



## Special Needs Dentistry: Interdisciplinary Management of Medically-Complex Patients at Hospital-Based Dental Units in Tasmania, Australia

Lim, Mathew AWT\*, Borromeo Gelsomina L

Melbourne Dental School, The University of Melbourne, Royal Dental Hospital of Melbourne, Australia

\*Corresponding e-mail: [m.lim18@student.unimelb.edu.au](mailto:m.lim18@student.unimelb.edu.au)

### ABSTRACT

**Background:** Increasing awareness of the interactions between oral and general health has led to the establishment of Special Needs Dentistry as a dental specialty in many countries. This specialty assists with the interdisciplinary management of patients between the medical and dental professions particularly those with complex medical problems, intellectual and physical impairments, and psychiatric conditions that may affect their oral health or the manner in which they receive treatment. However, little is known about the utilisation of specialised services provided to facilitate individuals with these needs. **Aim:** The aim of this study was to understand current utilisation of hospital-based dental services established to provide medically-necessary dental care. **Methods:** A retrospective review of the demographics and medical status of patients treated at referral hospital-based dental clinics in the state of Tasmania was completed for the month of August 2015. **Results:** Patients treated at these units had a variety of medical backgrounds. Most (46.4%) were referred from medical professionals within the hospital. On average, patients treated at these units had 2.56 medical conditions and were taking 3.59 medications each. Many of these were chronic medical conditions known to have an interaction with oral health. **Conclusions:** Our results demonstrate the growing recognition of dynamic interactions between oral and general health and the importance of these hospital-based units and interprofessional relationships in providing timely and holistic health care to these patients.

**Keywords:** Special needs dentistry, Special care dentistry, Hospital dentistry, Oral health, Dental, Interdisciplinary care

### INTRODUCTION

Historically, the oral cavity has been treated as separate from general health and health systems in many parts of the world have reflected this divide with minimal interaction between doctors and dentists. More recently, the growing interaction between oral and general health has been recognised, in particular, how one may exacerbate the effects of the other. Special Needs Dentistry (SND) was established as a dental specialty in Australia in 2003 recognising the need for growing interdisciplinary management of patients with complex medical conditions [1,2]. Specialists in this area assist with the provision of appropriate oral health care to individuals with intellectual and physical impairments, psychiatric conditions, medical conditions, and medications that may impact on their oral health or the way in which dental treatment is provided to individuals [1,2]. In many of these situations, these factors may act as barriers to access of ongoing dental care. Additionally, acute oral assessments and timely dental treatment are often required prior to significant medical interventions. Special needs dentists work in collaboration with other health professionals to adapt the dental treatment required in line with the patient's current medical status and needs.

In recognition of the barriers that exist for many of these patients, many public dental services in Australia have developed initiatives including specialist units at major public or dental hospitals in order to address the treatment needs of these patients. Oral Health Services Tasmania has established Special Care Dental Units (SCDU) associated with the Royal Hobart Hospital and North-West Regional Hospital [3]. These referral-based units accept patients on referral from oral health and medical professionals with the aim of removing barriers that often prevent timely dental assessments and treatments based on medical priority [3].

Since the recognition of this dental specialty and the establishment of these clinics, limited information has been

published about the types of patients treated at these specialised units. This study aimed to review the medical histories of patients treated at the Special Care Dental Units of Oral Health Services Tasmania to better understand service utilisation. It is hypothesised that the medical status of these patients will reflect the need for acute assessments and treatment involving the input from dentists thereby highlighting the important interaction between general health and the health of the oral cavity.

## METHODS

A retrospective review was conducted of records of all appointments for dental treatment at the Royal Hobart Hospital Special Care Dental Unit, North-West Regional Hospital Special Care Dental Unit, Royal Hobart Hospital Day Surgery Unit, and Mersey Hospital Day Surgery Unit between August 1 and August 30, 2015. Information collected included patient demographics (gender, date of birth, residential postcode), the ability to consent for procedures, concession card (low income health care card, pensioner concession card) eligibility, referral source, and the medical history, including medical conditions and current medications. All reviews were conducted by a single examiner.

Data were recorded in an Excel spreadsheet (Microsoft Corporation, Seattle WA, USA) using a standardised data collection form. Medical conditions and medications were classified according to the World Health Organization International Classification of Disease 10 (ICD 10) and the Anatomical Therapeutic Chemical and Defined Daily Dose (ATC/DDD) classifications respectively and will be the focus of this paper [4,5]. The Australian Statistical Geography Standard (ASGS) Remoteness Areas Classification 2011 was used to group residential postcodes [6]. Descriptive analysis of the data was completed using SPSS Statistics Version 23 (IBM Inc, Armonk NY, USA).

Ethics approval was obtained from the University of Melbourne Human Research Ethics Committee (Ethics ID 1544156) and the Tasmania Medical Human Research Ethics Committee (Ref No. H0015272).

## RESULTS

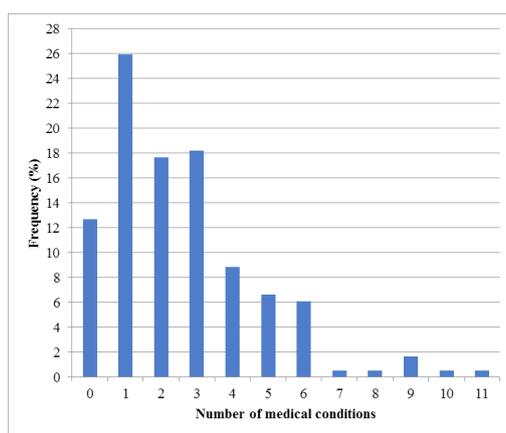
Around 181 appointments were identified during the study periods. Demographic data has been described together with its links to dental treatment provided [7]. The average age of patients was 52.3 years (Range: 13-91 years) with equal numbers of males and females. Most patients (92.8%) had a health care card or pensioner concession card, and were thus eligible for treatment under the public dental system. In addition, the majority had the ability to self-consent for dental procedures (95.6%). Patients were predominantly from inner regional areas (59.1%). Although a significant proportion of the sample had missing referrals (37.0%), the majority of those that were reviewed were from medical professionals (46.4%) (Table 1).

**Table 1 Patient demographics for appointments at Special Care Dental Units in Tasmania**

Patient demographics		N (%)
Gender	Male	89 (49.2)
Age*	<25 years	14 (7.7)
	25-34 years	26 (14.4)
	35-44 years	25 (13.8)
	45-54 years	28 (15.5)
	55-64 years	31 (17.1)
	65-74 years	36 (19.9)
	>74 years	21 (11.6)
Eligibility	Eligible for public dental care	168 (92.8)
Consent	Ability to self-consent	173 (95.6)
Remoteness of residence†	Inner regional	107 (59.1)
	Outer regional	71 (39.2)
	Remote	3 (1.7)
Referral source	Medical professional	84 (46.4)
	Oral health professional	30 (16.6)
	No referral	67 (37.0)
TOTAL		181 (100)
*Age categories were based on those used by the World Health Organization [44]		
†Australian Statistical Geography Standard (ASGS) Remoteness Areas Classification 2011 [6]		

The medical histories of patients had an average of 2.6 medical conditions (Range: 0-11) (Figure 1). The five most common medical conditions by body system were diseases of the circulatory system (35.4%), endocrine, nutritional,

and metabolic conditions (27.1%), diseases of the musculoskeletal system and connective tissues (26.5%), mental and behavioural disorders (24.3%), and malignant neoplasms (22.7%) (Table 2). Of the conditions involving the circulatory system, hypertensive disease was the most common (50.6%) followed by ischaemic heart disease (12.6%) and cerebrovascular disease (12.6%). Diabetes mellitus (67.3%) was the most common of the endocrine, nutritional, and metabolic conditions and diseases of the musculoskeletal system and connective tissues largely comprised of arthropathies (50.0%) or disorders of bone mineral density (46.4%). Oropharyngeal cancers represented 7.1% of cases of malignant neoplasms while the majority were breast cancers (21.4%) followed by bone malignancies (11.9%), testicular and prostate cancers (11.9%), and cancers of the digestive organs (9.5%).



**Figure 1** Number of medical conditions reported in the medical history of patients with appointments at Special Care Dental Units in Tasmania

**Table 2** Medical conditions of patients with appointments at Special Care Dental Units grouped by body system using the World Health Organization International Classification of Diseases 10 (ICD-10) [4].

Body system	N (%)
Viral infections of CNS	1 (<0.1)
Viral infections characterised by skin and mucous membrane lesions	4 (<0.1)
Malignant neoplasms	41 (22.7)
In situ/benign neoplasms, diseases of blood and blood forming organs, and certain disorders involving the immune mechanism	8 (<0.1)
Endocrine, nutritional, and metabolic diseases	49 (27.1)
Mental and behavioural disorders	44 (24.3)
Diseases of the nervous system	26 (14.4)
Diseases of the eye and adnexa, diseases of ear and mastoid process (Hearing loss/deaf)	1 (<0.1)
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Diseases of circulatory system	64 (35.4)
Diseases of respiratory system	34 (18.8)
Diseases of digestive system	34 (18.8)
Diseases of skin and subcutaneous tissue	2 (<0.1)
Diseases of the musculoskeletal system and connective tissue	48 (26.5)
Diseases of genitourinary system	7 (<0.1)
Congenital malformations, deformations, and chromosomal abnormalities	3 (<0.1)
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	3 (<0.1)
Physical injuries	4 (<0.1)
Other medical procedures	1 (<0.1)
Factors influencing health status and contact with health services	17 (0.9)
Total	181 (100)

Most of the psychiatric and behavioural disorders reported were mood affective disorders (40.0%) and anxiety disorders (23.6%). Individuals with mental and behavioural disorders constituted the largest proportion (37.5%) of patients treated under general anaesthesia. Other medical diagnoses amongst these patients included digestive (18.75%), neural (12.5%), endocrine (6.25%), respiratory (6.25%), cutaneous (6.25%), musculoskeletal (6.25%), and genitourinary conditions (6.25%), and congenital malformations and chromosomal abnormalities (6.25%).

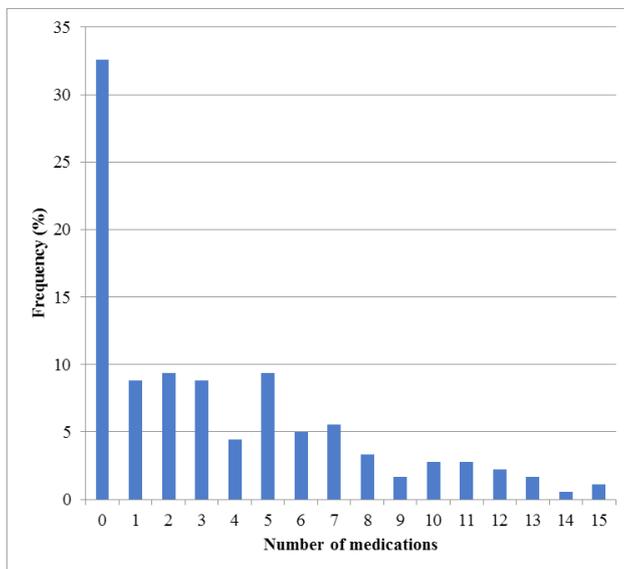


Figure 2 Number of medications reported in patient medical histories at Special Care Dental Units across Tasmania

Patients reported taking a total of 650 medications with each taking an average of 3.6 medications (Range 0-15) (Figure 2). Almost a third of patients (32.6%) were reported to not be taking any medications. The two most commonly prescribed medication groups by number of patients were medications for the nervous system (45.3%) and alimentary tract and metabolism (43.1%) (Table 3). This was also reflected in the number of medications prescribed with those for the nervous system (26.6%), alimentary tract and metabolism (24.6%), cardiovascular system (21.2%), musculoskeletal system (0.1%), and respiratory system (0.1%) being the five most commonly prescribed medication categories.

Table 3 Medications reported in the medical histories of patients with appointments at Special Care Dental Units categorised using the World Health Organization Anatomical Therapeutic Chemical and Defined Daily Dose (ATC/DDD) classification by number of patients taking a medication group and by number of medications prescribed [5]

Medication category	Number of patients (%)	Number of medications (%)
Alimentary tract and metabolism	78 (43.1)	160 (24.6)
Blood and blood forming organs	19 (10.5)	19 (<0.1)
Cardiovascular system	61 (33.7)	138 (21.2)
Dermatological	1 (<0.1)	1 (<0.1)
Genitourinary and sex hormones	8 (<0.1)	10 (<0.1)
Systemic hormonal preparations	17 (9.4)	17 (<0.1)
Anti-infectives for systemic use	15 (8.3)	18 (<0.1)
Anti-neoplastic and immunomodulating agents	18 (9.9)	24 (<0.1)
Musculoskeletal system	49 (27.1)	56 (0.1)
Nervous system	82 (45.3)	173 (26.6)
Respiratory system	18 (9.9)	33 (0.1)
Sensory organs	1 (<0.1)	1 (<0.1)
TOTAL	181 (100)	650 (100)

DISCUSSION

Special Needs Dentistry (SND) is defined as “the branch of dentistry that is concerned with the oral health care of people with intellectual disability, medical, physical or psychiatric conditions that require special methods or techniques to prevent or treat oral health problems or where such conditions necessitate special dental treatment plans” [2]. Following the recognition of the specialty in 2003, many public dental services in Australia established dedicated units to provide specialised dental care to these patients [2]. In Tasmania, two referral-based Special Care Dental Units were established from 2009 at the Royal Hobart Hospital and North-West Regional Hospital to meet the oral health treatment needs of these patients. Additionally, these services were aimed at promoting a greater interaction with the medical profession and increasing access to dental care for patients deemed to have medical need

for this care. Services provided by these units include treatment of outpatients at hospital-based clinics and general anaesthetic services at day surgery units at both the Royal Hobart and Mersey Hospitals [3]. Unlike many other dental clinics provided by the public sector, these units do not have low income eligibility criteria based on health care card or pensioner concession card status. Since their establishment little information has been published about the nature of patients referred to or treated at these units or similar units around the country.

Comparing the medical profile of patients treated at the units reviewed in this study with that of published data regarding referrals to other units in Australia is complicated by differences in methodology. Despite this, comparisons indicated that patients treated at the Tasmanian units were more medically-complex than those at comparable units with Tasmanian patients having higher proportions of medical conditions across most categories in the sample examined [8,9]. In particular, patients in this study had higher proportions of neoplasms, metabolic, nutritional, and endocrine conditions, circulatory disease, diseases of the respiratory system, and musculoskeletal and connective tissues conditions. In contrast, other units in Australia and internationally had higher rates of individuals with physical and intellectual disabilities [8,9]. Interestingly, a similar hospital-based unit in Madrid, Spain also showed high levels of medically-compromised patients, however, these had a greater prevalence of blood disorders, infectious conditions, kidney and genitourinary conditions, and autoimmune disorders [9]. Further investigation is required to ensure that these patient cohorts are not experiencing barriers to accessing care at the Special Care Dental Units in Tasmania and that it may instead be a reflection of different population demographics.

Conditions prevalent amongst patients treated at the Tasmanian Special Care Dental Units are concordant with chronic diseases that have been reported to place a significant burden on health care systems both internationally and in Australia [10-12]. Both the World Health Organization and Australian Institute of Health and Welfare attributed a significant burden of disease to chronic conditions such as cardiovascular disease and cancers [10,11]. Similar results have been reported in New Zealand, Canada, the United States, the United Kingdom, and Ireland [12]. Limited population statistics for Tasmania are available regarding those medical conditions that were less common amongst the study sample and thus conclusions cannot be made about the lower prevalence of these in our study. Further investigation would be warranted to elicit if these differences are reflective of differences in disease patterns across the population or whether these patients are currently not receiving care at these units. If the latter is the case, strategies may be indicated to investigate possible barriers in the current referral pathway for these patients or to raise awareness amongst health professionals treating patients with these conditions about the availability of this service and the possible impact of oral health in the overall management of these patients.

Patients with intellectual and physical impairments had a lower prevalence in this study sample in comparison to other studies [8,9]. These conditions may impact on the ability of individuals to maintain their oral health or access oral health care. In our study, there was a greater tendency for these patients to be treated under general anaesthesia. This is perhaps reflective of the availability of facilities and clinicians throughout Oral Health Services Tasmania to manage patients with milder impairments with only those that exhibited behaviours not conducive to treatment in the dental chair referred for management under general anaesthesia. Although another possible explanation may be that these individuals did not have co-morbidities that required the support of a hospital facility it is pertinent to recognise that many patients affected by syndromes often do experience multiple medical conditions with multi-system involvement. Hence, their management should be considered in this context beyond their more obvious impairments.

Many of these co-morbidities, as well as chronic medical conditions, can also have specific implications for the dental management of these patients with significant links established between these conditions and oral disease. For example, periodontal disease has been linked to cardiovascular disease, diabetes mellitus, and rheumatoid arthritis [13-16]. Although atherosclerotic cardiovascular disease is a complex multi-factorial condition, periodontitis has been shown to increase risk of future atherosclerosis-associated events independent of other well-known risk factors [15]. In addition, evidence exists to demonstrate that treatment of periodontal disease reduces systemic inflammation and future risk of cardiovascular disease [15]. Dental treatment to reduce gingival inflammation due to periodontal disease has also been shown to improve markers of systemic inflammation and responsiveness to haemodialysis therapy in patients with chronic renal disease [17]. Similarly, it has been established that poor glycaemic control in diabetes is associated with periodontal disease and that direct and dose-related bidirectional relationships exist between periodontal severity and diabetic complications [18-20]. Furthermore, randomised controlled trials have demonstrated that periodontal therapy can result in a similar clinical impact to the addition of a second pharmacological therapy

resulting in approximately a 0.4% reduction in HbA1C in 3 months [19,20]. Similar relationships are being established between the chronic inflammatory states of rheumatoid arthritis and Sjögren's syndrome and periodontal disease with *Porphyromonas gingivalis* commonly implicated in periodontal disease believed to predispose to more severe forms of both diseases [16,21,22]. Early research has also suggested a role for these same periodontal pathogens and chronic inflammatory processes in Alzheimer's disease [23-26].

Likewise, other conditions, such as cancer, which featured in many patients in the present study, can have significant implications for oral disease and dental treatment. In addition to the potential presence of malignant lesions in the mouth, surgical, radiotherapeutic, and chemotherapeutic treatment of these conditions can result in significant changes to the oral cavity which can in turn impact on quality of life. Surgery can cause significant alterations to the normal form and function of oral structures and require significant rehabilitation, sometimes requiring prosthetic obturation. Both head and neck radiotherapy and chemotherapy have been associated with the development of oral mucositis and dry mouth [27-29]. In addition to these acute side effects, radiation can cause long-term damage to the salivary glands resulting in reduced saliva flow and significant morbidity associated with the dry mouth, taste alteration, oral candidal infections, and increased risk of radiation caries (dental decay) [28,30,31]. Furthermore, risks of osteoradionecrosis are associated with extraction of teeth from within the irradiated field [31]. As a result, patients diagnosed with cancer are recommended to have a dental assessment prior to the commencement of their oncology treatment and for ongoing reviews to be completed by dentists experienced in the management of oncology patients with the view to addressing oral side effects and instigating preventive measures thereby mitigating the potential adverse effects [31,32]. This necessity for multidisciplinary management of these patients, including the involvement of a dentist, was demonstrated by the high prevalence of cancer patients being treated at these hospital dental units.

A significant proportion of the burden of disease in developed countries can also be attributed to management of these chronic conditions including the use of medications. An Australian study reported that 87.1% of Australians over the age of 50 took one or more medications within a 24-hour period with 43.3% of these prescribed five or more medications during the same period of time [33]. The results of our study were not as high with only 65% of patients taking five or more medications on a regular basis. The discrepancy may lie in the fact that just under half of our sample was under the age of 50. Furthermore, the most commonly reported medication categories in the current study reflected both international and Australian trends of prescribing associated with the diseases of the alimentary tract and metabolism, cardiovascular system, central nervous system, and respiratory system being highly prominent [34,35].

Although most medications can be managed by dental practitioners without significant complications, an area of interest within the dental profession is the increasing use of anti-resorptive medications such as bisphosphonates and monoclonal antibodies (e.g. Denosumab), in the management of osteoporosis, reduced bone mineral density, and bone malignancies. Particular concern relates to the predisposition to medication-related osteonecrosis of the jaw (MRONJ). This condition is defined as an area of exposed bone in the maxillofacial region that has persisted for a period of 8 weeks subsequent to a dental intervention or occurring spontaneously and in the absence of other potential bone pathology, such as metastatic bone disease, or previous irradiation to the region in a patient with a history of use of bisphosphonate or other anti-resorptive medications [36,37]. Although the incidence of this condition is believed to be relatively low, recent publications have suggested that patients taking an oral bisphosphonate for management of osteoporosis had an odds ratio of 13.1 for delayed dental healing following an extraction [36]. This is thought to be even higher for those being treated with infusions, who have had longer medication exposure, when treatment is for bone malignancies, and where other medical co-morbidities exist, such as those who are immunosuppressed or have concomitant long-term use of corticosteroids [37]. Significant morbidity can be associated with MRONJ, which is often recalcitrant to management. As a result, a dental review prior to commencing such medications, regular oral reviews including periodontal management, and avoidance of oral trauma are advocated, reflecting the need for special needs dental clinics [37]. Earlier work by the researchers has shown that these patients form a significant proportion of patients in these Tasmanian units often referred due to potential oral complications associated with anti-resorptive medications [38].

Due to well-established guidelines, most dental practitioners are comfortable treating patients prescribed Warfarin. Many however remain uncertain about the best way to manage patients on novel oral anti-coagulants (NOAC) drugs [39]. Unlike the International Normalised Ratio (INR) that can be used to assess bleeding risk for warfarin-treated patients,

there are no tests that have been standardised for assessment of NOACs [40]. The literature currently advocates that these drugs should not be ceased and bleeding should be managed primarily with local haemostatic measures [40,41]. For many dental practitioners, concerns arise if patients require dental extractions, and hence management of this group may be best completed by dentists at these special needs dental units due to their clinical experience and the support of hospital facilities including the hospital environment.

In addition to the effects of individual medications, polypharmacy has been known to be associated with reduced saliva flow which poses significant risks for dental disease [42]. In general, dental practitioners are trained to treat patients with an awareness of their medical conditions. However, this can become more complex as the number of conditions and medications increases or where the medical conditions begin to influence the nature of treatment required or the manner in which it must be facilitated, comfort in managing such patients declines [43, 44].

This study provides an initial profile of the medical background of patients referred to and receiving care at these units. While this begins to address deficiencies in our current knowledge of the utilisation of these services, the study design does have limitations. All retrospective reviews of medical records will always be limited by the variability of information contained in these records. Furthermore, despite efforts made to try and ensure the time period chosen for this review was representative, this may have introduced unintentional selection bias. Likewise, the limited time period restricted the sample size in this study. Future studies would ideally be conducted prospectively so that information collected could be more accurately standardised and completed over a longer time period to confirm the result of the present study. Likewise, other similar programs and services would be encouraged to complete similar research to better inform the specialty. In doing so, models of care can further be adapted to ensure equitable, timely and accessible dental care for this group of patients.

#### CONCLUSION

Oral health, along with cardiovascular disease, mental health disorders, and musculoskeletal conditions have been identified as the costliest disease groups to health expenditure in Australasia [12]. The links between oral and general health have been established and the evolution of our understanding of many chronic conditions is likely to increase the nature of these interactions. Special needs dental units, such as those established by Oral Health Services Tasmania, offer patients care that is appropriate to both their dental and medical needs and where their medical status may begin to influence their oral condition or the way in which treatment is provided. Increased awareness of the availability of these referral clinics amongst health professionals outside of the oral health sector will continue to foster the growth of this relatively new dental speciality.

This study provides an insight into the medical histories of patients treated at Special Needs Dental Units in Australia. The patients treated at Special Care Dental Units in Tasmania demonstrated significant variation in medical status but, on average, had 2.56 medical conditions and were taking 3.59 medications each. Due to the medical complexity of these patients, it is clear that significant interprofessional relationships between medical and dental professionals are paramount to providing holistic health care. Oral health can no longer be considered as separate from general health and the optimal health outcomes for these patients can be fostered through the development of special needs clinics to assist in removing the traditional barriers between these health professions and ensure timely and appropriate dental care for these patients.

#### DECLARATIONS

##### Conflict of Interest

The authors have no conflicts of interest to declare.

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