clindamycin
- Ciprofloxacin (Ciprobay)
- Ceftazidime (Tazicef)
- Other (please specify)

21. Regarding antibiotic prescribing in elective cholesteatoma surgery which best describes your practice?

- I do not routinely prescribe antibiotics perioperatively in cholesteatoma surgery
- I prescribe antibiotics in all cholesteatoma surgery
- I prescribe antibiotics only if done via a retro auricular approach
- I prescribe antibiotics only if purulent ottorhea is present at time of surgery

22. If you prescribe antibiotics in elective cholesteatoma surgery, which best describes your practice?

- Single induction dose only
- Short course antibiotics, i.e. systemic (oral or intravenous) for less than 48 hours post operatively
- Extended course therapeutic antibiotics, i.e. systemic antibiotics for more than 48 hours post operatively
- Other (please specify)

23. If you prescribe antibiotic prophylaxis in cholesteatoma surgery, which of the following best describes your antibiotic of choice, presuming no underlying history of drug allergy exists?

- Cefazolin (Kefzol)
- Co-amoxiclav (Augmentin)

- Azithromycin (Zithromax)
- Clindamycin
- Ciprofloxacin (Ciprobay)
- Ceftazidime (Tazicef)

24. Regarding antibiotic prescribing in clean elective Head and Neck surgery (no breach of upper aerodigestive tract or active infection, i.e. neck dissection only, parotidectomy, excision of submandibular gland, lymph node excision biopsy, excision thyroglossal duct cyst), which best describes your practice?

- I do not routinely prescribe antibiotics perioperatively
- I prescribe single dose antibiotics at the time of induction only
- I prescribe short course antibiotics, for less than 24 hours post operatively
- I prescribe an extended course of antibiotics for >48 hours post operatively

25. If you prescribe antibiotic prophylaxis in elective clean Head and Neck surgery, which of the following best describes your antibiotic of choice, presuming no underlying history of drug allergy exists?

- Cefazolin (Kefzol)
- Co-amoxiclav (Augmentin)
- Azithromycin (Zithromax)
- Clindamycin
- Ciprofloxacin (Ciprobay)
- Other (please specify)

26. Regarding antibiotic prescribing in clean-contaminated elective Head and Neck surgery (breach of the upper aerodigestive tract, i.e. wide local excision of an oral cavity or oropharyngeal tumour, laryngectomy etc.), which best describes your practice?

- I do not routinely prescribe antibiotics perioperatively
- I prescribe a single dose of antibiotics at the time of induction only
- I prescribe short course antibiotics, for less than 24 hours post operatively
- I prescribe an extended course of antibiotics for >48 hours post operatively

27. If you prescribe antibiotic prophylaxis in clean-contaminated elective head and neck surgery, which of the following best describes your antibiotic of choice, presuming no underlying history of drug allergy exists?

- Cefazolin (Kefzol)
- Co-amoxiclav (Augmentin)
- Azithromycin (Zithromax)
- Clindamycin
- Ciprofloxacin (Ciprobay)
- Other (please specify)

28. Regarding antibiotic prescribing in elective tracheostomy surgery, which best describes your practice?

- I do not routinely prescribe antibiotics perioperatively
- I prescribe a single dose of antibiotics at the time of induction only
- I prescribe short course antibiotics, for less than 24 hours post operatively
- I prescribe an extended course of antibiotics for >48 hours post operatively

29. If you prescribe antibiotic prophylaxis in elective tracheostomy surgery, which of the following best describes your antibiotic of choice, presuming no underlying history of drug allergy exists?

- Cefazolin (Kefzol)
- Co-amoxiclav (Augmentin)
- Azithromycin (Zithromax)
- Clindamycin
- Ciprofloxacin (Ciprobay)
- Other (please specify)