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Dentists' knowledge and experiences of treating patients with Head and Neck Cancer

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Abstract

Background: In Australasia, Head and Neck Cancer (HNC) is more common and survivable than ever before. Most patients have some teeth and are at high caries risk. Most will seek dental care from private-sector general dentists. Little is known about general dentists' capacity to treat these complex patients.

Methods: An emailed survey of 800 New Zealand general dentists was undertaken. Qualitative data were also collected.

Results: A total of 156 questionnaires were completed (20.4% response rate). Most respondents (73.4%), felt that providing dental treatment for HNC patients fell within their scope of practice, but few had recent experience.

General dentists were found to have sufficient knowledge, in practice if not in theory. HNC patient flow over the preceding year, being aged 50 to 59 years, and having 30 to 39 years of clinical experience were associated with superior knowledge.

Few clinicians reported confidence treating HNC patients. Willingness to provide treatment and clinical experience over the last year was associated with the invasiveness of the dentistry. New Zealand graduates scored better than their overseas-trained counterparts in knowledge, attitudes and behaviour domains.

Conclusion: Dentists have acceptable knowledge about HNC, but they are not able to confidently translate this into clinical practice.

Abbreviations and acronyms: DCNZ= Dental Council of New Zealand; HNC= Head and Neck Cancer; SWCN= Sydney West Cancer Network; WSLHD= Western Sydney Local Health District.

Introduction

Head and Neck Cancer (HNC) is a broad term used to define the cancers of the oral cavity [tongue, floor of the mouth, gums, palate (Horowitz *et al.*, 2000)], the pharynx (oro-, naso- and hypopharynx) and larynx (including hypopharynx) (US National Cancer Institute, 2018a; b). It is typically treated with complex and costly multi-modality regimens combining chemotherapy, surgery, radiotherapy and, more recently, immunotherapy.

HNC diagnoses represent around 2.5% of all new cancer diagnoses (Cancer Australia, 2020; National Head and Neck Cancer Tumour Standards Working Group, 2014). Between 2000 and 2010, there were 1916 new cases of HNC recorded in New Zealand (Gavidi *et*

al., 2014). In Australia, the number of annual diagnoses increased from 2475 in 1982 to 4633 in 2015 (Cancer Australia, 2020).

HNC has also become more survivable. Between 1987–1991 and 2012–2016, five-year relative survival for HNC improved from 62% to 71% in Australia (Cancer Australia, 2020). This equates to almost 17,000 people living with HNC in the Australian general population at the end of 2015 (those people diagnosed in the 5 year period 2011–2015) (Cancer Australia, 2020).

The Australian Institute of Health and Welfare (AIHW) and the New Zealand Ministry of Health have reported that most adults in the population today have some natural teeth (Chrisopoulos, 2016; New Zealand Ministry of Health, 2010). In addition, the substantial oral health burden that HNC survivors face as a direct result of cancer treatment is well-established in the evidence base (Andrews & Griffiths, 2001; Barry, 2005; Beech *et al.*, 2014; Epstein *et al.*, 2014; Fattore *et al.*, 1988; Hancock *et al.*, 2003; Huber & Terezhalmay, 2003; McCaul, 2012; Murdoch-Kinch & Zwetchkenbaum, 2011; Noone & Barclay, 2017; Ray-Chaudhuri *et al.*, 2013; Spect, 2002; Sroussi *et al.*, 2017). It follows that most HNC survivors will be at least partially dentate and will require access to routine general dental care for stabilisation, maintenance and rehabilitation of their dentition into the future.

Little is known about the capacity of the general dental workforce to manage these patients appropriately however. Anecdotally, patients report that they find it difficult to access basic dental care, which may be why they tend to delay presentation until dental disease is widespread and severe.

There have been some studies of general dental practitioners' knowledge, attitudes and practice with regard to providing dental treatment for patients with a history of HNC, but none is recent or has been undertaken in Australasia. Indeed, the evidence-base on this topic has almost completely concentrated on assessing dentists' knowledge and behaviours relating to screening for and diagnosing HNC, rather than evaluating how well the profession is able to support the survivors of HNC (Borhan-Mojabi *et al.*, 2012; Hertrampf *et al.*, 2011; Horowitz *et al.*, 2000). These studies have generally reported an inadequate level of knowledge and practice among general dentists in respect of HNC screening and identification (Borhan-Mojabi *et al.*, 2012; Hertrampf *et al.*, 2011; Horowitz *et al.*, 2000). To date, the Australasian situation remains unclear.

Accordingly, the aim of this study was to investigate and evaluate the knowledge, attitudes and behaviour of general dentists in respect of providing dental treatment for HNC patients.

Materials and Methods

Ethical approval was obtained from the WSLHD Human Research Ethics Committee and the University of Otago Human Ethics Committee. A self-administered web-based survey was developed with several general dentists who were identified by the investigator as having substantial experience in providing dental care for HNC patients. The survey was created using Qualtrics software. Data were collected in the 4 domains of participant demographic characteristics (8 items), knowledge (2 items), attitude (1 item) and practice (4 items). Most questions were multiple choice (some permitting multiple answers and some permitting free text). One of the two knowledge items consisted of 5 sub-questions and the attitude question had 9 sub-questions, both of which used a Likert scale.

The draft survey was pre-tested on a convenience sample of 10 general dentists employed by WSLHD in Sydney, Australia. It was then modified according to their feedback. A semi-structured qualitative interview was developed to aid in interpretation of the survey data.

Using the random selection procedure in SPSS, eight hundred randomly sampled general dentists from the Dental Council of New Zealand (DCNZ) Register (sampling frame) were invited into the survey on 27th September 2018, via email. This invitation was sent to the email account address provided to DCNZ on annual registration, and was distributed via Qualtrics software. The email invitation contained summarised information on the purpose of the study and the importance (and the likely burden) of participation. It contained a hyperlink to the study. An email reminder was distributed to all invitees who had failed to participate after one week, and again after two weeks, in order to bolster participation. Participation in this study was voluntary and a completed survey implied informed consent. All responses were anonymous (the investigator was blinded to the participant identities). Dental students, Dental Specialists, Oral Health Therapists, Hygienists, Dental Therapists and Dental Prosthetists were excluded from participation in the survey because the focus of the study was specifically on general dentists.

After survey completion and data analysis, the findings were discussed with 4 key informants to identify where and to what extent they aligned with, or differed from, expectations based on the experience of these clinicians (qualitative interview; data triangulation). These clinicians, who had a cumulative total of 83 years' experience working with the Sydney West Cancer Network (SWCN) Head and Neck Cancer Clinic, were purposively invited to take part based on their extensive experience providing dental treatment for patients with HNC; they were not part of the sample. Deductive thematic content data analysis was used.

The absence of published studies from Australasia meant that the required sample size was estimated

using data from a similar study which had reported on knowledge levels among Iranian dentists in 2014. In that study, 51% of participants were male (Akbari *et al*, 2015). The mean knowledge score for all dentists in this study was 72%, when knowledge score was converted from mean score to percentage of all questions answered correctly (Akbari *et al*, 2015). The calculation was made using G*Power software to provide 80% power at an alpha of 0.05 (95% confidence interval). A total sample size of 788 dentists was required. This was rounded up to 800.

Data were exported from Qualtrics to SPSS Version 25. An overall knowledge score was computed for each person based on their responses to the 15 knowledge items. Following the computation of summary statistics, differences in proportions were elucidated using cross-tabulations and chi-square statistics (with $P < 0.05$). Differences in means were examined using analysis of variance. Qualitative data were analysed thematically.

Results

The initial invitation yielded a 7.3% response rate after one week. A further invitation was emailed to non-responders and, two weeks after the initial invitation, participation had increased to 19.4%. A third invitation was emailed one week later to those who had failed to respond to the previous two invitations, and this further bolstered the participation rate to 20.4%.

Table 1 shows respondent characteristics, by sex. Roughly equal numbers of male and female dentists participated in this study. Female participants were, on average, over a decade younger than male participants, with less variability in their age distribution. Overall, most participants were aged 35 to 49 years, indicating around 15 years of clinical experience. One in seven of all survey participants reported that they had experience working in the public dental sector.

Table 2 presents overall knowledge score data. Figure 1 presents the knowledge questions asked. Mean knowledge was strongly associated with the volume of HNC patients that respondents reported seeing in practice over the previous year. There was a consistent gradient, whereby those who had seen more patients had higher knowledge scores. Participants aged 50-59 years had higher knowledge scores than those in the other age groups. Participants who had been in practice for 30-39 years had the highest mean knowledge score, while those who had been in practice for longest had lower-than-average knowledge scores.

Most participants felt that providing basic dental treatment for HNC patients fell within their scope of practice as general dentists, although self-perceived confidence was lacking. New Zealand trained dentists and dentists who saw greater numbers of HNC patients in the prior year were more likely to trust their own advice. New Zealand graduates were also less likely to refer a HNC patient to a specialist for dental management.

One quarter of all dentists reported that they had not seen a single HNC patient in practice over the last year. Less than one in twenty clinicians had seen 20 or more HNC patients over this same period. HNC patient flow was associated with New Zealand dental

Table 1. Age group and practising characteristics by sex (brackets contain column percentages unless otherwise indicated).

	Sex		Total
	Male ^a	Female ^a	
Mean age (SD)	52.0 (13.7)	41.5 (11.6) ^b	46.8 (13.7)
Age group (years)			
<35	12 (32.4)	25 (67.6) ^b	37 (24.0)
35-49	17 (35.4)	31 (64.6)	48 (31.2)
50-59	24 (61.5)	15 (38.5)	39 (25.3)
60+	25 (83.3)	5 (16.7)	30 (19.5)
NZ-trained			
No	24 (47.1)	27 (52.9)	51 (33.1)
Yes	54 (52.4)	49 (47.6)	103 (66.9)
Any public practice experience ^c			
No	70 (54.3)	59 (45.7) ^d	129 (86.0)
Yes	6 (28.6)	15 (71.4)	21 (14.0)
Practice location			
Urban	67 (51.1)	64 (48.9)	131 (85.1)
Rural	11 (47.8)	12 (52.2)	23 (14.9)
Years in practice			
<10	11 (29.7)	26 (70.3) ^b	37 (24.0)
10-19	15 (51.7)	14 (48.3)	29 (18.8)
20-29	9 (29.0)	22 (71.0)	31 (20.1)
30-39	24 (68.6)	11 (31.4)	35 (22.7)
40-49	16 (84.2)	3 (15.8)	19 (12.3)
50+	3 (100.0)	0 (0.0)	3 (1.9)
Practice sector			
Private	70 (54.3)	59 (45.7)	129 (83.8)
Public	0 (0.0)	7 (100.0)	7 (4.5)
Both private and public	6 (42.9)	8 (57.1)	14 (9.1)
Not practising	2 (50.0)	2 (50.0)	4 (2.6)
Total	78 (50.6)	76 (49.4)	154 (100.0)

^a Row percentages ^b P<0.001 ^c data missing for 4 respondents ^d P<0.05

Figure 1. Knowledge Questions.

Q9 What do you understand to be common side-effects of radiotherapy for HNC? Tick all that apply.

- | | | |
|---|---|--|
| <input type="checkbox"/> Gastritis | <input type="checkbox"/> Higher risk of dental caries | <input type="checkbox"/> Permanent loss of taste |
| <input type="checkbox"/> Higher risk of osteoradionecrosis | <input type="checkbox"/> Restricted mouth opening | <input type="checkbox"/> Mucositis |
| <input type="checkbox"/> Problems wearing removable prostheses (dentures) | <input type="checkbox"/> Dry mouth | |
| <input type="checkbox"/> Nephrosis | <input type="checkbox"/> Problems swallowing | <input type="checkbox"/> Colitis |

Q10 How much do you agree/disagree with the following statements?

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Dry mouth after radiotherapy is temporary. Saliva goes back to normal with time as saliva glands heal.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More than half of all people treated for HNC will survive for 5 years or longer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radiotherapy directly damages the teeth.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Non-smokers and non-drinkers don't get HNC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Table 2. Mean HNC knowledge score, by sample characteristics.

	Correct responses out of 15 questions ^a Mean (SD)	
Sex		
Male	9.5	(2.6)
Female	9.6	(2.7)
Age group		
<35	9.2	(3.1 ^d)
35-49	9.3	(2.6)
50-59	10.6	(2.0)
60+	9.1	(2.6)
NZ trained		
No	9.2	(2.7)
Yes	9.8	(2.7)
Public Sector experience		
No	9.5	(2.7)
Yes	10.0	(2.7)
Practice location		
Urban	9.6	(2.6)
Rural	9.5	(3.0)
Years in practice		
<10	9.4	(3.4 ^b)
10-19	9.2	(2.6)
20-29	9.6	(2.3)
30-39	10.4	(1.7)
40-49	9.4	(2.2)
50+	5.7	(5.5)
Practice sector		
Private	9.5	(2.7)
Public	10.9	(1.6)
Both private and public	9.6	(3.1)
Not working	9.8	(2.6)
Number of HNC patients seen in practice in previous 12 months		
None	9.1	(2.0 ^c)
1-5	10.1	(1.9)
6-19	10.1	(1.3)
20+	12.0	(1.5)

^a missing data for 6 respondents

^b P=0.05

^c P=0.003

^d P=0.0

qualification and experience working in the public sector. Public sector experience was associated with having undertaken HNC professional development in the previous 5 years.

Nine out of ten dentists would provide oral hygiene instruction for HNC patients. Seven out of ten would provide basic diet instruction. Just over half of participants would provide smoking cessation advice to HNC patients who continued to smoke.

Key informants undertook a semi-structured interview with the investigator. Their comments were grouped and analysed according to the themes of knowledge, attitude and practice which had emerged from the interview process. Recurring sub-themes that emerged from the qualitative analysis were: that dentists with experience treating HNC patients have greater knowledge and clinical confidence than their peers (“it makes sense that those dentists that see the most patients are the most knowledgeable because this is an area where you can’t learn from a textbook- you have to put in the hours on the clinical floor”); and that dentistry for HNC patients is indeed within the scope of a general dentist (“it’s just basic dentistry shaped by a unique set of patient factors”).

Discussion

This study has found that, although most general dentists believe that dentistry for HNC survivors falls within their scope, few have seen a HNC patient in practice in the previous 12 months and self-perceived confidence is lacking. HNC knowledge of general dentists follows a consistent gradient, with the few clinicians that report having seen a higher number of HNC patients in the past year having the best overall knowledge in this area, and vice versa.

This study has a number of weaknesses and strengths. The response rate was just 20.4% overall (after three waves of invitation emails had been sent). Nonetheless, there were no systematic differences between the source population and the study sample, at least where sex, mean age, country of graduation and age group are concerned, so it follows that the relatively low participation in the study did not introduce marked bias. Various design flaws were identified, including the potential for participants with both general and specialist registration to have participated and, because the survey was self-reported, recall bias.

There were many robust features of the study design, however. The sampling frame was a valid one for all dentists in New Zealand, since all practising dentists are required to be on the DCNZ Register, by law. In addition, the sampling frame was collated in the same year that the study was run (2018), which would have reduced the risk of non-response due to dentists having moved practices or changed their email address over time. In fact, the non-contact rate (percent of all questionnaires sent that were undeliverable) of the survey was just 4%. Furthermore, while there have been some studies undertaken to assess the competence of general dentists in screening and diagnosing HNC, it is believed that this study is the first to evaluate the knowledge, attitude and

practice of general dentists providing dental treatment to HNC patients. It thereby addresses a knowledge gap in the evidence base.

The findings were largely consistent with the international literature, whereby most general dentists providing dental treatment for HNC patients fail to meet the knowledge standard recommended for such care by key authors and expert organisations, including having an accurate knowledge of HNC and the prevention and treatment of associated dental complications. It is debatable whether the ability of New Zealand general dentists to answer just over 60% of knowledge questions correctly constitutes them having 'accurate' knowledge of HNC dental oncology, as specified by the Multinational Association of Supportive Care in Cancer and International Society of Oral Oncology (Multinational Association of Supportive Care in Cancer and International Society of Oral Oncology (MASCC/ISOO), no date of publication specified). Nonetheless, key informants commented that it is good enough to have a qualified dentist who is able to answer the majority of the knowledge questions posed in the survey correctly, and who practises in a risk-adverse manner similar to that employed when treating other medically complex dental patients.

As expected by key informants, participants had better knowledge of the common oro-dental side-effects associated with HNC radiotherapy (such as xerostomia) and poorer awareness of the 'fine detail' of these effects (such as the permanence of taste dysfunction) and of less common side-effects (such as trismus).

Dentists who reported little or no professional contact with HNC patients were most likely to answer incorrectly, while those with a moderate flow of HNC patients through their practice answered accurately more frequently. It is noteworthy that the 6 respondents who saw the greatest number of HNC patients (20 or more per annum) answered all questions correctly. Key respondents were not surprised by this pattern, since knowledge is typically a function of clinical experience.

This study could not adequately identify the barriers preventing HNC patients receiving dental care, however; the reasons put forward by key informants were at odds with the quantitative data. Over three quarters of participants felt that dentistry for HNC patients was within the scope of a general dentist, yet key informants reported that most dentists did not want to treat HNC patients for a variety of reasons, including higher-than-average risk of treatment failure, osteoradionecrosis, and because HNC patients were generally unsuitable for fixed prosthetic work.

Similarly, although most dentists reported that they would be willing to provide basic treatment for a patient with a history of HNC, the conversion rate into practice was much lower for all basic dental treatments, irrespective of their degree of invasiveness. As a rule of thumb, the more invasive the procedure, the less dentists were willing to perform it, or had performed it, for a HNC patient in the previous year in practice. Indeed, that only one in ten dentists who had seen a HNC patient in the previous year reported having actually provided

treatment for them suggests a degree of avoidance, especially given that HNC patients carry a greater burden of dental disease than the average patient.

Perhaps this dichotomy can be explained by the finding that few dentists had actually seen one or more HNC patient in the previous 12 months; this is consistent with the pattern of patient flow reported by key informants. That is, most dentists reported that their feelings aligned with the ideal ethical and moral response to this question: that they would treat HNC patients like any other patient. The validity of this response may be limited however, as the majority of clinicians had not had their ideals challenged and shaped by real-world exposure to HNC patients. Indeed, this is a training model that dentistry might borrow from our medical colleagues: seasoning of new graduates through introduction of a 'trainee intern' year of work in the public sector where there is ample access to a wide range of medically compromised patients such as those with a history of HNC and the opportunity for supervised practise. Creation of residency placements, short courses or a Diploma in Hospital Dentistry may also build capacity.

Establishment of supportive frameworks and models of care into the healthcare system may also build confidence and access to care. HNC Multidisciplinary Teams (MDT's) with dental input are the standard of care recommended in the literature, however few MDT's worldwide include a dentist (Barker *et al*, 2005; Epstein *et al*, 2014; Huber & Terezhalmay, 2003; Ray-Chaudhuri *et al*, 2013; Spect, 2002; Sroussi *et al*, 2017). As such, there are few dentists with significant experience in this area to act as 'mentors' for colleagues or build a universal model-of-care for dental treatment of HNC patients. Creation of funded hospital appointments for dentists to work within cancer services may address this issue and targeting of public funds toward dental health promotion in these high-complexity, high-acuity areas of dentistry, rather than surgical treatment of resultant dental disease. Upskilling of a small number of interested clinicians per geographical area could create a hub for management of these patients in both private and public sectors.

Such an internship might help address the lack of confidence in their ability to treat HNC patients which was reported by study respondents. Most dentists felt that dental school had not sufficiently prepared them to see HNC patients in the real world. In fact, only one in four dentists overall felt that dental school had prepared them sufficiently to treat HNC patients, which reflects a considerable lack of clinical confidence among general dental practitioners treating HNC patients in New Zealand. This finding is consistent with previous work involving dentists in Turkey, Iran, the US, Nova Scotia and British Columbia (Burzynski *et al*, 2002; Clovis *et al*, 2002; Guneri *et al*, 2008; Patel *et al*, 2012). The practitioners who felt that their training had suitably prepared them to treat HNC patients were those who also reported having seen the most HNC patients in practice over the previous year. The direction of that particular association was unable to be determined however; that is, it was not possible to determine if



clinical experience bred confidence or whether robust dental school training led to these practitioners accepting more HNC patients for treatment in practice. Follow-up qualitative research with respondents may have provided clarity here, but this was not possible due to time pressures and blinded design.

Although the findings of this study are generalisable to New Zealand dentists as a population, and may indeed be able to be replicated and repeated, it is unlikely that they would extend to the Australian context. Some features of the New Zealand dental industry are replicated in the Australian context, such as restricted access to public dental services, a public/private service mix and a predominantly user-pays system. Care paradigms for HNC are similar in both countries. Longitudinal dental workforce data from both Australia and New Zealand demonstrate the same patterns of increasing feminisation and multiculturalism over the last three decades. However, some aspects of the industry differ between the two countries: about 15% of dentists were employed in public practice in Australia

in 2013, whereas, in New Zealand, only 5% of dentists worked in the public sector at roughly the same time. This indicates an important difference in the workforce sector employment pattern between the two countries. Indeed, despite receiving ethics approval for this study in Australia and the survey being tested there, it was not logistically possible to conduct this research in Australia because of issues accessing the necessary sampling frame. As such, the aim of replicating this study in the Australian context remains a valid one.

Conclusions

This study has found that very few general dentists actually see any HNC patients in practice. Indeed, most HNC patients tend to 'cluster' with practitioners that routinely treat large numbers of HNC patients. This study also found that general dentists lack confidence in their ability to treat HNC patients. Although most dentists reported that they would be willing to perform basic dental treatment for a patient with a history of HNC, the conversion rate into practice was much lower.

References

- Akbari N, Raeesi V, Khazaei T, Ramezanzadeh K, Ebrahimipour S. Evaluation of general dentists' and dental specialists' knowledge about oral cancer in South Khorasan-Iran 2014. *Asia Pacific Journal of Cancer Prevention* 2015;16(16):6987-6990.
- Andrews N, Griffiths C. Dental complications of head and neck radiotherapy: Part 2. *Australian Dental Journal* 2001;46(3):174-182.
- Barker G, Epstein J, Williams K, Gorsky M, Raber-Durlacher J (2005). Current practice and knowledge of oral care for cancer patients: a survey of supportive health care providers. *Supportive Care in Cancer* 13(1):32-41.
- Barry J. The dentist's role in managing oral complications of cancer therapies. *Dentistry Today* 2005;24(8):58-61.
- Beech N, Robinson S, Porceddu S, Batstone M. Dental management of patients irradiated for head and neck cancer. *Australian Dental Journal* 2014;59(1):20-28.
- Beech N, Robinson S, Porceddu S, Batstone M (2014). Dental management of patients irradiated for head and neck cancer. *Australian Dental Journal* 59(1):20-28.
- Borhan-Mojabi K, Moradi A, Yazdabadi A. Evaluating the degree of knowledge on oral cancer among general practitioners and dentists in Qazvin. *Journal of Evaluation in Clinical Practice* 2012;8(2):498-501.
- Burzynski NJ, Rankin KV, Silverman S Jr, Scheetz JP, Jones DL. Graduating dental students' perceptions of oral cancer education: results of an exit survey of seven dental schools. *Journal of Cancer Education* 2002;17(2):83-84.
- Cancer Australia. Head and Neck Cancer in Australia Statistics [Internet] 2020 [accessed 2021 Jan 10]. Available from: <https://www.canceraustralia.gov.au/affected-cancer/cancer-types/head-neck-cancer/head-and-neck-cancer-australia-statistics>
- Chrisopoulos S, Harford J, Ellershaw A. Oral health and dental care in Australia: Key facts and figures 2015 [Internet]. Canberra: Australian Institute of Health and Welfare, 2016 [cited 2018 Sept 19].
- Clovis JB, Horowitz AM, Poel DH. Oral and pharyngeal cancer: practices and opinions of dentists in British Columbia and Nova Scotia. *Journal of Canadian Dental Association* 2002;68(7):421-425.
- Epstein J, Guneri P, Barasch A. Appropriate and necessary oral care for people with cancer: Guidance to obtain the right oral and dental care at the right time. *Supportive Care in Cancer* 2014;22(7):1981-1988.
- Fattore L, Mostofi R, Potashnick S. Dental management of the head and neck cancer patient. Gavidì RO, Rich AM, Cox B, King T. Comparing the occurrence of oral squamous cell carcinoma in New Zealand and the Fiji Islands from 2000-2010. *International Journal of Cancer Research* 2014; 48(1):1212-1225. *Illinois Dental Journal* 1988;57(5):342-345.
- Gavidì R, Rich A, Cox B, King T (2014). Comparing the occurrence of oral squamous cell carcinoma in New Zealand and the Fiji Islands from 2000-2010. *International Journal of Cancer Research* 48(1):1212-1225.
- Guneri P, Cankaya H, Kaya A, Boyacioglu H. Turkish dentists' knowledge of head and neck cancer therapy-related complications: implications for the future. *European Journal of Cancer Care (Engl)* 2008;7(1):84-92.
- Hancock P, Epstein J, Sadler G. Oral and dental management related to radiation therapy for head and neck cancer. *Journal of the Canadian Dental Association* 2003;69(9):585-590.
- Hertrampf K, Wenz H, Koller M, Grund S, Wiltfang J. The oral cancer knowledge of dentists in northern Germany after educational intervention. *European Journal of Cancer Prevention* 2011;20(5):431-437.

- Horowitz A, Drury T, Goodman H, Yellowitz J. Oral pharyngeal cancer prevention and early detection. Dentists' opinions and practices. *Journal of the American Dental Association* 2000;131(4):453-462.
- Huber M, Terezhalmly G. The head and neck radiation oncology patient. *Quintessence International* 2003;34(9):693-717.
- McCaul L. Oral and dental management for head and neck cancer patients treated by chemotherapy and radiotherapy. *Dental Update* 2012;39(2):135-138.
- Murdoch-Kinch C, Zwetchkenbaum S. Dental management of the head and neck cancer patient treated with radiation therapy. *Journal of the Michigan Dental Association* 2011;93(7):28-37.
- Multinational Association of Supportive Care in Cancer and International Society of Oral Oncology (MASCC/ISOO). Evidence-based management strategies for oral complication from cancer treatment. [Internet] no date of publication specified [accessed 2019, February 4]. Available from: https://www.mascc.org/assets/documents/Oral_Care-Summary-Oral_Complications_Systematic_Reviews.pdf.
- New Zealand Ministry of Health. Our oral health: Key findings of the 2009 new zealand oral health survey [Internet]. Wellington: Ministry of Health, New Zealand, 2010 [cited 2018 Sept 19].
- National Head and Neck Cancer Tumour Standards Working Group. Standards of Service Provision for Head and Neck Cancer Patients in New Zealand—Provisional. 2013. Wellington: Ministry of Health, New Zealand, 2013 [cited 2021 Jan 10].
- Noone J, Barclay C. Head and neck cancer patients—information for the general dental practitioner. *Dental Update* 2017;44(3):209-210, 213-215.
- Patel Y, Bahlhorn H, Zafar S, Zwetchkenbaum S, Eisbruch A, Murdoch-Kinch CA. Survey of Michigan dentists and radiation oncologists on oral care of patients undergoing head and neck radiation therapy. *Journal of the Michigan Dental Association* 2012;94(7):34-35.
- Ray-Chaudhuri A, Shah K, Porter R. The oral management of patients who have received radiotherapy to the head and neck region. *British Dental Journal* 2013;214(8):387-393.
- Specht L. Oral complications in the head and neck radiation patient. Introduction and scope of the problem. *Supportive Care in Cancer* 2002;10(1):36-39.
- Sroussi H, Epstein J, Bensadoun R, Saunders D, Lalla R, Migliorati C, Heavilin N, Zumsteg Z. Common oral complications of head and neck cancer radiation therapy: Mucositis, infections, saliva change, fibrosis, sensory dysfunctions, dental caries, periodontal disease, and osteoradionecrosis. *Cancer Medicine* 2017;6(12):2918-2931
- US National Cancer Institute. Head and Neck Cancers [Internet] 2018a [Accessed: 2021, Jan 10]. Available at: <https://www.cancer.gov/types/head-and-neck/head-neck-fact-sheet>.
- US National Cancer Institute (2018b). NCI Dictionary of Cancer Terms. [Internet] 2018b [Accessed: 2021, Jan 10]. Available at: <https://www.cancer.gov/publications/dictionaries/cancer-terms/def/head-and-neck-cancer>.

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