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An Exploration of Australian Undergraduate Dentist Gerodontology Education to Support a Growing Frail and Care-Dependent Population

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Advocacy	Australian Dental Association Federal Councillor (2020-2023) Australian Dental Association Board Director (2023-current) Australian Dental Association Constitution and Policy Committee Chair (2022- current) Panel Speaker World Dental Forum 2023 World Dental Parliament Australian delegate 2023 Aged Care Congress keynote speaker 2021
Media	Blog coverage of publication: https://rosies-newsletter-6baf24.beehiiv.com/p/silver-tsunami Australian Dental Association spokesperson for gerodontology (multiple radio and newspaper interviews, examples below). https://www.bitemagazine.com.au/dr-angie-nilsson-on-her-commitment-to-public-dental/ https://ada.org.au/dental-health-week-2023-media-coverage-highlights https://www.sbs.com.au/news/podcast-episode/dental-hygiene-habits-of-australians-revealed-in-survey-with-many-choosing-not-to-floss/0qhuep5d1

Publication recognition

Published papers relevant to gerodontology

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Nilsson A, Young L, Croker F. Preparing dental graduates to provide care for frail and care-dependent older patients: An educational intervention. *Focus Health Prof Educ.* 2021;22(2):23-38.

Nilsson A, Young L, Evans R, Jennings E, Lee A. Australian dental school academics' perceptions of gerodontology education in the undergraduate curriculum. *Eur J Dent Educ*. 2023.

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Statement on the Use of Generative AI

Generative AI technology was not used in the preparation of any part of this thesis.

Abstract

As people continue to live longer, maintaining their teeth well into old age has become increasingly common, leading to a decrease in the rate of edentulism over time. This trend is significant because preserving a natural dentition has been directly linked to extended life expectancy and enhanced quality of life.

Advocacy experts are calling for action to improve the oral health of older people, identifying the need for a workforce of dental professionals who are trained to manage a growing frail and care-dependent population. However, there is variability among Australian dental schools in terms of their gerodontology education – the branch of dentistry focused on older populations. Evidence suggests that the current approach is insufficient to adequately prepare dental graduates for managing the oral health needs of older individuals.

This study aimed to address the gerodontology education gap through various research objectives. These included compiling data on the mandatory gerodontology requirements in Australian dental school curricula, establishing a comprehensive benchmark curriculum for gerodontology, identifying gaps in current Australian dental school curricula compared to this benchmark, exploring stakeholder perceptions on gerodontology education delivery and outcomes, and providing recommendations for improving gerodontology education frameworks. The recommendations provided in the final chapter support the future oral health workforce to manage a growing older, frail, and care-dependent population, providing a framework for continuation of curriculum design for Australian dental schools. The study focusses on the education of dental students (ability to register as a dentist on graduation) as the dental practitioner with the full scope to continue specialist postgraduate study in the area of special needs dentistry.

A scoping review (Chapter 2) was conducted to determine the current status of gerodontology in the undergraduate dental curriculum, identify gaps in the literature, and summarise gerodontology content in dental schools from an international perspective.

A multi-methods qualitative approach was used including document analysis, surveys, focus groups, and semi-structured interviews (Chapter 3). Phase 1 (Chapter 4) consisted of the document analysis of existing benchmarks for gerodontology education internationally. Phase 2 (Chapter 4) sought to identify current gerodontology teaching in all nine Australian dental schools using surveys. Phase 3 (Chapter 5) provided the stakeholder exploration of perceptions of gerodontology education using semi-structured interviews and focus groups. The stakeholders included dental school academics (Part 1), dental students (Part 2), consumer representatives and directors of nursing (Part 3). Thematic analysis was used to inform the recommendations for future gerodontology curricula that were developed in Phase 4. Chapter 6 details Phase 4 where synthesis of the data from Phases 1, 2, and 3 provides a set of recommendations for gerodontology education to support and inform future gerodontology curricula.

The results of this study found wide variation in content and mode of gerodontology delivery in Australian dental schools. Themes from the stakeholder qualitative studies included social responsibility, organisational barriers, and preferences for service-based learning, practical learning experiences, and quality educators. The data analysed from all phases of the study found that current gerodontology education was inadequate to support the oral health care of Australia's older, frail, and care-dependent population.

To conclude, this thesis underscores the inadequacies of current gerodontology education in Australian dental schools. Australia's graduating workforce of dentists are not prepared to manage a growing older, frail, and care-dependent population. The recommendations developed from this study serve as a crucial step toward enhancing oral health outcomes for older Australians.

Table of Contents

AN EXPLORATION OF AUSTRALIAN UNDERGRADUATE DENTIST GERODONTOLOGY EDUCATION TO SUPPORT A GROWING FRAIL AND CARE-DEPENDENT POPULATION 0

ACKNOWLEDGEMENTS 1

DISSEMINATION OF WORK 2

STATEMENT OF CONTRIBUTION OF OTHERS 5

STATEMENT ON THE USE OF GENERATIVE AI 7

ABSTRACT 8

LIST OF TABLES 16

LIST OF FIGURES 17

LIST OF APPENDICES 17

LIST OF ABBREVIATIONS 19

GLOSSARY 20

CHAPTER 1. BACKGROUND AND INTRODUCTION 23

VIGNETTE OF THE RESEARCHER 23

INTRODUCTION 25

Oral Health 25

Theory of Age and Ageing 26

Frailty and a growing older dentate population 27

The Unique Needs of the Older Dentate Person 29

BACKGROUND: DENTISTRY AND ORAL HEALTH FOR OLDER PEOPLE. 31

The Role of the Dental Team in the Care of Older People 31

Gerodontology 32

Graduating as a Dentist in Australia 32

CHAPTER 2. SCOPING REVIEW 35

GERODONTOLOGY IN THE DENTAL SCHOOL CURRICULUM: A SCOPING REVIEW 36

Background 36

Methods *37*
Inclusion criteria 38
Results *40*
Gerodontology curriculum content 46
Attitudes, knowledge, and skills of undergraduate dental students 47
Didactic teaching 50
Elective vs Compulsory teaching 50
Extra-mural learning 50
Discussion *51*
Conclusion *53*
CHAPTER 3: METHODOLOGY AND METHODS 55
INTRODUCTION 55
RESEARCH DESIGN 57
Researcher Reflexivity *57*
Research Strategy *58*
Kern's Curriculum Design Framework 61
Phase 1 Methods 61
Data Collection 63
Data Analysis 63
Phase 2 Methods 64
Designing the survey 65
Participants 67
Study Site 67
Data Collection 67
Data Analysis 67
Phase 3 Methods 68
Part 1. Dental School Academics 69
Participants 71
Sample Size 71
Study Site 71
Data Collection 72

Data analysis ... 72
Part 2. Dental Students ... 72
Participants ... 73
Sample Size ... 73
Study Site ... 74
Data Collection ... 74
Data analysis ... 74
Part 3. Directors of Nursing and Consumer Representatives ... 74
Participants ... 75
Sample Size ... 75
Study Site ... 75
Data Collection ... 76
Data Analysis ... 76
Phase 4 Methods ... 76
Data Synthesis and Triangulation of Results ... 76
Data Analysis ... 79
Bowen's Document Analysis ... 79
Braun and Clarke's Thematic Analysis ... 79
Method Limitations ... 80
Ethics Approval ... 81
CHAPTER 4. DATA COLLECTION AND ANALYSIS: PHASES 1 AND 2 ... 82
PHASE 1: DOCUMENT ANALYSIS ... 84
Introduction ... 84
Results ... 86
Australian benchmarks for gerodontology competencies ... 87
Gerodontology internationally and comparison to Australia ... 90
Summary ... 105
PHASE 2: SURVEYS ... 106
Introduction ... 106
Results ... 107
Discussion ... 115

Conclusion ... *117*

CHAPTER 5. DATA COLLECTION AND ANALYSIS: PHASE 3 ... 118

PART 1: DENTAL SCHOOL ACADEMICS ... 118

Pilot Interview Guide ... *118*

Introduction ... 118

Developing an Interview Guide ... 119

Framework for the Interview Guide ... 119

Educational Environment Instruments ... 120

Final Interview Guide ... 123

Australian Dental School Academics' Perceptions of Gerodontology Education in the Undergraduate Curriculum ... *124*

Introduction ... *124*

Methods ... *125*

Participants, Setting and Ethics ... 125

Data Collection ... 125

Results ... *125*

Thematic Analysis ... 128

Theme 1: Clinical Exposure ... 129

Theme 2: Organisational levers ... 132

Theme 3: Sociological barriers ... 136

Discussion ... *140*

Conclusion ... *142*

PART 2: DENTAL STUDENTS ... 144

Introduction ... *144*

Methods ... *144*

Participants, Setting and Ethics ... 144

Data Collection ... 145

Results ... *145*

Thematic analysis ... *146*

Theme 1: Preferences for gerodontology ... 146

Theme 2: Barriers to gerodontology ... 149

Theme 3: Variation in learning 152
Discussion *155*
Conclusion *158*
PART 3: CONSUMER REPRESENTATIVES AND DIRECTORS OF NURSING 159
Introduction *159*
Methods *160*
Participants, Setting and Ethics 160
Data Collection 161
Results *161*
Thematic analysis *163*
Theme 1: Interrelations Between Stakeholders 163
Theme 2: Resources 166
Theme 3: Quality of Life 168
Theme 4: Curriculum Content 171
Discussion *173*
Conclusion *176*
CHAPTER 6. DISCUSSION AND CONCLUSION 178
INTRODUCTION 178
RECOMMENDATIONS 180
Recommendation 1. 183
Recommendation 2 185
Recommendation 3 186
Recommendation 4 188
Recommendation 5 190
Recommendation 6 191
Recommendation 7 193
Recommendation 8 194
Recommendation 9 195
Recommendation 10 196
RESEARCH STRENGTHS AND LIMITATIONS 201
Strengths *201*

Limitations *202*
Methodological limitations 202
COVID-19 203
Study sample 204
Future research *205*
Future directions *206*
CONCLUSION 209
REFERENCES 211
APPENDICES 232

List of Tables

Table 1. Probabilistic population projections based on World Population Prospects 2019[12] 28

Table 2. Accredited dental practitioner programs in Australia 33

Table 3. Inclusion and exclusion criteria for accepted articles...38

Table 4. Characteristics of studies 42

Table 5. Summary of gerodontology knowledge, attitude, and skills results 48

Table 6. Instruments for measuring the educational environment in dentistry[130]................70

Table 7. Braun and Clarkes' thematic analysis[109] 79

Table 8. Australian Dental Council (ADC) Guidelines for special needs dentistry[147]..............87

Table 9. Gerodontology competencies for the Australian newly qualified dentist based on ADC competencies. 88

Table 10. Gerodontology competencies: Japan and Europe...93

Table 11. Gerodontology descriptors coded as ADC domains from MCC and ECG competencies...99

Table 12. Gerodontology competencies for the newly qualified dentist for Phase 2 survey 103

Table 13. Demographics of Australian dental school participants 107

Table 14. Gerodontology content and mode of delivery 108

Table 15. Gerodontology competencies taught in Australian dental schools......................111

Table 16. Comparison of instruments and statements for consideration for interview guide 121

Table 17. Semi-structured questions for pilot interview guide 123

Table 18. Codebook from the interviews 126

Table 19. Final themes 146

Table 20. Codebook 162

Table 21. Final themes 163

Table 22. Recommendations to support undergraduate gerodontology curricula 182

Table 23. Recommendations with supporting evidence for Australian gerodontology education 198

List of Figures

Figure 1. Thesis map 24

Figure 2. Study selection flowchart of the scoping review 41

Figure 3. Kern's six-step approach to curriculum design[100] 60

Figure 4. Kern's six-step approach to curriculum design[100] Phase 1 62

Figure 5. Kern's six-step approach to curriculum design[100] Phase 2 64

Figure 6. Kern's six-step approach to curriculum design[100] Phase 3 68

Figure 7. Framework for semi-structured interview guide[131] 71

Figure 8. Kern's six-step approach to curriculum design[100] Phase 4 77

Figure 9. Flowchart of project phases...78

Figure 10. Research questions and project phasing summary 83

Figure 11. Mode of delivery of gerodontology content 110

Figure 12. A framework for the development of a qualitative semi-structured interview guide..119

Figure 13. Initial theme mind map...127

Figure 14. Sub-themes mind map 128

Figure 15. Summary of studies and results...180

List of Appendices

Appendix 1. Publication. Gerodontology in the dental school curriculum: A scoping review. Gerodontology 232

Appendix 2. Electronic database search strategy 245

Appendix 3. Included Study Characteristics 246

Appendix 4. Summary of gerodontology curriculum content results 250

Appendix 5. Summary of gerodontology knowledge, attitude, and skills results 253

Appendix 6. Australian Dental Council (ADC) professional competencies of the newly qualified dentist 48 256

Appendix 7. Information sheet and consent forms (Phase 3) 262

Appendix 8. Survey for Australian Dental Schools (Phase 2)....................................276

Appendix 9. Ethics Approval 288

Appendix 10. Publication. Australian dental school academics' perceptions of gerodontology education in the undergraduate curriculum. European Journal of Dental Education 289
Appendix 11. Publication. Stakeholder perceptions of gerodontology education for final year Australian dental school curricula. Journal of Dental Education..297

List of Abbreviations

ACAT	Aged Care Assessment Team
ADA	Australian Dental Association https://ada.org.au/
ADC	Australian Dental Council https://adc.org.au/
ADEA	American Dental Education Association
Ahpra	Australian Health Practitioners Regulation Agency https://www.ahpra.gov.au/
CDDS	Chronic Disease Dental Scheme
COALS	Clinically Orientated Active Learning Sessions
DBA	Dental Board of Australia https://www.dentalboard.gov.au/
DC(NZ)	Dental Council (New Zealand)
DON	Directors of nursing
DREEM	Dundee Ready Education Environment Measure
ECG	European College of Gerodontology
ERIC	Educational Resources Information Center
Guidelines	ADC/DC(NZ) Guidelines for Accreditation of Education and Training Programs for Dental Practitioners
JAGS	Journal of the American Geriatrics Society
JSG	Japanese Society of Gerodontology
MBS	Medicare Benefits Schedule
MCC	Model Core Curriculum
MSLES	Medical School Learning Environment Survey
NHS	National Health Scheme
NRAS	National Registration and Accreditation Scheme
PICO	Patient Intervention Comparison Outcome
QATSDD	Quality Assessment Tool for Studies with Diverse Designs
RACF	Residential aged care facilities
RN	Registered nurses
SND	Special needs dentistry
Standards	ADC/DC(NZ) Accreditation Standards for Dental Practitioner Programs
UK	United Kingdom

US United States

WHO World Health Organization

Glossary

Allied dental professional: dental practitioners other than dentists

Australian Institute of Health and Welfare: Australia's national agency for information and statistics on Australia's health and welfare

Care-dependent: the need for support in the domain of care to compensate a self-care deficit.

Caries: preventable disease process resulting from the interaction between acid-producing tooth-adherent bacteria and fermentable carbohydrates

Commonwealth (Australian): Australian federation consisting of six states and two governing territories.

Dentate: a person who has natural teeth in the oral cavity

Dental Therapist: a dental practitioner with a narrower range within the definition of dentistry than an oral health therapist

Dentist: a dental practitioner who may practise any activities within the definition of dentistry

Denture: a removable plate or frame holding one or more artificial teeth

Domiciliary visit: visitations by health professionals to place of patient's residence i.e., Home, nursing home, residential aged care facility, Older Persons Unit Ward

Edentulous: a person with no natural teeth in the oral cavity

Extra-mural learning: clinical learning experienced outside of the dental school setting.

Frailty: a clinically recognisable state in which the ability of older people to cope with every day or acute stressors is compromised by an increased vulnerability brought by age-associated declines in physiological reserve and function across multiple organs

Geriatric: relating to older people

Gerontology: the scientific study of old age, the process of ageing, and the problems of older people

Gerodontology: the study of dentistry which deals with the diagnosis, management, and treatment of dental conditions relating to older people.

Interprofessional collaborative practice: when multiple health workers from different professional backgrounds provide comprehensive services by working with patients, their families, carers, and communities to deliver the highest quality of care across settings.

Medicare: Australia's universal health insurance scheme giving Australian citizens and permanent residents access to healthcare with free or subsidised health services.

Medicare Benefits Schedule (MBS): the list of medical services for which the Australian Government will pay a Medicare rebate, to provide patients with assistance towards the costs of their medical services.

Medicare Chronic Disease Dental Scheme (CDDS): an Australian Government-subsidised dental care scheme for people suffering from a medical condition operating from 2007-2012.

National Health Service (NHS): the publicly funded healthcare systems of the United Kingdom.

Older person/people: Indigenous Australians aged 50 and over, and non-Indigenous Australians aged 65 and over (Australian Bureau of Statistics)

Oldest old: aged 80 and over (WHO)

Oral Health Therapist: A dental practitioner with a narrower range within the definition of dentistry than a dentist

Periodontitis: an irreversible inflammatory disease of the tissue surrounding the tooth structure also known as 'gum disease'

Prosthetist: a dental practitioner who works within the scope of practice to assess, treat, management and provide of removable dentures, and flexible removable mouthguards used for sporting activities

Prosthodontist: a dentist who specialises in the prevention, diagnosis, and treatment of periodontal disease, and in the placement of dental implants

Residential Aged Care Facility (RACF): a facility for older people who can no longer live at home. Reasons may include illness, disability, bereavement, an emergency, the needs of their carer, family, or friends, or because it is no longer possible to manage at home without help

Service-based learning *or* service-learning: clinical learning in residential facilities

Special needs dentistry *or* Special care dentistry (SND): the branch of dentistry which deals with the oral health care of people that require special methods or techniques to prevent or treat oral health problems, or where such conditions necessitate special dental treatment plans.

Undergraduate curriculum: completion of the program to graduate with a bachelor's degree in dentistry (may be BDS or DDS in Australia)

Undergraduate *or* entry-to-practice: a course that enables the student to meet the National Board's (or equivalent) requirements for registration as a dentist.

Chapter 1. Background and Introduction

Vignette of the researcher

My career as a dentist has been varied with the benefit of working in a British public health system allowing me to look after patients from all walks of life. Socio-economic status and location were not barriers to being able to provide oral health services in the United Kingdom (UK), so when the patients that I had been looking after for years grew older and became frail and care-dependent, I was able to jump in my car and provide domiciliary visits in the patient's home or their aged care facility. The knowledge that as dentists we could continue to manage our patients through their lifespan was something I took for granted, until I emigrated to Australia.

Working as an associate dentist in Tasmania for a few years, I asked the owner of the practice how I could arrange domiciliary visits for my patients who were starting to make plans to move to nursing homes. I was told this was not something the practice would provide as a service. He had investigated the possibility and found that the insurance was too expensive and the logistics too hard. I asked him who was responsible for the oral health of the patients when they were unable to advocate for themselves. 'No one,' he said.

This knowledge led me on an advocacy journey through volunteering for the Australian Dental Association, joining the Tasmanian Oral Health Aged Care Alliance, and providing a submission to the Royal Commission into Aged Care Quality and Safety.[1] The resulting recommendations from the Royal Commission clearly identified a need to provide a workforce equipped to manage the needs of older people. How better to equip a workforce with knowledge, skills, and attitudes than to embed it into the core curriculum? With a growing population of older people and these people keeping their teeth for longer, who would advocate for the frail and care-dependent people who were unable to communicate oral pain due to cognitive decline?

Older people have specific needs and complexities in oral and general health that differ from those of younger people. Without a curriculum designed to address the needs of this unique group of people specifically, we risk being behind the eight-ball for a growing problem that we know will arrive.

'A dental led Armageddon in the elderly is just around the corner and we are not prepared.'[2]

Figure 1 provides the chapter outline for the thesis.

Figure 1. Thesis map

Chapter 1
- Background and Introduction

Chapter 2
- Scoping Review

Chapter 3
- Methodology and Methods

Chapter 4
- Data Collection and Analysis: Phases 1 & 2

Chapter 5
- Data Collection and Analysis: Phase 3 (Parts 1, 2 , and 3)

Chapter 6
- Discussion and Conclusion

Introduction

Background of provision of oral health in Australia is provided in this section. As well as oral health, theory of ageing, and frailty, the special needs of the older dentate person are discussed as an introduction to gerodontology, the branch of dentistry associated with older people.

Oral Health

Good oral health contributes to overall health and wellbeing and is accepted as a basic right described in the World Health Organization's (WHO) Liverpool Declaration.[3] In the declaration, older people were recognised in the call for action as one of the eleven areas countries should work towards. Through this declaration, countries should have strengthened the oral health promotion and prevention of oral diseases of older people by the year 2020.

With the most vulnerable older people living in residential facilities, and also being frail and care-dependent, the ability to achieve good oral health is challenging in the current climate for dentistry in Australia. Chapter 4 Section 51 of the Australian Constitution grants dental services the same status as medical services and allows the Commonwealth the power to legislate and fund dental services, however, there is no obligation for this to occur. The result is that oral health is seen as the responsibility of the states and territories, with services and funding schemes targeted at children and eligible priority populations. Older people are, as yet not included as a priority population under a targeted funding schedule to ensure access to both public and private oral health care.

Approximately 1 in 3 people in Australia are eligible for public oral health services,[4] leaving the remaining two thirds of the population to seek dental care through private clinics. Private dental practitioners are not incentivised to provide domiciliary care with multiple barriers for patients accessing care, particularly those who have physical, cognitive, and financial challenges.[5] The results for older people unable to access services may lead to

compromised oral health.[2,5] This can include pain, discomfort, and embarrassment as oral health affects a person's ability to eat, speak, and socialise.

While the WHO sought to improve the quality of oral health care provided to older people by the year 2020, this has not come to fruition. Older Australians remain one of the most vulnerable groups with the poorest oral health outcomes. The last report by the Australian Institute of Health and Welfare was in 2000,[6] however, there has been no further data to show any improvements in the oral health of older Australians.

Theory of Age and Ageing

The adage 'you're as old as you feel' is foundational to concepts of age and ageing. Age with relation to the social construction of life span phases has proved difficult to determine as chronological age does not necessarily correspond to definitions of the process of ageing.

One accepted postulation by gerontologists is that four characteristics of ageing are involved.[7]

- Ageing is universal. and exists in all individuals of all species to varying degrees.
- Ageing must be intrinsic and is not attributable to any external or environmental factor.
- Ageing must be progressive, with progressive changes occurring during the ageing process and-throughout the life span.
- Ageing must be deleterious, and any phenomenon associated with ageing is determined to have adverse effects on the individual.

Gerontology theorists recognise there are biological, psychological, and social factors involved in the process of ageing and discussions should maintain a reflexive approach with the goal of achieving 'successful ageing.'[8] Defining ageing and the achievement of optimal ageing could be seen as a dichotomy but should be interpreted as a paradox where both healthy ageing and the course of the physical and biological ageing process, simultaneously play an important role in understanding the processes. The aim of moving through the

lifespan with functional ability is seen through international documents such as the WHO's focus on active ageing to 'healthy ageing.'[9]

Ageing, however, when associated with frailty and care-dependence becomes complicated by higher morbidity risks and lower quality of life.[10] This is further compounded when the world's older population is growing and keeping their teeth for longer.

Frailty and a growing older dentate population

People worldwide are living longer, with the proportion of older persons projected to accelerate at an unprecedented rate.[11] The number of 'oldest-old' people (people aged 80 years or over) is growing even faster than the proportion of older people overall, with estimations that this group will triple by 2050.[12] This trend is not specific to developed countries, with the oldest-old population in some developing Asian and Latin American countries predicted to quadruple by 2050.[13] The United Nations' probabilistic population projections anticipate that between 2020 and 2100, the proportion of the world population aged 65 and over will increase across all older age categories. Meanwhile, the percentage of the population aged between 0 and 14 is expected to decrease[12] (Table 1).

In Australia alone, the Australian Bureau of Statistics has projected an increase of 139% in the number of people aged 65 and over between 2000 and 2030.[14] Australians have one of the highest life expectancies in the world, and while the Australian Bureau of Statistics defines the older person as aged 65 and over, the Australian Institute of Health and Welfare acknowledges that Australia's Aboriginal and Torres Strait Islander population experience age-related conditions younger than the non-Indigenous population with aged care planning occurring at age 50.[15]

Table 1. Probabilistic population projections based on World Population Prospects 2019[12]

Region, subregion, or area	Population age 65+, both sexes combined, as of 1 July Year (thousands)			
	2020	2040	2060	2080
UN development groups	…	…	…	…
More developed regions	245 648	325 840	357 344	359 912
Less developed regions	481 959	974 677	1 453 053	1 794 996
Least developed regions	37 964	81 656	170 787	309 094
Less developed regions, excluding least developed countries	443 995	893 021	1 282 266	1 485 902
Less developed regions, excluding China	304 480	621 295	1 044 345	1 422 492
World Bank income groups	…	…	…	…
High-income countries	231 810	329 488	371 891	383 853
Middle-income countries	469 782	916 484	1 320 022	1 540 244
Upper-middle-income countries	287 568	554 354	709 524	714 628
Lower-middle-income countries	182 214	362 130	610 498	825 616
Low-income countries	25 679	53 899	117 711	229 783
No income group available	335	646	774	1 029
Geographic regions	…	…	…	…
Africa	47 096	97 500	202 108	373 251
Asia	411 603	802 393	1 112 713	1 243 162
Europe	142 906	188 280	202 580	190 811
Latin America and the Caribbean	58 651	113 560	174 074	207 509
Northern America	61 903	89 894	107 084	125 420
Oceania	5 448	8 890	11 841	14 755

Variations in defining the ‘older’ person have been considered by the United Nations with health-related and socio-economic differences rather than relying on chronological age alone.[12,16] In the absence of a universally accepted definition, the age at which a person becomes eligible for a retirement pension tends to become the default definition as being ‘old’. For this study, the population recognised as ‘older people’ will be associated with frailty and care dependence rather than chronological age. Informed by core components recognised in a recent systematic review,[17] the cause of frailty includes biological ageing but is not an inevitable result of older age. The reconceptualisation of healthy ageing is

supported in the WHO model for ageing where the focus on an older person's ability to function with person-centred value is more important than the absence of disease.[18]

The prevalence of frailty increases with age and has been recognised as a condition in which a person is at increased risk of poor health outcomes.[19] While experts have failed to reach a consensus on the definition of frailty,[20] it has been acknowledged that the early stages of frailty seen in older people living in community settings and residential facilities[21] include physical, psychological, and social change.[22] At the 2016 WHO Clinical Consortium on Health Ageing, the topic of focus was frailty and intrinsic capacity, with frailty defined conceptually as:

> *A clinically recognisable state in which the ability of older people to cope with every day or acute stressors is compromised by an increased vulnerability brought by age-associated declines in physiological reserve and function across multiple organs.*[23]

This thesis uses the older, frail, and care-dependent person as the focus for gerodontology education, not chronological age. This recognises the varied biological ageing seen in Australian populations[15] and the complexities of managing older patients as a group with special needs.[24] With a growing population of frail and care-dependent people in residential aged care facilities (RACFs)[25,26] it has become imperative to better prepare dental professionals for managing their health care needs,[27] with a call for public health action[28] to improve oral health status and quality of life for this population.

The Unique Needs of the Older Dentate Person

Most oral diseases are preventable with dental caries (tooth decay) remaining Australia's most common preventable chronic disease in both children and adults.[29] The oral health of residents in RACFs has been found to be poor,[30-32] with medical complexities, polypharmacy and an increase in co-morbidities contributing to the risk factors for poor oral health. Common medications result in xerostomia (dry mouth) as a side-effect that leads to reduced saliva buffering capacity and self-cleansing of the teeth. Poor quality saliva, an increase in functional dependence, and cognitive decline are all contributing risk factors to poorer oral health outcomes and an increased risk of caries and periodontitis (gum disease).

Age-associated changes in the oral cavity further inhibits achievement of optimal oral health. The pulp chamber decreases in size,[33] more secondary dentine is deposited, and dentine permeability decreases.[34] This can change the predicted outcomes of treatment provided in comparison to young adult dentition. Salivary glands also change with age with dry mouth becoming more common in older age.[35] The limited lifespan of a dental restoration adds to a 'restoration cycle' of more complex and larger fillings and restorations in the older person's dentition.

The effects of poor oral health on older people living in RACFs have been linked to aspiration pneumonia, a serious condition leading to morbidity and death.[36] Further, the likelihood of aspiration pneumonia in frail and care-dependent residents is higher due to poor oral health care.[37] A systematic review[36] suggests professional oral health care once a week as an intervention to reduce incidence. These assessments of patients may help predict aspiration pneumonia risk providing dental professionals with the measurement tool to reduce the risk factors associated with the condition.[38]

Dental materials and techniques in dentistry continue to evolve and improve, leading to an ability to retain teeth for longer into older age. Along with an increasing number of older people keeping their teeth as they age, comes the restorative cycle of more complex treatments.[39] This could also be attributed to the changes in societal norms regarding the perceived value of dentition in older people. Historically, it would have been acceptable and expected that adults continue to lose their teeth, with a view to complete edentulousness by the time they entered a RACF.[40] These changes are reflected in the rates of edentulism, with the proportion of people aged 75 and over who had lost all their teeth reduced by 8% between 1988 and 2010.[15]

Retention of teeth in older people is important for both oral and general health. Evidence has shown a direct correlation between maintaining a natural dentition with a longer life expectancy and improved quality of life.[41] Dental treatment planning for optimal oral health for the older, dentate person should be tailored for the patient's specific needs, taking into consideration the physical, psychological, and social changes that have occurred. Supporting

this statement are the recommendations from the Royal Commission into Aged Care Quality and Safety urging for a workforce with 'the skills, qualifications, and knowledge they need for their role to provide care and services'.[1] This points to a clear need for education at an undergraduate level to prepare dentists to manage the needs of older Australians. Whilst optimal oral health for aged care residents is reliant on a workforce extending beyond just the dental profession, the gerodontology education of dental professionals is an important part of successful provision of oral health care to older people.

Background: Dentistry and Oral Health for Older People.

The role of the dental team involved in the care of older people is discussed for background to the provision of oral health care to older Australians. Included is information on gerodontology, and the Australian education system for training dentists.

The Role of the Dental Team in the Care of Older People

The dental team has expanded from the traditional model of a dentist and assistant to include dental hygienists, dental therapists, oral health therapists and prosthetists, as described in the Dental Board of Australia's dental practitioner divisions.[42] The first dental therapy school was introduced to Australia in 1966 with dental hygienists and therapists focusing on disease prevention through intervention and education. Prosthetists provide removable dentures and flexible removable mouthguards for sports activities.

With increased oral disease rates in residents of aged care facilities linked to a lack of access to preventative oral care,[43] the need for allied dental practitioners (oral health therapists, dental therapists, and hygienists) is essential to the improvement of health outcomes[44] and decreasing barriers to access for older people. For example, on the New South Wales Central Coast, the Senior Smiles model of care successfully utilised dental hygienists to enhance collaboration and referral pathways in RACFs.[45] Whilst various programs exist to improve oral health access to RACF residents, geriatric oral health advocates argue there is further work to reduce poor oral health outcomes, including increased support for teaching and research of geriatric care.[46,47]

The Australian Dental Council (ADC) is the accreditation authority for dental practitioners. One of its functions is to accredit programs and describe the professional competencies at the point of graduation.[48,49] Dentists are the members of the dental team with the full scope of practice within the dental practitioner divisions[50] to provide all activities for all ages within the definition of dentistry.[50] With this scope of practice also comes the ability to continue postgraduate study to gain specialist recognition with 13 specialities recognised by the Dental Board of Australia (DBA).

Gerodontology

Gerodontology is the branch of dentistry dealing with the oral health of older people. It does not exist as a separate specialty of dentistry in Australia but sits within the branch of SND.[51] Only dental practitioners within the division[50] of 'dentist' may progress from postgraduate study to register as a SND specialist.[50,51]

There are content and structural differences in the undergraduate gerodontology curricula of dental schools both within countries and internationally, with a lack of standardisation afforded by current accreditation guidelines. Other countries have recognised the need to include gerodontology in their dental education system,[52-55] regardless of the socio-economic status and stage of development of these countries.[56,57] Societies contributing to the health promotion of older people also advocate for greater inclusion of gerodontology. The European College of Gerodontology and the European Geriatric Medicine Society both acknowledge the need for an educational action plan as part of their recommendation for policy makers with training, to improve not only the knowledge of health professionals, but attitudes to oral health.[52,57] The advocacy for gerodontology has not been actioned in Australia, with inconsistencies in gerodontology education across Australian dental schools and lack of clinical exposure to older patients.[27]

Graduating as a Dentist in Australia

There are nine Australian dental schools with varying pathways for graduating with a degree to enable registration as a general dental practitioner. Graduates of programs accredited by the ADC and approved by the DBA are eligible to apply for registration with the DBA. While

all of these require a foundation of undergraduate study, several Australian dental schools offer a postgraduate degree which enables registration as a dentist with the DBA[58] (Table 2).

Table 2. Accredited dental practitioner programs in Australia

Qualification	Dental School	Program/Years
Bachelor of Dental Science	Charles Sturt University	Undergraduate 5
Bachelor of Oral Health in Dental Science/Graduate Diploma of Dentistry	Griffith University	Undergraduate 5
Bachelor of Dental Health Science/ Master of Dentistry	Griffith University	Undergraduate 5
Bachelor of Dental Surgery	James Cook University	Undergraduate 5
Bachelor of Dental Science (Honours)	La Trobe University	Undergraduate 5
Bachelor of Health Sciences in Dentistry/Master of Dentistry	La Trobe University	Undergraduate 5
Bachelor of Dental Surgery	University of Adelaide	Undergraduate 5
Doctor of Dental Surgery	University of Melbourne	Postgraduate 4
Bachelor of Dental Science (Honours)	University of Queensland	Undergraduate 5
Doctor of Dental Medicine	University of Sydney	Postgraduate 4
Doctor of Dental Medicine	University of Western Australia	Postgraduate 4

For the purposes of this paper, the term ‘undergraduate curriculum’ will be used to describe programs accredited by the ADC and approved by the DBA for graduates to be eligible to apply for registration with the DBA regardless of whether they are offered in postgraduate courses.

This chapter has provided descriptions and information about the dentition of older people and a background to undergraduate dental training in Australia. In Chapter 2 a scoping review[59] was conducted to explore the current status of gerodontology in the undergraduate dental curriculum where information regarding content and mode of delivery for learning is described. The scoping review also aimed to identify existing gaps in the literature as well as summarise the gerodontology content in dental schools internationally.

Chapter 2. Scoping review

Chapter 2 outlines the scoping review which was undertaken to support the thesis and is included as a paper in Appendix 1. This also forms the first step of curriculum design, providing the problem identification required for development of health professional education. Through answering the research question from the scoping review, ‘What is known about the current status of gerodontology in the undergraduate dental curriculum’, the evidence for identifying the healthcare education problem was detailed through the data analysis and discussion in the scoping review.

Papers used in Chapter 2 and Chapter 5 are not verbatim from the papers and have been drawn from the text used in the researcher’s publications. Appendices of the published papers are included.

Gerodontology in the dental school curriculum: a scoping review

Nilsson A, Young L, Glass B, Lee A. Gerodontology in the dental school curriculum: A scoping review. *Gerodontology*. 2021;38(4):325-337. Appendix 1.

Background

People worldwide are living longer with the proportion of older persons projected to accelerate at an unprecedented rate.[11] The number of 'oldest-old' persons (people aged 80 years or over) is growing even faster than the proportion of older people overall, with estimations that this group will triple by 2050.[60] This statistic is not limited to developed countries, with the population of oldest old in some developing Asian and Latin American countries predicted to quadruple by 2050.[13] With this change in life expectancy comes an increase in dentate older people indicating the need for a workforce of health professionals equipped with the knowledge, skills, and attitudes to manage a growing frail and care-dependent population.[27]

Societal norms have changed concerning how we view dentition in older people. Historically, it would have been acceptable and expected for adults to continue to lose their teeth with a view to complete edentulousness by the time they are in a RACF.[40] As dental materials and dentistry techniques have improved over time, our ability to retain our teeth for longer has led to a frail and care-dependent population, with a need to be able to maintain the oral cavity and dentition. Evidence has even shown that it is beneficial to keep our dentition as long as possible with the presence of natural teeth correlating with greater life expectancy and quality of life.[41] The older dentate patient is more likely to have a complicated medical history with increased co-morbidities and changes in the oral cavity that necessitate dental management. Thus, there is a clear need for education at an undergraduate level to prepare dentists to manage this population. Advocacy in provision of better services for frail and care-dependent older people has been growing amidst a call for public health action to improve oral health status and quality of life for this population.[28]

There is a paucity in the literature on gerodontology education in the undergraduate dental curriculum. This scoping review was conducted to systematically map research in this area

and to identify existing gaps. The following research question was formulated: What is known about the current status of gerodontology in the undergraduate dental curriculum? This includes information regarding content, proportion of time allocated and mode of delivery for learning.

Methods

A scoping review was chosen for reviewing the literature due to the limited number of papers and varied research methodologies involved. This was conducted using Arksey and O'Malley's framework to map key concepts.[61] The search for this review was conducted in June and July 2019 with electronic databases including CINAHL, Educational Resources Information Center (ERIC), Google Scholar, Scopus, and Web of Science (Figure 2). Both MeSH terms and keywords were used in the search strategy. Keyword terms included 'gerodontology', 'aged care oral health', 'geriatric dentistry', 'dental students', 'curriculum', and 'education' (Appendix 2). Additional records were retrieved using an electronic search of two key journals, the Journal of Dental Education, and the European Journal of Dental Education. Manual searching was conducted by reviewing relevant articles. Data were extracted from each included study using the qualitative data analysis software NVivo to identify comparable information on geriatric dental education.

A scoping review framework was chosen to identify existing gaps in the research on undergraduate gerodontology education and clarify key concepts in the available literature.[62,63] This scoping review was conducted using the PRISMA-ScR statement to guide the reporting of the literature and ensure methodological rigour[64] to discover the current status of undergraduate gerodontology education internationally. The Patient Intervention Comparison Outcome (PICO) framework[65] was utilised to guide the selection of articles with dental students as the population, gerodontology education as the intervention, absent or reduced gerodontology as the comparison, and change in attitude, knowledge, skills, or conclusions regarding undergraduate gerodontology education as the outcomes.

Inclusion criteria

The review aimed to investigate the current status of gerodontology in the undergraduate dental curriculum, rather than examine the historic implementation of geriatric dentistry education. The inclusion and exclusion criteria for the review are listed below Table 3. Only articles from 2009 onwards were accepted. This timeline was chosen to reflect current practice in dental schools internationally with the acknowledgement that dental schools in various countries had increasing numbers of dental schools.[66,67]

Table 3. Inclusion and exclusion criteria for accepted articles

Included	Excluded
Peer reviewed journals	Non-peer reviewed journals
English language	Not in English
Undergraduate dental school	Not centred on undergraduate education
Centred on dental graduates or dental students	Not centred on dental graduates or dental students
Full text article	Title or abstract only
Gerodontology education	Not centred on gerodontology
Published from 2009 onwards	Published before 2009
	Grey literature, review articles, discussion papers, editorials, poster presentations

Two reviewers, experienced in health professional education, eliminated 71 articles by title using the PICO framework. A further nine articles were excluded after screening abstracts. Twenty-eight full-text articles were reviewed independently and any studies with differing opinion were eliminated or accepted by discussion and consensus.[63] Initial data charting utilised forms from the Critical Appraisal Skills Programme[68] with further data extraction and data handling with QSR International's NVivo 12 software.

The quality of the included studies was assessed using the Quality Assessment Tool for Studies with Diverse Designs (QATSDD)[69] by the two reviewers AN and KB. While the scoping review literature is undecided about the need for an assessment of quality[61,63] the QATSDD instrument has been used to provide evidence and judge the quality of literature sourced in mixed methods studies. The 15 accepted studies were critically reviewed against a 16-item quality assessment tool. Both reviewers assessed the articles independently and the interrater agreement was calculated, with any differences in scoring resolved by discussion as described by quality assessment method.[69]

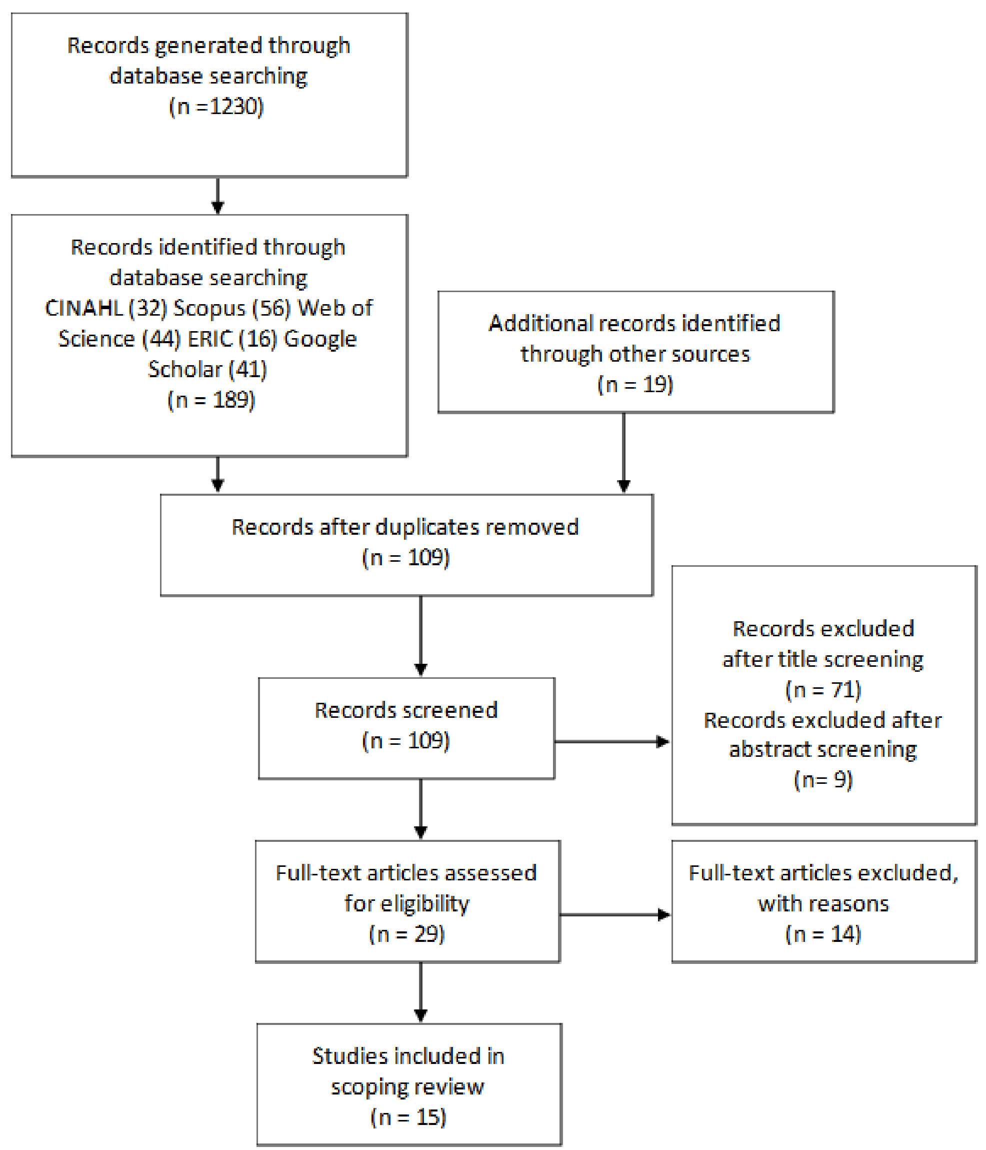
The QATSDD tool was chosen because the review involved health-related research, including studies that involved quantitative and qualitative methods. Although the tool exhibits good reliability and validity for use in quality assessment and encouraging dialogue among researchers for an iterative approach,[69] there are limitations to using the QATSDD. The scoring has the potential for bias and may not reflect quality when comparing papers as the method is subjective.[70] Therefore, it is necessary for any large deviations in scoring between researchers to use an iterative approach for a final score. The scores were represented as a percentage with the 'strongest' possible score being 100. An interrater reliability analysis using the Kappa statistic was performed to determine consistency among the reviewers which was found to be Kappa= 0.42 ($p < 0.001$) indicating moderate agreement.[71] This score is to be considered with the percentage agreement due to the limitations of using the QATSDD tool,[72] with the agreement of scores within a 10% interval resulting in 86% interrater agreement. The two papers with a difference larger than a 10% interval both had a difference of 12% (Table 4) with the final scores calculated as an average of scores for both reviewers.

Results

The results are presented as quantitative and descriptive data from the various study designs used in the reviewed papers. A total of 1230 potentially relevant studies were retrieved through the electronic database searches.

Four electronic databases were searched initially, with a fifth database searched to ensure data saturation. Two peer-reviewed journals relevant to the study, the Journal of Dental Education and the European Journal of Dental Education were searched, which elicited 15 studies. A further three studies were found after manual searching through the reference lists of relevant articles already retrieved. Of the 109 articles found and after duplicates were removed, 71 studies were excluded by the first reviewer by title relevance and the exclusion criteria described in Table 3. After independently reviewing the remaining articles, the two reviewers excluded nine additional studies by abstracts. Twenty-nine full-text studies were read by both reviewers to decide if the inclusion and exclusion criteria were met, and any disagreements were resolved through discussion and consensus culminating in a final 15 studies accepted for the review. Figure 2 provides the study selection flowchart of the scoping review.

Figure 2. Study selection flowchart of the scoping review



The studies included qualitative, quantitative, and mixed methods. Three studies used online website searches to collate information on the dental school curriculum.[73-76] The majority of studies used questionnaires or surveys to acquire data.[76-84] Two studies, both by Núñez et al., used semi-structured interviews,[85,86] while a further study collected bibliographical data and local information from a selected dental school.[87] Table 4 provides the summary of characteristics of the 15 studies in the scoping review. Further detail of included studies can be found in Appendix 3, 4, and 5).

Table 4. Characteristics of studies

First author, year, *journal*	Setting/ country	Participants	Study design	Aim	Major findings relevant to undergraduate gerodontology	Quality (using QATSDD approach) %
Attard et al., 2018 ***European Journal of Dental Education***	University of Malta, Malta	27 undergraduate dental and 8 dental hygiene students	Online questionnaires	Students' clinical activities and perspectives	55% of the students felt adequate training	50*
De Visschere et al., 2009 ***European Journal of Dental Education***	Six Belgian dental schools	132 of 357 new graduate dentists	Mailed questionnaires	Impact of undergraduate gerodontology training	Knowledge and attitudes towards ageing are poor	77
Ettinger et al., 2018 ***Gerodontology***	US	Deans or geriatric dentistry teachers 56 of 67 dental schools	Web based survey	To assess teaching of geriatric dentistry	Wide variation in the teaching of gerodontology	68
Kitagawa et al., 2011 ***European Journal of Dental Education***	Japan	Showa University School of Dentistry	Descriptive and statistical analyses of bibliographical data and local information	An evaluation of geriatric dental education	Fourth year- 43 hours. Fifth years- 90 clinical hours exclusively for geriatric dentistry	28

First author, year, *journal*	Setting/ country	Participants	Study design	Aim	Major findings relevant to undergraduate gerodontology	Quality (using QATSDD approach) %
Kossioni et al., 2017 ***BioMed Central Oral Health***	Europe	Deans or other contact persons at 216 dental schools across 39 European countries.	Electronic questionnaire emailed to participants	Current status of gerodontology teaching	Gerodontology independent subject in 37.4% of schools, Clinical teaching in 64.2%	73
Léon et al., 2016 ***Gerodontology***	Chile	Deans from 16 out of 19 Chilean dental schools	Web-based questionnaire	Status of undergraduate geriatric dentistry education	84% teach some aspects 37% formal course in geriatric dentistry. Outreach service-based clinical learning 16%	59
Levy et al., 2013 ***Journal of Dental Education***	US	62 US dental schools	Website searches	Reassess teaching of gerodontology	89% undergraduate gerodontology component. 22.6% clinical component	55
Marchini et al., 2018 ***Special Care in Dentistry***	Multiple countries across 5 continents	Faculty members from a selection of several countries across 5 continents	Surveys and PubMed database search	Summary of geriatric dentistry in dental schools	Geriatric dentistry as a stand-alone subject is not established in most schools.	41

First author, year, *journal*	Setting/ country	Participants	Study design	Aim	Major findings relevant to undergraduate gerodontology	Quality (using QATSDD approach) %
Nitschke et al., 2009 ***Gerodontology***	Leipzig, Germany and Zürich, Switzerland	34 Leipzig undergraduate dental students and 33 Zürich graduate dentists	Questionnaire	Evaluation of attitude towards the clinical component of gerodontology program	Mobile dental van experience rated the highest in positive statements	36
Nitschke et al., 2013 ***Journal of Dental Education***	Austria, Germany, and Switzerland	20 of 37 deans and 87 of 140 department heads of Austria, Swiss, and German dental schools	Mailed questionnaire	Assess changes in undergraduate gerodontology teaching	All Swiss and 2 of the 3 Austrian dental schools offered gerodontology seminars. In Germany, 6 of 30 schools offered this	59
Nitschke et al., 2018 ***European Journal of Dental Education***	Austria, Germany, and Switzerland	18 of 35 deans and 66 of 139 department heads of Austria, Swiss and German dental schools	Mailed questionnaire	Assess changes in undergraduate gerodontology teaching	Gerodontology teaching in Switzerland is compulsory	58
Núñez et al., 2017 ***Brazilian Journal of Geriatrics and Gerontology***	Brazil, Peru, Argentina, Colombia, and Chile	20 professors of geriatric dentistry or equivalent	Semi-structured interviews	To analyse the teaching of undergraduate gerodontology curriculum	Teaching is generally aligned with the National Curricular Guidelines	73

First author, year, *journal*	Setting/ country	Participants	Study design	Aim	Major findings relevant to undergraduate gerodontology	Quality (using QATSDD approach) %
Núñez et al., 2019 ***Gerodontology***	Brazil, Peru, Argentina, Colombia, and Chile	20 professors of geriatric dentistry or equivalent and 30 final year undergraduate dental students	Semi-structured interviews	To analyse undergraduate gerodontology teaching characteristics	Insufficient hours dedicated to gerodontology teaching	68
San Martin Galindo et al., 2015 ***Current Research in Dentistry***	Spain	19 Spanish dental schools	Cross-sectional survey of websites	To assess the geriatric dentistry education programs	8 of the schools offered a gerodontology course	60
Tahani et al., 2019 ***Journal of Education and Health Promotion***	Iran	18 Iranian dental schools	Cross-sectional survey	To analyse current status of geriatric education and facilities	Current status in Iran is inadequate. Dental schools ill-equipped for older people	50

***Interrater agreement percentage larger than 10% interval with both having 12% difference in rater scoring**

Fourteen articles assessed the content of the undergraduate dental curriculum relating to geriatric education[73,75,76,78-87] and four articles investigated attitudes, skills, and knowledge of ageing or gerodontology.[77,78,84,86] Two of the studies involved dental students,[77,84] two studies graduate dentists,[78,84] and eight studies with dental school academic staff.[74,79-83,85,86] Four used dental school data.[73,75,76,87] The majority of studies were set in Europe with seven originating from European countries,[75,77,78,80,82-84] while three were from South

America,[81,85,86] two from North America,[73,79] two from Asia[76,87] and one included five continents.[74]

Five themes were highlighted in the studies: 1) gerodontology curriculum content, 2) attitudes, skills, and knowledge of undergraduate dental students, 3) didactic teaching, 4) elective and compulsory teaching, and 5) extra-mural learning.

Gerodontology curriculum content

Gerodontology curriculum content describes the inclusion of the subject within the dental undergraduate curriculum. Twelve of the 15 studies yielded quantitative data and detailed gerodontology curriculum content of dental schools (Appendix 3). Several studies were limited in their ability to give accurate summaries of gerodontology curricula due to the sample selection, data collection, poor response rate, or limited information in the text.[75,78,80,82,83,85,86] Marchini et al. used a convenience sample from selected 'world regions'[74] while also adopting a database search to estimate geriatric dentistry. Summarised data from this paper (Appendix 4) lacks objective information that can be compared with other studies. For example, Núñez et al. used intentional sampling to include only public universities with geriatric dentistry in the curriculum,[85] stating that similar or equivalent to geriatric dentistry met the inclusion criteria. The definition of what was considered 'similar or equivalent' to geriatric dentistry, however, was not included in the text.

Response rates varied between countries and there were two studies with no reported response rate due to either lack of information detailed in the paper[85] or the study's design not necessitating responses from a third party.[74] Kossioni et al. listed responses from 29 countries in Europe with a mixed response rate ranging from 12.5% to 100%.[80] Eleven countries did not respond to the emailed questionnaires. Information summarising numbers with tabulation of undergraduate gerodontology curriculum by geographical area showed that Northern Europe had the highest prevalence with 93% and Southern Europe the lowest with 82%, however the percentage of responding schools per geographic area was relatively low, ranging from 14.7 to 20.1%.[80]

Thirteen of the 15 papers concluded that current gerodontology undergraduate curricula were inadequate.[73-77,79-86] Multiple papers did not state if countries included elective or compulsory components in the course, whether there was extra-mural learning, or whether gerodontology was a stand-alone course (Appendix 3). In general, the inclusion of gerodontology in dental schools varied widely and reliable information regarding the content was difficult to gain due to poor response rates and lack of data.

Attitudes, knowledge, and skills of undergraduate dental students

The papers reporting on attitudes, skills and knowledge used varied methods to obtain data and have been summarised in Table 5. De Visschere et al. (2009) utilised the Ageing Semantic differential[88] and Palmore's Facts on Ageing Quiz,[89] Nitschke et al. (2009) and Attard et al. (2018) used questionnaires, and Núñez et al. (2019) collected data through interviews. The countries explored in these papers included Malta,[77] Belgium,[78] Germany and Switzerland,[84] Argentina, Colombia, Chile, Brazil, and Peru.[86]

Attard et al. (2018) found that 47% of students who commented about clinical placement at a geriatric unit experienced emotional difficulty. The authors attributed this to reduced exposure to older patients during the curriculum compared to dental hygiene students who immediately manage frail, challenging older patients.[77] Conversely, Núñez et al. (2019) found that students' attitude to older patients was positive.[86] The study by De Visschere et al. (2009) revealed there was no impact on attitude towards institutionalised older people according to recently graduated dentists. This assertion, however, was based on respondents who had experience in collaborating with a nursing home, of which only 8% of the respondents had the collaborative experience.[78] Nitschke et al. (2009) reported varied results regarding student attitudes to older patients dependent on the program studied.[84] The Leipzig students experienced more feelings of pity and mental strain compared to the Zürich students, with the authors attributing this to the Leipzig students being unable to provide treatment to residents and only monitoring the patients' deterioration of health.[84]

The assessment of students' knowledge of ageing by De Visschere et al. (2009) was not based on knowledge of gerodontology.[90] The paper found that Belgian students' knowledge of ageing was low, with only 50% of the questions answered correctly.[78] This is comparable

to the study from a dental school in Malta, which revealed that only 55% of students felt prepared to manage older patients after their clinical training.[77] In an indirect exploration of students' knowledge, Núñez et al. (2019) reported that gerodontology professors (or equivalent) and final year dental students regarded the short time allocation to the subject as a weakness in the learning process.[86] Regarding the current status of geriatric teaching, it was found that when the subject was taught solely through theory, there was less interest from students and there was a need for varying learning methods to encourage greater student participation.[77,84,86] While there was conflicting evidence supporting the inclusion of gerodontology in the curriculum, overall, this review found that greater time devoted to teaching the subject and increased clinical exposure impacted positively on attitudes, skills, and knowledge.

Table 5. Summary of gerodontology knowledge, attitude, and skills results

Author Response rate	Undergraduate gerodontology curriculum structure	Key findings	Limitations to the study
Attard et al. 2018 **Response rate 90% (undergraduate dental students)**	3rd year: 108 contact hrs, 1 session domiciliary visit 4th year: 120 contact hrs, 2 sessions of open clinic, 1 oral diagnosis clinic 5th year: 100 contact hrs, 2 sessions of open clinic, 1 oral diagnosis clinic	60% students felt adequate time at geriatric unit clinical exposure. 54% felt prepared to manage older adults in future 47% expressed emotional difficulties and challenges relating to the patients' care.	The study included 8 dental hygiene students out of the 36 participants 20% of the participants advised of an interest in gerodontology Small cohort and the only school in Malta.
De Visschere et al. 2009 **Response rate 37% (recent graduate dentists)**	Great variability for inclusion of gerodontology. Included graduates of 2004, 2005, and 2006	Low mean values for inclusion of gerodontology and very varied. Low knowledge of geriatric dentistry.	The overall response rate was poor at 37%. Large variation in geriatric dentistry education between the schools.

Author Response rate	Undergraduate gerodontology curriculum structure	Key findings	Limitations to the study
Nitschke et al., 2009 **100% response (undergraduate dental students)**	**Leipzig (Germany):** Introductory lectures 2nd year Extra-mural placement 3rd and 4th year 4th year elective lectures **Zürich (Switzerland):** 4th year: 10 hours lectures 4-day clinical placement at the gerodontology outpatient clinic. 3 days with dental van 3 days at acute geriatric ward 5th year: 6 hours seminars 15-hour elective revision course five weeks	Greatest positive answers came from the mobile van. Least positive answers came from the ward round placement at the acute geriatric ward.	Guiding questions used for survey. No control results to compare students not exposed to the programs.
Núñez et al., 2019 **Response rate 82% (professors/equivalent and final year undergraduate dental students)**	**Argentina:** 60 hours gerodontology theory/practical **Brazil (3 schools):** 90 hours 'Integrated gerodontology clinic' theory/practical 120 hours theory/practical 54 hours theory **Chile (2 schools):** 64 hours theory/practical 81 hours theory/practical **Colombia:** 152 hours 'Seniors' adult clinic theory/practical **Peru (2 schools):** 87 hours theory/practical 170 hours 'Integrated geriatric clinic' theory/practical	Theory only gerodontology resulted in less interest with a need to allow for greater student participation. Short amount of time devoted to gerodontology insufficient to teach the content.	Intentionally selected 11 schools (9 participated) but not clear how the schools were similar in their gerodontology training and not accounting for what could be large variations. Not clear definitions of what an integrated gerodontology clinic is compared to an integrated geriatric clinic or Senior's adult clinic. Different languages used and online interviews.

Didactic teaching

A common finding when reporting on the teaching of gerodontology was that didactic teaching was often utilised by dental schools.[75,76,79-83,87] This review is unable to report the number of schools using didactic teaching as several papers lacked this information (Appendix 3) and only the learning mode was discussed.[73-75,79-82] Although it was more common to find schools teaching gerodontology using lectures, it was reported that the time allocated at different schools varied and inclusion as an independent subject was unclear as some aspects of geriatric dentistry were taught in other subjects.[73,74,79,81-83]

Elective vs Compulsory teaching

Seven papers reported the percentage of dental schools providing mandatory gerodontology teaching component to the undergraduate curriculum.[73,75,77,79-82] The number varied considerably depending on the country. The highest results were from Switzerland and Malta at 100%[77,82] and the lowest from Nigeria at 0%.[74] The study from Spain reported three quarters of schools included geriatric dentistry education as a mandatory requirement; however, the actual result based on the 19 Spanish schools showed that only six schools offered mandatory geriatric course content giving a result of 32%, not 75% (Appendix 3).[75]

Extra-mural learning

Nine papers reported on extra-mural learning of gerodontology in the undergraduate curriculum in Europe, Iran, Chile, and the US.[73,75-77,80-82] Elective extra-mural training components of gerodontology were reported to be offered by four countries: 50% of Canadian schools,[74] 82.8% of Japanese,[74] 22.6% of North American,[73] and 75% of Swiss dental schools.[83]

In Europe, 26.8% of dental schools were found to offer clinical training in outreach facilities[80] which was similar to US schools at 22.6%.[73] However, the US results were not specific about extra-mural placements and described the clinical component as ‘specific clinical experience with older adults’, not including regular clinic time.[73] European results from Kossioni et al (2017) should be considered with the knowledge there are wide

variations within countries as shown by results from Spain. Despite that reporting 12.5% of schools included extra-mural learning, when calculated as a percentage of the total number of schools, it was only 5.2% (Appendix 4).[75] Two papers concentrating studies on Switzerland, Austria and Germany found varied results depending on the year of publication with 20% of German schools offering extra-mural activities in 2018 compared with 33.3% in 2013 and 77.8% in 2009.[82,83] Similarly varied results were reported for Austria from 0% in 2009 to 33.3% in 2013 and 0% in 2018 while Switzerland remained static at 75% across 2009, 2013 and 2018.[82,83]

Two studies evaluated specific programs that included extra-mural learning, assessing attitudes and knowledge as a result of gerodontology programs.[77,84] Nitschke et al (2009) found that using mobile vans for training elicited positive ratings with Attard et al (2018) similarly indicating that placements on the geriatric unit elicited high approval responses.

Discussion

Overall results from the included papers in the scoping review highlighted a large variation in the methodologies, presentation of data, and findings. While all the papers in the study emphasised a need for greater inclusion of gerodontology content in the undergraduate dental curriculum, only one study found that dentists' knowledge and attitudes were not influenced by their learning experience (Appendix 5).[78] The critical appraisal[69] of the literature found there was broad spectrum of quality and rigour, ranging from low quality at 28% through to 77% at the highest quality.

This scoping review has described the current status of gerodontology in the undergraduate dental curriculum. The inclusion of gerodontology education in dental schools varies in content and may or may not include clinical exposure to older patients.[27] This review found limited studies that reported the inclusion of gerodontology content in dental schools. Very little research is currently investigating dental professionals' attitudes, knowledge and skills regarding geriatric dentistry and education.

Comparison of the literature proved challenging due to a lack of linear definitions and the great variability of how gerodontology is classified as a discipline of dentistry. There does

not appear to be any standardisation of the definition of the older patient and this needs to be addressed to allow for comparisons. Studies including gerodontology with 'similar/equivalent'[85] did not define what similar or equivalent content. Commonly, gerodontology will find itself under the umbrella of Special Needs Dentistry (SND) leading to a dilution of information when attempting to identify how much content is dedicated to gerodontology specifically.[91-93] Difficulties with collection of data regarding curriculum content due to the limited information available were recognised[87] and the figures for clinical training noted errors in accuracy as students treating older, medically compromised patients in general clinics may not have been considered.[73]

The gerodontology volume and content in the undergraduate curriculum varied widely within and across countries. Even when viewing variation within individual dental schools, it was seen over longitudinal studies that the content changed, and the percentage of time spent on gerodontology was declining.[82,83] This study showed the stark contrast between the need for population health to have greater inclusion of educational action for gerodontology[11,28] and what is actually being delivered to dental students.[27,94]

The overwhelming majority of authors advocated for an increase in gerodontology content to address a growing frail and care-dependent population of older patients. The one paper identifying a lack of support for improved knowledge and attitudes towards ageing by recently graduated dentists acknowledged the large variation of gerodontology education between the dental schools in Belgium.[78] However, that paper did not compare data with students who had completed a gerodontology curriculum. In contrast, Nitschke et al.'s (2009) comparison of students who were able to provide treatment to older patients and students who were not able to participate, found that attitudes had improved with clinical-based learning.[84] Further, the assessment quiz De Visschere et al. (2009) used to gain information on graduates' knowledge of ageing was not based on their understanding of gerodontology, but on general ageing and has been found to be unsuitable for use in health professional education.[90]

Factors that must be considered when interpreting the available literature include the varied economic and geographic factors influencing the authors' choice of participants.

Several countries differentiated between public and private dental schools[75,85,86] and grouped countries into zones.[80,85,86] A limitation of this study was the inclusion of papers with varied methodologies; however, the data surrounding education are usefully analysed by assessment of information that includes both qualitative and quantitative data.

Results from the review highlight a distinct lack of literature in gerodontology education and a need for the standardisation of definitions surrounding geriatric dentistry. A call for greater inclusion of gerodontology in the dental curriculum is notable and consistent with the current global opinion of experts in the field.[5,95] Further research into addressing the gerodontology gap in Australian dental schools is needed to prepare the dental workforce for managing frail, older Australians with a rising number of dentate older people who are experiencing oral health issues. Equally important is ensuring that our dental workforce is adequately trained and prepared to care for this demographic. This scoping review scrutinised the dental curriculum based on studies published from 2009 onwards.[96-99] However, it is worth noting that the challenges identified have been documented for many years before this period.[24] Regrettably, there is no indication that the dental profession or educational institutions are making strides to tackle these concerns.

Conclusion

The presence and emphasis of gerodontology within the dental curriculum significantly differ not only worldwide but also between individual dental schools within the same country. The main challenge seems to be standardising gerodontology as a fundamental subject across all institutions. The majority of countries have insufficient content of gerodontology in undergraduate training and limited dental schools offer extra-mural clinical learning experiences. The need for greater emphasis on this subject as part of undergraduate learning has been identified and advocated over many years, however, the dental profession, educational institutions and public policy makers have yet to take the actions needed to provide adequate dental care for our growing older dentate population.

The scoping review revealed a dearth of literature exploring gerodontology curricula, coupled with a scarcity of comprehensive data, making it challenging to provide accurate

overviews of gerodontology instruction at dental schools. The undergraduate curriculum currently lacks sufficient gerodontology content, highlighting the need for national and international guidelines to mandate specific training in gerodontology. Evidence-based recommendations would ensure that graduates are adequately prepared to serve a growing population of dentate, frail, and care-dependent individuals. The evidence from this review underscores the need for enhanced integration of gerodontology into undergraduate dental education, advocating for the establishment of curricular standards and guidelines for dentistry undergraduate degree courses.

Chapter 3 will outline the overarching research question and describe the methodology and methods used to provide the data required to answer the research question. The research philosophy and strategy will introduce the pragmatic approach used with recognised educational theory to structure the methods.

Chapter 3: Methodology and Methods

Health professional education should be tailored for the health needs of the population. Curriculum design frameworks provide structure to address population healthcare needs, and the needs of the learners. The scoping review in the previous chapter provided the problem identification for framing the research methodology. In Chapter 3, the researcher philosophy and research strategy will be discussed with the educational theory[100] that supports the phases of the study. The methodology for this thesis was qualitative using a multi-methods approach.[101] The phasing of the study was in three parts, including document analysis (Phase 1), surveys (Phase 2), and focus groups and semi-structured interviews (Phase 3). Chapter 3 details the methods for each of the phases (Chapters 4 and 5) and the data synthesis, analysis, and recommendations (Chapter 6) as the final phase of the study.

Introduction

The scoping review, in Chapter 2, illustrated the limited availability of information on gerodontology education in the undergraduate curriculum for students in entry-to-practice programs as dentists on graduation. While there was a dearth in available relevant literature, the scoping review highlights the lack of gerodontology inclusion in dental schools leading to the overarching research question for the thesis:

> ***How could Australian undergraduate gerodontology curricula support an ageing, frail, and care-dependent population?***

To create a framework for dental education there is a need for multiple sources of information, including document analysis and stakeholder engagement to inform recommendations for designing future gerodontology curricula. The study design for this research project was based on the following research questions, which were associated with the outcomes for each phase:

RQ 1. What are the mandatory requirements of gerodontology in the Australian undergraduate curriculum?

RQ 2. What benchmarks for comprehensive gerondontology curricula exist internationally and how do they compare to Australian requirements?

RQ 3. How and what are Australian dental schools currently teaching in gerodontology education?

RQ 4. How does gerodontology education differ between Australian dental schools?

RQ 5. How do the gerodontology education curricula delivered by Australian dental schools align with ADC mandatory requirements for gerodontology education for the registration of graduating dentists, and international benchmarks?

RQ 6. What are the perceptions and attitudes of dental academic leads in special needs dentistry to gerodontology education?

RQ 7. What are dental students' perceptions of and attitudes to education in gerodontology they received during their undergraduate program?

RQ 8. What are the perceptions of Residential Aged Care Facility (RACF) staff towards gerodontology education for dentists?

RQ 9. What are the perceptions of consumers towards gerodontology education for dentists?

The project outcomes aimed to provide the goals, objectives, and educational strategies for undergraduate gerodontology education to support the continuation of a curriculum design for Australian dental schools. To address the outcomes and answer the research questions, multiple methods were used for this study. While there are existing frameworks for developing curricula in health professions,[100,102] the researcher philosophical stance needed to be established to frame interpretation of the data.[103]

Research Design

Researcher Reflexivity

Throughout the research, I have been wearing 'different hats' in my personal life and professional life, which contribute to how I influence and interpret information. Using researcher reflexivity to understand my place at each phase of the study allowed me to understand the research paradigm associated with the project and myself:

- *British born, moved to Australia 2010, lived in three Australian states.*
- *Family. Wife, mother, ageing parents.*
- *Dentist in senior role within the public sector*
- *Aged care advocate*
- *Councillor and Director for professional bodies*
- *Student*

With a career based mostly within the field of science, my leanings were towards the belief that there is one truth and as a health professional our clinical decisions are based on the best available evidence. Studying for the Master of Health Professional Education steered me further away from an objective approach to acquiring knowledge, leaning more towards advocacy roles. During the advocacy and volunteer work I was involved in for the improvement of oral health of institutionalised older people, I found that my philosophy aligned with pragmatism. I viewed health professional education with the development of a curriculum that is ever-changing and transferable.[104] Through pedagogy and a better appreciation of an active cycle of problem identification, stakeholder engagement, problem solving, assessing, and evaluating, pragmatism resonates with the need to revisit problems to ensure outcomes are relevant to the needs of the current situation.[104]

The pragmatic research paradigm refers to different layers of truth where multiple methods are useful in understanding how to answer questions[104] and as pragmatism has been discussed with the embracing of uncertainty I also identify as the uncertain researcher.[104] My belief is that to answer a question relating to pedagogy and advocacy for an ever-changing population, there is a need to acknowledge the complexity and layers involved in finding a solution. The social accountability I feel as an educator demands that I do not treat education as a priori but as a reflexive process to 'educate the educators'.[106] The advocate component to my research interest and professional roles was valuable in recognising that I would be using a deductive approach to develop recommendations for education frameworks but also inductive in overarching advocacy recommendations on the complex and multi-layered topic of the health welfare of older people.

For this thesis, pragmatism and educational theories structured the phasing of the studies. It is worthwhile, however, to consider that initiation of this research was founded on the advocacy work in my various roles and that other arms of research philosophies may influence the behaviours and capabilities of organisations to support an 'ideal' gerodontology education for Australian dental schools.[107]

Research Strategy

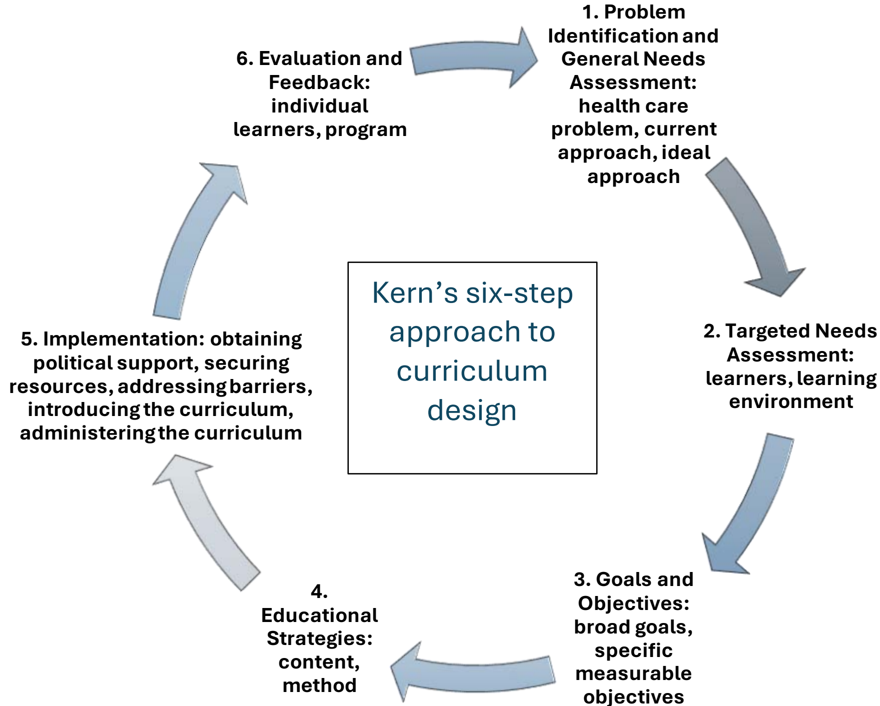
The basis of the methodology was a qualitative multi-methods study design with quantitative data to supplement the data gained from the qualitative study.[107] Multiple methods were used with a pragmatic approach.[104] The choice of method to answer the research question in each phase was taken using pragmatism to answer the particular research sub-questions and included surveys, interviews, and focus groups. The qualitative study methods included document analysis, through deductive logic using Bowen's framework,[108] and thematic analysis using Braun and Clark's method[109] with an inductive approach. The document analysis used evaluation of available documents to interpret data gain understanding of gerodontology education. The thematic analysis included a process of

initial familiarisation with the data to generate initial codes through to defining and naming themes for providing a final thematic report.

This study addresses standards set by the Royal Commission into Aged Care Quality and Standards which is to 'provide a workforce able to perform their roles for older people'.[110] For educational institutions to ensure social accountability, curriculum development in health profession education should be linked to the health care needs of the population. Kern's six-step approach[100] to curriculum design (Figure 3) is a recognisable framework used by health professional educators to address the teaching and learning design to support the health care needs of the population and the needs of the learners.[53,111]

The first stage of Kern's curriculum design framework includes *problem identification* and a *general needs assessment* (Figure 3). It also includes the *current approach* and *ideal approach* for a curriculum. The study looked at the mandatory requirements for Australian dental schools and current teaching of gerodontology was compared to a benchmark of comprehensive gerodontology education from international dental schools. The international dental school benchmark provided a framework for 'ideal approach' comparison as part of Kern's framework. The scoping review conducted for this project explored the gerodontology education that undergraduate dental schools are currently providing for dental students. Findings from the review link to stage 1 of Kern's design, *problem identification* and *general needs assessment*. Stakeholder perceptions contribute to both the first and second stages of Kern's curriculum design framework[100]; *problem identification* and *general needs assessment*, and *needs assessment of targeted learners*.

Figure 3. Kern's six-step approach to curriculum design[100]



Acknowledgement is given to the importance of the role of allied dental practitioners in the improvement of oral health outcomes for older people,[45,112] however, the focus of this project was undergraduate dental education, given that it is graduate general dentists who have the requisite scope of clinical practice most pertinent to all of the management of the oral health needs of the ageing population. The dentist is also the division of dental practitioner that can progress to postgraduate study and registration as a specialist in special needs dentistry (SND)[51] which is the branch that gerodontology sits within. This is reflected in the stakeholder groups for the qualitative study. Exploration of perceptions of stakeholders involved in the gerodontology education of dentists included dental students and recently graduated dentists, academic dental leads, directors of nursing (DONs) from residential aged care facilities (RACFs), and consumer representatives from peak advocacy bodies.

Kern's Curriculum Design Framework

Kern's curriculum design framework (Figure 3) was chosen because of its widespread and accepted use in education and researcher familiarity having previously designed a curriculum during the researcher's Master of Health Professional Education research project 'Development and pilot of an aged care curriculum as part of final year dental student's clinical placement'.[113]

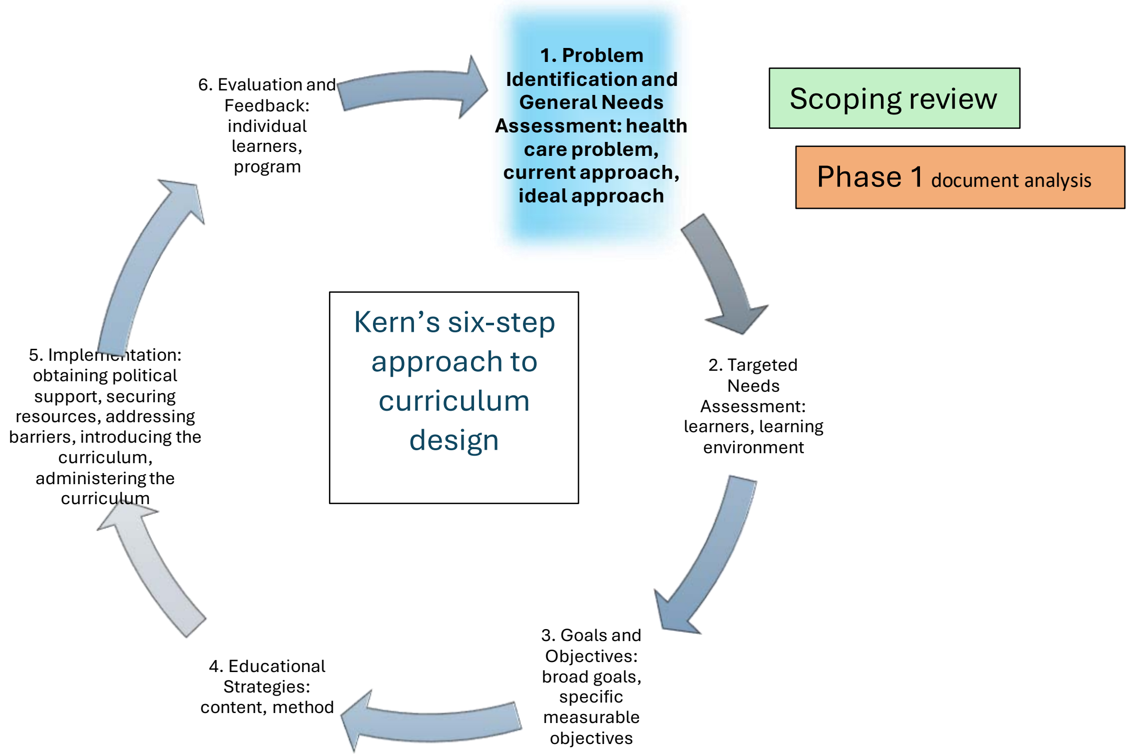
Health professional education peer-reviewed journals recognise Kern's framework[100,114-116] as consistent with healthcare needs in that there needs to be continuous cycle of change and improvement to adapt to current requirements of the population. The designed curriculum is not intended to remain static but provide a framework to revisit and reassess that the current approach aligns with the ideal approach. The methods for the phases of the project are described using a pragmatic approach to answering the research questions and with Kern's framework to structure the phasing and the methods involved three phases.

Phase 1 Methods

RQ 1. What are the mandatory requirements of gerodontology in the Australian undergraduate curriculum?

RQ 2. What benchmarks for comprehensive gerodontology curricula exist internationally and how do they compare to Australian requirements?

Figure 4. Kern's six-step approach to curriculum design[100] Phase 1



Bowen's document analysis method was used to answer the questions for Phase 1 of the study, as an important part of sifting through the information on current education in gerodontology.[108] The emphasis was on the quality of material rather than quantity to gain a deeper understanding of the context of requirements and existing curricula specific to gerodontology.[117] An iterative process was used to separate significant information from that which was not applicable to gerodontology. Initial superficial examination of the documents, followed by reading, interpretation, and pattern recognition led to the themes identified as categories for analysis and development of the international benchmark.

Using document analysis,[108] data were collected from the ADC as the accrediting body for dental schools.[48, 49, 58] This included the ADC guidelines for accreditation of education and training programs for dental practitioners and the ADC professional competencies of the newly qualified dentist. [48, 49] Insights were provided into the requirements for gerodontology education to enable graduating dental practitioners to register with the Australian Health Practitioners Regulation Agency (Ahpra) and comparison to the current

delivery of gerodontology education in Australian dental schools (Phase 2). The data provided information about content schools were required to deliver as well as the competencies relevant to the field of gerodontology for students to graduate with a degree allowing them to apply for registration as a dentist with the Dental Board of Australia (DBA).

The 'ideal approach' as detailed in the first stage of Kern's (1998) curriculum design framework[100] was explored by reviewing the requirements of comprehensive undergraduate gerodontology curricula available internationally. Although the 'ideal approach' identified in Phase 1 was contrasted with Australia's 'current approach,' it was not presented as the definitive ideal method for gerodontology education within this project. Instead, it functioned as a benchmark for a curriculum with distinct competencies, separate from SND. The concept of an 'ideal' curriculum is framed around the current requirements of the ADC gerodontology competencies, without assessing whether the standards that Australian dental schools are currently measured against are ideal. The benchmark comprehensive curriculum findings were compared to the 'current approach' from the data collected from the ADC and the current gerodontology curriculum being delivered in Australian dental schools.

Data Collection

Relevant literature and information on international and Australian gerodontology competencies were collected in the document analysis. Where information was not accessible on the internet, the ADC and accrediting bodies were contacted directly by phone, email, or letter to bridge any the gaps in information.

Data Analysis

The document analysis using Bowen's approach[108] compared the 'ideal approach' with the 'current approach'[100] (Figure 4). The results gained from the ADC in Phase 1 were used to compare the data from surveyed Australian dental schools (Phase 2) to assess how the current delivery of gerodontology education aligned with the ADC mandatory requirements for registration[48, 49] of graduating dentists and international benchmarking of a curriculum.

Phase 2 occurred after Phase 1 as the data informed the questions that were developed for the survey.

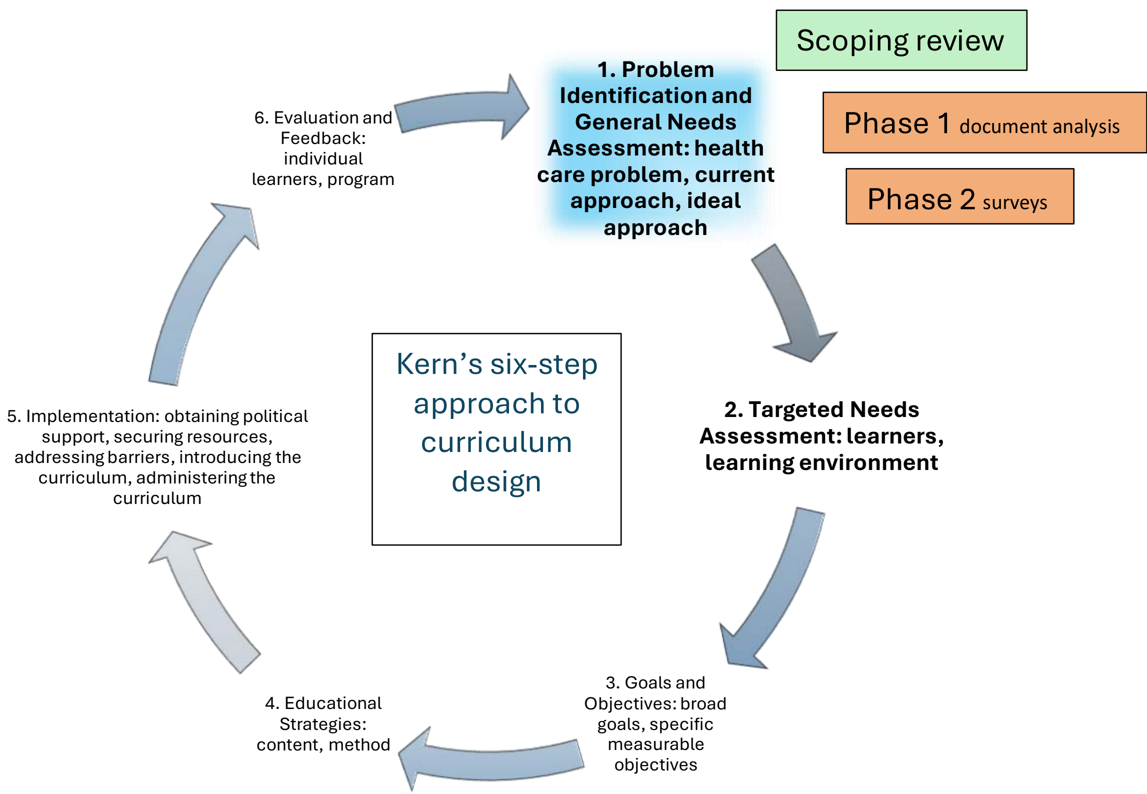
Phase 2 Methods

RQ 3. How and what are Australian dental schools currently teaching in gerodontology education?

RQ 4. How does gerodontology education differ between Australian dental schools?

RQ5. How do the gerodontology education curricula delivered by Australian dental schools align with ADC mandatory requirements of gerodontology education for registration for graduating dentists, and international benchmarks?

Figure 5. Kern's six-step approach to curriculum design[100] Phase 2



Bowen's document analysis[108] was used for the second phase using the information gathered in Phase 1. Statistical analysis was not used because the quantitative dataset was not large enough due to a possible maximum of only nine Australian schools providing valuable data. In line with the research approach and strategy, a narrative analysis and discussion were adopted.

A survey of Australian dental schools reviewed the gerodontology content in the curriculum of each Australian dental school. The results provided a comparison of current delivery of gerodontology education in each of the schools with the requirements from the accrediting body (ADC), and linked to step 1 of Kern's curriculum design approach, 'current approach' (Figure 5).[100] Using the information gained from surveys of Phase 1, the data identified gaps between Australian requirements for gerodontology education and the gerodontology competencies developed from the document analysis of Phase 1. This supported information upon which to base recommendations for an Australian gerodontology education in dental schools and provided a map for educational strategies to be developed from the findings in Phase 3 (Chapter 4. Data Collection and Analysis: Phases 1 and 2).

Designing the survey

The development of the survey was based on the ADC competencies and domains[48, 49] as this framework is used to map the learning outcomes of accredited dental school programs to the competencies. The competencies[48, 49] also describe the expectations of the newly qualified dental practitioner eligible for registration in Australia. The survey design considered the workloads of dental school academics intending to provide the capacity for its completion on a computer or mobile phone using Qualtrics (Qualtrics, Provo, UT). Qualtrics is a software program for data collection and analysis in qualitative and quantitative research methods.[107]

The survey was structured around the previously identified questions for Phase 2 (RQ 3. How and what are Australian dental schools currently teaching in gerodontology education? RQ 4. How does gerodontology education differ between Australian dental schools?) with the inclusion of the benchmark competencies for gerodontology education prepared from Phase 1. This was piloted with two James Cook University (JCU) academics knowledgeable in the curriculum content of the dental school to ensure respondents could understand and answer the questions.[118] The academics completed the survey and provided feedback separately. The edited survey was then redistributed to confirm the clarity of the questions and whether further detail was needed to ensure the questions were targeting the information required for the phase (Appendix 8).

Questions in the survey included content on gerodontology and alignment to the ADC competencies. Examples of some of these questions included:

- Does the program provide gerodontology specific course content? (i.e., content not included within other disciplines such as SND, Prosthodontics, or Life Span Development)?
- What mode or modes of delivery is used for the gerodontology content?
- Please select if any of the following gerodontology specific competencies are included in the current program at your dental school (Please complete a separate survey if there are multiple programs resulting in entry-to-practice as a registered dentist with Ahpra).

There was a focus on the individual competencies included in each school program. It was necessary to identify if gerodontology-specific competencies were required in the programs to compare them with the ADC structure of Competencies for the Newly Qualified Dentist.[48] The various modes of teaching delivery were also explored (e.g., service-based learning, lectures, and clinical learning) since the evidence around modern pedagogy describes better learning outcomes with active learning than traditional didactic lectures.[119,120] In addition, higher levels of cognition used in learning (moving from gaining knowledge to applying knowledge and up to higher level cognitive abilities such as evaluation) lead to developing critical thinking skills, which are valuable for the newly qualified dentist and necessary within the ADC competencies.[48]

As the survey required the participants to collect information, the software allowed its completion to be paused, so the academic could source the correct information as needed. The researcher acknowledged that participants might require clarification on the answers as the education needing to be identified as gerodontology in the program could be interpreted as being included in other disciplines of dentistry, such as SND, or prosthetics (design and construction of dentures). The researcher used reflexivity to understand the risk of subjectivity when answering the survey questions, and with this in mind discussed the

survey and the needs of the data collection with the individual participants prior to distributing the survey.

Participants

Representatives from all nine Australian undergraduate dental schools (including 'postgraduate programs' for entry-to-practice as a dentist) accredited to provide graduates with the qualification to register to practice dentistry in Australia were invited to participate in this study.

Study Site

Study sites included Australian dental schools providing programs allowing entry-to-practice as a dentist on graduation including James Cook University, University of Queensland, Griffith University, University of Sydney, Charles Sturt University, University of Melbourne, La Trobe University, University of Adelaide, and University of Western Australia. There are no dental schools in Tasmania, the Australian Capital Territory, or the Northern Territory.

Data Collection

Data collection involved auditing the current teaching of gerodontology in undergraduate dentistry Australian dental schools. These records were collected online and included university prospectuses and marketing material. Where information gaps existed, dental schools were contacted by phone, email, or letter to seek further clarification or information. Letters of support were sought prior, to engage dental schools in the project and facilitate access to the data and participants. Personal networking with colleagues within the researcher's community of practice was also valuable in providing support for project participation.

Data Analysis

Curricula information obtained from various sources from Australian dental schools was analysed using Bowen's approach to document analysis.[108,121] The results from analysis of each curriculum were compared to all other dental school curricula. Additionally, the results from Phase 2 were compared using triangulation with results from Phase 1 to assess the

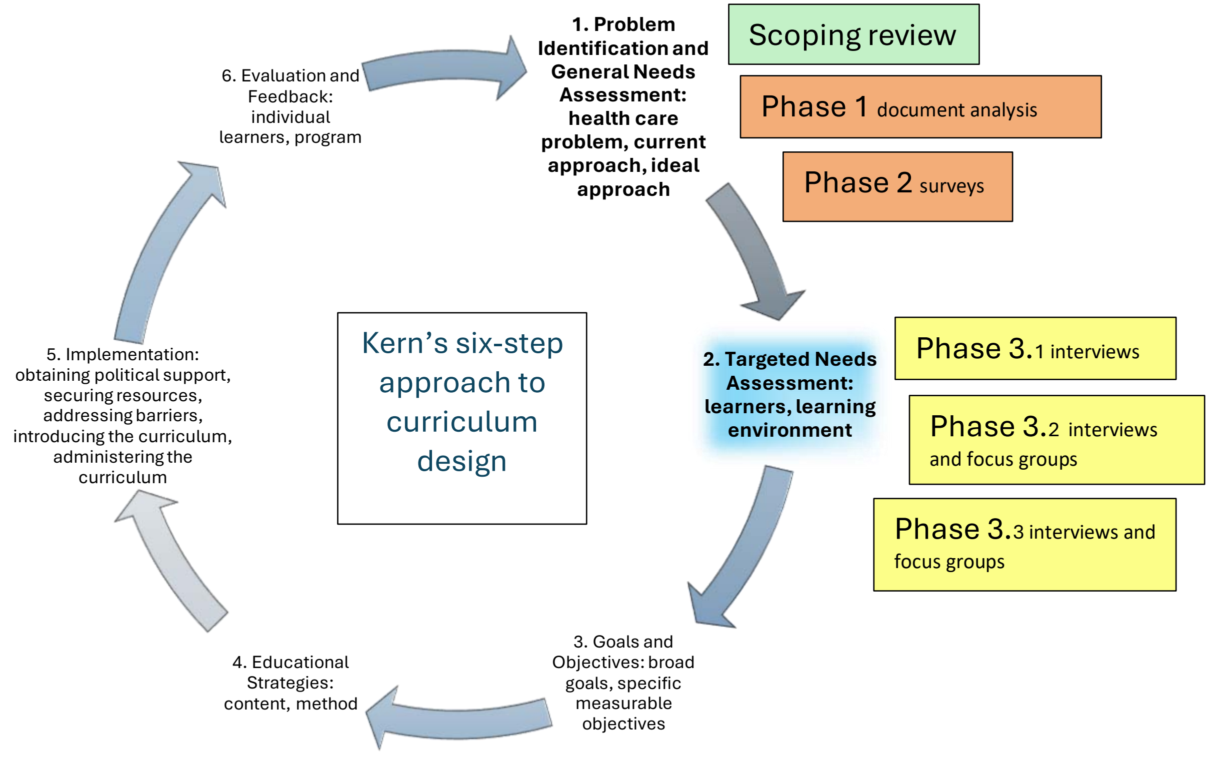
alignment of Australian gerodontology curricula with ADC mandatory requirements and international benchmarks.

Quantitative information included discrete numeric data, for example, hours allocated to didactic teaching for gerodontology at each school. Where quantitative data was retrieved in Phases 1 and 2, descriptive analysis was used to compare data between the dental schools and the baseline competencies required from the data retrieved in Phase 1. Triangulation of results from Phases 1 and 2 helped identify gaps in gerodontology education in Australian dental school curricula and informed the development of interview and focus groups guides.

Phase 3 Methods

RQ 6-9. What are the stakeholder perceptions and attitudes to gerodontology education?

Figure 6. Kern's six-step approach to curriculum design[100] Phase 3



Phase 3 of the study was split into three parts as determined by the participants: 1) dental school academics; 2) dental students; and 3) directors of nursing (DONs) and consumer representatives as one group. DONs and consumers were analysed separately but discussed together since there is existing literature on the perceptions of nurses towards gerodontology education of dental students.[122-124] Existing literature overlapped consumer and RACF staff perceptions,[127] but none centred on the education of undergraduate dentists, therefore exploring the needs of this stakeholder group was necessary for identifying the problem and gaining a general needs assessment[100] (Figure 6).

A multi-method approach to data collection was used with semi-structured interviews and focus groups with information sheets and informed consent sheets provided to participants and returned prior to proceeding with data collection (Appendix 7). Braun and Clarkes' (2006) thematic analysis framework was used in data analysis for all participant groups.[109] The researcher sought to find overlaps and similarities of codes through immersion with the data. Two academics, experienced in qualitative research methods, independently reviewed the de-identified transcriptions as reliability coders to confirm the codebook used by the master coder (researcher). The themes were then cross-checked by all three coders to ensure quality checking and facilitate the production of final themes. This inductive analysis used an iterative process to organise the qualitative data with differences reconciled by consensus discussion.[129] De-identification of the transcripts included removing place names to protect participants' anonymity. The methods for the three parts of the qualitative study exploring the stakeholder perceptions of gerodontology education is detailed in the next section. The final participant sample size and details for each stakeholder group is described in detail through Chapter 5 in each of the three parts of Phase 3.

Part 1. Dental School Academics

RQ 6. What are the perceptions and attitudes of dental academic leads in special needs dentistry to gerodontology education?

A qualitative study using semi-structured interviews explored dental school academics' attitudes and perceptions toward gerodontology education currently being provided at their

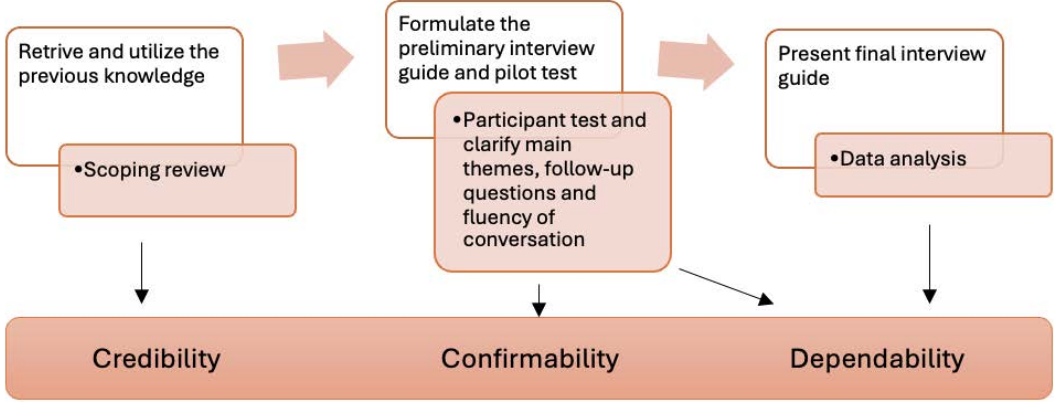
school. Part 1 of Phase 3 aimed to identify enablers and barriers to curriculum change and perceptions of the need to include gerodontology in the curriculum. Validated instruments for measuring attitudes to education were identified (Table 6), guiding the structuring of interview questions. The instruments chosen were identified for use in dentistry in a systematic review of instruments measuring the educational environment in health professions education.[130] Further detail on the structuring of the interview framework is provided in Chapter 2 (Phase 2: Surveys).

Table 6. Instruments for measuring the educational environment in dentistry[130]

Measurement Instrument	Health Profession Instrument Used For-
Questionnaire (Gerzina et al, 2005)[165]	Dentistry
Clinical Education Instructional Quality (ClinEd IQ)[159]	Dentistry
Learning Environment Study (LES)[159]	Dentistry
Dental Student Learning Environment Study (DSLES)[159]	Dentistry
Dundee Ready Education Environment Measure (DREEM)[139]	Health professional educators

Semi-structured interviewing was chosen to collect data, so the questions were neither 'closed' nor 'leading' but ensured key topics and the data needs were fulfilled. This method supported in-depth discussion around the topics with answers that may not have been anticipated with surveys. A framework for developing the semi-structured interview guide formed the final interview guide for data collection[131] (Figure 7). A preliminary interview guide was pilot tested with a dentist involved in teaching undergraduate dental students (but not involved in this data collection) to confirm the coverage and relevance of the guide's content and assess if there was a need to reformulate the questions.[131] The final interview guide is detailed in Chapter 5 including the semi-structured questions used for the interviews. Focus groups were not chosen as data specific to the participant's dental school program was sought rather than broad themes on gerodontology education.

Figure 7. Framework for semi-structured interview guide[131]



Participants

Representatives from all nine Australian dental schools were invited to participate in individual interviews. While the aim was for 100% participation from all schools, the themes generated were based on academics as a stakeholder group without the intention of separating schools for analysis. As gerodontology does not exist as a specialist branch of dentistry in Australia, the academic lead or specialist in SND of the dental school was chosen. If no SND academic existed at the dental school, or the educator was not directly involved in the education of the undergraduate dentists, the head of school or academic directly engaged in teaching gerodontology topics was invited to be interviewed.

Sample Size

Data collection continued until data saturation was reached, as determined by the interviewer/researcher lens assessment of no further emerging themes,[132] and attempts at gaining data collection from all nine dental school representative academics.

Study Site

The study sites invited to participate included all nine Australian dental schools, James Cook University, University of Queensland, Griffith University, University of Sydney, Charles Sturt

University, University of Melbourne, La Trobe University, University of Adelaide, and University of Western Australia.

Data Collection

The researcher conducted semi-structured interviews using the framework by Kallio et al. (2016) using videoconferencing.[132] Recording devices, note-taking and Microsoft Teams software for transcription were used. Questions used in the interviews can be found in Chapter 5 (Part 1: dental school academics).

Data analysis

Data analysis followed Braun and Clarke’s (2006) thematic analysis framework (Table 7).[109] The goal was to identify themes that would offer insights into how educators perceived gerodontology education being provided to their students. This also helped to highlight the perceived shortcomings relevant to the fourth phase of the project, which was designed to assess the needs of stakeholders as per Kern's second step of curriculum design.

Part 2. Dental Students

RQ 7. What are final year dental students’ perceptions of and attitudes towards education in gerodontology they received during their undergraduate program?

A qualitative study using focus groups and semi-structured interviews explored final year dental students’ perceptions of the gerodontology education they received in their program. This included perceived strengths or weaknesses of the current education received, areas where gaps were identified, modes of preferred learning specific to gerodontology and perceptions of readiness for managing frail and care-dependent older people. Data analysis from Phases 1, 2, and 3 informed the questions for the focus groups to ensure that all aspects needed to be explored on the topic were included in the discussion. Further detail on the questions developed is described in Chapter 5, including the final participant numbers.

A mix of focus groups and semi-structured interviews were used as the qualitative method of data collection. This method was chosen to generate in-depth discussion around the topic[133] to describe and understand the perceptions about a particular issue,[134] in this case, the gerodontology education of undergraduate dentists.

As an interviewer, researcher, dentist, healthcare consumer, and educator, the researcher considered positional reflexivity.[135] Steps were taken to ensure that a perceived power differential with dental students or graduates was mitigated by removing the researcher as a direct supervisor or educator of the participants in any location where this was relevant. As the researcher had prior knowledge about the topic and curriculum content through Phases 1 and 2 of the project and previous research in this area, assessment of emerging patterns in themes and evaluation of data saturation was possible.[132] Initial data analysis occurred during data collection to inform the researcher further about data saturation. The validated instrument identified in Phase 3 for measuring attitudes towards education provided a scaffold for questions for this participant group.

Participants

Information from final year dental students was collected from focus groups and semi-structured interviews. Only students in their final year of dental school (and who had completed all their mandatory clinical work) were included to minimise variation in attitudes, skills, and knowledge about gerodontology content and clinical exposure they had received in any years of their program. Graduate dentists were not included in the group because this project focused on current, not past, education being delivered at dental schools.

Sample Size

The focus groups aimed to be conducted in groups of five to eight participants as this is an optimal number to encourage in-depth, rich discussion.[133] It was recognised prior to commencement that this might not be possible logistically due to varying factors, for example, participant recruitment delays and the COVID-19 pandemic. Students were

recruited through the researcher's networks, dental school student associations and the Australian Dental Student Association through email and phone.

Study Site

The study sites invited to participate included all nine Australian dental schools: James Cook University, University of Queensland, Griffith University, University of Sydney, Charles Sturt University, University of Melbourne, La Trobe University, University of Adelaide, and University of Western Australia.

Data Collection

Focus groups and semi-structured interviews were conducted using videoconferencing. Recording devices, note-taking and Microsoft Teams transcription were used. Data sampling ceased when data saturation was reached, determined by the interviewer/researcher lens assessment of no further emerging themes,[132] and the whole target population had been approached. Questions used in the interviews can be found in Chapter 5 (Part 2: dental students).

Data analysis

Data analysis used Braun and Clarke's (2006) thematic analysis framework (Table 7).[109] Themes provided insights into student perceptions of gerodontology education received in their undergraduate training. This data relates to Phase 4 of the project.

Part 3. Directors of Nursing and Consumer Representatives

RQ 8 & 9. What are the perceptions of directors of nursing and consumer representatives towards gerodontology education for dentists?

A qualitative study using focus groups explored perceptions of gerodontology education of DONs, and consumer representatives from peak bodies (e.g., Council of Ageing, Older Person Advocacy Network and Dementia Australia) perceptions of oral health and the need for greater integration of dentistry and gerontology. The data collection occurred through separate focus groups and semi-structured interviews for each participant group.

Participants

The DONs were selected from a convenience sample of RACFs in the researcher's locality and chosen based on criteria described in the study site. Consumer representatives from peak bodies were chosen to be consumer stakeholder rather than interviewing residents of RACFs because there is a link between frailty and cognitive impairment.[136] There were also logistical problems with conducting face-to-face focus groups during the pandemic due to restrictions for entry to RACFs and resident movement out of RACFs. Therefore, consumer representatives from Australian advocacy groups for older people were invited to participate.

Sample Size

The focus groups were aimed to be conducted in groups of five to eight participants. Data sampling ceased when data saturation was reached, determined by the interviewer/researcher lens assessment of no further emerging themes.[132]

Study Site

The DONs were invited through professional and social media networks within Australia. The insights sought from this group looked for general perceptions of dental school education related to older people; therefore, location-specific groups were not required for the stakeholder group. The criteria for RACF inclusion were if they provided services for people who require 'high care' as assessed by the Aged Care Assessment Team (ACAT). High care is the care provided for people who need almost complete assistance with daily living activities.[137]

Focus groups and semi-structured interviews with DONs and consumer representatives were conducted using videoconferencing due to the COVID-19 pandemic. The need to avoid unnecessary gatherings and movements in nursing homes, which house vulnerable individuals, significantly affected the possibility of conducting face-to-face discussions with these two groups, more so than with academics and dental students. Where it was possible

to conduct face-to-face focus interviews, these were held off-site, such as in a meeting room at the researcher's place of study.

Data Collection

Data collection for both the DON focus group and the consumer representative group used videoconferencing or in person interviews. Questions used in the interviews can be found in Chapter 5 (Part 3: DONs and consumer representatives).

Data Analysis

Data analysis used Braun and Clarke's (2006) thematic analysis framework (Table 7).[109] The analysis for the DONs was completed separately for the DON and consumer representatives.

Outcome Phases 1-3: General and targeted needs assessment of stakeholders involved in an undergraduate gerodontology curriculum.[100]

Phase 4 Methods

Outcomes. What are the goals, objectives, and educational strategies needed to develop a gerodontology curriculum for undergraduate dental students?

Data Synthesis and Triangulation of Results

Thematic analysis from the qualitative data from each stakeholder group was analysed and triangulated with the document analysis from Phases 1 and 2 and shown in Figure 9. Synthesis of results was used to support and inform ideas relating to the broad goals and objectives for the development of future undergraduate gerodontology curricula, linking to the third step of Kern's six-step approach to curriculum design (Figure 8). Recommendations were provided to stakeholders from Phase 3 (Part 1) directly involved with curriculum for feedback.[130] This consolidated the findings of the research [138] and was used to triangulate evaluation of the recommendations for gerodontology education.[139,140]

Outcome Phase 4: Development of recommendations to support gerodontology education.[100]

Figure 8. Kern's six-step approach to curriculum design[100] Phase 4

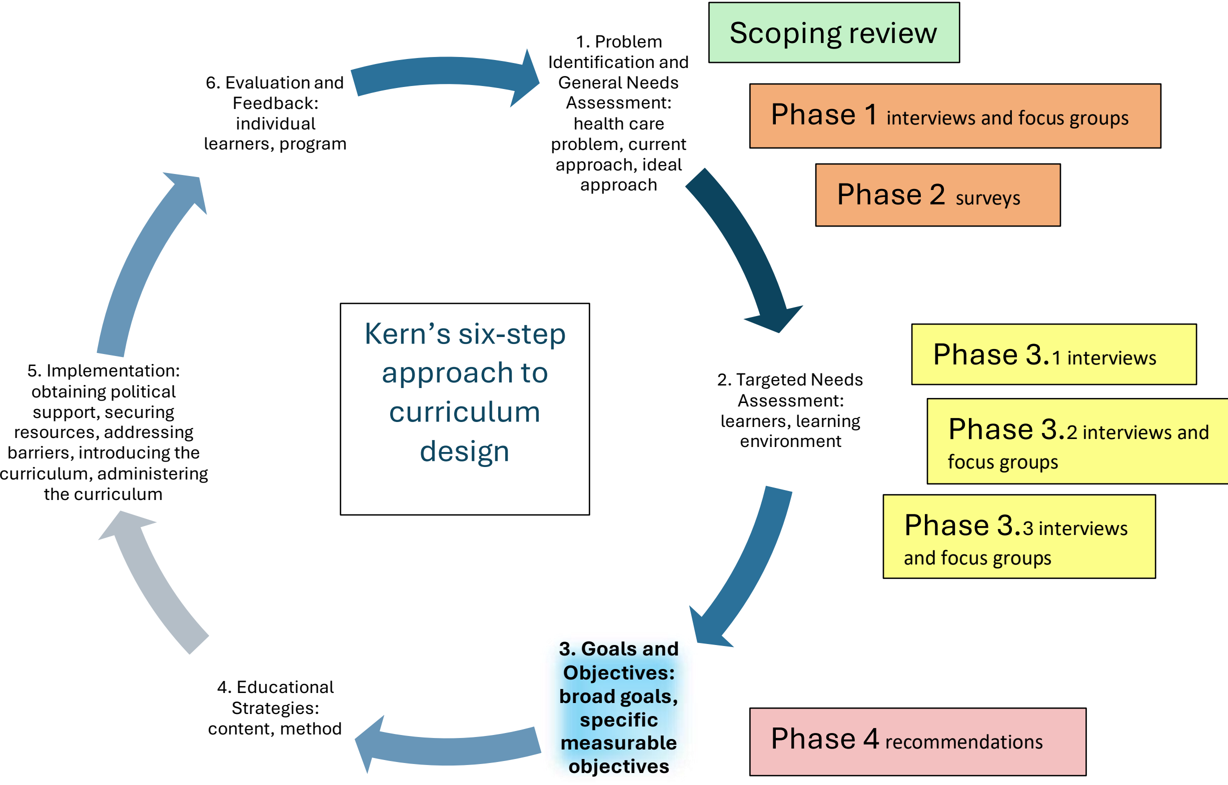


Figure 9 provides a summary flowchart of all four phases for the study with outlining aims to describe the research process.

Figure 9. Flowchart of project phases

Phase 1: Curriculum mandatory requirements (current approach Australia and international benchmark)

- Identify mandatory Australian requirements for gerodontology

Phase 2: Current gerodontology teaching in Australian dental schools

- Identify current gerodontology teaching in all nine Australian dental schools

- Compare the gerodontology curriculum in each Australian dental school against the mandatory requirements
- Identify gaps in gerodontology education in Australian dental schools against the identified benchmark approach

- Review educational environment measurement instruments to frame questions for focus groups and interviews
- Develop semi-structured interview guide
- Pilot interview guide with special needs dentistry educators

Phase 3: Stakeholder perceptions

- (Part 1) Qualitative study academic leads of dental school
- (Part 2) Qualitative study dental students/
- (Part 3) Qualitative study peak body representatives and DONs

Phase 4: Data synthesis and recommendations

- Data synthesis from Phase 1, 2 and 3
- Provide recommendations for gerodontology education to stakeholders
- Outcome: Recommendations to support and inform undergraduate gerodontology education

Data Analysis

Bowen's Document Analysis

Pre-existing textual sources were needed to gain information to answer questions from Phases 1 and 2. Document analysis was chosen as data collection required discrete data from multiple sources and allowed the researcher to make sense of the appropriate information for the study,[108,141] with Bowen's method providing the framework.[108] This was completed through initial superficial examination of documents, thorough examination of documents, and interpretation through an iterative process.

Braun and Clarke's Thematic Analysis

Braun and Clarkes' (2006) thematic analysis (Table 7) was used because it has a flexible approach while still providing a systematic framework for coding qualitative data.[109] Finally, the analysis method is a recognised approach for health professional research.[142]

Table 7. Braun and Clarkes' thematic analysis[109]

1. Familiarisation with the data	Immersion in the data by rereading and listening to the audio recording. Annotations to the script aid interpretation of the participants' experiences
2. Generating initial codes	Initial recording of the descriptive content of the data that is potentially relevant to the research question
3. Searching for themes	Capturing patterned responses relevant to the research question by reviewing the coded data and identifying overlaps and similarities between codes
4. Reviewing potential themes	Review of developing themes with relation to the coded data and entire data set to ensure quality checking
5. Defining and naming themes	Immersion in the data by rereading and listening to the audio recording. Annotations to the script to make sense of the participants' experiences
6. Producing the report	Initial recording of the descriptive content of the data that is potentially relevant to the research question

Method Limitations

There were some limitations to the methods selected for the phases of the research. Document analysis can be limited due to potential issues such as low retrievability, lack of detailed information, and biased selectivity.[108] However, for Phase 1, the efficiency and accessibility of data selection of documents, as opposed to data collection, offset these limitations. Further, data gathered from the survey in Phase 2 was utilised to corroborate and enhance the data obtained from the document analysis.

It was necessary to have the flexibility of smaller group interviews during a period when final year dental students were engaged in exams. This timing needed to coincide with a point in their course where there was less variation in their completion status. Microsoft Teams transcriptions contained inaccuracies but were corrected by the researcher after listening to the recordings, immersion of data, and revisiting field notes to ensure the context was correctly reflected in the final transcriptions used for data analysis.

The limitations of videoconferencing providing a platform for open and comfortable discussion were more challenging compared to in-person interviews and focus groups. This was particularly noticeable with the consumer representative groups. These groups might have participated less or struggled with videoconferencing, likely due to their unfamiliarity with the software. In contrast, the student, and academic groups, who had been using this system for daily communication, learning, and teaching during the COVID-19 pandemic, were more comfortable with it.

Prior to commencement of the qualitative studies, the researcher acknowledged that focus groups of five to eight people might not be possible logistically due to factors such as participant recruitment delays and the COVID-19 pandemic. The number of people available to participate in the focus groups for the consumer representatives and one of the student groups was limited due to the difficulties in recruitment and coordinating a time and date convenient for all participants. The researcher used the rounding of all data collected from the three groups to allow some secondary analysis of the qualitative data,[143] but it would

have been better for the evaluation of the recommended gerodontology education strategies to have been provided to participants from the student group rather than only the academics. This was logistically unachievable as the student participants forwarding emails from their university account was unknown once they had graduated from their dental school.

In summary, this thesis was based on a qualitative strategy with a multi-method approach adopting existing research and education curriculum design methods (deductive), and qualitative data to provide insights into stakeholder perceptions of gerodontology education in dental schools that were previously unknown (inductive). Document analysis and thematic analysis allowed for a synthesis of the results, which were then used to develop recommendations for dental school curricula in gerodontology education.

Ethics Approval

Ethics approval for all phases of the research was obtained through the JCU Human Research Ethics Committee (approval number H8288) (Appendix 9).

Chapter 4 (Data Collection and Analysis: Phases 1 and 2) will detail the data collection and analysis for the first two phases of the study. This includes document analysis (Phase 1) and surveys (Phase 2) to provide Australian benchmarks for gerodontology competencies and international gerodontology benchmarks for comparison against what is currently being delivered in Australian dental schools.

Chapter 4. Data Collection and Analysis: Phases 1 and 2

Dental practitioners registered in Australia are regulated by the Dental Board of Australia (DBA) in partnership with the Australian Health Practitioner Regulation Agency (Ahpra), to ensure dentists are appropriately trained, qualified, and provide safe practice.[50] The Australian Dental Council (ADC) is the accreditation authority for accrediting dental school programs in Australia, assessing programs against the standards known as 'domains' with accompanying criteria.[58] Dental students are assessed by the dental school against the professional competencies of the newly qualified dentist as prescribed by the ADC.[49]

Chapter 4 will describe data collection and analysis of Phases 1 and 2 of the study, utilising document analysis and surveys. This phase contributed to the first step of Kern's curriculum design where the health care problem, current approach, and ideal approaches were explored.[100] Phase 1 results provided international gerodontology benchmarks to develop Australian gerodontology competencies for comparison against what is currently being delivered in Australian dental schools. The survey results from Phase 2 synthesised the gerodontology content being delivered in Australian dental schools and was completed by the educators directly involved in the gerodontology content. Phases 1 and 2 were grouped because~~,~~ although they were not completed simultaneously, the document analysis informed the survey~~,~~ and it was necessary to use information from Phase 1 to explore the information gained in Phase 2. The results of the studies in Chapters 4 and 5, are written as papers for publication and include summaries of the methods described through this chapter. Figure 10 illustrates the research questions associated with each of the four phases of the study.

Figure 10. Research questions and project phasing summary

How can Australian undergraduate gerodontology curricula support an ageing, frail, and care-dependent population?

Phase 1- Document analysis

What are the mandatory requirements of gerodontology in the Australian undergraduate curriculum?

What benchmarks for comprehensive gerodontology curricula exist internationally and how do they compare to Australian requirements?

Phase 2- Surveys

How and what are Australian dental schools currently teaching in gerodontology education?

How does gerodontology education differ between Australian dental schools?

How do the gerodontology education curricula delivered by Australian dental schools align with ADC mandatory requirements of gerodontology education for registration for graduating dentists, and with international benchmarks?

Phase 3- Stakeholder focus groups and interviews

What is the dental school doing well in gerodontology?

What could the dental school do better with gerodontology education?

What are the perceptions of dental school academics, final year dental students, DONs, and consumer representatives towards gerodontology education?

Phase 4- Data synthesis and recommendations

How can Australian undergraduate gerodontology curricula support an ageing, frail, and care-dependent population?

What are the recommendations for Australian dental school curricula in gerodontology education?

Phase 1: Document Analysis

Introduction

The scoping review identified insufficient inclusion of gerodontology in dental school curricula internationally and identified it is not a requirement of most dental schools. Further insight into international benchmark guidelines for undergraduate gerodontology curricula was needed to provide recommendations for comprehensive gerodontology education. Kern's six-step approach to curriculum design provided the framework for developing these recommendations.

The first step of Kern's six-step approach to curriculum design as discussed in Chapter 3, involves *problem identification* and *general needs assessment*.[100] The scoping review[59] in Chapter 2 identified the problem which found a need for national and international guidelines for gerodontology in the dental school curriculum. Phase 1 provided the general needs assessment, and this translated into an assessment of the current requirements of Australian dental schools to deliver gerodontology education for entry-to-practice dentistry students.

The second part of Phase 1 data collection involved identification of international benchmarks to compare against the current Australian model of gerodontology education. The data from these international documents were employed to draw a concrete comparison between the current offerings of Australian dental schools and a benchmark curriculum. It was essential to identify the Australian competencies for gerodontology prior to the international ones, as the Australian standards were used as a reference to code the international data during the document analysis.[108]

Accreditation of dental schools in Australia and special needs dentistry

An entry-to-practice dentistry program is a course enabling graduates to meet the Dental Board of Australia's (DBA) requirements for registration as a dentist. The term 'undergraduate program' is used synonymously throughout this thesis with 'entry-to-practice dentistry.' It should be noted, however, that several dental schools' graduate students can register with the DBA after graduating from a program that is not a primary bachelor's degree program. These schools offer entry-to-practice programs as a postgraduate program.

The ADC is the independent authority responsible for the accreditation of dental professions. This role is designated by the DBA as part of the National Registration and Accreditation Scheme (NRAS). The DBA's role is to regulate dental practitioners within the framework of the NRAS. In partnership with the Ahpra, the DBA aims to protect the public and oversee practitioners. In Australia, all accredited programs are assessed against the *ADC/Dental Council (New Zealand) (DC[NZ]) Accreditation Standards for Dental Practitioner Programs* (the Standards).[58] If a program meets all Standards, the ADC will accredit the program as outlined in the *ADC/DC(NZ) Guidelines for Accreditation of Education and Training Programs for Dental Practitioners* (the Guidelines).[144] All nine Australian dental schools are currently accredited with the ADC and meet the requirements for their programs to graduate students who can register as dental practitioners with Ahpra.

Exploring the content of gerodontology in dental school education in Australia is conducted through the lens of the specialist branch of dentistry called 'special needs dentistry' (SND). Gerodontology is not recognised in Australia as an independent specialty and is taught under the branch of special needs dentistry. The terms 'special needs dentistry' and 'special care dentistry' are used interchangeably dependent on location and as this branch of dentistry evolved, these terms became essentially synonymous.[145,146]

Results

The results are presented as a document analysis with discussion throughout using Bowen's method[108] with an iterative process to elicit findings. Through deriving and comparing information from international and Australian gerodontology competencies, the resulting reframed gerodontology competencies were used in the survey (Phase 2) to allow a reasonable comparison of competencies related to gerodontology that the newly qualified dentist should achieve. This resulted in the survey framework to answer the first question required as part of pragmatic approach to the study:

> *What are the mandatory requirements of gerodontology in the Australian undergraduate curriculum?*

The data collection from the ADC was publicly available from the ADC website[48, 58, 144, 147] and included information from:

- the accreditation standards for dental practitioner programs (the Standards),[58]
- the guidelines for accreditation of education and training programs for dental practitioners (the Guidelines),[147]
- and the competencies for the newly qualified dentist[48] (Appendix 6).

The second question sought to find the international benchmark for comparison and provided further structure to the survey questions (Phase 2: Surveys).

> *What benchmarks for comprehensive gerodontology curricula exist internationally and how do they compare to Australian requirements?*

The intention of the Phase 1 document analysis was not as a stand-alone study for analysis and discussion, but for gaining an understanding of what a hypothetical Australian gerodontology-specific competency framework might look like for academics to compare against their current approach.

Australian benchmarks for gerodontology competencies

While there are no mandatory requirements for Australian dental schools to include gerodontology in their curriculum, the ADC outlines the 'Competencies for the Newly Qualified Dentist'[48] which can be linked to the Guidelines. The Guidelines state that general courses or topics expected to be included in a program for dentists include SND containing 'aged care dentistry,' 'medically compromised,' and 'disabled' (Table 8). The Guidelines also inform the clinical experiences undertaken by dental students, with gerodontology coming under the umbrella of SND within the discipline of oral pathology and oral medicine (Table 8). The ADC Standards include six domains: public safety, academic governance and quality assurance, program of study, the student experience, assessment, and cultural safety (to include specific content for the health of Aboriginal and Torres Strait Islander peoples).[58]

Table 8. Australian Dental Council (ADC) Guidelines for special needs dentistry[147]

ADC Guidelines for accreditation of education and training programs for dental practitioners
Curricula- Courses and topics General courses/topics that are expected to be included in a program for dentists are: special needs dentistry, including aged care dentistry, medically compromised, disabled. **Clinical experiences for dental students** A guide to the clinical experiences undertaken by dental students is as follows: Oral pathology and oral medicine: special needs dentistry, including aged care dentistry, medically compromised, disabled.

Competencies directly relevant to gerodontology education were identified to provide the themes that would develop a framework to compare with the international benchmark (Table 9). The domain descriptor for patient care used sub-headings from the ADC's competencies rather than each competency. This presented more definitive specific clinical competencies for a benchmark needed for managing the older patient. The third ADC domain descriptor, 'critical thinking covers the acquisition and application of knowledge' was not included since competency is not specific to gerodontology and would be applied to all disciplines of dentistry.

Table 9. Gerodontology competencies for the Australian newly qualified dentist based on ADC competencies.

Key (ADC domains):

1. Professionalism covers personal values attitudes and behaviours
2. Communication and leadership covers the ability to work cooperatively and to communicate effectively
3. Health promotion covers health education and the promotion of health in the community
4. Scientific and clinical knowledge covers the underlying knowledge base required by dental practitioners
5. Patient care

ADC Competencies	Code
Professionalism covers personal values, attitudes, and behaviours • demonstrate that patient safety is paramount in all decisions and actions. • demonstrate appropriate caring behaviour towards patients and respect professional boundaries between themselves and patients, patient's families, and members of the community. • demonstrate that all interactions focus on the patient's best interests and provide patient-centred care, respect patients' dignity, rights, and choices. • understand the principles of efficient, effective, and equitable utilisation of resources, and recognise local and national needs in health care and service delivery across Australia's geographical areas. • provide culturally safe and culturally competent practice that includes recognition of the distinct needs of Aboriginal and Torres Strait Islander peoples in relation to oral health care provision.	1
Communication and leadership covers the ability to work cooperatively and to communicate effectively • communicate and engage with patients, patient's families, and communities in relation to oral health. • present clear information in a timely manner that ensures patients are advised of and understand care and treatment options to be provided. • communicate with other health professionals involved in patients' care. • engage in mentor/mentee activities and leadership within a health care team. • understand the importance of intra and interprofessional approaches to health care.	2

ADC Competencies	Code
<u>**Health promotion covers health education and the promotion of health in the community**</u> • understand the determinants of health, risk factors and behaviours that influence health. • understand health promotion strategies to promote oral and general health. • understand the design, implementation, and evaluation of evidence-based health promotion.	3
<u>**Scientific and Clinical Knowledge covers the underlying knowledge base required by dental practitioners**</u> • understand the biomedical, physical, and behavioural sciences in relation to oral health and disease. • understand the scientific basis, application, limitations, and risks of using dental materials. • understand the principles of pharmacology, the risks, and limitations in using therapeutic agents and the implication of the Prescribing Competencies Framework on dental practice.	4
<u>**Patient Care**</u> • obtain clinical information. • evaluate individual patient risk factors for oral disease. • provide diagnosis and management planning covers the identification of disease or abnormalities that require treatment or investigation. • recognise health as it relates to the individual. • diagnose disease or abnormalities of the dentition, mouth and associated structures and identify conditions which require management. • determine the impact of risk factors, systemic disease and medications on oral health and treatment planning. • formulate and record a comprehensive, patient-centred, evidence-based oral health treatment plan. • determine when and how to refer patients to the appropriate health professional.	5

ADC Competencies	Code
• obtain and record patient informed consent and financial consent for treatment. • apply the principles of behaviour management. • manage a patient's anxiety and pain related to the dentition, mouth, and associated structures. • provide clinical treatment and evaluation with the provision of evidence-based patient-centred care.	

Through pattern recognition and iterative interpretation, the Australian competencies relevant to gerodontology were prepared for comparison against the available international benchmarks.

Gerodontology internationally and comparison to Australia

While the older population of countries is growing globally, approaches to teaching gerodontology in dental schools vary internationally.[59] Recognising dental specialties allows clinicians to contribute to a workforce that is equipped with the necessary education to expand their skill set in a specific specialist area. It is also necessary to discuss gerodontology from the perspective of international benchmarks and historical perspectives to understand the Australian context.

Dental specialists are recognised by certifying boards and accrediting authorities as dentists who have also completed a dental specialty program. This advanced level of training and education in a particular area of interest can be found in dental schools internationally, with Australia developing entry level competencies for dental specialists through the DBA and the Dental Council (New Zealand) (DC[NZ]).[51] Australia recognises 13 dental specialties including SND. Gerodontology is not included as a stand-alone specialty described in the entry-level competencies for SND.[92]

A lack of recognition of gerodontology (or geriatric dentistry in the US) as a dental specialty is a common theme in gerodontology education literature.[59,148] This may be attributed to the belief that the needs of the public are best served if the profession is focused on general practice, as reflected in the position of America's National Commission on Recognition of Dental Specialties and Certifying Boards.[91] The American Dental Association recognises dental specialties where there is a need for advanced knowledge and skills integral to the maintenance or restoration of oral health.[91] While gerodontology is not included as a specialty, 'the Curriculum Guidelines for Geriatric Dentistry' were published in 1989 in the Journal of Dental Education, followed by a resource guide produced in 2006 by the American Dental Education Association (ADEA) to provide specific educational outcomes and resources for dental schools.[149] This resource was entitled 'Oral Health for Independent Adults' and focussed on older Americans living independently.[150]

Comparing Australian accreditation standards to that of the US, the American Commission on Dental Accreditation lists as one of the standards; 'graduates must be competent in assessing the treatment needs of patients with special need. These individuals include, but are not limited to, people with developmental disabilities, cognitive impairment, complex medical problems, significant physical limitations, and the vulnerable elderly'.[151(p30)] This is the only reference to gerodontology specific education and could be interpreted differently by education providers. In 2001, the Brazilian Dental Council recognised geriatric dentistry as a specialty in response to the increasing ageing population and demand for dental treatment amongst older people.[152] Brazil was confirmed through the literature,[153] and contact with leading academics in the field internationally, to be the only country that recognised gerodontology as a specialist branch of dentistry. While this led to an increase in specialty training programs for this area and an increase in research activity, the inclusion of gerodontology in curricula at an undergraduate level remains limited.[152] A recent study found that gerodontology service provision in Brazil has not improved in comparison to other countries that do not recognise this as a specialty.[153] Recognising that the discipline as a dental specialty may not result in the creation of undergraduate guidelines for gerodontology education, and the awareness that there is a wide variation of the inclusion of gerodontology within Brazil, Brazil was excluded as a benchmark. The ADEA's resource[150]

was also excluded as a benchmark because it focused on independent older adults rather than frail and care-dependent older people.

Data collection for the benchmark curriculum was sought through the Japan's Ministry of Health, the Japanese Society of Gerodontology (JSG), and the European College of Gerodontology (ECG). Japan's population is classified as a 'super-ageing' society with the highest life expectancies in the world.[154] Japan is recognised as a pioneering country in the field of geriatric dentistry.[153] The first gerodontology department in Japan was established in 1987 and the Society of Gerodontology founded in 1986.

In 2018, a core curriculum for Japanese dental schools was published by the Ministry of Health with gerodontology included as a compulsory subject.[155] Within the Model Core Curriculum (MCC), each dental school develops their own education program using the textbook edited by the JSG which follows the JSG published guidelines for geriatric education.[156]

The ECG was founded in 2009 as the representative body for gerodontology in Europe to provide a forum for contact between those with a shared interest and for the improvement of the oral health of older people. The College provided an expert opinion paper in collaboration with the European Geriatric Medicine Society to provide European policy recommendations on oral health in older adults.[52] As well as an established history of advocacy and building communities of practice within the branch of geriatric dentistry, the ECG has embedded research in gerodontology with the internationally recognised scholarly peer-reviewed journal, *Gerodontology.*[157] With this foundation of gerodontology education and advocacy in geriatric dental curriculum, Japan was identified as a comparable education context for the purposes of this study.

In the same year as the ECG was founded, the college published undergraduate curriculum guidelines stating that training in gerodontology at the undergraduate level should be mandatory.[158] While the guidelines include an outlined curriculum, the competencies listed in the paper were more comparable in structure with Australian competencies and Japan's 'basic qualities and abilities' thus allowing for a better comparison. The JSG's Educational

Principles of Gerodontology,[156] similar to the ECG curriculum outline, provide more specific course and subject outlines. Therefore, the MCC was used as Japan's national benchmark standard for their mandatory gerodontology competencies.

Table 10 displays the gerodontology competencies from Japan's MCC, and the ECG. The Australian domain descriptors from Table 9 were coded against ECG and Japan's competencies to compare similarities and differences between the two international benchmarks.

Table 10. Gerodontology competencies: Japan and Europe

Key (ADC domain):

1. **Professionalism covers personal values attitudes and behaviours**
2. **Communication and leadership covers the ability to work cooperatively and to communicate effectively**
3. **Health promotion covers health education and the promotion of health in the community**
4. **Scientific and clinical knowledge covers the underlying knowledge base required by dental practitioners**
5. **Patient care**

ECG Undergraduate Curriculum Guidelines: Core Competencies	ADC domain coding against ADC competencies
The dentist must be competent at: 1. Displaying an appropriate and ethical caring behaviour towards older patients	1
2. Identifying the chief complaint and the needs and demands of the older patient	5
3. Obtaining a thorough general, medical, dental, and social history	5
4. Performing an intra- and extra-oral examination	5
5. Communicating effectively with the aged dental patient taking into account the physical, psychological and mental status of the patient	2
6. Assessing patients' comprehension and competency.	2
7. Communicating effectively and sharing information with all members of the health care team (physicians, nurses, dental assistants, hygienists etc.) and the carers	2
8. Taking and assessing radiographs (head and neck) in the aged patients	5
9. Recognising oral mucosal disorders and referring accordingly	5

ECG Undergraduate Curriculum Guidelines: Core Competencies	ADC domain coding against ADC competencies
10. Recognising signs of elder abuse and neglect and describing the methods of reporting it to the appropriate authorities	1
11. Performing a written referral to clarify the patient's general condition	2
12. Recognising the presence of the major systemic diseases in old age and how they affect the delivery of oral care	5
13. Taking the patients' vital signs	5
14. Identifying the age-related changes in the oral structures.	4
15. Assessing oral health related quality of life in elderly patients.	1
16. Identifying nutritional deficiencies, performing dietary analysis, and providing nutritional advice	5
17. Providing oral education and oral hygiene instructions to the older patient and particularly to patients with diminished manual dexterity	3
18. Training auxiliaries and carers in basic skills of oral hygiene for the frail and dependent aged.	3
19. Training auxiliaries and carers in the perception of pain and oral impairment for dental referral.	3
20. Suggesting strategies to overcome barriers to dental care for the elderly patients.	3
21. Selecting individualised patient-centred treatment options	1
22. Preventing and managing dental and medical emergencies in clinical dental practice	5
23. Diagnosing xerostomia, its aetiological factors and managing the condition	5
24. Completing a wide range of dental procedures (e.g., simple extractions, management of root caries, secondary carries, tooth wear, periodontal treatment, endodontic therapy, fixed and removable prostheses and management of dry mouth which are common in the elderly patients).	5
25. Recognising and managing the special difficulties in removable prostheses in the elderly.	5
26. Managing denture-related conditions.	5
27. Providing oral health care in a multidisciplinary context.	2
28. Managing aged patients with compromised general health and various levels of dependency and knowing when to refer.	2
29. Providing adequate treatment in patients' homes and long-term care settings using appropriate dental equipment.	5

ECG Undergraduate Curriculum Guidelines: Core Competencies	ADC domain coding against ADC competencies
Have knowledge of: 30. The principal demographic characteristics and trends in the aged population.	3
31. Physiological and pathological age-related changes.	4
32. Age-related changes in special senses (sight, hearing, smell, and taste).	4
33. Common medical conditions in the elderly population.	4
34. Relevance and incidence of co-morbidity.	4
35. The principal socio-economic status of the elderly relevant to oral care.	3
36. Major neurological and psychological disturbances in the aged (memory impairment, pain perception, changes in anxiety, self-esteem, and disorientation).	4
37. The effect of loss of status, health, family, employment, income and companions on the behaviour and attitude of the aged.	1
Have knowledge of: 30. The principal demographic characteristics and trends in the aged population.	3
31. Physiological and pathological age-related changes.	4
32. Age-related changes in special senses (sight, hearing, smell, and taste).	4
33. Common medical conditions in the elderly population.	4
34. Relevance and incidence of co-morbidity.	4
35. The principal socio-economic status of the elderly relevant to oral care.	3
36. Major neurological and psychological disturbances in the aged (memory impairment, pain perception, changes in anxiety, self-esteem, and disorientation).	4
37. The effect of loss of status, health, family, employment, income and companions on the behaviour and attitude of the aged.	1
38. Appropriate laboratory diagnostic tests for the most common geriatric diseases and the interpretation of the results	4
39. The oral manifestations of systemic diseases.	4
40. The principles of pharmaco-dynamics and pharmaco-kinetics in the elderly patient.	4
41. Drug interactions and relevance of polypharmacy.	4
42. Side effects of drugs and their impact on oral health.	4
43. The oral health-care management of people with cognitive impairment.	5
44. Procedures in managing patients with reduced ability to consent.	2

ECG Undergraduate Curriculum Guidelines: Core Competencies	ADC domain coding against ADC competencies
45. The organisation of a safe and friendly treatment environment for the older patient for easy access to dental care.	1
Be familiar with: 46. Theories of ageing.	4
47. The organisation of general and oral health care for the elderly in the community and in the hospitals and the organisation of domiciliary care	2
48. The principles of management of geriatric medical conditions.	4
49. The use of geriatric assessment scales (dementia, depression, nutrition).	4
50. Concepts of death and dying.	1
Japan's MCC: Basic Qualities and Abilities Required of a Dentist *(Relevant to 'Elderly People')*	**ADC domain coding against ADC competencies**
Contribution to regional medical care: 1. Understand the concept of the Integrated Community Care System and explain necessity of interprofessional and inter-departmental (including public administration) collaboration in areas of health care (maternal and child health, school health, occupational health, adult/elderly people's health, community health, mental health), medical care, welfare, and nursing care	1
Systems of health, medical, welfare, and nursing care: 1. Understand the related social system, regional medicine, and social environment to provide health care, medical care, welfare, and nursing care appropriately based on the viewpoint of effective use of limited medical resources	1
2. Explain the social environment surrounding elderly people.	3
Anaesthesia and systemic management/general care necessary for dental treatment: 1. Understand the basics of general care, local anaesthesia, psycho-sedation, and general anaesthesia	4
2. Explain the evaluation of a patient's systemic condition (including paediatric, pregnant people, and elderly people).	4

Japan's MCC: Basic Qualities and Abilities Required of a Dentist *(Relevant to 'Elderly People')*	ADC domain coding against ADC competencies
Dental treatment of elderly people: 1. Understand the physical, mental, and psychological characteristics and points of caution for dental treatment of elderly people.	4
2. Explain the physiological, psychological, and behavioural characteristics of elderly people.	4
3. Explain the diseases common in elderly people, and the medications they take.	4
4. Explain the tests to detect, and the preventative methods for, oral function degradation (including preventative nursing care).	4
5. Explain the tools and treatment used in oral health management of elderly people.	4
6. Explain the systemic management practised when performing dental treatment on elderly people.	4
7. Explain the important points of caution for performing dental treatment on elderly people requiring nursing/long-term care (including home healthcare recipients).	1
8. Explain in-home medical care (including homebound dentistry).	1
9. Explain the examination, testing, and diagnosis of dysphagia.	4
10. Explain dysphagia rehabilitation.	4
11. Explain nutritional management and dietary type adjustment.	4
12. Explain the signs and handling of elder abuse.	4
Treatment of elderly people and people with disabilities: 1. Through simulation training (pre-clinical practice (model practice using mannequin) and peer-clinical experience), master the basic clinical procedures to perform dental care/treatment.	5
2. Perform basic support with elderly people and their nursing caregiver.	2
3. Perform basic support with people with disabilities and their nursing caregiver.	2
4. Assist in-home medical care (including homebound dentistry).	2
5. Assist with psycho-sedation *(not relevant to undergraduate dentist training in Australia)*	*Not relevant in Australia*

When building comparisons between Japan's and the ECG's guidelines and Australian requirements, it is important to note that the ADC does not explicitly require dental schools to include gerodontology as part of the curriculum for entry-to-practice as a dentist. The only inclusion with reference to dentistry for older people is that topics in the curricula and clinical experiences should include SND which includes aged care dentistry (Table 8). To compare an international benchmark based on the guidelines of the identified long-standing gerodontology societies, the ECG and JCG, a thematic approach to the Australian competencies from the ADC was needed to identify how the benchmark would correlate to what currently exists in Australia.

Initial coding of the MCC and ECG competencies was conducted through themes generated from the ADC. Where duplication of competencies was found, they were identified and consolidated into a single competency descriptor for the benchmark (Table 11).

Table 11. Gerodontology descriptors coded as ADC domains from MCC and ECG competencies

Key (ADC domain):

1. **Professionalism covers personal values attitudes and behaviours**
2. **Communication and leadership covers the ability to work cooperatively and to communicate effectively**
3. **Health promotion covers health education and the promotion of health in the community**
4. **Scientific and clinical knowledge covers the underlying knowledge base required by dental practitioners**
5. **Patient care**

***Statement included in addition to ECG and MCC statements/competencies**

Code	Common Descriptor (coded to ADC domains)
1	• Understanding appropriate and ethical caring behaviour towards older people • Recognising signs of elder abuse and neglect and describing the methods of reporting it to the to the appropriate authorities • Assessing oral health related quality of life in older people • Selecting individualised patient-centred treatment options for older people • Understanding concepts of death and dying, and theories of ageing • Understanding the effect of loss of status, health, family, employment, income and companions on the behaviour and attitude of older people • Understand the organisation of general and oral health care for older people in the community, hospitals, and the organisation of domiciliary care • Explaining the important points of caution for performing dental treatment on older people requiring nursing/long-term care (including home healthcare recipients) • Explaining in-home medical care (including homebound dentistry) • Explaining the signs and handling of elder abuse • Knowledge of age-related differences and considerations for Aboriginal and Torres Strait Islander older people* • Understanding the principles of efficient, effective, and equitable utilisation of resources, and recognise local and national needs in health care and service delivery across Australia's geographical areas in aged care*

Code	Common Descriptor (coded to ADC domains)
2	• Assessing an older person's comprehension and competency including knowledge of the oral health-care management of people with cognitive impairment • Performing basic support with older people and their nursing caregiver. • Communicating effectively and sharing information with all members of the aged care team (physicians, nurses, dental assistants, hygienists etc.) and the carers • Providing oral health care to frail and care-dependent older people in a multidisciplinary context. • Performing a written referral to clarify the older person's general condition • Knowledge of procedures in managing an older person with reduced ability to consent. • Managing older people with compromised general health and various levels of dependency and knowing when to refer.
3	• Knowledge of the principal demographic characteristics and trends in the older population • Knowledge of the principal socio-economic status of older people relevant to oral care • Suggesting strategies to overcome barriers to dental care for the frail and care-dependent older person • Providing oral education and oral hygiene instructions to the older person and particularly to older people with diminished manual dexterity • Explaining the social environment surrounding frail and care-dependent older people • Training auxiliaries and carers in basic skills of oral hygiene for the frail and dependent older people. Training auxiliaries and carers in the perception of pain and oral impairment for dental referral

Code	Common Descriptor (coded to ADC domains)
4	• Explaining the physiological, psychological, and behavioural characteristics of older people. • Knowledge of physiological and pathological age-related changes and identifying the age-related changes in the oral structures • Explaining the diseases common in older people including relevance and incidence of co-morbidity, and major neurological and psychological disturbances in (memory impairment, pain perception, changes in anxiety, self-esteem, and disorientation). • The principles of pharmaco-dynamics and pharmaco-kinetics in the older person. Drug interactions and relevance of polypharmacy. Side effects of drugs and their impact on oral health • Explain the tools and treatment used in oral health management of frail and care-dependent older people. • Explain the systemic management practised when performing dental treatment on frail and care-dependent older people. • The principles of management of geriatric medical conditions including knowledge of dysphagia in older people including multi-disciplinary team management of dysphagia • Knowledge of the use of geriatric assessment scales (dementia, depression, nutrition). • Knowledge of appropriate laboratory diagnostic tests for the most common geriatric diseases and the interpretation of the results
5	• Managing all aspects of dental treatment using concepts used for the needs of older people (e.g., Minimal Intervention Dentistry, shortened dental arch) • Diagnosing xerostomia, its aetiological factors and managing the condition in older people • Recognising and managing the special difficulties in removable prostheses in frail and care-dependent people. • Providing adequate treatment in older peoples' homes and long-term care settings using appropriate dental equipment

A descriptor unique to Australia's population of older people was included; 'knowledge of age-related differences and considerations for Aboriginal and Torres Strait Islander older people' as this relates to ADC domain descriptor; 'provide culturally safe and culturally competent practice that includes recognition of the distinct needs of Aboriginal and Torres Strait Islander peoples in relation to oral health care provision.' Also included in the benchmark statement was 'understanding the principles of efficient, effective and equitable utilisation of resources, and recognise local and national needs in health care and service delivery across Australia's geographical areas in aged care' which came from the ADC's domain 1. This statement replaced the Japanese competency for understanding social systems and healthcare systems specific to that country.

The Japanese MCC included references to psycho-sedation assistance which is not included in the scope of the newly qualified general dentist in Australia; therefore, it was excluded from the final descriptors for the survey. The final descriptor group, 'patient care,' included all aspects of general dentistry encompassed in four brief general statements relating to patient care specific to older people.

A final list of gerodontology competencies structured around the ADC domains formed the basis of an ideal approach for assessing the competence of the newly qualified graduate (Table 12).

Table 12. Gerodontology competencies for the newly qualified dentist for Phase 2 survey

Domain	Competency
Professionalism covers personal values, attitudes, and behaviours	Understanding appropriate and ethical caring behaviour towards older people
	Recognising signs of elder abuse and neglect and describing the methods of reporting it to the appropriate authorities
	Assessing oral health related quality of life in older people
	Selecting individualised patient-centred treatment options for older people
	Understanding concepts of death and dying, and theories of ageing
	Understanding the effect of loss of status, health, family, employment, income and companions on the behaviour and attitude of older people
	Understand the organisation of general and oral health care for older people in the community, hospitals, and the organisation of domiciliary care
	Explaining the important points of caution for performing dental treatment on older people requiring nursing/long-term care (including home healthcare recipients)
	Explaining in-home medical care (including homebound dentistry)
	Explaining the signs and handling of elder abuse
	Knowledge of age-related differences and considerations for Aboriginal and Torres Strait Islander older people
	Understanding the principles of efficient, effective, and equitable utilisation of resources, and recognise local and national needs in health care and service delivery across Australia's geographical areas in aged care
Communication and Leadership covers the ability to work cooperatively and to communicate effectively	Communicating effectively with the frail and care-dependent older dental patient taking into account the physical, psychological, and mental status of the person
	Assessing an older person's comprehension and competency including knowledge of the oral health-care management of people with cognitive impairment
	Performing basic support with older people and their nursing caregiver
	Communicating effectively and sharing information with all members of the aged care team (physicians, nurses, dental assistants, hygienists etc.) and the carers
	Providing oral health care to frail and care-dependent older people in a multidisciplinary context
	Performing a written referral to clarify the older person's general condition
	Knowledge of procedures in managing an older person with reduced ability to consent
	Managing older people with compromised general health and various levels of dependency and knowing when to refer

Domain	Competency
Health Promotion covers health education and the promotion of health in the community	Knowledge of the principal demographic characteristics and trends in the older population
	Knowledge of the principal socio-economic status of older people relevant to oral care
	Suggesting strategies to overcome barriers to dental care for the frail and care-dependent older person
	Providing oral education and oral hygiene instructions to the older person and particularly to older people with diminished manual dexterity
	Explaining the social environment surrounding frail and care-dependent older people
	Knowledge of age-related differences and consideration for Aboriginal and Torres Strait Islander older people
	Training auxiliaries and carers in basic skills of oral hygiene for frail and dependent older people. Training auxiliaries and carers in the perception of pain and oral impairment for dental referral
Scientific and Clinical Knowledge covers the underlying knowledge base required by dental practitioners	Explaining the physiological, psychological, and behavioural characteristics of older people
	Knowledge of physiological and pathological age-related changes and identifying the age-related changes in the oral structures
	Explaining the diseases common in older people including relevance and incidence of co-morbidity, and major neurological and psychological disturbances (memory impairment, pain perception, changes in anxiety, self-esteem, and disorientation)
	The principles of pharmaco-dynamics and pharmaco-kinetics in the older person. Drug interactions and relevance of polypharmacy. Side effects of drugs and their impact on oral health
	Explain the tools and treatment used in oral health management of frail and care-dependent older people
	Explain the systemic management practised when performing dental treatment on frail and care-dependent older people
	The principles of management of geriatric medical conditions including knowledge of dysphagia in older people including multi-disciplinary team management of dysphagia
	Knowledge of the use of geriatric assessment scales (dementia, depression, nutrition)
	Knowledge of appropriate laboratory diagnostic tests for the most common geriatric diseases and the interpretation of the results

Domain	Competency
Patient Care	Managing all aspects of dental treatment using concepts used for the needs of older people (e.g., Minimal Intervention Dentistry, shortened dental arch)
	Diagnosing xerostomia, its aetiological factors and managing the condition in older people
	Recognising and managing the special difficulties in removable prostheses in frail and care-dependent people
	Providing adequate treatment in older peoples' homes and long-term care settings using appropriate dental equipment

Summary

The European College of Gerodontology (ECG) and the Japanese Society of Gerodontology were found to be two internationally recognised bodies producing a framework of undergraduate gerodontology competencies for dental schools. The exploration of international benchmarks could be explored more deeply in future research to determine if other benchmarks for gerodontology exist. Document analysis from the Phase 1 allowed for reconfiguring the existing ADC framework to provide gerodontology specific Australian competencies. This served as a foundation for the study designed for Phase 2 where Australian dental school academics responsible for the gerodontology content were surveyed to provide information regarding the inclusion, content, and mode of delivery within the program for undergraduate dentists (Appendix 8).

Phase 2: Surveys

Introduction

Phase 2 involved a survey of Australian dental schools to review the gerodontology content in the curriculum of each school using the competencies summarised in Table 12 of Phase 1. The objective was to understand current delivery of gerodontology education in dental schools according to the benchmark set of competencies identified in Phase 1. The survey was distributed to academic leads of gerodontology education in all nine undergraduate dental schools across Australia.

Step 1 of Kern's curriculum design approach links into the method of answering the research questions below by investigating the 'health care problem'[100] (an increasing ageing population keeping teeth longer) with the ideal approach (Phase 1: document analysis) and the current approach (Phase 2: surveys). Using information from the document analysis, the data identified gaps between Australian requirements for gerodontology education against international gerodontology benchmarks.

The following questions were asked as part of Phase 2:

- How and what are Australian dental schools currently teaching in gerodontology education?
- How does gerodontology education differ between Australian dental schools?
- How do the gerodontology education curricula delivered by Australian dental schools align with ADC mandatory requirements of gerodontology education for registration for graduating dentists, and with international benchmarks?

Results

The survey was conducted between June 2021 and August 2021. Results from the dental schools were non-parametric and from a purposive sample size of nine schools and are presented descriptively. Eight dental schools responded using the survey link to the emailed invitation. The ninth school was experiencing staffing changeover and the unplanned leave of the academic involved in gerodontology education and responded after the closure of the survey through an email rather than using the survey software. The dental school participant who did not provide a response using the survey link was not included in the survey results (Table 15). Table 13 provides details of the nine Australian dental schools including length of program and undergraduate or postgraduate course. Three dental schools offered entry-to-practice dentistry programs as a four-year graduate course. University of Adelaide, Melbourne University, University of Queensland, and Sydney University also offered accredited dental practitioner programs to allow registration with the DBA as a SND specialist.[144]

Table 13. Demographics of Australian dental school participants

Dental School	Participant Role at Dental School	Entry-to-Practice Dentistry Program
Charles Sturt University	Head of school	Undergraduate (5 years)
Griffith University	SND academic	Undergraduate (5 years)
James Cook University	SND academic	Undergraduate (5 years)
La Trobe University	Curriculum consultant	Undergraduate (5 years)
University of Adelaide	Program board chair	Undergraduate (5 years)
University of Melbourne	SND academic	Postgraduate (4 years)
University of Queensland	SND academic	Undergraduate (5 years)
University of Sydney	SND academic	Postgraduate (4 years)
University of Western Australia	SND academic	Postgraduate (4 years)

Responses around content and mode of delivery of gerodontology content varied widely between schools (Table 14). Seven of the nine schools did not offer specific content on the subject. The two schools that did not include gerodontology as a discrete subject included

content within the Special Care Dentistry teaching. Eight of the nine schools included the content in one (or both) of the final two years of the program with two schools including the content in earlier years. None of the schools offered gerodontology in the first year of the dental school program.

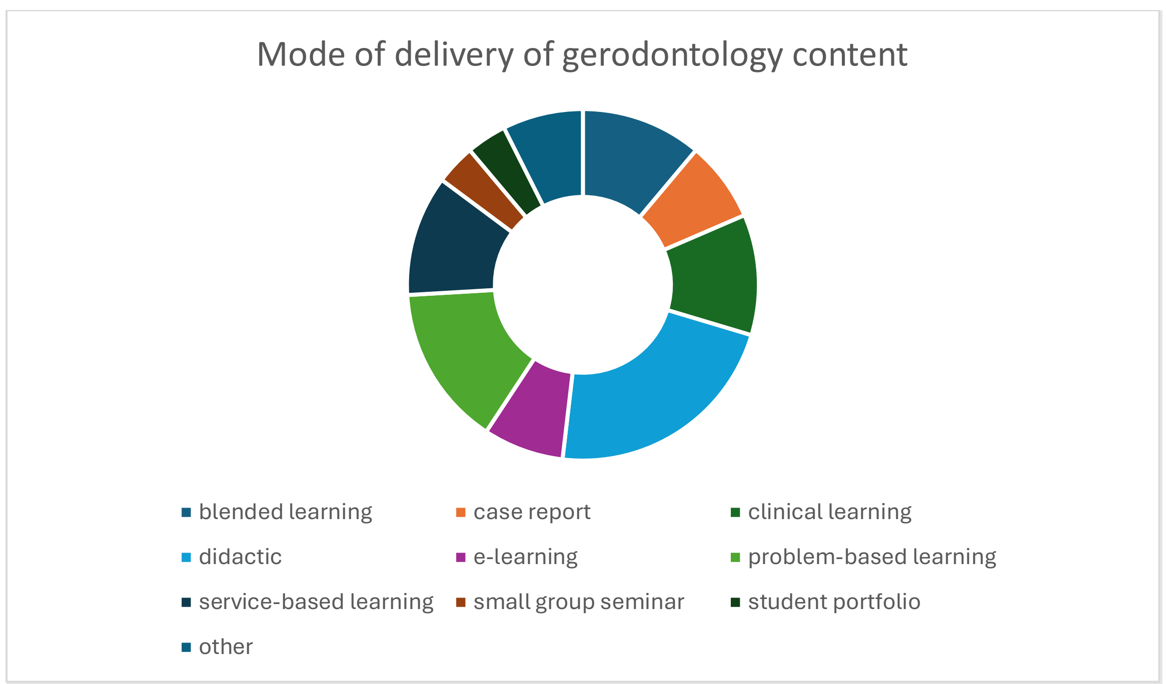
Table 14. Gerodontology content and mode of delivery

Dental School	Gerodontology Specific Content	Content Provided in Year	Mode of Delivery of Content
Charles Sturt University ***Note: no response submitted to online survey from dental therefore excluded from survey data (Table 15)***	Yes	5 (final year)	Didactic (lecture) Service-based learning (workplace learning clinical portable dentistry placement program and students visit participating aged care facilities to provide oral health screening, oral health promotion and emergency care) Other (Two assessment tasks. The first involves the preparation of a critical review on a relevant topic The second assessment is a multi-part assignment)
Griffith University	No; included in Special Care Dentistry subject	4	E-learning (8 hours) Small group seminar (3 hours)
James Cook University	Yes	3, 5 (final year)	Case report (opportunity to choose gerodontology) Didactic (2 lectures; one on the medical perspective giving a background in ageing the second from a dental perspective) Problem-based learning (Clinically Orientated Active Learning Sessions cases involving a group presentation, involving a client from the aged population to the rest of the cohort) Research project (students may choose to undertake a research project or literature review about gerontology) Service-based learning (a small number of 5th-year students may accompany a specialist in SND on aged care facility visits in Alice Springs) Student portfolio (5th-year portfolios may include reflections on clinical work on clients from the aged population) Other Community Health Project (a few groups of students choose to provide a health promotion event at a local aged care facility)

Dental School	Gerodontology Specific Content	Content Provided in Year	Mode of Delivery of Content
La Trobe University	Yes	2, 4, 5 (final year)	Blended learning Clinical learning
University of Adelaide	Yes	4	E-learning (5 hours) Problem-based learning (10 hours)
University of Melbourne	Yes	3, 4 (final year)	Case report Didactic (lecture) Service-based learning
University of Queensland	No; included in SND dental practice	4	Didactic (lecture) (15 hours) Problem-based learning (1.5 hours)
University of Sydney	Yes	3, 4 (final year)	Blended learning Clinical learning Didactic (lecture) Research project
University of Western Australia	Yes	3, 4 (final year)	Blended learning Clinical learning Didactic (lecture) Problem-based learning

Didactic lectures were the most popular mode of delivery for gerodontology content with six schools (Charles Sturt University, Griffith University, James Cook University, La Trobe University, University of Adelaide, University of Melbourne, University of Queensland, University of Sydney, and University of Western Australia) using didactic teaching (Figure 11). Figure 11 does not represent the time allocated to the modes of content delivery but provides a visual representation of the overall proportion of the dental schools surveyed providing each mode. Two schools provided content in alternative formats; one used a community health project specific to an RACF, and one used an assessment for learning. More detail was provided by one school who stated that the community health project, portfolio, service-based learning, research project, and case report content specific to gerodontology was not a standard mode of delivery for the curriculum to all students.

Figure 11. Mode of delivery of gerodontology content



The next section of the survey gathered information on gerodontology specific competencies developed from Phase 1 of the project using the existing framework from the ADC[48] and benchmarks from international gerodontology competencies (Table 15). The participants were asked to select all gerodontology specific competencies currently included in their program curriculum with the ability to provide further detail on the mode and year of delivery for the selected competencies. The dental school that had not provided responses using the survey link was not included in these results as no information had been given for this section. A breakdown of the results according to the domains that align with the ADC's accreditation standards for dental practitioner programs is summarised in Table 15.

Table 15. Gerodontology competencies taught in Australian dental schools

ADC domain	Competency	Number of schools (out of 8) providing content linked to the competency
Professionalism covers personal values, attitudes, and behaviours	Understanding appropriate and ethical caring behaviour towards older people	7
	Recognising signs of elder abuse and neglect and describing the methods of reporting it to the appropriate authorities	3
	Assessing oral health related quality of life in older people	8
	Selecting individualised patient-centred treatment options for older people	8
	Understanding concepts of death and dying, and theories of ageing	4
	Understanding the effect of loss of status, health, family, employment, income and companions on the behaviour and attitude of older people	6
	Understand the organisation of general and oral health care for older people in the community, hospitals, and the organisation of domiciliary care	5
	Explaining the important points of caution for performing dental treatment on older people requiring nursing/long-term care (including home healthcare recipients)	6
	Explaining in-home medical care (including homebound dentistry)	5
	Explaining the signs and handling of elder abuse	2
	Knowledge of age-related differences and considerations for Aboriginal and Torres Strait Islander older people	5
	Understanding the principles of efficient, effective, and equitable utilisation of resources, and recognise local and national needs in health care and service delivery across Australia's geographical areas in aged care	4

ADC domain	Competency	Number of schools (out of 8) providing content linked to the competency
Communication and Leadership covers the ability to work cooperatively and to communicate effectively	Communicating effectively with the frail and care-dependent older dental patient taking into account the physical, psychological, and mental status of the person	7
	Assessing an older person's comprehension and competency including knowledge of the oral health-care management of people with cognitive impairment	6
	Performing basic support with older people and their nursing caregiver	4
	Communicating effectively and sharing information with all members of the aged care team (physicians, nurses, dental assistants, hygienists etc.) and the carers	6
	Providing oral health care to frail and care-dependent older people in a multidisciplinary context	7
	Performing a written referral to clarify the older person's general condition	4
	Knowledge of procedures in managing an older person with reduced ability to consent	7
	Managing older people with compromised general health and various levels of dependency and knowing when to refer	7
Health Promotion covers health education and the promotion of health in the community	Knowledge of the principal demographic characteristics and trends in the older population	3
	Knowledge of the principal socio-economic status of older people relevant to oral care	3
	Suggesting strategies to overcome barriers to dental care for the frail and care-dependent older person	4
	Providing oral education and oral hygiene instructions to the older person and particularly to older people with diminished manual dexterity	6
	Explaining the social environment surrounding frail and care-dependent older people	3
	Knowledge of age-related differences and consideration for Aboriginal and Torres Strait Islander older people	3
	Training auxiliaries and carers in basic skills of oral hygiene for frail and dependent older people. Training auxiliaries and carers in the perception of pain and oral impairment for dental referral	2

ADC domain	Competency	Number of schools (out of 8) providing content linked to the competency
Scientific and Clinical Knowledge covers the underlying knowledge base required by dental practitioners	Explaining the physiological, psychological, and behavioural characteristics of older people	4
	Knowledge of physiological and pathological age-related changes and identifying the age-related changes in the oral structures	6
	Explaining the diseases common in older people including relevance and incidence of co-morbidity, and major neurological and psychological disturbances (memory impairment, pain perception, changes in anxiety, self-esteem, and disorientation)	5
	The principles of pharmaco-dynamics and pharmaco-kinetics in the older person. Drug interactions and relevance of polypharmacy. Side effects of drugs and their impact on oral health	5
	Explain the tools and treatment used in oral health management of frail and care-dependent older people	4
	Explain the systemic management practised when performing dental treatment on frail and care-dependent older people	4
	The principles of management of geriatric medical conditions including knowledge of dysphagia in older people including multi-disciplinary team management of dysphagia	4
	Knowledge of the use of geriatric assessment scales (dementia, depression, nutrition)	3
	Knowledge of appropriate laboratory diagnostic tests for the most common geriatric diseases and the interpretation of the results	2
Patient Care	Managing all aspects of dental treatment using concepts used for the needs of older people (e.g., Minimal Intervention Dentistry, shortened dental arch)	6
	Diagnosing xerostomia, its aetiological factors and managing the condition in older people	6
	Recognising and managing the special difficulties in removable prostheses in frail and care-dependent people	6
	Providing adequate treatment in older peoples' homes and long-term care settings using appropriate dental equipment	5

Overall findings from the survey are described below. These are structured under the subheading of each ADC domain; Professionalism, Communication and Leadership, Health Promotion, Scientific and Clinical Knowledge, and Patient Care.

Professionalism Covers Personal Values, Attitudes, and Behaviours

While all eight schools that responded to the survey advised their curriculum covered the competencies ‘selecting individualised patient-centred treatment options for older people’ and ‘assessing oral health related quality of life in older people,’ overall Australian schools did not provide comprehensive coverage of this domain. Three of the 12 competencies were covered by half (or fewer) of the schools. The least covered competency from this domain was ‘explaining the signs and handling of elder abuse’ with only two schools providing education in this area.

Communication and Leadership Covers the Ability to Work Cooperatively and to Communicate Effectively

This domain received above-average responses for most of the competencies, with at least six of the eight schools providing learning opportunities in six of the eight competencies in this domain. The two competencies ‘performing basic support with older people and their nursing caregiver’ and ‘performing a written referral to clarify the older person's general condition’ were included for half of the dental schools.

Health Promotion Covers Health Education and the Promotion of Health in the Community

Health promotion was covered least from all the gerodontology specific competencies included in the survey. Five of the seven competencies were covered by less than half of the dental schools. One competency received positive responses from more than half of the schools: ‘providing oral education and oral hygiene instructions to the older person and particularly to older people with diminished manual dexterity.’

Scientific and Clinical Knowledge Covers the Underlying Knowledge Base Required by Dental Practitioners

The competency covered by most dental schools in this domain was 'knowledge of physiological and pathological age-related changes and identifying the age-related changes in the oral structures.' Six of the nine competencies received responses from half (or less) of the dental schools. The least covered area was for 'knowledge of appropriate laboratory diagnostic tests for the most common geriatric diseases and the interpretation of the results.'

Patient Care

The competencies in 'Patient Care' were covered by most of the dental schools with more than half of the schools providing positive responses to all four of the competencies described in the survey.

In summary, health promotion and professionalism were the least covered ADC domains by dental schools. Patient care, communication, and scientific and clinical knowledge as ADC domains in comparison were covered the most by dental schools.

Discussion

As a snapshot from 2021, the overview of gerodontology being delivered in Australian dental schools to dental students in programs for entry-to-practice dentistry was mirrored in the scoping review.[59] This included wide variations in the mode of delivery of education and time dedicated to gerodontology. The survey results provided insights to one particular year of education and would not necessarily indicate long-term gerodontology education for ongoing cohorts of students.

Domains used for the survey were based on document analysis from Phase 1 with benchmarks for gerodontology education in alignment with the ADC standards for the newly qualified dentist. These could provide a framework for core standards in undergraduate curriculum design; however, further information was required from stakeholders. Further to this, the revised ADC professional competencies of the newly qualified dental practitioner[49] included a need to demonstrate that all the competencies

take into account 'ageing persons requiring additional care or residing in residential and aged care facilities.' Given this 2023 revision the need for inclusion of gerodontology into the undergraduate curriculum is essential for the preparation of the newly graduated dentist. As a limitation of this survey, the dental schools would have been expected to meet the ADC competencies based on what was required at the time of data collection (2021), not the revised competencies.

Limitations with the survey included multiple staff members being involved in parts of the curriculum that would be encompassed in the competencies described in the survey, potentially leading to the underrepresentation of certain competencies covered in the current curriculum. Another limitation was that curriculum designed by a consultant did not equate to education that was being delivered at a dental school.

To understand the gaps in the Australian gerodontology curriculum and how best to provide recommendations, the insights of stakeholders involved in dental school education was needed. These stakeholder insights were explored in Phase 3 through qualitative studies of the dental school academics, dental students, consumer representatives, and DONs at RACFs.

Conclusion

A survey of the benchmark competencies developed in Phase 1 of the study was made with the current delivery of gerodontology education in Australian dental schools. Results showed Australian dental schools varied widely in content, mode, and time dedicated to gerodontology. This is reflected in gerodontology education internationally as detailed in the scoping review.[59]

The framework for curriculum design has provided the ideal approach and current approach to gerodontology education as the first step in the 'general needs assessment' of Kern's cycle.[100] For dental schools to plan for a fit-for-purpose gerodontology curriculum, insights from stakeholders involved in the education of dental students was required to provide the 'targeted needs assessment' as the second step of Kern's cycle.[100] Where gaps, barriers, and enablers to gerodontology education were discovered in Phase 1 and 2, the data was triangulated against perceptions from dental academics, dental students, consumer representatives, and directors of nursing (DONs) and are described in Phase 3 in Chapter 5.

Chapter 5. Data Collection and Analysis: Phase 3

Gerodontology education for undergraduate dentists has been found to be widely varied in the inclusion, content, and mode of delivery.[59] Surveys from Phase 2 of the study identified gaps in competencies taught in Australian dental schools against international benchmarks for gerodontology detailed in the document analysis from Phase 1. Chapter 5 describes the focus group and interviews conducted in Phase 3 of the study with stakeholders of gerodontology education. The stakeholders included dental school academics (Part 1), dental students (Part 2), consumer representatives and directors of nursing (DONs) (Part 3) and formed the targeted needs assessment of the second step in Kern's curriculum design.[100] The results are presented as three separate studies of Phase 3.

Part 1: Dental School Academics

RQ 6. What are the perceptions and attitudes of dental academic leads in special needs dentistry to gerodontology education?

Pilot Interview Guide

Introduction

The scoping review[59] and Phase 2 surveys of Australian dental school gerodontology delivery identified a lack of gerodontology inclusion in the Australian dental school curriculum against international benchmarks that were identified in Phase 1 document analysis. The second step in Kern's six-step curriculum development[100] is the targeted needs assessment to investigate the environment and stakeholder needs. This study included dental academic leads for gerodontology at Australian undergraduate dental school programs, dental students, older person's advocacy groups and consumer representatives, and nursing staff of residential aged care facilities (RACFs) as the stakeholders in the targeted needs group.

The first stakeholder qualitative study for the dental academic leads used semi-structured interviews. This method was used rather than focus groups to allow greater insight into the perception of individual dental school academics and relate the information to the data

collected from the survey results from each dental school. The aim was to explore academics' attitudes of and perceptions towards gerodontology education being provided at their dental school, and to identify possible enablers and barriers to curriculum change. Validated instruments for measuring attitudes to education were needed for guidance in structuring the questions for the interviews to address the following broad questions centred on gerodontology:

- What is the dental school doing well in gerodontology?
- What could the dental school do better with gerodontology education?

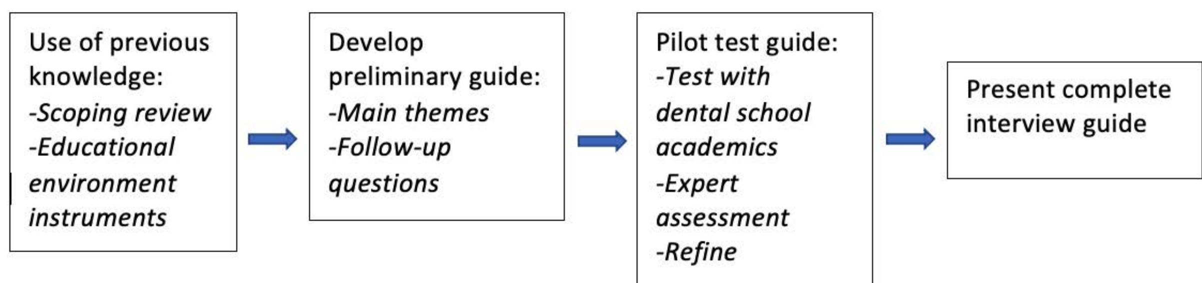
The results from Phases 1 and 2 informed the development of the questions. The creation of the main theme and follow-up questions for an interview guide formed the framework for the focus group questions for stakeholder perceptions in Phase 3.

Developing an Interview Guide

Framework for the Interview Guide

Semi-structured interviewing was used to provide questions that were neither 'closed' nor 'leading' but ensured that the key topics and the data needs were fulfilled. It also allowed comprehensive discussion around the issues and provided the researcher with information that may not have been discovered through the survey method. A preliminary interview guide was developed using a framework (Figure 12) and pilot tested with a dentist involved in teaching undergraduate dental students to confirm the coverage and relevance of the guide's content and assess the need to reformulate questions.[131]

Figure 12. A framework for the development of a qualitative semi-structured interview guide



The scoping review[59] and results from the dental school surveys provided themes that could be explored in the interviews however, further knowledge was needed around specific questions on the educational environment. Therefore, educational environment instruments applicable to dental schools were utilised for structuring the pilot interview guide questions.

Educational Environment Instruments

A systematic review of instruments measuring educational environment in health professions education[130] found five measurement instruments used specifically for dentistry out of the 31 instruments extracted (Table 6). The Dental Student Learning Environment Survey (DSLES)[159] was determined to be the most suitable for measuring educational environments in dental undergraduate settings; however, this assessment was based on the validity of the Medical School Learning Environment Survey (MSLES)[160] and its similarity to this instrument. The only difference between the two instruments was replacing the words '*medicine'* and '*physician'* with '*dentistry'* and '*dentist'.* [161] The purpose of the measurement instrument was to guide the content of the semi-structured interview questions, so each of the five instruments used for dentistry was assessed independently to focus questions on the perceptions and attitudes of dental academic leads towards gerodontology education (Table 6).

While the DREEM instrument is a robust and validated tool for the study of learning environments within medical education,[130] it is used for the exploration of student perceptions, not of teachers'[139,140] and was considered when assessing the usefulness of its questionnaire statements for this study's pilot interview guide (Table 17).

The comparison table of instruments and statements for the interview guide (Table 16) outlines the focus of each measurement instrument and relevant statements to be considered for the pilot guide.

Table 16. Comparison of instruments and statements for consideration for interview guide

Measurement instrument	Teacher or student perceptions of educational environment	Type of educational environment and summary of instrument	Questionnaire statements for consideration in pilot interview guide
Questionnaire (Gerzina et al, 2005)	Teacher and student	Comparison of teacher and student perceptions relevant to applying educational theory in dental clinical teaching. Uses Likert scale.	Clinical demonstrations of procedures assist student preparation for independent clinical practice Follow-up during the first year after graduation by a `faculty mentor would assist student confidence in their dental clinical practice Clinical demonstrations of procedures assist student preparation for independent clinical practice Discussion of alternative treatments and procedures during clinical sessions assists student preparation for independent clinical practice A high level of interactivity, such as completing part of the clinical procedure, by the clinical tutor during clinical sessions assists student preparation for independent clinical practice
ClinEd IQ	Student	Based on MedEd IQ. Examines 4 components of students' clinical experiences, clinical learning opportunities, involvement in specific learning activities, interaction with clinical instructors, and personal perceptions about clinical education.	I have experienced a good mix of patients, problems, and clinical experiences I increased my independence in caring for patients I have had the opportunity to work in a variety of patient care settings I have experienced a good mix of patients, problems, and clinical experiences

Measurement instrument	Teacher or student perceptions of educational environment	Type of educational environment and summary of instrument	Questionnaire statements for consideration in pilot interview guide
LES	Student	Student perceptions of educational environment using Likert scale. 7 domains scored including satisfaction with the learning environment, faculty and clinical preceptors, the learning environment, professionalism, handling concerns, moral distress, and interprofessional education opportunities.	Not relevant to this interview guide
DSLES	Student	Based on MSLES to identify student perceptions of learning environment, intellectual climate, social environment, and student-teacher relationships. Uses 55 items using a 4-point scale.	Not relevant to this interview guide
DREEM	Student	50 closed statement questions scored with a Likert scale. Student perceptions of learning, teaching, academic self-perceptions, atmosphere, and social self-perceptions.	I feel I am being well prepared for my profession Much of what I have to learn seems relevant to a career in medicine

Final Interview Guide

Using the relevant statements identified in Table 17 and survey information from the nine dental schools (Table 15), a preliminary guide was constructed. The steps involved testing the guide[131] with two relevantly experienced academics; a member of the advisory panel as a SND specialist and an academic member of JCU dental school versed in the current curriculum. Further field testing of the guide occurred with the academic member of JCU.

Expert review allowed discussion about the relevance of the broader main questions using feedback on the specific wording and prompting questions. This included more defined questions on learning activities, assessment, and content, and whether dental schools were benchmarking from other universities. Discussion around the wording of the questions and content of probing questions found they were broad and clear, with the addition of further probing questions to be used if needed (Table 17).

Table 17. Semi-structured questions for pilot interview guide

Main Theme	Follow-Up Questions	Further Probing Questions
Describe what the current program does well in gerodontology	• What is good about this area? • How has this been seen to be an area that is done well?	• Is the dental school benchmarking the curriculum from another university or source?
Are there things that could be done differently in gerodontology education?	• What needs to be improved? • Who needs to be involved? • Why does it need to be improved?	• Are you aware of what other dental schools are teaching? • Is there integration of subjects across different disciplines
If you could have a vision of what gerodontology education looked like for Australian dental schools, what would it be?	• What are the barriers to this vision? • What are the enablers?	• What would you change?
What does the future look like for graduates with the current gerodontology education?	• Are they prepared? • Can education influence their preparedness?	• Are our supervisors and specialists equipped to prepare the students?

Australian Dental School Academics’ Perceptions of Gerodontology Education in the Undergraduate Curriculum

Nilsson A, Young L, Evans R, Jennings E, Lee A. Australian dental school academics' perceptions of gerodontology education in the undergraduate curriculum. *Eur J Dent Educ.* 2024: 28: 337-346. Appendix 10.

Introduction

In Australia, gerodontology is addressed in postgraduate training for special needs dentistry (SND) with dentists being the only dental professional able to progress to specialist training in SND. While SND specialists receive specific training in gerodontology, all dentists are deemed competent to provide health care for older people upon graduation. Therefore, there is a need to consider the readiness of newly graduated dentists to manage frail and care-dependent people. Six of the nine Australian dental schools offer undergraduate programs and three offer a graduate entry course to allow students to graduate with the ability to register under the National Registration and Accreditation Scheme (the National Scheme).[162]

In Australia, gerodontology is usually taught under the umbrella discipline of SND or incorporated into other dental subjects, rather than having a separate, focused subject within curricula.[59] Each school has their own curriculum and structure accredited against the Australian Dental Council (ADC)/Dental Council (New Zealand) accreditation standards for dental practitioner programs (the Standards).[147] The current accreditation standards for Australian dental schools do not specifically require SND to be taught as a discreet subject nor is there a requirement to include gerodontology education in the curriculum.[58] The revised dental competencies, which come into effect in 2023, detail the need for a demonstration of all competencies considering ‘groups or populations at increased risk of harm or poor oral health… likely to include… ageing persons requiring additional care or residing in residential and aged care facilities’.[49(p8)]

Methods

Participants, Setting and Ethics

There are nine universities in Australia offering programs allowing students to practice as a dentist upon graduation. All dental schools were invited to participate in the study. Where there was no specific gerodontology lecturer, a SND lecturer or Head of School was invited to participate. The participants were given information and consent forms before interviews and all responses were de-identified (Appendix 7).

Data Collection

A qualitative, explorative study design was used to elicit a broad discussion of health educators' perceptions[163] and allow the distillation of common themes.[142] Semi-structured interviewing was chosen for data collection to ensure key topics were discussed while allowing for in-depth answers and probing for information on topics that may not have been anticipated in the initial interview guide. The framework for the interview guide used Kallio et al.'s[131] approach, with the interviews conducted by videoconference on Microsoft Teams. The preliminary guide was informed by relevant literature[159,161,164-170] and influenced by instruments used to measure the educational environment of dental schools.[130] The pilot interview guide (Table 17) contained open questions as initial questions with further follow-up and potential probing questions for use if appropriate. Questions were tested by a dentist involved in teaching entry-to-practice dental students to assess the validity and comprehensibility of questions.

Results

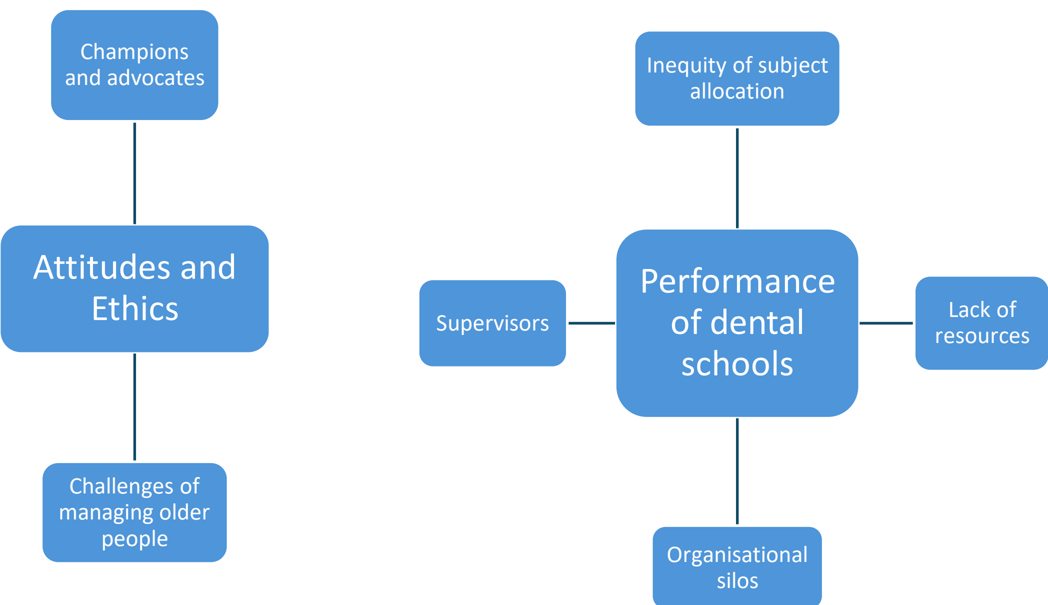
Six dental schools responded with a staff member from each willing to participate in a semi-structured interview. Three dental schools did not respond, and one dental school declined to participate with no reason given. Participants included one head of school, four SND lecturers, and one gerodontology lecturer. The interviews were conducted by the first author between November 2021 and April 2022.

Using Braun and Clarkes' (2006) framework for analysis,[128] initial codes were generated with a codebook (Table 18) used to refer to the transcripts and determine the reliability of coding.[109] This was performed by two independent coders. The overarching themes developed are illustrated in Figure 13.

Table 18. Codebook from the interviews

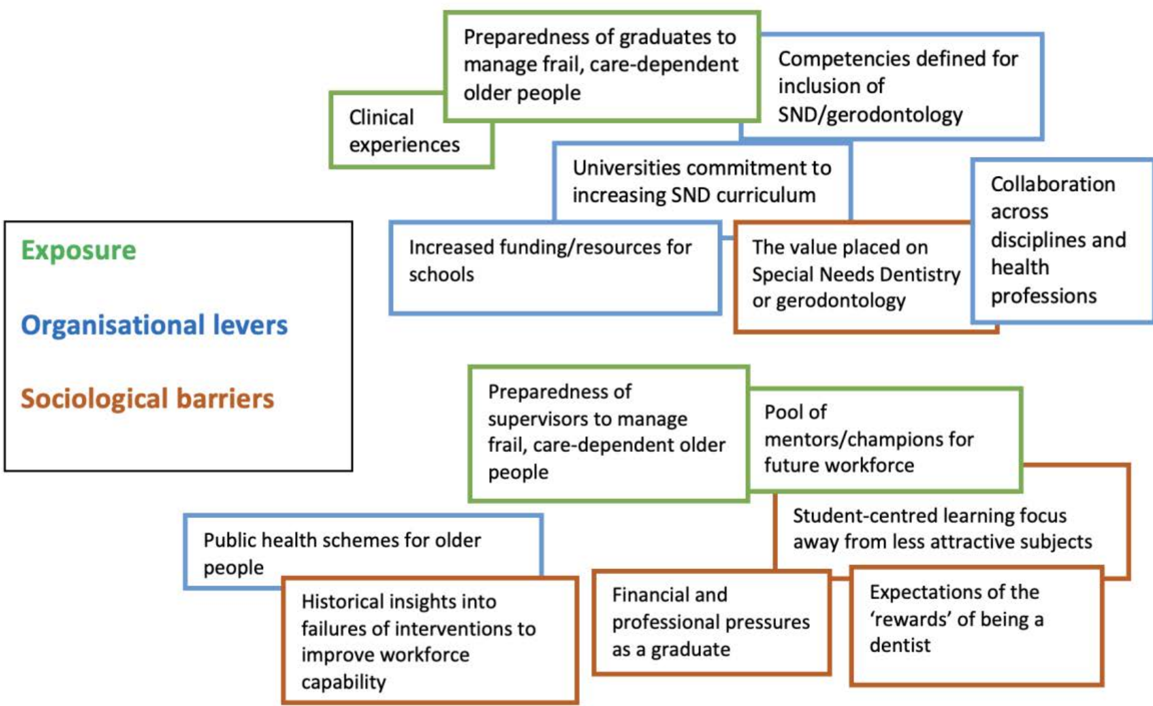
Codes
Attitudes and ethics
Challenges of managing older people
Champions and advocates
Performance of dental schools
Inequity of subject allocation to SND or geriatric care
Lack of resources
Organisational silos and interdisciplinary learning
Supervisors and mentors
Preparedness
Hands-on clinical experience
Importance of rational care planning
Knowledge on prosthetics
Standards of competency
ADC competencies
Risks to patients where scope of practice limited

Figure 13. Initial theme mind map



The final themes and sub-themes evolved from this initial thematic analysis by consensus discussion with the independent coders. The final overarching themes and their connection with the stories that were weaved between themes are illustrated in Figure 14.

Figure 14. Sub-themes mind map



Thematic Analysis

The interviews sought to explore the perceptions of dental school academics involved in gerodontology or SND components of entry-to-practice dentistry programs. Three distinct themes emerged through the analysis of transcripts: exposure; organisational levers; and sociological barriers. These themes are presented below, beginning with the influence on education of individual students, broadening to organisational considerations and then to the even broader view of sociological influences. The first theme of exposure covers the opportunity for students to learn through clinical and theoretical sessions and their exposure to, and contact with, gerodontology-focused educators and mentors.

Theme 1: Clinical Exposure

'Without that undergraduate clinical experience of the aged mouth...then, students aren't really that prepared.' (Academic X)

> Theme 1 links the perceptions of preparedness of not just students and graduates, but that of the supervisors and mentors for a future dental workforce. A need for greater clinical exposure to frail and care-dependent older people was identified. A limited pool of Special needs dentistry specialists and skilled supervisors added to the barriers to high quality gerodontology teaching and learning.

Clinical experience: The amount of clinical time allocated to gerodontology was seen not only as a contributing factor to preparedness in terms of skills and knowledge but also to improving attitudes of clinicians, as noted by Academic Z: *'I think the main way is actually getting them practical experience and actually seeing the reward, seeing the rewards of actually treating these patients and communicating with these patients.'* Gaining experience in treating patients was considered crucial for interacting with geriatric patients and having significant learning experiences associated with this practice. Such experiences could be obtained through service-based learning or mentorship. Academics discussed this topic as follows:

> *The students actually need to learn something from it rather than just getting exposed to it and a lot of the learning is through role modelling and you know, not necessarily the textbook stuff.* (Academic X)

> *If you've never spoon excavated a carious lesion, then I have zero hope that you'll be able to do that in a patient with dementia or with autism (and that's not through any fault of their own they've just not had the opportunity).* (Academic Y)

Supervisors: Quality mentors and supervisors were mentioned as a necessity for providing role modelling opportunities and for teaching students appropriately. There was also discussion of the idea that these role models would select and mentor future champions for older people and graduates interested in SND. Academic X described the flow of teaching at

the dental school as providing a limited number of experiences to students as *'it sort of self-selects individuals that are more interested in gerodontology.'* Further to this, it was said that the importance of role-models would lead to better learning outcomes by inspiring progression, as illustrated in the following comment: *'that [clinical experience] will drive students to learn and to progress, but also inspire that deep learning rather than the surface learning'* (Academic X). There was an understanding that mentoring was necessary not only before graduation but also after graduation as Academic Z describes *'recognising that the graduate isn't the finished article,'* was weaved into the theme of organisational levers in the form of vocational training programs.

A lack of appropriately equipped supervisors was seen as a barrier to providing quality exposure to students. Importance was placed on clinician awareness to provide patient-centred oral health planning to people approaching frailty and deterioration of cognitive capability. The gap in student and graduate dentist attitudes (as well as knowledge and skills) to apply rational care planning was experienced by academics. In particular, the story of an octogenarian having dental extraction and driving home alone without the dentist considering adequate sociological support for the patient was described:

> *I had a patient a couple of weeks ago that needed some teeth taking out (I was helping one of the dentists because of the treatment planning) the lady was 80 years old, and she was coming 25 kilometres for a dental appointment and coming down the freeway. And I said, "you know, are you going to be alright? You're have two teeth taken out that you've got to drive back" …and "Oh no, I'm fine!" [imitating patient saying she was fine] She's like fiercely, staunchly, independent (was 81 or 82 or something) but that dentist involved had not thought about that at all, you know. So, I think we really don't have our next generation very well prepared…and a lot of the stuff that we've been reading about and talking about, with this huge avalanche of older people coming towards the profession (me being one of them!) …I just don't think we're prepared for it.* (Academic X)

Preparedness References were made linking the life trajectory of the patient and lack of preparedness of dentists to manage older people, for example *'I think our students are*

probably prepared for those functionally independent patients, but I think the minute they [students] start getting wobbly, I think they're not great' (Academic X). There was importance in defining the change in the patient; not to just being older chronologically, but the increasing biological, pharmacological, and medical complexities as part of the frail and care-dependent older person. This was identified as the gap in graduate preparedness for complex care with comments such as *'what we've been trying to push for a lot in some of those gerontology workshops is the pre-planning... you know pre-dependent planning… because we know that by the time, they move from 75 to 80…the chances of them having a catastrophic medical event or having dementia is pretty high'* (Academic Y).

Thoughts around how ideal student exposure to older people and geriatric dentistry might be described included acknowledgement that didactic teaching alone would not improve preparedness of the graduate; *'I think it is difficult to prepare people just based purely on didactic [teaching]… without that undergraduate clinical experience of the aged mouth...then, students aren't really that prepared'* (Academic X). Exploring preparedness elicited direct responses from the participants with a feeling that organisational levers were involved in forming the barriers as illustrated by Academic Z: *'I don't feel they're particularly well prepared. Full stop, never mind just the elderly.'*

Academic Y noted that in respect to organisational levers, competencies could be set as a minimum to assess graduates but limitations remained in having sufficient clinical exposure to enable the assessment; *'I think in terms of the minimum competency set... you know we all know what that is around gerodontology and the safety markers but that whether or not we get to assess them in terms of their competency clinically is another matter, because invariably, these patients are not being seen clinically by students.'* These levers are explored in the second theme, 'organisational levers,' with academics attempting to provide reasoning behind the failures of a prepared dental graduate workforce.

Theme 2: Organisational levers

'Like Swiss cheese, there will be a lot of enablers that move into that space.' (Academic Y)

The theme "organisational levers" centred around the barriers and enablers to achieving an ideal learning space for gerodontology and developed a prepared workforce for older frail and care-dependent patients. This included factors associated with universities, professional organisations, and political bodies as a conduit for a 'utopic' learning scape regarding oral care needs of the target older population.

Resources in universities Several of the constraints to providing the ideal gerodontology education in current settings were felt to be potentially addressed by changes within universities. These statements included:

- improving the integration of gerodontology and SND across other disciplines within dentistry
  - *'It [gerodontology] would be something that occur[s] over multiple years, so it's not just something that you would do in, say, your final year or wherever, like a couple of months. It would very much be integrated with other specialties as well…if you don't understand the complexities that come with that, then what's the point?'* (Academic W)
  - *'I think this is probably more of a comment on all dental education rather than specifically for gerodontology is that we you know the faculty here is quite fragmented and the teaching is fragmented.'* (Academic Y)
  - *'There's supposed to be within [institution] an interprofessional collaborative practice program...the one that's within the medical school has no dental input into it at all and the one that's within the dental school only talks about technicians and prosthetists.'* (Academic Z)
- increasing resources to allow for high quality supervision
  - *'The problem is those [clinical placements] are very resource intensive activities. You need small groups and an academic with them, so in terms of efficiency the universities are very poorly resourced for that.'* (Academic X)

- *'I was trying to supervise six dental students and on top of that, 6 Bachelor of Health students. So, 12 students and I wasn't supervising their work because I wasn't there, but I was being asked to sign. So, I think it's politically as well a very tricky situation to be in.'* (Academic Y)

- supportive structures to develop more SND specialists.
    - *'I would love to have a clinical allocation for special care dentistry...but there's only me and I can't possibly in the course of my timetable give every single student the appropriate amount of clinical exposure.'* (Academic Z)
    - *'I believe…if I want to teach or if I want to provide individualised teaching, it needs to come from me because I'm a specialist in that area. But if you want to teach 70 students from the same cohort, it wouldn't be only me because I don't have the capacity to attend every single undergraduate clinic.'* (Academic Q)

Providing quality clinical exposure for students was found in the first theme of the results. However, the concept of exposure also ran through the organisational levers theme as an opportunity for universities to increase the time dedicated to teaching and clinical experience of care for frail and care-dependent older people with comments such as:

- *'It would be perhaps more useful if we were able to have a more structured approach to allocating patients. However, that then becomes very labour intensive, both in terms of allocation and the monitoring.'* (Academic Z)
- *'There was a time when University X were doing it well because X had a domiciliary service and the students taken along did get exposure…it was part of the undergraduate curriculum.'* (Academic X)

Although the academics were clear in their view that good quality exposure would improve learning outcomes, universities were perceived as reducing the clinical exposure over time; *'Probably over the last 10 years I would say, but even, 15 years, is that clinical time is more and more and more reduced. There is a lot more focus on academic time'* (Academic Y). The clinical exposure theme discussed formalised training programs to address gaps in graduate preparedness for gerodontology. An organisational change was suggested by Academic Z:

'The ultimate support system is something like vocational training or general professional training… recognizing that the graduate is a safe beginner and needs some mentoring afterwards' with a warning that outcomes affect the dentist as well as patient in terms of safe keeping their registration; *'you know, for as much as anything for the protection [registration] of the new graduate.'*

Competencies The need for organisations to deliver on the competencies required for accreditation of dental school programs by the ADC[147] was understood as a shaping mechanism for graduate attributes. The link between preparedness and organisational levers was evident when exploring the enablers and barriers to improving preparedness. The ability to assess competency to produce safe and prepared graduates was limited by the students' exposure to clinical experience as discussed in Theme 1, but the competencies themselves were seen as an enabler to drive change in organisations Academic AK: *'We also need a competency around rational care planning'.* Academic Z goes further to identify the ADC as playing an integral part in reducing the learning gap for geriatric dentistry *'I think until the ADC actually specifies something about the age more clearly or about managing special care patients including elderly, frail…a lot of [dental] schools will just put that in the too hard basket'.* Comparison was made to the additional standards set for cultural safety by Academic Z with the suggestion that links to older people within the ADC competencies were too vague. This was seen when discussing the objectives of educators to align with ADC expectations for Standards: *'When you look at them [ADC competencies] you could actually say "I don't have to put much in the way of education about old people here because I can cover all the rest of it". For example, there is significantly more now about First People than there is about elderly. I'm not saying that having the bit about First People is wrong, but the omission of the elderly is.'*

There was further discussion around the accountability of dental schools in providing evidence of specific learning for accreditation with reflections on how this compares to international dental schools. The General Dental Council in the UK was noted as including preparation to practice post-graduation as offered by this insight: *'the first five years had a phase in; the students had to have knowledge of sedation which meant they had to actually have done it, but not be competent in it'* (Academic Z). Exposure and preparedness with

supported mentoring was linked with this theme, with one participant identifying vocational training programs in the UK. The compulsory Vocational General Dental Practitioner training, which includes mentoring, was reflected on as *'the ultimate support system is something like vocational training or general professional training'* (Academic Z).

Recruitment and remuneration The Medicare Benefits Schedule (MBS) as the Australian government health funding scheme has introduced schemes for accessing dental care which would target the priority populations.[172] Participants felt there were levers that could be pulled at the organisational level of government including how MBS funds older people. Funding models for oral health were met with trepidation due to historic misuse of government schemes, such as the MBS Chronic Disease Dental Scheme (CDDS)[173,174] and a concern that the fee-for-service model of care was contributing to poor care. Academic X noted this as an issue; *'it [CDDS] was really used and abused for a lot of complex care and general care was not looked after, so I don't know how much of that is a lack of training in chronic disease or how much of that is actually, a reflection of the fee for service model'* (Academic Y). The pressures of a productivity-based health care system were seen as a barrier: '*everybody, regardless of whether it's community or private, a lot of our KPIs are productivity-based and trying to provide domiciliary care is going to be low productivity'* (Academic X). This in turn was perceived as a driver for recruitment and inability to provide quality supervisors for students with comments such as:

> *It may be emotionally and intellectually demanding trying to deal with a whole lot of complexities… and not financially rewarding.* (Academic X)

> *Well, if you look at the special needs…there hasn't been a formal training program until the last, say 10 or 15 years, so a lot of our supervisors have individuals who have taken an interest in in gerontology and developed an experience from there...Yeah, I think the recruitment is probably the trickiest part.* (Academic W)

The inadequate number of specialists in the field of SND was a self-perpetuating problem for future-proofing the workforce for an older dentate population observed by Academic Y; *'What we're missing is a voice in terms of we need more specialists [SND] as well. We need*

more [SND] specialists with additional training to be able to carry forward this work not only in tertiary centres but across all hospitals.' This was positively affirmed by Academic W in terms of capacity building, who said *'The university is looking at establishing a specialist program [in gerodontology] in the next two to three years so that will change things a lot as well… and I think once you've got your own workforce then you've got a few more options.'*

This sub-theme of recruitment and remuneration linked into the third theme where the barriers to provision of an ideal gerodontology curriculum were not only due to dental schools' limited capacity to increase resources, but also a lack of willingness to change due to the preferences of students. This is explored in the third theme: sociological barriers.

Theme 3: Sociological barriers

'It's about what's seen to be fashionable or acceptable in the general dental community…and being a special needs specialist is "why would you want to work with that cohort of patients?".' (Academic X)

The theme on sociological barriers includes the perception that students lack a SND academic perspective. The value placed on SND from dental schools was lacking and a continued failure in advocacy efforts for older people was observed.

Lack of appeal While providing dental care for older people in aged care facilities was seen as an altruistic part of the dental profession, the financial inequity and less appealing aspect of the physical work provided was seen as reasons for dentists and students to avoid being involved in gerodontology. Remuneration is discussed in this sub-theme as an attitudinal issue and later in the sub-theme 'pressure of financial rewards' in greater depth as attitudes and the financial needs of a graduating student are interwoven.

Sociological barriers to ideal learning for gerodontology were found in the discussion with the academics. When probed for a utopic vision of how gerodontology education might look for the entry-to-practice curriculum, the sub-theme of 'comfort' of clinicians able to support treatment of frail and care-dependent older people identified a problem in trying to achieve

the ideal. This was illustrated in one academic's view: *'Having undergraduate students have access to experienced clinicians who are comfortable in providing treatment in…gerodontology is where I would see the ideal world'* (Academic X). Students competent on graduation to potentially go back into the workforce pool of supervisors were instead taking jobs on graduation more likely to generate a better income and less strenuous. Graduates were also viewed to be seeking jobs that provided a greater source of increased clinical skills development, such as prosthodontics. These insights of comfort and preference were reflected in several comments by the academics:

> *The general dentists often shy away from that [gerodontology] because it's, particularly in practice, it's not a money-maker.* (Academic X)

> *Often there are practitioners who themselves aren't comfortable treating these patients, let alone watching a dental student treating them. So, the big issue is probably maybe only two or three clinicians that are comfortable treating this group of patients and comfortable I guess supervising students, managing them as well, so that's been a huge barrier for us.* (Academic W)

> *There's no desire to do that work because it's perceived as being difficult, it's perceived as being complex, it's physically demanding. It may be emotionally and intellectually demanding trying to deal with a whole lot of complexities… and not financially rewarding.* (Academic X)

The confirmation that general dentists and students are not drawn to the area of gerodontology was touched with concern that this could lead to naïve and inexperienced dental professionals providing care to older people outside their scope or competency: *'We have too few specialists in special needs dentistry and we have private practitioners who are not really interested because this is not a sexy field…I think that we are setting ourselves up for real fallout with our health colleagues but also with the public because what's going to happen is that there's going to be a whole lot of clinicians... young, I clinicians, who go out with extended scope within a limited scope…'that's a recipe for disaster, but it's happening., I'm very scared about that'* (Academic Y).

Pressure of financial rewards The concern that less money is generated by work on care-dependent older people was a notion weaved throughout the themes and sub-themes. Along with the attitudes and perceived discomfort of managing older people was the pressure of new graduates to do work that would be more financially rewarding; A conversation was recalled by one academic; *'They think about the funds that they will generate as a result of that personal income, and they want to do things that are exciting. When I was talking to a new graduate today that works in the private practice that's some five years out of dentistry an' she's not happy doing general dentistry; she wants to do Botox and she wants to do Invisalign…s', it's also about what's seen to be fashionable or acceptable in the general dental community as well'* (Academic X). Working on the attitudes of students towards providing care to older people was important to counteracting this problem; '*I think the attitude part is very important because you've got to get past the attitude of 'If I'm doing that [gerodontology], I'm not treating patients. I'm not making money'* (Academic Z).

There was a sense of urgency to remove the barrier associated with perceptions of managing older people before students entered practice. The late introduction of SND into programs was seen as aiding the perceptions students had built about where their clinical focus would be on graduation; Academic Q considered the timing of SND learning as part of this problem; *'Unfortunately SND always comes very late in year 4 when they had already made their mind about how important it is to become a dentist… to make money or how you can make more money by doing cosmetic treatment'.*

Failure of advocacy and interventions Historical health schemes set up to help manage patients with chronic diseases (CDDS) were seen as a failure in the management of older people and feeding into the poor attitudes of dentists providing reasonable care. Academic Y details the additional workload for SND specialists; '*We found that with the chronic diseases model, the number of you know things that we were mopping up.'* Further to this, there was a question mark over why this was happening with Academic Y querying; *'I don't know how much of that [abuse of CDDS] is a lack of training in chronic disease or how much of that is actually, a reflection of the fee for service model and the medico-legal ethics of our*

profession.' The movement of older people into aged care facilities and being away from society and the profession's radar was noted; *'I just think we're going to get more and more behind in caring for people in those facilities because they're hidden. They're hidden from our population they're hidden from our profession'* (Academic X). This extended into the logistical problems of managing older frail and care-dependent people and the ease with which patients who do not physically present to general dental practices can lead to ignoring of the healthcare needs of this patient cohort.

The failure of health schemes did not absolve the patient from contributing to the abuse of the schemes as it was perceived that patients also sought to 'milk the system' for what they thought they were entitled to. Academic Y described the patient's part in this failure':

> *I'm sure there would have been plenty of patients going in and saying, look, I'm entitled, I want to get those two crowns now because I've got this money from the government to get those two crowns that I would never have gotten for myself because they are asset rich and cash poor…and you know they're retirees and they would have said, 'OK, well that's fine. Just do the filling or I'll pay for the cleans and I'll come back for the clean for my periodontitis but do this crown now.* (Academic Y)

The responses associated with this theme had a defeatist tone, participants doubting that positive change and improvement would be occur. This was summarised in a sense of hopelessness by one academic:

> *…Do you think it's going to get better?* (Researcher AN)
> *Honestly, no…I'm seeing increasing cohorts of students who think coming in paying lots of money mean's 'I'm going to leave with my ticket. Failure is not an option. I bought it'…I think increasingly the motivation here is, sadly, money.* (Academic Z)

Discussion

This study sought to provide insights into the perceptions and attitudes of dental school academics to gerodontology in entry-to-practice dental school curricula. The interview analysis found areas in the current Australian dental school curriculum that were perceived as enablers or barriers to providing the academics' ideal gerodontology curriculum. There were no other studies to compare perceptions of SND academics regarding undergraduate gerodontology education. Themes arising from the interviews, however, were not dissimilar to gerontology education studies from other health professions where educators felt attitudes were an important part of learning[174] and barriers included sociological factors and limited access to experts.[175] Resources across the academics' experience with organisations meant staff were needing to do more with less and this included less skilled supervisors and less available time for teaching. There was recognition this was not necessarily limited to SND alone but challenging for teaching in general in universities. This has been recognised in other studies, not just limited to healthcare professional courses.[176,177]

Results from the thematic analysis indicated that greater resources and commitment to SND as part of the undergraduate or entry-to-practice curriculum might improve negative attitudes and sociological barriers to the preparation of the dental workforce for an older, frail, and care-dependent person. The academics viewed gerodontology was undervalued by organisations, students, and the general profession in comparison to other disciplines of dentistry, and there was a fatalistic sense the workforce would continue to be unprepared for the needs of the older population until these problems had been addressed. The sociological barriers of ageism within society, the healthcare system, and education system, have been reflected in literature on nursing education[175] as well as in medicine, highlighting attitudinal change needed to improve the learning environment.[178] There has been progress with organisational enablers for change occurring: the ADC's revised dental competencies of the newly qualified dental practitioner made a pointed change in the competencies to include social responsibility as well as professionalism.[49] Recognition of care-dependent older people in residential facilities at increased risk of harm or poor oral health continues to be the discussion point from SND specialists and advocates for older people.[49,110] This is perhaps where change will occur; to set the benchmark for expectations of dental schools achieving

accreditation rather than through funding of educational institutions where the financial and resource pressures exist in all disciplines.

Optimism in the discussions centred on the future champions of gerodontology and existing role models within SND, that they may propel replenishment of properly skilled supervisors. Enablers centred around the exposure students were gaining by actively learning from clinical experiences and in clinics from competent mentors and supervisors. There were opportunities noted in using rational care planning and linking subjects across the curriculum to better prepare students for gerodontology on graduation. The use of interdisciplinary learning would lend itself to deeper learning and ability to progress beyond basic knowledge and skills,[179] providing an aid to organisation efficiencies where resources are scarce,[180] and potentially improving people's health outcomes.[181]

On the other hand, there was also a sense of pervading sense of pessimism there would be positive change. Although the interviewees were from different Australian dental schools, the academics were unanimous in their view that the workforce was not being adequately prepared for Australia's growing older, frail, and care-dependent population. This was not limited to the preparation of managing this cohort of patients alone but extended to the teaching of SND as the umbrella speciality discipline over gerodontology. To enable replenishment of appropriately skilled supervisors and specialists, there was a lens on students who had a natural talent for this area of dentistry or were drawn towards the subject and potential future specialists in the discipline. The need to increase this pool of future champions seemed stymied by limited resources and availability of good quality mentors for students. This realisation, along with the view political and organisational levers may not improve the outcomes for frail older people in residential facilities, gave the participant responses a feeling of defeatism that there would be no improvement as had been observed over several decades of advocacy in the area.

The sense of pessimism that students would not be adequately prepared on graduation was coupled with the need to change society's view on older people's oral (and general) health to improve and sustain the provision of care to a frail and care-dependent population. Dentistry is not included in the MBS fees and does not remunerate practitioners when visiting aged

care facilities. When compared to other visiting health professionals such as doctors, podiatrists, and optometrists, this attitude is reinforced that oral health is less valued by society.[182] This was reflected in the sub-theme of financial barriers and perceptions there was less value placed on learning when the challenging work of dentistry in aged care facilities is poorly remunerated. The academics talked of schemes that had been in place to manage oral healthcare for people with chronic disease[172] but had fallen short of meeting the needs of older people.

Limitations to the study included having six Australian dental schools participating in the interviews rather than all nine. However, the major themes that emerged were reflected across the six participating schools and a pattern of barriers and enablers were seen across the interviews. Another limitation to consider, was that interviews took place during periods of 'lockdown' during the COVID-19 pandemic, where the ability to provide 'normal' teaching may have affected the academics' contributions and answers. This study provides a view of dental academics' perspectives on gerodontology education, but further research of other stakeholders involved in the education of dentists is needed to provide a rounded view of the needs of a future gerodontology curriculum for entry-to-practice dental students.

Conclusion

The exploration of dental academics' perceptions of undergraduate gerodontology education found that several levers exist to achieving optimal frameworks for adequate preparation of students on graduation. These levers included exposure of students to managing older people, sociological barriers, and organisational levers.

Academics from Australian dental schools are important stakeholders in the delivery of education to prepare the future workforce of dentists to manage an older, frail, and care-dependent population. Their perception the current delivery of gerodontology education falls short of what is needed to adequately prepare dentists on graduation would indicate that recommendations for a gerodontology curriculum are necessary to manage the oral health needs of this cohort of older people. The disciplinary silos and the need to improve horizontal learning was evident. Inclusion of greater clinical exposure to manage frail, older people could

serve to potentially improve the learning experience and preparedness of dental graduates in all aspects of general dentistry.

An experiential learning method with skilled supervisors as role models is needed to replenish a dwindling workforce of advocates and produce dental professionals adept in managing the oral health of older people. Whether this is possible is uncertain given the limited resources organisations are provided to educate dental students. This could be taken as an opportunity however, by guiding the improvement of interdisciplinary learning to translate across all years of dental school rather than teaching gerodontology as a distinct subject or over a brief period later in the program.

With a cycle of failure in the face of continued advocacy to make meaningful change, a collaborative effort across organisations with the power to influence change in dental school curricula is essential. Further stakeholder engagement in the delivery of gerodontology education is required to inform the design of an optimal Australian gerodontology curriculum. The baseline set for Australian dentists at entry-to-practice perhaps does not appear sufficient as a benchmark for managing a population of older patients that is growing rapidly. The sharing of time allocation to the various disciplines of dentistry is limited and how exposure to gerodontology occurs for dental students is a paradoxical discussion that is necessary to ensure our future dentists are equipped with the skills, knowledge, and attitudes needed to serve this population on graduation.

The semi-structured interviews from dental school academics involved in gerodontology content in Australian dental schools provided the first themes from the stakeholders of Phase 3 in this study. The second part of Phase 3 explored the views of dental students who provided learner insights as part of the needs assessment for Kern's curriculum design.[100]

Part 2: Dental Students

RQ 7. What are the perceptions of final year dental students towards gerodontology education?

Nilsson A, Young L, Evans R, Jennings E, Lee A. Stakeholder perceptions of gerodontology education for final year Australian dental school curricula. *J Dent Educ*. 2024; 1-7. Appendix 11.

Introduction

Preparedness of graduate dentists to manage the growing pool of patients who are frail and care-dependent requires consideration of stakeholders involved in education for entry-to-practice programs.[100] A needs assessment of students graduating to register as dentists was necessary to inform future dental school curriculum design with the social responsibility expected of Australian dental schools.[183,184] Australian dental schools have variation in program length with several dental schools having programs as a four-year postgraduate course as opposed to a five-year undergraduate course.[144] On graduation from both undergraduate and postgraduate dentistry programs, the graduate can register with the Australian Health Practitioner Regulation Agency as a dentist.[162] The expectation is that the newly qualified graduate, regardless of which program they graduate from, is able to attend to the oral health needs of older patients. This is consistent with the revised competencies from the Australian Dental Council (ADC) where the competency statements take into account 'ageing persons requiring additional care or residing in residential and aged care facilities'.[49]

Methods

Participants, Setting and Ethics

Final year students from all nine Australian dental schools enrolled in programs allowing entry-to-practice as a dentist on graduation were invited to participate in focus groups and semi-structured interviews. Only students in their final year of dental school were included to provide a comparable point of exposure to gerodontology education across the majority of their program prior to graduation.

The research strategy aimed for focus groups, however, challenges with coordination of participating students meant that both focus groups and semi-structured interviews were used. Students were recruited through the researcher's networks, dental school student associations, and the Australian Dental Student Association. Participants were given information and consent sheets prior to the interviews and all responses were de-identified (Appendix 7).

Data Collection

Focus groups and semi- structured interviews were conducted between August 2022 and November 2022 using videoconferencing. Data analysis used Braun and Clarke's thematic analysis framework,[109] a widely used framework in qualitative health research.[142] Development of the framework of questions utilized existing instruments for measuring the educational environment in dentistry[130] with initial opening discussion questions including; 'how do you feel about managing the dental needs of older people?' and 'how do you feel about the time given to gerodontology in your undergraduate dental education?'.

Results

Of the nine Australian universities offering programs for entry-to-practice as a dentist on graduation, final year students from seven dental schools participated in this study. A focus group with five students took place in August 2022 and a semi-structured interview with the remaining two students in November 2022. All participants participated in the videoconferences separately from various locations across Australia.

Trending themes from initial coding were distilled by the first author (AN) with independent coding for reliability with the second and third author (LY and RE). Through iterative discussion, themes were adapted and agreed upon by the second and third author (LY and RE). Immersion into the data further with file notes and mind mapping refined key themes that addressed the research question 'What are the perceptions of final year dental students towards gerodontology education?'.

The final themes, 1. Preference for gerodontology, 2. Barriers to gerodontology, and 3. Variation in learning (Table 19) are discussed in the narrative analysis and included subthemes within the themes.

Table 19. Final themes

Major themes	Subthemes
Preferences for gerodontology	• Exposure • Practical learning
Barriers to gerodontology	• Time pressure • Availability of SND clinics or clinical placements • Attitudes to geriatric dentistry
Variation in learning	• Supervisor quality/experience • Undergraduate/postgraduate program and international program graduate expectations

Thematic analysis

Theme 1: Preferences for gerodontology

'I feel because the amount of experience that I am getting on placement, I do feel prepared.' (Student 1)

Theme 1 focuses on the students learning experiences and those they felt benefited their knowledge of gerodontology. This theme also looked at which methods of teaching were optimal for preparing them on graduation for working with older patients.

Exposure Clinical exposure to older, frail, and care-dependent people was key in preparing students to manage their care on graduation. Student 3 noted the idea of being presented with a case in an aged care facility would be difficult, *'I think I would struggle because I haven't really had that exposure as a student.'* This became more evident when there was a need to manage medically complex older people with Student 2 and 3 agreeing that they would refer rather than manage a case themselves:

'If I'm doing a very invasive procedure and they're very medically complex, then like I would personally refer.' (Student 2)
'Yeah, that's when I refer.' (Student 3)

The useful experiences were also dependent on the support they were provided. Here, supervisors played a key role. Student 2 felt fortunate to have had that on one placement, *'I was lucky to have a supervisor who was great. Good exposure there.'* Student 1 was able to manage a larger number of older people due to the region the placement was located, *'I find that a majority of our patients are pensioners and they're like either 60, 65, and above.'* Student 1 went further to provide a suggestion for future students by incorporating managing challenging communication in older patients: *'I'm finding that on placement I am seeing a lot of elderly patients and I find that it would be very beneficial if the university did incorporate some sort of course in regards to management of the elderly, because I'm learning a lot of things and it's only because I'm managing them day to day.'* Student 4 agreed that the best learning experiences came from *'the patients themselves.'*

Appropriate communication skills were seen as challenging to learn unless there was exposure with older patients. Student 3 recognised this, *'communication is one of those tricky things that you just need to get from more and more exposure… definitely with senior patients with dementia.'* Student 1 reflected this sentiment when discussing difficult communication: '*a lot of the management strategies that I'm learning is by clinical practice.'* This linked in with getting the hands-on experience for increased exposure as well as a preferred learning method. This preference is discussed in the sub-theme 'practical learning'.

Practical learning There was a preference for learning one-on-one with patients and gaining practical clinical experience for preparation to work with older patients on graduation. This included service-based learning and working with patients in clinic. This differed from being exposed to older people as student observation or case studies. The students able to gain skills on clinical placement appeared to be more confident than their peers. Student 3 reflected on a classmate's ability to increase skills in dentures: *'So, by the end of that*

placement she was super good at troubleshooting denture problems, whereas for me I didn't really get that exposure.' Positive responses to the opportunity of in-service learning were, however, mixed with concern that the curriculum was at capacity to accommodate any more. Student 2 seemed conflicted when discussing going to aged care facilities, '*I mean we are currently in fifth year is five days already [in clinic/teaching]. So, I mean I would love to actually go and because it's good exposure as well…but I'm not too sure how they can.'*

While there was generalized consensus that hands-on experience was preferable, a holistic approach to learning was emphasized by Student 6 with case discussion, patient-based learning, and support by SND specialist dentists giving a rounded learning experience:

> *So, when we were in third year, that's when we first started seeing public patients. I think that gave me a lot of experience and learning how to manage patients who are elderly or who are aging a lot better because I was able to spend the time with my tutor, talking through the cases. They taught me how to treatment plan, what are some considerations before and after [treatment]. I think that clinical experience was vital for me to learn how to treat patients who are elderly. And then only in 5th h, we got more information from our special needs lecturer who gave us that extra confidence in managing specific medical conditions which were, will be, might be necessary in the future.* (Student 6)

While the students had recognized a preference and need for experiential service-based learning, there was wariness around how this might occur. A perception that attending domiciliary visits would be difficult to organize was discussed by Student 7 *'in terms of residential aged care… you can't treat people at their facilities because they don't have dental chairs or equipment. We can't bring our own mirrors or our own instruments that we use in simulation clinics and just tell them to "open up".* ' This was seen as an organisational barrier around what resources were available at the dental school with Student 7 having experiences where the school did not have '*capacity to see their own patients'* without the option of having service-based learning at aged care facilities. This was not directly attributed to the dental school; Student 7 felt that solutions for oral health care of older

people should not lie with dental schools alone, '*I feel like there needs to be other input as well. Like maybe government funding or some sort of other solutions.*'

Theme 2: Barriers to gerodontology

'...it's pretty much like you do everything once and then you're like, hey, but how good are you at something after doing it just once?' (Student 2)

This theme describes the perceived barriers to gerodontology, including how dental school programs are resources, time pressure, and attitudes to older people and inclusion of gerodontology.

Time and resource constraints The students agreed that expansion of the curriculum would be challenging with lack of available time to provide to gerodontology in the preferred delivery of practical learning. Student 3 considered didactic options as a solution, *'it is pretty jam packed as it is to be honest. I don't know how you could like squeeze in like a whole unit of gerodontology. Maybe it might be like a lecture.'* Expanding further on this, Student 3 suggested a short sequence of theoretical sessions, *'I think I would add it like a mini lecture series. Maybe one to three lectures like a cheat sheet.'*

While some students considered options for time managing by expanding the current curriculum to include greater gerodontology content, Student 5 could not see this as a possibility, *'I'm not so sure. At least for us, we have maybe one free day a week, but that's allocated to research. So, I think unless we were really keen and went out in our own time to go do it, I don't think it's really too much of an option for us...no, I don't really think we have enough time.'*

Student 7 and Student 4 saw time constraints through the lens of 4-year postgraduate programs having less capacity to add content to ensure graduate preparedness than 5-year courses.

'Our first two years has to be dedicated to just basic theory because some of us used to be photographers, finance counsellors, and none of us know anything about this [dentistry]. Then we have two years to get competent in literally everything [dentistry]. So, aged care tends to be like special needs…tends to be that thing that gets sacrificed. So, you know time wise, for me [postgraduate dental student] may not just be like a Monday to Friday during the week thing. Maybe like the whole course needs to, you know, find more time for this area [gerodontology]. (Student 7)

Other time considerations noted by Students 5 and 6 included suggested reallocations of time to areas that were felt of lesser value as a newly graduated dentist:

'I feel like it [oral maxillofacial observational clinic rotation] probably could be better use somewhere else …so I think perhaps that time could be better used distributed to perhaps like domiciliary visits or something. That's a little more relevant to general dentistry and perhaps gerodontology.' (Student 5)

The variation between programs in terms of time pressure was reflected by Student 6 who felt that rather than time barriers, it was meeting the demand for appropriately skilled supervisors that was required:

'In fifth year, for two out of the three trimesters in final year we only see patients for one and a half [days per week] and there's one lecture there. So, there's plenty of time. It's more I think there's not enough dentists or clinicians who are actually going to residential facilities to do dental treatment. So, that would be the area of improvement.' (Student 6)

Resourcing dental schools and time pressure were linked in the discussions. There was a feeling that there was a lack of available dedicated clinics to provide exposure to gerodontology. Student 5 considered this to be an issue where dental schools and public health clinics worked in conjunction for student clinics, '*most of them [SND specialists] don't have the chance to supervise undergraduates because they either don't have the time, or*

they have to organize like a collaboration between our university and the health system. So, the bureaucracy is a bit messy.'

Student 7 reflected on the difficulty with public health and university collaborations when posed with the option of aged care placements, *'being in a public hospital, you have to coordinate with a lot of people, and it takes a lot of effort to set up. So, when you do that and only maybe two people put their hand up and one of them pulls out then it's probably not going to last very long, but it's [aged care elective placement] definitely an area that has potential.'*

Attitudes and ageism One student touched on the gap of accessing older, frail patients and developing communication skills whilst linking it to ageism:

> *'I think that interaction would be important, um, to find out from them personally what they do or do not like when they go to a doctor or a dentist…and it just blows my mind, how people talk to the elderly, like, because he can't hear you it doesn't mean that he's unintelligent. I'm sure they had a lot of frustrations and I feel that they experience a lot of ageism, and I would just like to sit down and just interact with them and find out from them, what they would like to see, how they would like to be treated.'* (Student 1)

When further probed on whether attitudes towards older patients' part of learning for Student 1 was, the response was, *'No, I wouldn't say that we've had much discussion on it. It was more medically related, like medications and illnesses etc..'*

There was recognition that gerodontology was an area of need and graduating dentists would be required to understand management of the older, frail, and care-dependent patient. Student 6 felt that the barrier to achieving this was attitudes to geriatric healthcare *'perhaps the attitude towards that is it's a bit more troublesome…everyone wants to do, cosmetic dentistry or put on their resume they want to do surgery, that sort of thing. It's perceived as trouble or it's tiring or difficult.'* The student went further to say, *'I think it just*

makes sense that we should be incorporating this [gerodontology] into our learning somehow.'

The ability of programs to gather enough interest in electives structured to gerodontology was noted as a barrier, with Student 7 recollecting on previous experience with scepticism for future electives:

> *'I think there used to be a special needs placement as an elective for about two to four weeks and being in a public hospital, you have to coordinate with a lot of people, and it takes a lot of effort to set up. So, when you do that and only, I don't know, maybe two people put their hand up and one of them pulls out then it's probably not going to last very long.'* (Student 7)

Theme 3: Variation in learning

'We didn't have too much education in gerodontology in the first place… last week was probably the first time I heard the word.' (Student 5)

Variations in preparedness and learning methods between programs was seen through this theme with student discussions comparing experiences and expectations.

Inter-program variation Students experienced varying degrees of content and methods of learning and were cognisant that within their own peer groups in the same program their preparedness was often dependent on fortuity and timing. Student 2 captured this sentiment: *'it depends on individual experiences as well, so, I've had more experiences with elderly patients than some other people just because [of the experience on placement or clinics].'*

Supervisor variation was picked up by several students with Student 5 noting the ability to supplement didactic information provided by the program was dependent on who was supervising the clinical skills: *'I found that for us, it's very dependent on the individual supervisor.'* The student went further to detail the importance of quality supervision: *'I*

learned more clinically than I ever would've during our lectures, but I think if you didn't have that luck with supervisors, it would've been probably quite different. I think there's only so much you can do based on your own experience and your own learning without someone telling you or giving you pointers.' Student 2, however, felt that the supervision at the school was more consistent based on the training of the supervisors while still very individual to that person's experience. The consistency was also attributed to the nature of the employed supervisors as they were academic staff as opposed to practising dentists who were supplementing their clinical work with supervising dentals students:

> *'It depends a lot on the individual experiences of every demonstrator [supervisor], but also, we have demonstrators that are not from outside (like not general) [dentists providing supervision as part-time] and, generally speaking, all our supervisors undergo training. So, they're normally prepared to answer any questions.'* (Student 2)

Student choices influenced experience as this varied within programs dependent on which elective placements were available and preferred. One dental school was noted by Student 7 as having various electives as options, however, exposure to special needs patients was dependent on the choice of participation: *'So the way it [dental school] runs is, you can either do courses or you can do clinical placements and the way they've set it up is that I think there used to be a lot of disciplines that you can do placements. But I think the issue was a lack of participation from students.'* The availability of optional additional learning opportunities did not, however, correspond to all the dental schools with variations distinguishable in larger contexts.

Macro-variations *undergraduate vs postgraduate vs international*

Continuing from inter-program variations in learning and teaching, the ability for students to choose elective placements did not exist for Student 5 and 1. When asked whether these students would find time to have elective options, Student 1 was firm in a negative response to having additional electives. Student 5's learning experience was through individual discipline clinics and felt these were similar to electives although not being through choice.

There was consideration, however, that this did not include the ability to specifically manage special needs patients:

> *'We have a dedicated paeds [paediatric] clinic one day a week, and we used to, in previous years, have dedicated pros [prosthodontic], endo [endodontic], oral surg [oral surgery], and that sort of thing. So, I don't think it'd be bad to have half a day in the special needs department or something else.'* (Student 5)

Student 5 also noted the variation between didactic teaching and the timing of when students in various schools manage clinical work: *'I just noticed something based on what Student 6 was saying is that I think the timetables must be really different across all the unis, because at least for us, we don't have any lectures anymore. We finish our lectures in fourth year and now we just have four days of clinic a week.'* The reference had been to Student 6 contemplating the amount of time available to use for in-service learning at residential aged care facilities. With the variation to other students in the final year, it was felt that it would be reasonable to include more content into the curriculum but the barrier to in-service learning was the availability of supervisors:

> *'In fifth year, out of the three trimesters in final year, we only see patients for one and a half. And there's one lecture there. So, there's plenty of time. It's more I think there's not enough dentists or clinicians who are actually going to these residential facilities to do dental treatment.'* (Student 6)

The majority of the students felt unprepared for dealing with denture problems. The theme of preparation focused on being dependent on the quality and luck of the placement and cases: Student 4 *'to be honest, I really didn't know what was happening [denture problems] much until I saw my own patient and then I still didn't really know what was happening. I would definitely say at least for me dentures is not something [prepared to manage] …depending on where you go for clinical placement*' (Student 3). Student 3 also felt that teaching of removable prosthodontics was not just dependent on clinical exposure, but the quality of the curriculum dedicated to this subject *'it's [removable prosthodontics] a bit confusing in the beginning with how we're taught. It's also really hard to put together.'* In

contrast, Student 2 felt 'lucky' with the preparation received at the dental school with three dedicated prosthodontists providing treatment planning sessions. Student 2 had the additional benefit of fortune with a positive supervisor and placement experience to add to the preparedness, *'I was also lucky to have a supervisor who was great. Good exposure there.'*

The student focus group included both undergraduate and postgraduate programs for entry-to-practice dentistry on graduation. This allowed discussion to compare the four-year postgraduate courses to the five-year undergraduate course in terms of how capable students were in managing older people.

> *'If there's any advantage of the four-year postgrad course, I don't think it's to do with what we spent our undergrad doing, but I think it's just the fact that we're a little bit older and that we've dealt with a little more people.'* (Student 7)

> *'Yeah. I agree with that. I find that our cohort has a similar kind of vibe about it.'* (Student 4)

Student 1 agreed with the age-related maturity but related it more to experience gained with patients as a health professional prior to entry into the dental program; *'I think I come from a, a different, entirely different background because I'm a mature age student. I have been in a hygienist [dental hygienist] for I think close to 25 years. So, I do have a lot of experience dealing with geriatric patients. So, I think I'm coming from a totally different background that kind of gives me that advantage in having patients that are elderly and dealing with them and management.'*

Discussion

Gerodontology was more commonly reported to have been taught within other subjects or through opportunistic clinical learning rather than as a distinct curriculum module. There was a clear indication that students felt unprepared for the management of older people, however, this was also seen as part of the process of being the newly qualified dentist with a starting point for development to proficiency. While the benchmark for the newly

qualified dentist is identified in the ADC's competencies[49] it could be argued that this is not appropriate given the proportion of older frail people that newly qualified dentists are likely to need to care for upon graduation.

Clinical exposure and hands-on learning were preferred to didactic teaching, although didactic lectures were noted as providing time-poor schedules a chance to fit gerodontology components into the curriculum. The link to learning communication techniques through patient exposure strengthened the students' preferences for more clinical experiences. This aligns with pedagogical knowledge of deep learning through practical experience and should be considered when constructing educational frameworks for health professionals. Further to this, meaningful learning experiences for health professionals may be varied across a student cohort to provide strategies that drive deep learning.[186]

Quality of practical learning was bound in the quality of the supervisors. An optimal learning environment with experienced and appropriately trained supervisors and lecturers is important for improving learning outcomes[187] but also has the essential component of providing role-modelling of attitudes. Communication and behavioural management of older, frail patients who may be living with dementia can be confronting to manage[188] making the need for appropriate supervisors necessary for both the learner and patient. The potential for lack of engagement of newly qualified dentists with older people has cause for concern with regards to patient-centred care as this may be compromised where students noted a need to better understand patient flow and communication. Students understood pathways for referral where preparedness was lacking, however, there was awareness that resources for SND specialists are limited with only 24 specialists registered with the Dental Board of Australia at the time of writing.[185]

Solutions for balancing less exposure and learning opportunities in gerodontology were challenging to realistically apply due to the limited available mentors and SND lecturers as well as unavailable in-service learning in aged care facilities. Time pressure was a strong theme, and while reallocation of some time to gerodontology was discussed, the students felt their curriculum was already squeezed to the maximum use of the timetable. This time pressure was across both undergraduate (five-year program) and postgraduate (four-year

program) courses. Consideration as to whether the length of the dental program could be extended would look to comparable health professions such as medicine.[189]

An extension of length of program in medicine through internship has been shown to prepare the newly qualified medical professional to better support bridging of gaps and provide a framework for supportive mentoring and professional development.[190] The Australian Medical Council, the independent national standards body for medical education and training, describes the intern year as *'a key part of the transition from medical school to independent practice and specialty training, and focuses on practical (on the job or work based) training under supervision from senior colleagues, who also provide you with support, feedback, teaching, and assessment'*.[191] This could be explored as a solution to workforce preparedness and provide a transition for the inexperienced dental professional.

Limitations to the study included students participating may have had an interest in gerodontology themselves and thereby influenced the discussion with a preference for gerodontology learning. An overarching discussion comparing other stakeholder groups involved in undergraduate gerodontology curriculum in dental schools would provide another lens to the themes identified in the study. Another limitation centred on the events of the COVID-19 pandemic and resulting reduction in clinical placements in Australia. While placements and clinical exposure had returned to normal at the time of interviews, the graduating cohorts from the period over the pandemic may have been impacted in their perceptions and learning of gerodontology. Comparison studies with other stakeholder groups, including perceptions of dental school academics (Part 1: Dental School Academics), consumer representatives and DONs (Part 3. Directors of Nursing and Consumer Representatives) would provide further insights into an overall picture of the needs for future gerodontology curriculum development.

Conclusion

The study of the dental student stakeholder group (Phase 3 Part 2) revealed a preference for practical exposure for learning and included themes that recognised barriers to achieving an ideal approach to gerodontology education. These barriers included resourcing, ability to access quality supervisors and mentors, and the time available to dedicate to gerodontology.

There is an overwhelming growth of older, frail, and care-dependent people requiring oral health care from the Australian workforce of dentists. The newly qualified dentist graduating to manage this wave of complex and vulnerable patients are not prepared to manage their needs with patients further compromised to access by a limited number of appropriately trained specialists.

Curriculum development should encompass the health needs of the population as well as learner needs with evidence pointing to meaningful and practical learning experiences. While it is known that learning outcomes are improved with clinical learning rather than didactic experiences alone, it is essential that the planning of undergraduate gerodontology education in Australian dental schools considers the need to provide students with supervisors who are experienced in the management of geriatric patients.

Parts 1 and 2 of the Phase 3 of the study explored the educator and learner perceptions of gerodontology in dental schools. The needs of the stakeholders directly associated with the oral health care provision of care-dependent older people was also required to provide insight into the requirements of a fit-for-purpose gerodontology curriculum. The third part to Phase 3 explored the perceptions of consumer representatives of older people, and directors of nursing working with care-dependent older people.

Part 3: Consumer Representatives and Directors of Nursing

RQ8. What are the perceptions of directors of nursing and peak body representatives towards gerodontology education for dentists?
RQ 9. What are the perceptions of consumers towards gerodontology education for dentists?

Nilsson A, Young L, Evans R, Jennings E, Lee A. Stakeholder perceptions of gerodontology education for final year Australian dental school curricula. *J Dent Educ.* 2024; 1-7. Appendix 11.

Introduction

At all stages of lifespan development, oral health is integral to maintaining general health and wellbeing. Good oral health leads to functional wellness, emotional wellbeing, and can also be measured by sense of self, and satisfaction with care.[192, 193] While access to general healthcare is considered a human right,[194] oral health is often not considered, with wide recognition that people living in residential aged care facilities face more challenges to achieving good oral health and suffer poorer oral health.[195] This is amplified under the lens of frail, older, care-dependent people where the ability to advocate for one's health may be challenged by cognitive decline, physical dependence on others for accessing care,[122,125] and the biological changes that occur in the oral cavity .

The barriers and enablers to integration of oral health care for older people are complex, and the compartmentalized culture in which oral health is viewed within general health care is a problem that requires systems level change.[196] Curriculum design for health professionals should consider both population needs and the needs of learners,[100] acknowledging that the workforce for a population should be prepared for the healthcare requirements of that population. Collaboration with stakeholders, including consumers and nursing staff, involved in the care of older people is necessary to provide insights to develop a curriculum for dentists that is fit for purpose.[100,197] The aim of this study was to understand perceptions of consumer representatives and nursing staff in high level aged

care facilities on the education of undergraduate dentists in Australian dental schools to inform recommendations for future gerodontology curricula in dental schools.

This group of stakeholders as 'other stakeholders' to those involved directly with dental school education, would provide a broader perspective of perceptions and attitudes to gerodontology education delivered at Australian dental schools.

Methods

Participants, Setting and Ethics

Participants for the study included directors of nursing (DONs) and consumer representatives from peak bodies of from advocacy groups of older people. The interviews and focus groups were conducted separately for the DONs and the peak body representatives.

DONs working in RACFs were invited through professional and social media networks within Australia. The insights sought from this group were to determine general perceptions on dental school education related to older people, therefore, location specific groups were not required for the participants. The criteria for RACFs included if they provided services for Aged Care Assessment Team (ACAT) and assessed people who require high care. High care is defined as the care provided for people who require almost complete assistance with daily living activities.[137]

Consumer representatives of peak bodies were chosen as the consumer stakeholder rather than residents of RACFs as the link to frailty and cognitive impairment[136] was considered. There were also logistic problems with conducting face-to-face focus groups during the COVID-19 pandemic as restrictions for entry to RACFs and resident movement out of RACFs attempted to limit the risk of disease transmission to this vulnerable population. Consumer representatives, although not residents of aged care facilities themselves, were also consumers of oral health services either as older people[198] or managing older parents in RACFs.

Data Collection

A qualitative, explorative study design was used to provide insight into the Director of Nursing (DONs) and consumer perceptions[163] of geriatric dentistry education (gerodontology) that students graduating as dentists receive. Focus groups were used as the method of data collection to encourage in-depth, rich discussion[133] utilising videoconference on Microsoft Teams. Where it was not possible to use focus groups for data collection due to participant availability, semi-structured interviews were used. Data sampling ceased when data saturation was reached, determined by the interviewer/researcher lens assessment of no further emerging themes.[132]

Open questioning included the overarching questions:

- How do you feel about dentists having education specifically for the dental needs of older people?
- How do you feel about the services provided by dentists at aged care facilities?
- How do you think consumers and families feel about dentists having education specifically for the dental needs of older people?
- Describe your thoughts about dental care for care-dependent people living in RACFs?

Results

Five consumer representatives from peak advocacy groups for older people, and three DONs at aged care facilities providing high care services, participated in the study between July 2022 and March 2023. Data collection from seven of the participants occurred through videoconference as all members of the focus group were in varying locations across Australia. One consumer representative participant was interviewed face-to-face.

Braun and Clarke's thematic analysis[109] was used to initially code the transcripts in two groups, consumer representatives and DONs. This occurred through the first author with the second and third author conducting independent coding for reliability. An iterative

process to confirm coding with all three coders led to the final codebooks with a framework of themes (Table 20). The two codebooks were analysed concurrently to identify themes where a narrative was developing from both groups.

Table 20. Codebook

Consumer Representatives	DONs
Interrelations between stakeholders	**Interrelations between stakeholders**
Supporting families and carers	Role of dentist to support staff
Educating aged care staff	Whole team approach to clinical handover
Understanding how to communicate with older people	Relationships for consent process
Resources	**Resources**
Financial pressures of families and residents	Logistics of providing in-service care
Staffing pressure in facilities	Rural and regional access barriers
Funding programs	Staffing pressure and need for support
Barriers of dentists to managing older people	Barriers of dentists to managing older people
Quality of life	**Quality of life**
Ageism	Dignity for end-of-life care residents
Maintaining self-dignity	Awareness of frailty
Oral health low priority for daily activities of living	
Curriculum content	**Curriculum content**
Integration and interprofessional teaching	In-service learning
Emphasis on educating families, staff, and patients	Mobile service i.e., vans
Understanding trajectory of dementia and behaviour management	Support education of staff and carers
In-service practical education	Knowledge of physical and cognitive decline

The researcher used mind mapping and immersion in the data through cyclical revisiting of the transcripts, recordings, and file notes and produced the final themes to provide the thematic analysis for discussion. The overarching themes between the consumers and the DONs were analysed under the major theme headings and associated sub-themes (Table 21).

Table 21. Final themes

Major themes	Sub-themes
Interrelations between stakeholders	• Support of staff • Role of the aged care worker in oral health
Resources	• Unappealing work for dentists • Funding
Quality of life	• Ageism • End-of-life care
Curriculum content	• Knowledge of ageing trajectory and managing the frail care-dependent older patient • On-site learning

Thematic analysis

Interviews and focus groups with consumer representatives and DONs sought the insights of this stakeholder group. This group depends on a workforce of dentists prepared on graduation to manage frail and care-dependent older people therefore recommendations for a dental curriculum would directly impact their ability to achieve good health outcomes. The analysis is discussed under the banner of four overarching themes: interrelations between stakeholders, resources, quality of life, and curriculum content.

Theme 1: Interrelations Between Stakeholders

DON3 *'You'd want them to have a good understanding of the role of the carers and nurses in those facilities.'*

Theme 1 looks at the need for cohesion between the stakeholders for improved outcomes of older people and the roles that each play in achieving these outcomes.

Supporting aged care staff The need for oral health promotion and education on hygiene was identified as necessary for staff and carers as well as patients. This presented in the discussion as a plea from DON2:

> *They can help us to, they can help the staff ... 'is there any alternative way how they can brush their teeth' or anything with the dental stuff if there is any alternative [options]. Because we do have some residents who don't want to wear dentures.* (DON 2)

The consumer representatives found their own experiences of managing frail, older family members pointed to a lack in oral health knowledge. Consumer X referred to her mother; *'she's not educated enough in herself to take care of her teeth* whereas Consumer Q found the gap in education was evident with aged care staff *'The staff (and that includes the nurses) don't understand the importance of oral health.'* This was mirrored in one DON's reflection of aged care staff knowledge with reference to the length of time an aged care certificate takes to obtain and the unlikelihood of having adequate oral health education to prepare for managing older people's dental hygiene routine:

> *I really doubt their learning capacity and the process [of aged care training]. With that qualification you always need to update yourself. You always need to do education and training, so that's definitely going to be something we would be looking for [dentists providing education and training to staff].* (DON1)

It was important to the DONs that more value was placed in supporting staff with both training and oral hygiene maintenance rather than the patient themselves. This was due to the cognitive decline of residents in high care facilities with the majority of residents needing supervisory or physical assistance with care. DON1 suggested, *'instead, if we could teach the staff who supervise the resident, or maybe do the physical assistance during the cleaning… I think that would be much better.'* Family members were also noted with some families preferring involvement in the information provided to maintain oral health for the residents.

The role of the aged care worker in oral health There was a sense from the DONs and consumer representatives that graduating dentists needed to have good comprehension of the importance of aged care staff and the challenges they face. This linked into a later subtheme of that drew on perceptions of geriatric care as unappealing work. DON3

summarised this point: *'you'd want them to have a good understanding of the role of the carers and nurses in those facilities too, because a lot of the barriers to the carer.'* DON3 also recognized *'there's a lack of understanding between the teams and how things work and having understanding of the pressure of workloads in those places…why things don't happen necessarily the way you would want it to.'*

The consent process of cognitively declining older people was explored, with the aged care staff an essential conduit to gaining appropriate consent. While this was managed within facilities, it was not seen by an ideal scenario by all with DON3 noting *'I would say I think people rely on their internal systems within the aged care facility. So, I think a lot of visiting providers [health professionals] rely on the facility having gained that consent. So, is that appropriate? Probably not necessarily all the time, given that, you know consent needs to be obtained at the time [of the health care appointment].'* It was clear, however, that the aged care staff would ensure consent if gained from the family member if appropriate, and with aged care staff conveying requests and information to the dental professional. DON1 spoke of the process with a dental professional (prosthetist) providing dentures to a resident: *'So, in those cases we always communicate with the family member first if they want to proceed further. If they have given the consent to proceed further or happy with the pricing and everything, that's only when we when we communicate with the prosthetist. Without getting families consent, we do not. We do not start or commence any procedure.'*

The consent process and link between the aged care staff through to families and consumers drew further discussion about the quality of the clinical handover with dentists with suggestions for improvement through the education of dentists. This is discussed in theme 3, 'Quality of Life', where aspects of this issue had a knock-on effect on perceptions of the quality-of-care patients received.

The perceptions the DONs and consumers had of achieving optimal care and education for dental students showed pessimism and a scepticism for being achievable. Further elaborated in the second theme, this presented as challenges with resources, whether this was from different stakeholders, financial barriers, or human resources.

Theme 2: Resources

Consumer Z ***'****it's not fun work for, it's not seen as high status and it's seen as overly demanding for what their return is.'*

The theme covering resources included the pressure that was felt by aged care staff and recognised by consumers. There was also recognition that financial pressure and perception of geriatric care as low value work as a barrier to older people gaining access to dentists.

Unappealing work The DONs struggled with getting dentists to visit the facilities identifying several barriers including proximity, financial pressure, and the challenge of managing patients outside of a dental surgery. The proximity issues were noted by DON1, '*first thing, they will be located somewhere very far, and they don't want to travel far'* which was supported by DON3 who found that the residents living remotely experienced this even more *'aged care and remote and Indigenous aged care I think the issue the hasn't been the care as much as has been the access.'*

Difficulty treating patients outside of surgeries was seen as physically challenging with DON 3 linking the physical decline of frail older people and manoeuvring patients for dental care, *'it must be very difficult because you've got mobility issues and all of that sort of positioning challenges.'* This linked into the sub-theme of funding and staffing pressure as consumer Z saw the dilemma further complicated, *'it's not necessarily to do with their mobility…a lot of people are stuck in the facilities because there's no transport being offered by the facilities.'* Travelling as a barrier was bi-directional with Consumer Q predicting the lack of appeal from private dentists: *'I still don't think for a private practice it would be attractive, from the return that you would get for the time period that you would have to spend traveling to, and from the facility.'*

The unattractiveness of gerodontology was not only due to financial and physical issues but linked in part to ageism (discussed in the third theme 'Quality of Life') in that working with older people was perceived by others as less valuable and less appreciated as a career choice. DON3 reflected that *'it's not dissimilar to geriatric medicine... it's probably often*

viewed by people to be one of the least skilled parts of the health spectrum.' This perception of low value from the profession was also seen by consumers with Consumer Z feeling that geriatric dental care was *'not fun work for, it's not seen as high status and it's seen as overly demanding for what their return is.'*

Funding The DONs focus on resources was less attributed to financial pressure and more so with a scarcity of human resources and staffing. DON3 felt there was a dearth of comprehension in general, *'There's a lack of understanding between the teams and how things work…having understanding of the pressure of workloads in those places, why things don't happen necessarily the way he you would want it to.'* This was recognized by consumers as well with Consumer Z noting, *'there's staff shortages because of COVID, it's worse than the situation though…I think it's always been an issue… it's a common problem that low there's a staffing problem in the residential aged care homes.'* Funding from governments was given as a factor by Consumer Q *'they're [aged care facilities] very limited in what they can supply for the resources that they're given by the state governments and the Commonwealth government.'*

Consumers showed sympathy towards aged care staff and there was observation that resources to provide care to residents was limited. Consumer Q reflected, *'the staff from the aged care facility were very apprehensive about having any type of measure about oral health because it was yet another hurdle with the minimal resources that they had to cover.'* The feeling was that oral health was lower on the ladder of need for aged care workers already struggling to manage care with limited capability. There was a sense that this was because of failure of funding systems for oral health with Consumer Z stating, *'probably on the back of neglect over a lifetime because of not being covered by Medicare.'* The consumers also looked at financial barriers to older people seeing a dentist where they might be reliant on support workers to take them to a clinic: Consumer Z *'if a person doesn't have the financial capacity to pay for a support worker to take to see a dentist, or if they don't have family who is capable of doing that, then those people are likely not getting any dental service.'*

Residents' ability to afford dental treatment was noted by Consumer X, *'the affordability to for the elderly, they just can't afford their dental procedures, it's just way too much it's very expensive.'* Financially accessible care was felt strongly by consumers as a barrier with suggested solutions of a publicly funded mobile van service like school dental van programs. The DONs also saw the benefits of using mobile dental vans with DON3 providing this summarising statement:

'We should be bringing care to the to the aged care and mobile vans. I think it's a great model, it brings the infrastructure, the dentistry team is on site so they can come into the facility. They can see the challenges. But there's also that capacity to bring people to an environment where they can actually do the clinical intervention stuff.'

Theme 3: Quality of Life

DON3 *'You've got to remember that underneath all of this challenge is an individual. So, trying to provide person-centred care is really hard when you can't see the person.'*

Quality of life discussions included advocacy for the older person and ageism as a barrier to provision of appropriate oral health care. A need for awareness of the physical and cognitive decline in the lifespan trajectory was noted with end-of-life care knowledge lacking.

Ageism Gaps in the knowledge of dentists were seen as directly impacting the quality of life that older people might be experiencing. There were suggestions from the DONs that the handover process from dentists to aged care staff or families could be improved. The link between quality of care that could be provided on handover led to a feeling this might be compromised with DON1 saying *'I would want dentists to have a little bit of talk communication with the family members cause (I understand they are extremely busy, they have a time frame to finish work)…sometimes when they give us a handover to the other staff or family members things goes missing.'*

Focusing dental students' education in aged care facilities was dismissed by one DON with a preference to expand to older people in community rather than perceptions of frail, older

people living only in nursing homes, '*Should be not aged care only but older adults, even in the community because not all older people live in aged care. Yes, they do live outside in the community as well'* (DON2).

DON2 went further to say that dentists should learn how older people are supported in aged care, *'being a dentist…they need to be aware of what aged care look like and what are the expectations from residents.* DON3's comments supported DON2 with perceptions of older people and providing equitable care, *'trying to provide person centred care is really hard when you can't see the person. So, you know it's a matter of trying to scrape all that away. And I think the only way to do that is to give people plenty of exposure. In a supported environment [on-site placement]*.' Consumers also felt that ageism presented as blame and knowledge of neglect of oral health and hygiene routines for older people 'should be part of the education' as Consumer Q concluded, *'to blame the person who's got the poor oral health, particularly of an older person nowadays there's a waste of time, basically. It doesn't have to be mentioned at all. So that's part of the respecting the person.'*

Consumers felt that ageism existed in dentistry with a feeling there was blame on older people for poor oral health, *'So that's part of the respecting the person thing to talk to the person and not be paternalistic when you [the dentist] walk in at all.'* When looking at consent, there was also a lack of safety felt by consumers where quality of care and consent might be overseen by a third person due to cognitive decline. Consumer X criticised delegated decision makers being accountable for all patient care seeing this as not 'a safe place'. Consumer X stated, *'particularly, I think clients in the locked towards in the dementia and the memory units, they, they get really badly overlooked'* with respect to maintaining appointments and providing preventative care. An understanding from dentists as to what constitutes quality of life for an older person included thoughts on the extent of complex treatments provided to achieve this with Consumer Q feeling that *'the only type of treatment you should be doing is stuff which will improve their quality of life, but not getting too severe [complex]… I think a lot of dentists don't understand that…and that's part of the training.'* Consumer Z agreed that *'there's a lack of acknowledging how important [oral health is] to a person and their dignity and, in general, there's a lot of ageism*.' While it was not explicitly discussed as a trajectory to end-of-life care, the increased need for advocacy

and equitable oral health provision to the dying patient was evident when discussing increasing high-needs care and nursing homes.

End-of-life care It was felt that knowledge of frailty was lacking with a gap in knowledge of cognitive and physical decline noted as applicable from other professions. DON2 told an account of a hairdresser coming to the facility with no prior knowledge of aged care; the hairdresser was surprised that the residents did not have the capability to tilt their head back. She went further to say *'how can you expect them to go and move with all the movements we can do? Even in nursing we have aged care older adults subject [as part of nursing curriculum]. So, if they have as well [as part of dental curriculum], being a dentist, they have to be aware.'*

One DON focused strongly on end-of-life care placing experience in palliative aged care as a basis for seeing the divide between care provided to older people and that of the dying older patient. The role of the dental team in end-of-life care was seen as inadequate with DON3 reflecting, *'I think probably the dental team could have a fairly big impact in educating existing workforce and carers as well about the importance of oral healthcare still in the dying patient... you know deteriorating person or the elderly person, even that could be tricky to provide. I think that's really important and the importance of getting them [dying patient] assessed still.'*

As highlighted by consumers in the 'ageism' sub-theme, the DONs favoured increased knowledge in decision-making of dental management for end-of-life care to avoid a cookie-cutter approach to treatment. DON3 saw this as a problem in all health professionals with dentists an integral part of the care team during the deterioration of the dying patient: *'clinicians of whatever ilk, dentistry or allied health or medicine, sometimes they often can't recognise the dying person and, obviously, where they are on that trajectory changes your [dental] management. Not saying you don't manage people [if they're dying], but you know your interventional thresholds change…and symptom control becomes a much higher priority.'* Acknowledgement and recognition of the dying patient was needed in the skills and knowledge of dentists as well as the ability to refer appropriately. Some of the

association with recognising end-of-life trajectory for older people wove into awareness of frailty and care-dependence.

Theme 4: Curriculum Content

DON3 *'I think certainly there's a theoretical body of knowledge that probably should be included for all dentists and health professionals. But then there's nothing like actually seeing it…being part of it.'*

Theme 4 focuses on suggestions for inclusion of content into a gerodontology curriculum and preferences for how teaching might occur.

Knowledge of ageing trajectory and managing the frail care-dependent older patient

Following on from the previous theme, basic awareness of cognitive and physical decline in older frail and care-dependent people was emphasized by the DONs as necessary for inclusion in the dental curriculum. DON2 included behaviour management as part of this, *'I think they [dental school] need to Include the knowledge of how to look after old people, they need to be aware of the behaviours [living with dementia].'* The specific needs of older people were emphasized as a need in the education of the dentist, with DON 3 feeling there was a clear difference through the life trajectory, *'the broader clinical needs [of older people] are quite different. The social needs are different. The consent aspect of it. The appropriateness of service is quite different depending on where they live. So, it's such a complex area and I guess there's a larger proportion of people that are maybe nearing end of life. So, there's that ethical moral overlay as well.'* Consumer Z's experience was that some older people relive past trauma and dental students should be trained in awareness of this as a trigger for distress *'because going to a dentist can be associated with the loss of control.'* Consumer Q agreed with Consumer Z that older people living with advanced dementia could see dental treatment as a threat.

As well as managing challenging behaviours, the consumers felt an understanding of how to communicate effectively with older people was useful. Consumer X felt it could be confronting if dental students were not prepared in this aspect: *'they might get offended*

with different things they will say to you...that will be a bit of a shock for someone to come in, you know, thinking 'what's happening here?' but that's just elderly people in general…they haven't got an understanding how to communicate properly when it gets to that age.' Consumer discussion on effective communication with older people was shaped by the advocacy component of reducing ageism. Consumer Z was specific regarding dental student's training: *'I think one of the things is to provide in the training a very clear understanding that it's important to be very respectful about the way that you speak to people that, that even if they have other parties with them, that you're looking at them and directing your questions to them and giving them the opportunity to answer.'*

There were connections between dental students needing to understand the unique needs of the frail and care-dependent older person and the benefits of having on-site learning. These benefits are discussed in the subsequent sub-theme with the vignette of reducing barriers to provision of dental care and supporting staff and carers with in-service oral health education.

On-site learning Comparisons were made between other services entering RACFs and how this might transfer to dental students. DON1 shared an account of how audiologists visited the facility and were able to teach staff while providing a service thereby sustaining good health outcomes:

> *I get some external people to come and do training…maybe once every three months or maybe when we have new clients…or when we have residents requiring new hearing aids, we ask them [audiologists] to come in for training when they come in on site. So, I would prefer a similar thing with the dentist as well.* (DON 1)

The consumers were in strong agreement that on-site learning was part of the education of dentists. Consumer Q went so far as wanting this as a mandatory component with an experienced supervisor, *'I would make certain as part of it [dental curriculum], it should be compulsory, that they do visit the places with someone with a lot of experience. Yeah. In handling it. They've got to see it face-to- face. That's number one.'* Consumer X likened practical placements in aged care facilities to an apprenticeship and as a hands-on job there

was a necessity that this occurred on site, *'you go into that place [aged care facility] and you're taught the practical side of it. Not just on paper. So, you need that practical. In anything in life, I think it's important to have that practical.'*

The role of the dentist to promote education and sustain oral health through prevention and good hygiene was highlighted in theme 1 where DONs sought dentists to teach staff and liaise with families and carers. This went further to specifically teach registered nurses (RNs) for aged care with DON1 championing the role of the nurse: *'RNs are the most important team member in aged care. cause any small incident that is already directly reported to the RN. So, if the RN has the proper in-service education, at least they can guide the staff "okay this is what we need to do...what would we be doing in future if something happens [with the residents oral health]".'*

DON 2 and DON3 concurred that using mobile dental van services as a learning environment was necessary as part of dental student training. DON3 reflected that if dental students received in-service exposure to learning, they would be able to see the challenges as well as providing clinical interventions. These challenges were described as not only due to behavioural difficulties experienced with patients living with advanced dementia, but also the challenges experienced by staff in the facilities, *'it would have to be practical exposure probably placement stuff…you'd want them to have a good understanding of the role of the carers and nurses in those facilities too, because a lot of the barriers to the carer.'*

Discussion

Part 3 explored perceptions of DONs and consumer representatives about the education of dentists in entry-to-practice programs to better inform the design of future gerodontology curricula. There was acknowledgement from all participants that the growing number of dentate older people was not a future oral health problem but already evident. A common thread through the themes indicated a preference for dental students and dentists to be present at the place of residence. This physical presence was not only valued for provision of healthcare to residents but as a support for staff and carers. Recognition of challenges that staff face and being part of a supportive workforce to carers, as well as residents was

viewed as part of the role of the graduating dentist. This expectation also expanded on how this might affect health outcomes including achieving appropriate consent and referral pathways as well as better understanding how to communicate with older people. The relationships between the aged care facility staff, in particular the nurses and support workers, was seen as an important part of the learning process for students. This sentiment is also evidenced in the training across other health disciplines, lending itself to improved health outcomes.[199]

Resource barriers to achieving optimal geriatric oral health care and learning opportunities was noted with pessimism on the ability for improvements. Underfunding of aged care has been a widely discussed topic in the media[200,201] and with the recent Royal Commission into Aged Care Quality and Safety providing recommendations, including immediate funding for oral health education and training to improve the quality-of-care.[1] While the participants acknowledged a need for investment in education and training, the staffing pressure in facilities was linked to the value placed on a dental student clinical placement on site to support staff. Support for mobile dental vans as a model of care sought to address the resource problems by reducing the need to remove staff from facilities for external clinic visits. It was also viewed to be an accepted mode of managing frail and care-dependent older people who preferred to stay at their place of residence, although the lack of appeal for dentists to provide services at point of residence was notable. This is also seen across other health professional attitudes with the perception that remuneration was not adequate for the work provided.[202] It was also a supported mechanism for enabling the presence of healthcare provision at the older person's place of residence which, as previously discussed, emerged as a desired mode of dental professional presence.

As may be expected, there was a keen sense of advocacy for older people from consumers and DONs. This is supported by literature across dentistry as well as other health professions[203,204] where there was an identified need for an appropriately trained and sustainable workforce. The need to flag ageism and how it presents as inequitable oral health care for older people linked into visiting health professionals' perception of valuing older people's participation and empowerment of their own healthcare due to a paternalistic approach to management and inadequately executed consent processes.

Where historically healthcare may have been provided as a transactional experience,[205] the accepted collaborative model of care that is patient-centred[206,207] and empowers the consumer with their healthcare choices, is still viewed as needing further improvement. The priority placed on oral health was deemed to be low in terms of managing daily activities of living with educational support of carers with limited knowledge on oral health recognised as needing to be upskilled before expected to manage the dental hygiene of residents who were care-dependent. Dentists' behavioural management of older people and communicating with dignity and respect was noted as lacking by the participants, and they expressed a need for inclusion of communication and trauma-informed care in dentist's education to bridge this gap. Awareness of end-of-life care management and working as part of a multi-disciplinary team to provide patients with a quality of life that was expected tied into this as part of the attitudes and knowledge required by a graduating dentist.

Clear direction was provided for curriculum content for programs allowing entry to practice as a dentist. There was a strong desire for integration and interprofessional education across the dental school by stakeholders involved in the oral health of older people. There was an emphasis on the bi-directional learning with educating families, staff, and patients in oral hygiene management and included behavioural management and communication skills that dental students would gain. Modelling communities of practice[208,209] in this manner was preferred to be provided at the residence of the care-dependent older person whether it was as a mobile service or in the facility. As well as the behaviour management of the physically and cognitively declining older person, the participants thought there was a need for specific inclusion in the curriculum of understanding the trajectory of living with dementia and of the dying patient. This included understanding appropriate treatment planning choices and management without a standardised approach of viewing only the dental problem, but the patient at large and their quality of life.

While the Consumers and DONs sought to provide a broader perspective of gerodontology education and outside student and teacher perceptions, it is acknowledged that multiple 'other' stakeholders may be considered when scoping the needs of stakeholders. Families and friends of the frail and care-dependent older person would provide valuable insights,

noting that while the consumer representatives were not residents of facilities themselves, it was disclosed that they were also 'older people' with several having family members in an aged care facility.

Conclusion

The perceptions of DONs and consumer representatives is important in gaining a targeted needs assessment of gaps in the Australian dental school curriculum for programs of entry-to-practice as a dentist. The focus groups provided insights from this stakeholder group as the final part of Phase 3 of the study, identifying a need to include in-service learning and gain a better understanding of the wider role of the dentist within the workforce managing frail and care-dependent older people. Communication and the behavioural management of older people in cognitive and physical decline was seen as an important part of dental students' learning to manage the older person's oral health.

Insights from stakeholders who are directly or indirectly affected by the preparedness of dentists on graduation is essential for planning gerodontology curricula. Future research for this stakeholder group may involve wider qualitative studies of families and friends who are involved in the care of older people.

While oral health access and the declining oral health of older people has been advocated for without distinguishable improvement, the ability to improve quality of life through the future workforce of graduating dentists may be an opportunity to provide a sustainable workforce better prepared for the needs of the frail and care-dependent older person.

Outcome Phases 1-3: General and targeted needs assessment of stakeholders involved in an undergraduate gerodontology curriculum.[100]

This qualitative multi-methods study included document analysis of Australian and international gerodontology benchmarks (Phase 1), surveys of Australian dental schools to determine current gerodontology education delivered (Phase 2), and stakeholder interviews and focus groups to explore stakeholder perceptions of gerodontology education for dental

students (Phase 3). Braun's analysis[109] was used for Phase 3, with themes discussed for each stakeholder group as three separate parts. The overarching themes for each of the three groups were as follows:

Dental school academics: exposure, organisational levers, sociological levers

Dental students: preferences for gerodontology, barriers to gerodontology, variation in learning

Consumer representatives and DONs: interrelations between stakeholders, resources, quality of life, and curriculum content.

The analyses from Phases 1 to 3 are synthesised in the next chapter. Chapter 6 will include recommendations presented to support gerodontology education and provide a platform for continuation of the steps in gerodontology curriculum design for Australian dental schools.

Chapter 6. Discussion and Conclusion

The perceptions of gerodontology education in undergraduate dental schools with the aim of providing recommendations to support Australia's growing older population have been explored. Stakeholder groups involved in the qualitative studies included dental school academics, dental students, consumer representatives, and directors of nursing (DONs). Results from this study informed strategies aimed at reforming gerodontology curricula for Australian dental schools so that graduate dentists will be adequately prepared to manage older, frail, care-dependent people.

Chapter 6 provides data synthesis with discussion of results from the document analysis (Phase 1: document analysis), survey of the dental schools (Phase 2: surveys), and stakeholder perceptions (Phase 3: Part 1 dental school academics, Part 2 dental students, Part 3 DONs and consumer representatives). Strengths and limitations of the study, future directions for research and advocacy progression for gerodontology are discussed, with a conclusion of evidenced recommendations to support and inform gerodontology education for dental students.

Introduction

The overall aim of this thesis was to provide recommendations for Australian gerodontology curricula to support a growing older, frail, and care-dependent population. The overarching research question, ***'how can Australian undergraduate gerodontology curricula support an ageing, frail, and care-dependent population?'*** (Chapter 3: Methodology and Methods) was framed around Kern's curriculum design framework[100] (Figure 3).

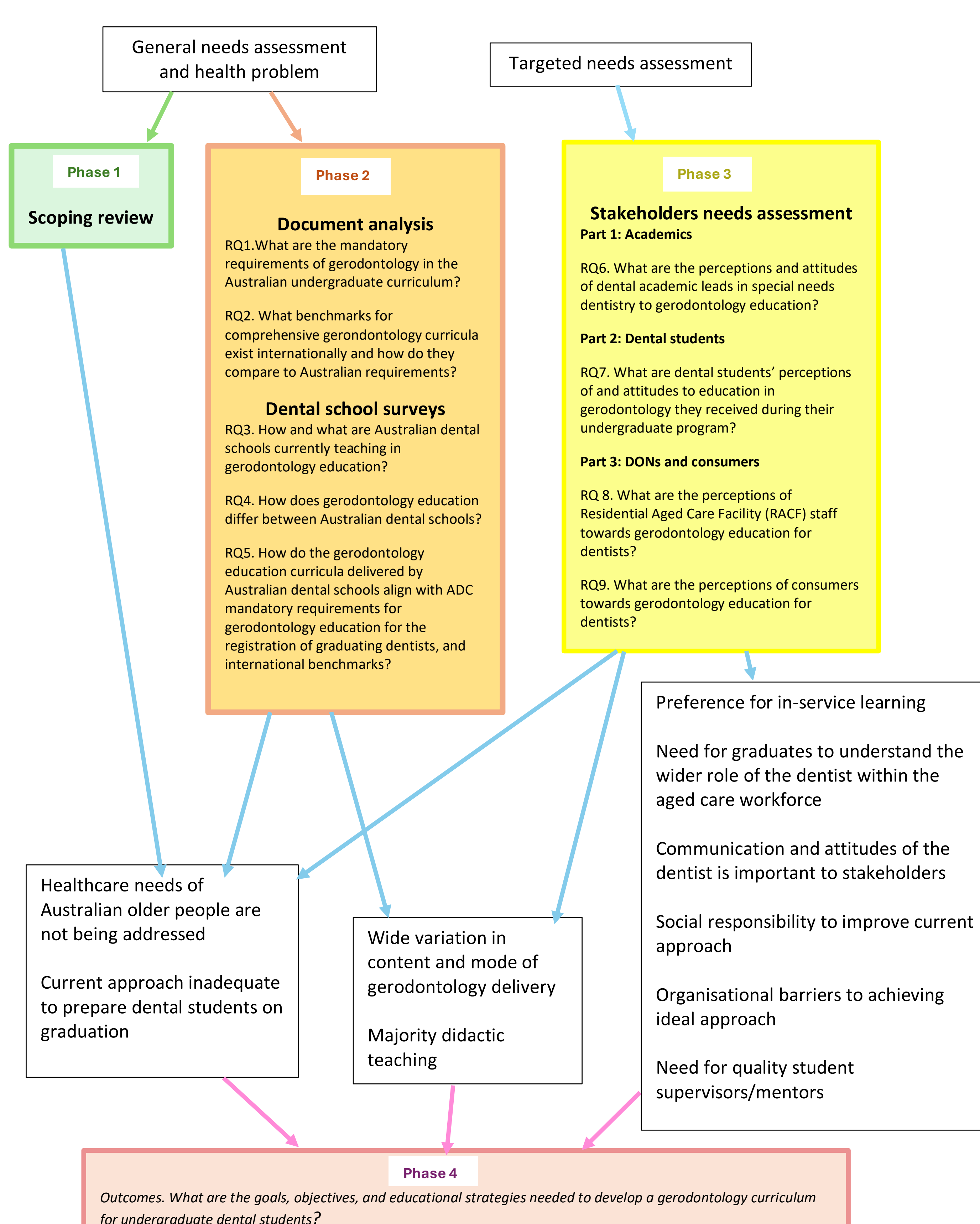
Kern's method was used as it is a recognised framework for health professional education curriculum design.[100] The approach included assessment of the health care problem, educational problem identification, current approach and ideal approach to education, and targeted needs of stakeholders (learners and learning environment). The problem identification and general assessment of the education approach (current and ideal) was addressed in Phase 2 of the study through document analysis of existing gerodontology

benchmarks internationally, and with Australian dental school curricula surveys completed in 2021. Eight of the nine Australian dental schools participated in the survey. Analysis of the first two phases found wide variation in content and mode of gerodontology delivery when compared against international benchmark competencies for the newly qualified dentist.

The targeted needs assessment of the stakeholders was conducted in Phase 3 over three parts, with Australian academics from six dental schools participating in interviews (Part 1), final-year students from seven of the nine dental schools taking part in focus groups (Part 2), and DONs and consumer representatives (Part 3) interviewed as part of the exploration of stakeholder perspectives of gerodontology education. Analysis of the general and targeted needs assessment resulting from the interviews and focus groups of stakeholders (Phase 3) provided a foundation of broad goals, objectives, and educational strategies for future undergraduate gerodontology education. These strategies were structured as recommendations for gerodontology curriculum reform and continuation of Kern's curriculum design[100] for Australian dental schools.

The recommendations are presented with the acknowledgement of researcher reflexivity, understanding the researcher leadership roles in policy and advocacy for the dental profession contributed to the structure of the recommendations. Language used throughout the recommendations consider responses from reviewers of paper submissions to peer-reviewed journals, feedback from dental school academics, and previous submissions and policy drafting as a public oral health clinical director and in the researcher's role as the Australian Dental Association (ADA) Chair of Constitution and Policy Committee. The study phases and summarised qualitative analysis themes (using Braun's thematic analysis[109]) associated with developing the final recommendations are illustrated in Figure 15.

Figure 15. Summary of studies and results



Recommendations

The final phase of the study provides answers to the research question 'how can Australian undergraduate gerodontology curricula support an ageing, frail, and care-dependent population?' These answers are discussed as recommendations (Table 22) for policy makers, dental schools, government and non-government organisations, and stakeholders involved in the health of older Australians to support appropriate gerodontology education of dental students.

The recommendations (Table 22) were emailed to the dental school academics involved in the Phase 3 interviews with requests for their feedback, suggested changes, and comments. Five out of six dental school academics responded. All were in support of the recommendations which are summarised in Table 23*.* Each recommendation is accompanied by a narrative discussion of the study with study data and supporting literature to justify the statement*.* The ten recommendations are framed with the first recommendations at the granular level of competencies (Recommendations 1-5) for Australian programs through to the broader, systems-level requirements (Recommendations 6-10) to correct the projected shortfall in capacity to manage frail, older, care-dependent people.

Table 22. Recommendations to support undergraduate gerodontology curricula

Recommendations
1. *All Australian programs leading to registration as a dentist must include specific gerodontology competencies that are aligned to the broader existing accreditation authority requirements for newly qualified dentists and included as part of learning outcomes*
2. *All gerodontology curricula in Australian dental school programs must include objectives relevant to older people for social responsibility, communication and behaviour management, lifespan (including end-of-life care), and interprofessional collaborative practice for working with aged care workers.*
3. *All Australian dental schools should include service-based learning for frail, care-dependent older people in all programs for all dental students.*
4. *Management of older, frail, care-dependent people should utilise a rational care approach to oral health treatment with inclusion in the dental school curriculum of shared care between general dental practitioner and SND specialists.*
5. *Newly qualified dentists should understand the management of dental patients during end-of-life care.*
6. *Dental schools must be supported through appropriate government funding to ensure service-based learning (for older patients) is provided for every student and not only as an elective option.*
7. *Governments must resource specialist programs for special needs dentistry to provide a sustainable workforce of experts, mentors, and educators for the newly qualified dentist.*
8. *Further research and scoping of postgraduation professional development must commence for a sustainable general dentist workforce capable of managing older, frail, and care-dependent patients.*
9. *Governments and universities must take action to provide a sustainable workforce of dentists with a special interest in gerodontology to manage Australia's frail and care-dependent older population.*
10. *Universities must be supported to develop capability of dental school to include SND specialists as educators.*

Recommendation 1.

All Australian programs leading to registration as a dentist must include specific gerodontology competencies that are aligned to the broader existing accreditation authority requirements for newly qualified dentists as part of learning outcomes.

Gerodontology as a separate curriculum delivered within programs for the dental undergraduate is not a new concept. It has been prescribed and structured by international leaders in this area of dentistry[52,153,210] with specified gerodontology learning outcomes recommended for inclusion in the education of dentists.[211] Concerns with the decline in geriatric content in undergraduate curricula is also not unique to dentistry with medical schools similarly aware of this decline.[212,213]

The first part of the study, Phase 1 (document analysis) provided an outline of the mandatory requirements in the Australian undergraduate curriculum and explored benchmarks for comprehensive gerodontology curricula that exist internationally as a comparison to the existing Australian requirements. This data provided evidence for international benchmarking for gerodontology, supporting the evidence that this is an expectation for newly qualified dentists to achieve on graduation.[52,153,210] In Brazil, gerodontology has been recognised as a specialty branch of dentistry[152] while the Japanese Society of Gerodontology[210] (JSG) and European College of Gerodontology[158] (ECG) provide core competencies required for dental students to achieve prior to graduating.

The second phase*,* Phase 2 (surveys)*,* sought to identify what was currently being taught in Australian dental schools, the variations amongst schools, and how they aligned with the ADC requirements and international benchmarks identified in Phase 1. Through the document analysis in Phase 1 of the study, it was possible to link the more prescriptive components of the JSG and ECG to the professional competencies of the ADC for the newly qualified dentist (Table 15). It was apparent, however, that Australian dental schools would need to apply a rubric for learning outcomes specific to gerodontology to provide the clarity

needed to ensure the revised competencies required by the ADC with relation to 'ageing persons'[49] were being taught with value and not just as a perfunctory exercise[215] for accreditation of dental programs.

At the time of the Phase 2 survey (2021) the revised competencies were not in place (May 2023), and as all nine dental schools must be accredited by the Australian Dental Council (ADC), it could be reflected that the programs would be assessed against the wording 'the demonstration of all professional competencies must take into account…ageing persons requiring additional care or residing in residential and aged care facilities.'[49] Unsurprisingly, there was large variation in mode of delivery, content, and time devoted to gerodontology (Appendix 4).[59]

Fluidity of designing curricula for health professional education is necessary so that the learning outcomes evolve with changing population needs and societal expectations. A standardised graduate is not necessarily ideal for developing a graduating workforce of dentists when taking into account the geographical and population landscape in Australia where there are areas that are decentralised, remote, and variations in biological ageing of populations.[14, 15] The diversity of curricula in Australian dental schools aligns with the first step of Kern's method when addressing the 'health care problem' and ensuring that this occurs as a cyclical active process of curriculum design.[100]

Variations in dental school programs facilitates graduating dentists to have strengths in differing areas, and these strengths (or weaknesses) would be dependent on which school they graduate from. Not all schools have dental specialists in all specialist branches of dentistry as was seen in Phase 3 (Part 1) where not all schools had an SND specialist to participate in interviews. Further supporting evidence from the study data was seen from the Phase 2 surveys, with the content and mode of education delivery varying considerably. This variability would provide diversity to the workforce allowing the new dentist to choose which area to further develop or even specialise. This view, however, was not reflected in the results of the Phase 3 dental school academic interviews with one dental school academic feeling there was disparity in the Standards[58] with how they were applied to older people in comparison to how they applied to other priority populations. Including extra

Standards may not be reasonable as other special groups should also then be considered for specific inclusion, however, there is scope for some greater specificity in the competencies[49] with regards to older people as a distinct special group.

Looking to the medical curriculum, a World Health Organisation (WHO) survey on geriatrics concluded that ‘the basic principles of the special care needs of older persons should not be of exclusive concern to specialists’.[215] This statement is transferable to the oral health needs of older people and is supported by the first recommendation. There is stakeholder insistence for more specificity on gerodontology competencies against accreditation authority rubric. Along with this is the need to address the widely varying content and commitment from Australian dental schools with current delivery of gerodontology education.[27] The second recommendation leads from this, advising objectives relevant to older people that should be included in all dental school programs.

Recommendation 2

> *All gerodontology curricula in Australian dental school programs must include objectives relevant to older people for social responsibility, communication and behaviour management, lifespan (including end-of-life care), and interprofessional collaborative practice for working with aged care workers.*

Older people as a ‘special group’ will constitute a quarter of the Australian population by 2050.[14] Organisations involved in education of dentists have the social responsibility to manage existing barriers to ensure a sufficient workforce with the capabilities to manage their needs. The general health impact of oral care cannot be underestimated, with poor oral health in older adults contributing to increased mortality rate for aspiration pneumonia[36,216,217] where interprofessional experiences with oral health interventions increasing knowledge, attitudes, and confidence compared with those students only participating in didactic lectures.[218] Through interprofessional practice, the team involved in the oral healthcare of the frail, care-dependent, older person may improve oral and systemic health outcomes.[2199,220] Acknowledging the role of aged care workers to support oral and general health care within an interprofessional team was supported by data from

Phase 3 (Part 3) with the DONs and consumer representatives. These participants felt that the interrelations between stakeholders was important and dental students should recognise the importance of the broader aged care team.

Social responsibility was a common theme in all the focus groups and interviews with the stakeholders of Phase 3. The dental school academics found multiple failures in the current Australian dental school system with resources being a variable that should be improved. The resources available for adequate teaching of gerodontology falls short of what is required for the needs of older patients with resourcing seen to be progressively deteriorating without organisational and systems-level intervention.[221] As discussed for Recommendation 1, the content applied for geriatric care to undergraduate curricula has been diminishing across health professional programs[212,213] with a lack of basic training required in the care of older adults.[222]

While accreditation authorities for dental programs have moved away from prescribing curricula, mechanisms must be in place for newly graduated dentists to ensure they can provide for the needs of the general and ageing population.[220] This includes, as determined by the needs of the stakeholders detailed in Chapter 5. Data Collection and Analysis: Phase 3, objectives relevant to older people for social responsibility, communication and behaviour management, lifespan (including end-of-life care), and interprofessional collaborative practice specific to working with aged care workers.

Recommendation 3

> *All Australian dental schools should include service-based learning for frail, care-dependent older people in all programs for all dental students.*

The stakeholders most integrally involved in the daily living and health care of older people, DONs and consumer representatives, strongly advocated for providing dental students with real-life scenarios and learning in aged care facilities and in the home. This not only reduced the strain on RACF resources and staff already under stress, but from a patient-centred, empathetic standpoint the DONs and consumer representatives felt that this is what

patients would want. People living with cognitive decline and frailty are better served within the safety and familiarity of their home where possible,[223] and reducing the pressure for escorting residents to clinics supports both families and DONs.

Further supporting data from the Phase 3 Part 2 study, showed that the students favoured service-based learning, aligning with their preference for experiential learning. The preferred mode of learning, however, was not achieved in dental schools, with the majority of gerodontology curriculum delivery (Phase 2: surveys) being delivered through didactic learning.

Recommendation 3 is also validated by literature, with service-based learning supporting students' sense of social responsibility to work with aged care staff, residents, and families of the residents, to understand and support the challenges in achieving good oral health for residents.[224,225] This echoes Phase 3 stakeholder discussion of needing greater involvement and understanding of communication and attitudes to older people, as well as collaboration with the wider aged care team. Further to the need for greater collaboration, Ahpra details requirements within the Interprofessional Collaborative Practice Statement of Intent[226] for effective team-based care. This must be considered as dentists work with the multi-disciplinary team involved in the care of the older patient.

Students, DONs, and consumer representatives recognized that communication skills could be better developed through managing patients face-to-face, but the manual handling of patients and clinical skills the students felt could not be achieved with alternative teaching methods. The evidence is strong for practical experience providing deep learning[186,227-229] with dentistry, in particular, requiring highly developed fine motor skills to provide optimal outcomes with procedures.[230]

As discussed earlier through the lens of social responsibility, service-based learning provides the opportunity to develop attitudes and through the experience, practise techniques to manage the older patient in cognitive decline. In an environment where more of our future patients will become older, dentate, and medically complicated with complex medications

impacting on oral health[19] these are skills essential for safe delivery of care and are also transferable to the conventional dental clinic.

While the data showed that some students were able to visit RACFs, service-based learning was not an experience offered by all dental schools or to all students. The importance of adopting this recommendation is supported by resources from the International Association for Disability and Oral Health (iADH). In the guidance document from the iADH are recommendations for educators to include hands-on practical teaching and learning for managing patients from special groups.[231] Organisational and resourcing barriers to achieving service-learning in universities are addressed in Recommendation 6 as the recommendations develop through to systems-level solutions. Before further discussion of broader system-level recommendations to achieving fit-for-purpose gerodontology curricula, additional considerations are needed for the teaching and learning strategies involved at the operational level. Service-learning requires the inclusion of interprofessional collaboration, as discussed in Recommendation 2, and this multidisciplinary team includes general dentists and SND specialists. The shared care management of older people is discussed in Recommendation 4.

Recommendation 4

> *Management of older, frail, care-dependent people should utilise a rational care approach to oral health treatment with inclusion in the dental school curriculum of shared care between general dental practitioner and special needs dentistry specialists.*

Rational care planning[232,233] for older people becomes ever more important at the end of the life span trajectory where consideration for complex medical histories, polypharmacy, and care dependence is factored into the mix.[234,235] The data from stakeholders (Phase 3) supported a need to focus the new graduate on rational care planning and shared care when a lack of experience or skills is identified.

The result from the stakeholders is supported by existing literature, with frameworks such as the Seattle Care Pathway rationalizing treatment choices by assessment of frailty and life trajectory.[232] Further to this, there is a call for pathways such as this to be included in worldwide policy specific to the needs of older people.[237] It would be considered unreasonable and unethical by the professions for a dentist to consider complex and invasive treatment on a frail, older patient with advanced dementia and inability to maintain good oral hygiene.[238] If the disease process is managed through a 'drill and fill' strategy without taking into account holistic patient care, the resulting outcomes could be detrimental to the overall health of the patient.[239]

In the UK, there is an existing framework for training of general dentists to manage caseloads appropriately while still providing pathways to specialist when required.[236] Shared management in this manner provides patient-centred care while also forming communities of practice[209] where general dentists may manage patients locally rather than automatic referral to specialists. This aligns with findings from the Phase 3 study between dental school academics and DONs when discussing a need for rational care planning and shared care. The preference from the academics and DONs links to Recommendation 4 to understand management of an older patient across dependency and life trajectory, including end-of-life care.

Shared care with mentoring from experts was a major theme from both academics and students (Phase 3 Parts 1 and 2) with a need for quality student supervisors (Figure 15). The dental student data supported the academics' preference for gerodontology material included in the curriculum, indicating that a holistic approach through support from special needs dentistry (SND) specialists was helpful for learning experiences. This also tied into the treatment planning and specific consideration needed for frail, older patients. While supportive mentoring and critical thinking by way of experience is necessary for a new graduate to manage treatment planning decisions, a basis of understanding is needed through a gerodontology curriculum as one of the targeted needs assessment results from the stakeholders.

Recommendation 5

Newly qualified dentists should understand the management of dental patients during end-of-life care.

End-of life care was provided as a specific recommendation separate from the other recommendations because the data[240] from this study and existing evidence[241,242] showed that this was a distinct problem. The risk of including Recommendation 5 as part of one of the other recommendations is that dental students' knowledge in this area is diluted.

The life trajectory of the frail, care-dependent, older person is not limited to death, and health professionals managing the health of older people should include all stages of end-of-life care. All stakeholders from this study (Phase 3) sought improved inclusion of communication techniques, and development of positive attitudes towards older people. The inclusion of end-of-life care integrated with oral health care was emphasized as a gap in dental professionals' knowledge by the DONs (Phase 3 Part 3). The ability to develop these skills through role-modelling is known in current literature [243,244] and ties in with the need to provide this through patient-facing care and mentoring. A sufficient workforce of SND specialists and general dental practitioners competent in managing the complexities of frail, older people is required to provide students with the learning opportunities including role-modelling and practical learning experiences.[229]

Interprofessional collaborative practice in this area is an opportunity to work with aged care workers on communicating with patients and families as well as navigating complexities around consent and ethics during end-of-life care. Advocating for the patient at every stage of their life was evident in discussion with consumer representative and DONs and has been noted in a previous study showing that dental professionals are not adequately prepared to meet the needs of patients and families in end-of-life care.[241] Further to this, literature suggests that dentists felt that dental school did not prepare them to communicate with patients and families regarding end-of-life issues.[242]

Providing end-of-life care exposure to students is challenging but might be explored through innovative teaching methods where real-life scenarios cannot be presented.[245] Virtual

reality as a teaching method had not been considered or discussed by the stakeholders but perhaps this is due to the technique is still in its infancy for use in dental education. The potential to use virtual reality in managing cognitive decline of older patients could be explored as a learning innovation for communication techniques. There is also the consideration that in a climate of funding challenges for universities, resourcing innovations may not be a priority. Although multimedia as a practical learning tool may enhance conventional teaching, it cannot replace the value found in real-life scenarios required for training healthcare professionals.[246] The issue of resourcing and sustainability of workforce for managing the oral health of older patients is addressed in following recommendations.

Recommendation 6

> *Dental schools must be supported through appropriate government funding to ensure service-based learning (for older patients) is provided for every student and not only as an elective option.*

Improving attitudes and knowledge through service-based learning[247-249]is not a novel approach, but what is clear from the data in this study is that the current model of teaching is not working towards providing an appropriately trained workforce for the needs of Australia's older people. Service-based learning has evidenced ability to improve learning outcomes and bridge the community-identified needs for reducing health inequities, through provision of services.[247, 248] In addition to increasing health access to priority populations, learning experiences with older adults in clinical settings has also been shown to improve dental students' attitudes towards older adults.[164,250]

Older people are a population group with special needs, recognised throughout healthcare in Australia as a priority population experiencing the most significant barriers to accessing oral health care and the greatest burden of oral disease.[171,198] In contrast to experiential learning or situated teaching in a dental school clinic, service-based learning provides an opportunity to develop students' attitudes and also provide contribution to society.[247] In addition to this, student placements may also help to resolve issues associated with residents accessing oral health care. Service-based learning in residential aged care facilities

(RACFs) has the benefit of reducing aged care staff pressure by bringing services to the residents, as well as reducing potential stress on residents and families by transporting frail, older people to external surgeries.[112] The challenge with dental schools delivering teaching through residential RACFs, is providing the necessary resources for students to attend these residential facilities. Planning and coordination are required to allocate dedicated time for students RACFs visits, and to make these experiences meaningful by providing staffing for appropriate clinical supervision. The need for better resources to accommodate service-learning was recognised in the Phase 3 study though discussion of limited budgets and dwindling expertise further compounded barriers for improvement. This is also evidenced by only three of the eight dental schools surveyed (Phase 2) providing service-based learning, with students and academics confirming that this learning was not always provided and not all students received this experience.

Survey results (Phase 2) revealed teaching at the time was predominantly not practical or service-based when it came to managing older, frail patients. This was substantiated by data provided by the dental school academics and final-year dental students. The gerodontology specific competencies developed from the benchmarks of the document analysis in Phase 1, included reference to social responsibility and knowledge of the social environment. These described competencies (Table 15) were the lowest recorded by the schools for content.

In the focus groups and semi-structured interviews with the stakeholders (Phase 3) all groups identified a need to improve communication and knowledge of managing frail, older people and to have an awareness of the complexities and challenges that arise from people requiring support in achieving good oral hygiene and care. It could be extrapolated that increasing service-based learning would provide the ability for learning opportunities to develop attitudes and knowledge of social responsibility.[218, 219] A sustainable workforce to mentor and educate students on the placements is required for this to occur, leading onto the next recommendation regarding resourcing of SND specialist programs.

Recommendation 7

Governments must resource specialist programs for special needs dentistry to provide a sustainable workforce of experts, mentors, and educators for the newly qualified dentist.

Organisational barriers were a strong theme across all the stakeholder groups with deep frustration from those directly involved in the education system. These included difficulties in recruiting staff, a lack of adequate funding, as well as minimal time allocated by dental schools for the provision of SND teaching. There was cynicism regarding improvements being achieved without a drastic change in how dental schools were resourced. Several of the subthemes from the focus groups and interviews started with stakeholders' preferences for teaching and learning. The Phase 3 study stakeholders wanted quality supervisors (dental students and dental academics), more hands-on time with older patients (dental students), and more dental students in facilities (DONs and consumer representatives). In particular, dental students supported by dedicated dentistry specialists in their field felt better prepared and having supervisors as general dentists who were strong in the field of geriatric dentistry was important.

A common theme through Phase 3 for resolving the lack of quality supervision and SND specialists was availability of resourcing. The data from the interviews and focus groups indicated that Australian dental schools appear to be poorly resourced, unable to provide enough clinicians and academics appropriately trained and experienced in gerodontology or SND. Further exacerbating the lack of educators, dental schools that had a specialist workforce to supervise students did not have sufficient SND specialists to afford time in the overwhelming training schedule of students to accommodate any extra learning or ability to take students to placements in RACFs.

The Swiss cheese effect[251] from lack of SND specialists cannot be ignored when seeking to improve the mentors and educators of gerodontology. When the dental school educators and dental students have shown in Phase 3 to require experts in the field of gerodontology to provide support and education, it is an impossible task when there are not enough SND specialists to fulfil this demand. As of the 2023 Dental Board of Australia (DBA) registrant

data, only 26 specialists in SND were registered in Australia.[252] As the specialists with the postgraduate qualification best prepared to manage older people as a special needs group, they are the champions for future SND students and general dentists with a passion for working in aged care. Difficulty appointing qualified academic staff is not a new challenge;[253] and this must be addressed if there is any chance of inspiring a future cohort of postgraduate SND students.

Recommendation 8

> *Further research and scoping of postgraduation professional development must commence for a sustainable general dentist workforce capable of managing older, frail, and care-dependent patients.*

All resourcing problems (some of which included time, funding, and educators) that arose in Phase 3 interviews were tinged with a hopelessness around an age-old issue of seeing no improvements to a lack of resources. The concern with resourcing is reflected in the literature and notable that while the scoping review looked to literature from 2009 onwards, the issues of a lack of gerodontology education in undergraduate curricula have been reported for several decades.[27,59,254] Increased funding from governments would be a step towards supporting RACFs and dental schools, however, a long-term plan for providing more dentists with the scope to manage the special needs of older patients is needed to ensure the success of a gerodontology curriculum. While not within the scope of this study, a wider discussion about how SND as a specialist branch is valued, remunerated, and resourced through government and educational organisations in Australia is necessary to bridge the gap of inequitable access to specialist care and educators.

The scoping review[59] (Chapter 2) evidenced a lack of available literature in gerodontology education, and it is recognised by the profession that there is a dearth of research funding specifically for oral health. A recent study by Ghanbarzadegan et al. (2023) found that there was disparity between funding of research in dentistry in comparison to other health professions. Considering the burden of disease associated with poor oral health,[255] and the economic impact this has on society,[256] it is reasonable that further research is supported and

appropriately funded in the study of gerodontology education and impacts on health outcomes and workforce capability.

Recommendation 9

Governments and universities must take action to provide a sustainable workforce of dentists with a special interest in gerodontology to manage Australia's frail and care-dependent older population.

While Recommendation 9 is similar to Recommendation 7 in terms of special interest in gerodontology, the context is not centred on increasing the number of SND specialists but providing solutions to workforce maldistribution. Results from studies supporting this recommendation can be seen from the themes detailing a lack of resourcing and a need for quality mentors (Figure 15). The regional-metropolitan disparities in health care have been evident for some time,[257] but it is just as important to recognise the lack of dentists providing service to care-dependent older people. Older people are recognised as a 'priority population'[258] as are rural and remote people due to their poorer health outcomes.[172] The solution of using allied dental pratitioners to supplement workforce issues was not advocated for by the SND specialists (Phase 3 Part 1) and supported by evidence that concern is raised that they be used inappropriately to manage a gap in gerodontic workforce.[259]

Research into the willingness of dentists to manage special needs patients has shown there is a greater likelihood of success where communities of practice exist for specialists to interact with generalists.[260] It is through generalist dentists that most dental work on frail, older people can be completed, rather than requiring specialist SND dentists. An example of where this has been used successfully is through the NHS Case Mix tool.[261] This model enables sustainable use of workforce and through a workforce of competent dentists able to manage general care for cases that are within their scope. As one of a number of tools[262] available to support general dentists to manage the varying stages of frailty in the older person, it is inherent that government and universities deliver on the capability of the graduating dental workforce. Actions may include incentives for studying SND at a

postgraduate level, or funding residencies within public oral health systems to support general dentists to be mentored by SND specialists. Inspiring a new cohort of SND postgraduate students leads to the final recommendation for building capability of all dental schools to include SND specialists as educators.

Recommendation 10

> *Universities must be supported to develop capability of dental schools to include special needs dentistry specialists as educators.*

This study illustrated a demand from students and academics for educators and specialists who are experienced and competent in the management of frail, older, care-dependent people. Further to this, it is not possible to address clients' oral health needs without competent educators and specialists, resulting in failure to address the requests of DONs and consumer representatives to improve the quality of life of older people.

Universities are suffering a shortage of staff[253,263] including clinical demonstrators. To replenish the pool of educators, a critical number of specialists must be available to support and develop mentors or supervisors. With a limited number of SND specialists in Australia,[252] it remains with the dental school to ensure the clinical demonstrators and academics are competent in gerodontology.

Existing literature shows a lack of willingness by dentists to pursue postgraduate training in SND[264] which is further complicated by the shortage of dental academic staff.[263] Whilst it is not within the scope of this study, organisational change and government support are needed to provide a greater number of quality supervisors. Supporting those supervisors already within the system who may look to training in gerodontology or identification of skills gaps has been observed in the prescribed professional development of other health professionals such as medical doctors.[265]

Accredited programs and the overall dental course blueprint should consider stakeholder preferences for learning and teaching with evidence-based pedagogical approaches to

teaching.[265, 267] Specific competencies for the newly qualified dentist relating directly to gerodontology education (Table 15) could provide the platform for curriculum development. Including sufficient gerodontology learning in dental school curricula will be important for graduating dentists being appropriately skilled to care for older patients.

Further, without the critical number of champions for gerodontology and SND, Australia is not providing an appropriately skilled workforce of dentists to manage older patients. The ten recommendations showing supporting data and relevant literature for Australian gerodontology education are summarised in Table 23 with corresponding supporting study data and existing literature.

Table 23. Recommendations with supporting evidence for Australian gerodontology education

Recommendation	Supporting Data	Supporting Literature
1. *All Australian programs leading to registration as a dentist must include specific gerodontology competencies that are aligned to the broader existing accreditation authority requirements for newly qualified dentists and included as part of learning outcomes*	Large variation in content and time committed to gerodontology (Phase 2 surveys and Phase 3 Parts 1 and 2) Academics felt students were not prepared on graduation to provide care to frail, care-dependent older people (Phase 3 Part 1)	Scoping review (Nilsson et. al, 2021) 'The basic principles of the special care needs of older persons should not be of exclusive concern to specialists' (Keller et. al, 2002)
2. *All gerodontology curricula in Australian dental school programs must include objectives relevant to older people for social responsibility, communication and behaviour management, lifespan (including end-of-life care), and interprofessional collaborative practice for working with aged care workers.*	Social responsibility a theme across all stakeholders (Phase 3) Communication and behavioural management important in the care of older people (Phase 3)	Interprofessional practice improves oral and general health outcomes (Bhagat et. al, 2020) Proposed Interprofessional Collaborative Statement of Intent (Ahpra, 2023) Lack of basic training required in the care of older adults (Boutin et. al, 2019)
3. *All Australian dental schools should include service-based learning for frail, care-dependent older people in all programs for all dental students.*	DONs and consumer representatives wanted students at place of residence (Phase 3) Students preferred to learn experientially (Phase 3)	Beneficial for attitudes and development of social responsibility (Wallace et al., 2014) Educational value in RACF service-learning community placements (Wallace et al., 2014)

Recommendation	Supporting Data	Supporting Literature
4. *Management of older, frail, care-dependent people should utilise a rational care approach to oral health treatment with inclusion in the dental school curriculum of shared care between general dental practitioner and SND specialists.*	Academics wanting the dental graduate to understand rational care planning for older people (Phase 3) Students' preference for supportive care environment with SND specialists (Phase 3)	Rational care planning through the Seattle Care Pathway (Pretty et al.,2014) Complex health needs of older people required interprofessional work (Chavez et al.,2018)
5. *Newly qualified dentists should understand the management of dental patients during end-of-life care.*	DONs perceived a gap in skills and knowledge in managing older people in end-of-life care (Phase 3) Consumers felt there was a lack of knowledge in the life trajectory of frail, older people, and a need to understand how to communicate with people living with advanced dementia (Phase 3)	Dentists feel dental schools did not prepare them for end-of-life issues (Sirmons et al., 2010) Undergraduate dental education is not preparing students to manage the needs of patients and families requiring end-of-life care (Macdonald et al., 2020)
6. *Dental schools must be supported through appropriate government funding to ensure service-based learning (for older patients) is provided for every student and not only as an elective option.*	All stakeholders acknowledged lack of resources (Phase 3) All stakeholders valued service-based, practical experiences (Phase 3) Lack of service-based learning through surveys (Phase 2)	Service-learning in dental education critical to improving attitudes (Hood, 2009) Increased contact improves dental students' attitudes (Nochajski et. al, 2011)
7. *Governments must resource specialist programs for special needs dentistry to provide a sustainable workforce of experts, mentors, and educators for the newly qualified dentist.*	Students wanted more contact with SND specialists and generalists equipped to supervise (Phase 3) Academics under pressure to provide quality learning experiences due to lack of resources (Phase 3)	Difficulties recruiting into academia (Freer et al., 2010) 26 SND specialists currently registered in Australia (Dental Board of Australia, 2023)

Recommendation	Supporting Data	Supporting Literature
8. *Further research and scoping of postgraduation professional development must commence for a sustainable general dentist workforce capable of managing older, frail, and care-dependent patients.*	The newly qualified dentist was seen as unprepared to manage older, frail, care-dependent patients by academics and students (Phase 3) While dental schools are limited for time in the current curriculum for SND, a need exists to increase the skills/knowledge/attitude gaps to manage older people after graduation (Phase 3)	Disparities in oral health research funding in relation to disease burden (Ghanbarzadegan et al., 2023) Lack of available literature for gerodontology education and workforce implications (Nilsson et al., 2019, 2021)
9. *Governments and universities must take action to provide a sustainable workforce of dentists with a special interest in gerodontology to manage Australia's frail and care-dependent older population.*	Demand from academics to have a pool of competent clinicians to manage frail, older people (Phase 3) Students value experiences with quality supervisors and mentoring from specialists (Phase 3)	Maldistribution of dentists exists across populations as well as regions (COAG, 2016) Structured networks with specialists improve ability and willingness to treat patients with special needs (Lim et al., 2022)
10. *Universities must be supported to develop capability of dental school to include SND specialists as educators.*	Academics feel under-resourced for supervision of students (Phase 3) Students recognised resource driven for ability to support gerodontology programs (Phase 3)	Skills shortage in dental academia (Hayes & Ingram, 2021) Lack of willingness of dentists to pursue SND as postgraduate training (Derbi & Borromeo, 2016) Small number of SND specialists (currently 26 registered in Australia) (DBA, 2023)

Research strengths and limitations

Strengths and limitations of the thesis will be discussed and suggestions for future research will be outlined. Future directions in line with policy recommendations and advocacy are also considered as part of this discussion.

Strengths

The thesis is strengthened by the current body of advocacy work for older people.[1,268] Other strengths discussed include transferability of the recommendations and rigour involved through the study.

Advocacy

The call to action for gerodontology education has been international,[27,28] and of vital importance in securing the oral health of Australia's older people. A strength of this study is in the weight of advocacy behind making change from a variety of stakeholders so that the addition of these results to the existing body of evidence may force change to achieve the outcomes required. While the messaging observed in the data may be unsurprising (need for greater resourcing, funding, and support for all stakeholders),[59] those messages are essential to provide the framework for graduates who will be prepared to manage the needs of frail, older people.

The timing for the study aligned with a focus on older people and access to oral health care. In the early phases of the study, the Royal Commission into Aged Care Quality and Safety[1] had concluded and provided recommendations. The Senate Inquiry into the Provision of and Access to Dental Services in Australia had also commenced at the time of writing with expert witnesses calling to provide parity to older Australians for access to oral health.[267] The study adds to the weight of evidence provided by oral health advocates to support better health outcomes for all older Australians.[5,24,26]

Transferability

The framework for completion of designing Australian dental school curricula has been provided as recommendations without restriction of use for Australia alone. As a recognised global issue, the growing older, dentate population requires the same focus in other

countries as recognised in the scoping review.[59] In addition, the recommendations may be extrapolated to other dental professionals who are also recognised in being an important part of the interprofessional collaborative practice to maintain oral health.

Rigour

Recognition of the unique requirements in Australia was evident through the study. Gaining breadth and depth of perceptions from stakeholders locally and through narrative discussion was confirmed with threads of aligned themes such as resourcing and preferences for experiential learning, further strengthening the recommendations. Providing the SND academics with recommendations for gerodontology education provided triangulation and validity to the findings. By using Kern's model[100] which is a recognised, validated framework for curriculum development, and education environment measurement instruments to guide the qualitative data questioning, further added to the robustness of the study and recommendations. However, there were a number of limitations impacting the study phases.

Limitations

Limitations to the study include methodological limitations and study sample. Several constraints during the period over the COVID-19 pandemic also impacted on some phases of the study.

Methodological limitations

A number of methodological limitations impacted this study. Document analysis is limited by the potential for low retrievability, insufficient detail, and biased selectivity.[108] A deeper exploration of curriculum frameworks for all Australian dental schools and the accreditation authority criteria for successful accreditation of dental programs may have elicited better understanding of the delivery of gerodontology education at the point of data collection.

The point in time of data collection was also a limitation as dental schools adjust their curriculum frequently while the collection of interviews and focus group data may not have correlated accurately to the information provided by the document analysis. This, however,

was mitigated by discussion of broader educational concepts and needs of stakeholders rather than specifically to the education being provided at that point in time.

During the stakeholder study, it was necessary to have flexibility of smaller group interviews during a period in the dental student's final year when they were time constrained with exams and placements but needed to be the window (the last semester of their final year) where there was less variation in curriculum content and 'finishing' their course. Microsoft Teams transcriptions contained some inaccuracies but were corrected through the researcher listening to the recordings, immersion of data and revisiting field notes to reflect the context in the final transcriptions used for data analysis.

There were limitations associated with videoconferencing providing a platform for open and comfortable discussion which was generally more challenging compared with in person interviews and focus groups. This was evident with the consumer representative groups where there may have been less experience in videoconferencing participation compared with the student and academic group who would have been videoconferencing regularly to communicate, learn, and teach throughout the COVID-19 pandemic. This risk was mitigated by offering an in-person interview where possible and resulted in a mix of focus group and interview data collection for the DONs and consumer representatives.

COVID-19

It was recognised prior to commencement of interviews that focus groups of 5-8 people may not be possible due to participant recruitment delays and the COVID-19 pandemic. DONs and consumer representatives, who themselves identified as older people, were recruited during a period of the COVID-19 pandemic, where gathering in groups was against the advice of state health services and governments.[269] Consideration should also be given to variations that may have occurred with clinical time allocated to students during this period as well as periods of lock-down where comparable teaching and lock down pre-pandemic may have drawn out different perceptions from stakeholders.

Study sample

Participant groups could have been broadened to include families of older people, dental professionals providing care to residents of RACFs, graduate dentists, and specialist SND dentists. Insights may have provided further themes and greater depth to recommendations. This could be explored further in future study, however, the groups chosen for this research were restricted to the four described through the thesis.

Phase 3 interviewees may have chosen to participate in the study due to a pre-existing interest in geriatric health advocacy. This would be assumed for the peak consumer representative body group, DONs in aged care facilities and SND academics, but may have also occurred for the final-year students as they were aware of the subject content for the study prior to participation.

Movement of the interviewees due to job changes, death, and illness was experienced through the study. This may have affected information provided by dental school academics as their perceptions may have been impacted by what was being experienced at the time of interview. This was notable in the document analysis where one of the surveyed academics who was heavily involved in curriculum development for the dental school, later advised that they were contracted for the gerodontology curriculum design but had since been aware that the curriculum was not planned for implementation. Triangulating the information gathered from the dental school surveys (Phase 2) with the focus group data (Phase 3) allowed for broad perceptions and themes to support validity of the recommendations.

Building on the findings of the study, the next section discusses future research possibilities. It includes potential direction for policymakers and organisations involved in the delivery of gerodontology education.

Future research

The thesis focussed on educational theory using an established curriculum design framework.[100] Completion of the remaining steps of Kern's cycle is a future direction that would be individualised for each dental school dependent on their local population needs and organisational values. It was clear from the data, however, that several barriers needed to be addressed in order for this to occur and to develop opportunities for further research.

The organisational barrier was discussed with a lens on the value placed on SND. Further study is required to understand how the discipline is resourced and balanced within the Australian dental education system in comparison to other specialist dental groups. The subject of accreditation and competencies would also need to be assessed. This could be investigated in the context of the baseline graduate dentist and how competence in managing older people should be demonstrated.

Other research areas to assess the recommendations provided, based on Kern's curriculum design framework,[100] could provide translational results to inform and evaluate a gerodontology curriculum as part of an undergraduate dental program. It would be useful to identify whether this evaluation would translate into improvement of health outcomes and to what extent stakeholder measured outcomes and experiences[270,271] may be influenced by the curriculum. Further investment into oral health research would contribute to providing data on the oral health of frail older Australians to ensure measurable outcomes.

The current model for accrediting dental schools provides Australia with newly qualified dentists who have varied strengths dependent on where they trained. Diversity in skill across a graduating workforce of dentists was not, however, perceived by dental academics as effective for managing the growing population of frail, older patients. Health professionals in Australia have been moving towards a prescriptive professional development model postgraduation[265,272] and while this relates to registered health professionals, further research is necessary to review whether this should translate to entry-to-practice health professional programs. This has proved to be another barrier to improvement as the dental profession continues to be woefully underfunded for research in

comparison to other health professions, with oral health sciences having the lowest and most inequitable level of support from the Australian government.[273]

Considering the burden of oral disease both socially and economically, the disparity in oral health funded research must be addressed in order to provide informed decision making regarding continued professional development post-graduation. While the question of societal impact research was not within the scope of this study, the recommendations resulting from the data could be further strengthened by another consideration:

> *Governments must fund research in dentistry at a level that is equitable to other health professional research and reflective of the burden of oral diseases.*

Future directions

The need for greater gerodontology inclusion in dental schools was widely recognised by the stakeholders[274] and reflected in the literature.[27,59] At odds with finding a solution, the stakeholders also acknowledged the lack of adequate resources to support gerodontology, including time committed to SND and service-based learning. Additional time to an existing pre-registration curriculum would likely be met with unpopularity amongst dentists currently accruing larger tuition debt on graduation than other university graduates.[275] When considering the organisational barriers to achieving an appropriately skilled dental workforce, it is useful to evaluate the methods other countries have evolved to develop new graduates. Medical doctors continue their development through residencies, while vocational training in the United Kingdom (UK) involves supported mentoring through clinical practice, enabling the graduate to provide care under the National Health Service on completion of 'dental foundation training'.[276]

Brave leadership would be required to consider a mandatory dentist internship for full registration, or vocational training to enable billing on Medicare dental schemes. However, the challenge is posed for innovative change requiring an internship period for dentists on graduation, which would develop the incomplete graduate to a competent clinician. With recommendations from professional bodies and leaders to expand government funding

schemes to older people,[1,277] the ability to claim reimbursements under the Dental Benefits Act[277] as a registered dentist should provide those older patients with the knowledge that they are proficient in their skills, attitudes, and knowledge of gerodontology. One such recommendation, if the educational objectives, strategies, and broad goals are not achieved, would be:

> *All graduates for entry-to-practice dentistry programs must enter a 1-year residency program within a public health service to enable any claims from government schedule of fees.*

The focus on public health service programs would provide greater ability of interprofessional collaborative practice, links with registered dental specialists, and recruiting to an area of need where rural and regional older people have reduced access to dental care and poorer oral health outcomes. [258,279] The timeframe would also align with medical counterparts as first year postgraduates. The Australian 4-year postgraduate or 5-year undergraduate dental programs are in stark comparison to Japan's dental school programs which are a mandatory 6-year program with 1-year compulsory residency post-graduation.[280] Further to this, a new initial accreditation of a 3.5-year postgraduate program for a Doctor of Dental Medicine to allow entry-to-practice as a dentist is distancing Australia away from an ability to include adequate clinical contact time for students.[281]

While the focus of this thesis is based on pragmatism and educational theories, it is also necessary to consider research paradigms that would enable execution of the suggested recommendations. Future research should consider critical theory[282] to address the role of social, cultural, political, and economic factors that may constrain or enable success of adoption of the recommendations and completion of Kern's cycle of curriculum design for 'ideal' Australian gerodontology curricula.[107]

The thesis utilised a recognised educational theory for curriculum design[100] with the final steps of constructing content and method, implementation, and evaluation of the gerodontology curriculum beyond the scope of this current research. The political and geographical landscape of a country as large and diverse as Australia must be taken into

consideration when continuing the design of a gerodontology curriculum. This ensures the skills, knowledge, and attitudes of the graduating workforce are tailored for the health care problems of each region. The intention is not to provide a cookie-cutter approach for health care professionals but to deliver diversity of workforce who are able to manage frail and care-dependent older people. This leads to the resulting recommendations having strength in their transferability and advocacy not just across the dental workforce but also to international dental schools.

Conclusion

The aim of this study was to provide recommendations for gerodontology education in undergraduate dental schools to support Australia's growing frail and care-dependent population. This was accomplished through exploration of perceptions of stakeholders engaged in the provision and outcomes of undergraduate gerodontology education in dental schools. The stakeholders included dental school academics, dental students, consumer representatives, and DONs. Data analysis and synthesis of the results from the studies through the four phases of the study provides broad goals, objectives, and educational strategies as the foundation to complete gerodontology curricula for Australian dental schools.

Overarching themes influencing recommendations from the study included; variation in learning, interrelations between stakeholders, quality of life, sociological levers for change, organisational levers for change, and preferences for practical exposure to gerodontology. The culmination of this exploration yielded ten recommendations derived from the study's findings, which were subsequently presented to the dental school academics participating in the stakeholder interviews for feedback. There were no disparate views from the expert group, and the recommendations were accepted in their existing form as recommendations for Australian gerodontology curricula.

The importance of this thesis aligns with the call for action to improve the quality of life and oral health of older Australians, as evidenced by the recent Senate Inquiry into the Provision of and Access to Dental Services in Australia and the Royal Commission into Aged Care Quality and Safety. This work is significant because it applies to all populations in Australia and is transferable internationally with rapidly growing older, frail populations a global problem.

The results of this study contribute to existing literature and underscore a pressing need for decisive action to rectify the deficiencies in gerodontology education within Australia's dental entry-to-practice programs. With significant disparities among Australian dental schools in delivery of gerodontology education, the fate of an older patient's oral health care often hangs precariously upon the chance selection of a recent graduate who has

experienced practical gerodontology during their time at dental school. Stakeholder perceptions unequivocally highlight the urgency for improvement in this realm, mandating a pivotal role in shaping dental school curricula and accreditation processes.

The evidence has been presented as an opportunity for change where decades of failed advocacy has occurred. Monumental steps must be taken before dentistry as a health profession is afforded the value and funding proportionate to the disease burden. A concerted effort to bolster research funding and support in gerodontology is imperative to fortify our understanding in this domain, crucial for improving the oral health and overall well-being of the ageing population.

The future direction of this thesis is through the outcome of the recommendations presented. These recommendations must be adopted by organisations and governments to ensure a sustainable, appropriate framework for education of dental students to support frail, care-dependent older Australians. In the words of one study participant, *'I just think we're going to get more and more behind in caring for people in facilities because they're hidden. They're hidden from our population; they're hidden from our profession.'*

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Appendices

Appendix 1. Publication. Gerodontology in the dental school curriculum: A scoping review. Gerodontology

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WILEY

REVIEW

Gerodontology in the dental school curriculum: A scoping review

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Objective: To explore the current status of gerodontology in the undergraduate dental curriculum.

Background: Internationally, there is recognition for the need to include gerodontology in dental education due to accelerating numbers of older dentate people. There is wide variation in the content and method of delivery of gerodontology in undergraduate curricula of dental schools.

Methods: A scoping review framework was chosen to identify existing gaps and key concepts in the research on current undergraduate gerodontology education. Arksey and O'Malley's framework was used with the qualitative data analysis software NVivo to identify comparable information on geriatric dental education.

Results: Five themes were highlighted in the studies including (1) gerodontology curriculum content, (2) attitudes, skills and knowledge of undergraduate dental students, (3) didactic teaching, (4) elective and compulsory teaching, and (5) extra-mural learning. The review found large variations in methodologies, presentation of data and findings. All studies emphasised a need for greater inclusion of gerodontology content in the undergraduate dental curriculum.

Conclusion: The review found limited research reporting on the educational outcomes of gerodontology in dental curricula with a lack of comprehensive information to inform gerodontology content in dental schools. This review has highlighted the need for national and international guidelines to ensure mandatory inclusion of sufficient and specific gerodontology training to prepare graduates for a growing dentate frail and care-dependent population.

KEYWORDS
curriculum, dental school, dentist, Gerodontology

1 | BACKGROUND

People worldwide are living longer with the proportion of older persons projected to accelerate at an unprecedented rate.[1,2] The number of "oldest-old" persons (people aged 80 years or over) is growing even faster than the proportion of older persons overall, with estimations that this group will triple in number by 2050.[3] This statistic is not limited to high-income countries, with the population of oldest old in some low- to middle-income Asian and Latin American countries predicted to quadruple by 2050.[4] With this change in life expectancy comes an increase in dentate older people indicating a need for a workforce of dental professionals equipped with the knowledge, skills and attitudes to manage a growing frail and care-dependent population.[5,6]

Societal values and expectations of the oral health of older people have changed. Sussex et al[7] found that in New Zealand, it was

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acceptable and expected for adults to continue to lose their teeth with a view to complete dentures by the time they were in a residential care facility. As dental materials and dentistry techniques have continued to improve, we are able to retain our teeth for longer. Evidence has shown the importance of keeping our dentition as long as possible with the presence of natural teeth correlating with greater life expectancy and quality of life,[8] indicating a clear need to be able to maintain the oral cavity and dentition in older people. The older dentate patient is more likely to have a complicated medical history, increased co-morbidities and changes in the oral cavity that necessitate unique challenges in their dental management. Thus, there is a need for education at an undergraduate level to prepare dentists to competently manage the oral health needs of this population. Dental schools may graduate students with the ability to register as a dentist from a graduate programme rather than an undergraduate Bachelor programme; therefore, for the purposes of this review, the term "undergraduate" will be associated with a student who on graduation will be eligible to register as a dentist. Advocacy in the area of provision of better services for frail and care-dependent older people has been growing amidst a call for public health action to improve oral health status and quality of life for this population.[9]

There are differences in the content and method of delivery in undergraduate gerodontology curricula of dental schools. Internationally, there is recognition for the need to include gerodontology in dental education, irrespective of whether it is a developed or developing country.[10-13] The European College of Gerodontology and the European Geriatric Medicine Society formed a task and finish group to identify areas where positive change for the oral health of older people could be made.[14] This group highlighted the need for an educational action plan as part of their recommendation to policymakers with training to improve not only the knowledge of health professionals, but attitudes to oral health for all stakeholders involved.[14]

There is a scarcity in literature on gerodontology education in the undergraduate dental curriculum. This scoping review was conducted to identify research in current gerodontology education and provide insight into areas where further research is needed. The following research question was formulated: What is known about the current status of gerodontology in the undergraduate dental curriculum? The results from the review will include themes elicited from included recent gerodontology education papers. The authors acknowledge the importance of the role of allied dental practitioners in the improvement of oral health outcomes for older people[15-17]; however, the focus of this review is undergraduate dental education, given that it is graduate general dental practitioners who have the requisite scope of clinical practice most pertinent to the management of the oral health needs of the ageing population.

2 | METHODS

A scoping review was chosen as the method for reviewing the literature to identify existing gaps in the research on current undergraduate gerodontology education and to clarify key concepts in the available literature.[18,19] It was also the chosen method due to the limited number of papers and varied methodologies of research involved and was conducted using Arksey and O'Malley's framework in order to map key concepts in gerodontology.[20] The search for this review was conducted in June/July 2019 using the following electronic databases: CINAHL, Educational Resources Information Center (ERIC), Google Scholar, Scopus, and Web of Science (Figure 1). A subsequent search for papers was conducted in December 2020. Both MeSH terms and keywords were used in the search strategy. Keyword terms included "gerodontology", "aged care oral health", "geriatric dentistry", "dental students", "curriculum", and "education" (Table 1). Additional records were retrieved using an electronic search of two key journals, the Journal of Dental Education and the European Journal of Dental Education. Hand searching was conducted by searches from relevant articles. Data were extracted from each included study using the qualitative data analysis software NVivo to identify comparable information on geriatric dental education.

This scoping review was conducted using the PRISMA-ScR statement to guide the reporting of the literature and ensure methodological rigour [21] with the objective of discovering the current status of undergraduate gerodontology education internationally. The main components guiding the selection of articles included dental students, gerodontology education, absent or reduced gerodontology, and change in attitude, knowledge, skills or conclusions regarding undergraduate gerodontology education. Statement of these key elements was identified in line with the PRISMA extension for scoping reviews.[21]

2.1 | Inclusion criteria

The review aimed to investigate the current status of gerodontology in the undergraduate dental curriculum, rather than examining the historic inclusion of gerodontology education. The inclusion and exclusion criteria for the review are listed in Table 2. For the purpose of this review, only articles from 2009 onwards were accepted. This timeline was chosen to reflect current practice in dental schools internationally with the acknowledgment that various countries had increasing numbers of dental schools over this period.[22,23]

Two reviewers (AN, KB), experienced in the area of health professional education, were involved in the screening of papers. The first reviewer eliminated 71 articles by title using the framework discussed in the methods with a further nine articles excluded after screening abstracts. Thirty-two full-text articles were reviewed independently by the two reviewers and any studies with differing opinions were eliminated or accepted after discussion and consensus as described in the PRISMA extension for scoping reviews.[18] Eight articles needed further discourse by the reviewers with agreement to include one of those eight articles. Initial data charting utilised forms from the Critical Appraisal Skills Programme[24] with further data extraction and handling of data with QSR International's NVivo 12 software.

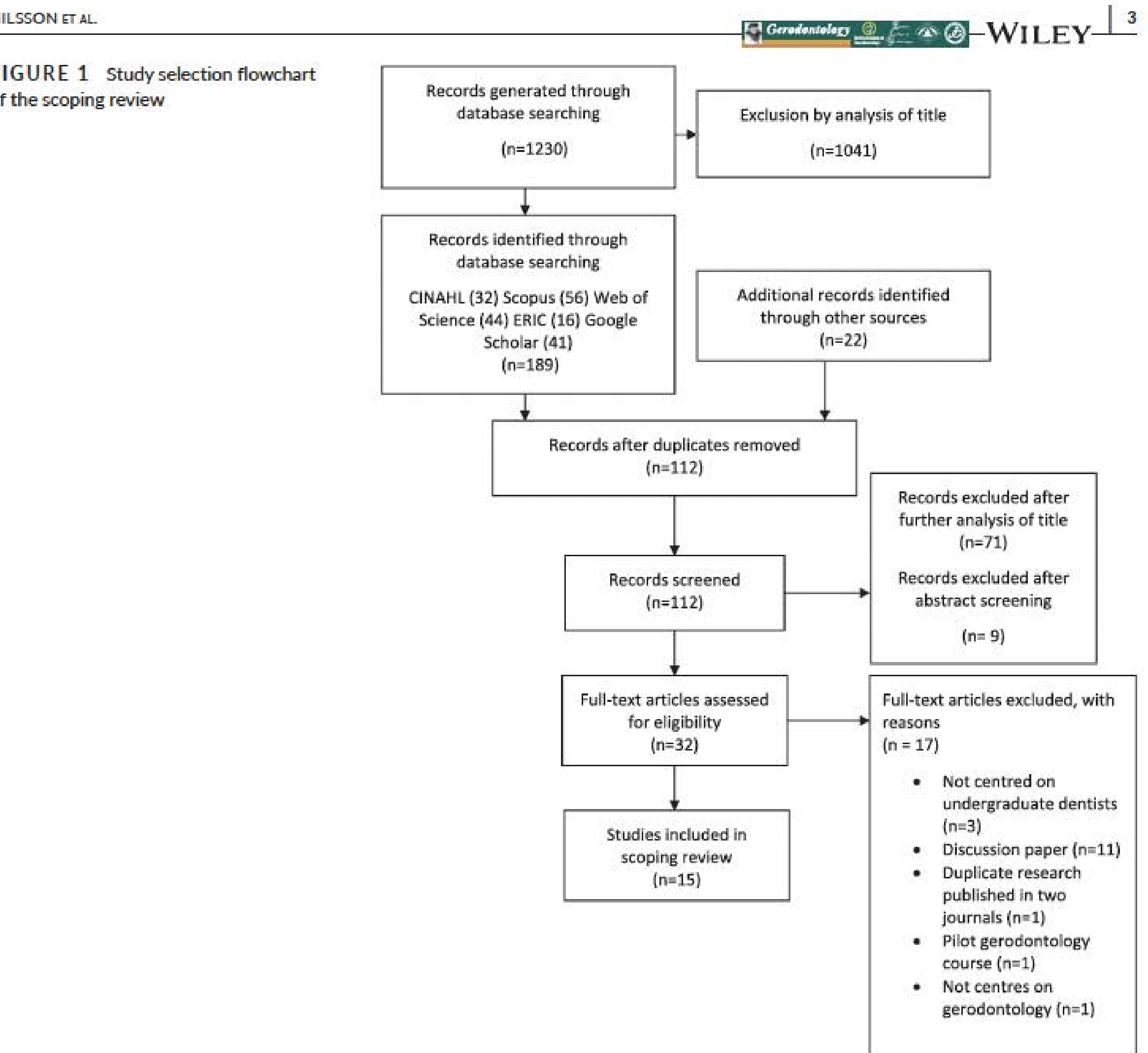

FIGURE 1 Study selection flowchart of the scoping review

TABLE 1 Electronic database search strategy

Database	Search terms
CINAHL	((MH "Dental Health Education") OR (MH "Dental Care for Aged/ED") OR (MH "Students, Dental Hygiene/ED") OR (MH "Students, Dental/ED") OR (MH "Dental Hygienist Attitudes/ED") OR (MH "Education, Dental Hygiene/ED") OR (MH "Education, Dental/ED") OR "dental curriculum OR dental student OR oral health OR dental health education OR dental health AND (older adults or elderly or seniors or geriatrics)" OR (MH "Health Services for the Aged/ED") OR (MH "Dental Clinics/ED") OR (MH "Schools, Dental/ED") OR (MH "American Dental Hygienists Association/ED") OR (MH "Faculty, Dental/ED") OR (MH "Oral Health/ED")) AND aged care
ERIC	"geriatric", "dentistry", "dental"
Google Scholar	"gerodontology", "geriatric", "older adults", "aged", "elderly", "frail", "dental", "education", "curriculum", "school", "students"
Scopus	"gerodontology", "education", "older adults", "dental curriculum", "geriatric"
Web of Science	"gerodontology", "geriatric dental education"

TABLE 2 Inclusion and exclusion criteria for accepted articles

Included	Excluded
Peer-reviewed journals	Non-peer-reviewed journals
English	Not in English
Undergraduate dental school	Not centred undergraduate education
Centred around dental graduates or dental students	Not centred around dental graduates or dental students
Full-text article	Title or abstract only
Gerodontology education	Not centred on gerodontology
Published from 2009 onwards	Published before 2009
	Grey literature, review articles, discussion papers, editorials, poster presentations

The quality of the included studies was assessed using the Quality Assessment Tool for Studies with Diverse Designs (QATSDD)[25] by the two reviewers AN and KB. While the scoping review literature does not explicitly require an assessment of quality,[18,20] the QATSDD instrument has been used to provide evidence and make a judgement about the quality of literature sourced in mixed methods studies. The 15 accepted studies were critically reviewed against a 16-item quality assessment tool. Both reviewers assessed the articles independently and the inter-rater agreement calculated, with any differences in scoring resolved by discussion as described by the method of quality assessment.[25] The QATSDD tool was chosen as the review involved health-related research with studies that involved quantitative and qualitative methods. Although the tool exhibits good reliability and validity for use in quality assessment and spurring dialogue amongst researchers for an iterative approach,[25] there are limitations with using the QATSDD. The scoring has potential for bias and may not be reflective of quality when comparing papers as the method is subjective in nature.[26] It is therefore necessary for any large deviations in scoring between researchers to use an iterative approach for a final score. The scores were represented as a percentage with the "strongest" possible score being 100. An inter-rater reliability analysis using the Kappa statistic was performed to determine consistency amongst the reviewers which was found to be Kappa = 0.42 ($P < .001$) indicating moderate agreement.[27] This score is to be taken into account with the percentage agreement due to the limitations of using the QATSDD tool,[28] with agreement of scores within a 10% interval resulting in 86% inter-rater agreement. The two papers with a difference larger than a 10% interval both had a difference of 12% (Table 3) with the final scores calculated as an average of scores for both reviewers.

3 | RESULTS

The results are presented as quantitative and descriptive data from the variety of study designs used in the reviewed papers. A total of 1230 potentially relevant studies were retrieved through the electronic database searches.

Four electronic databases were searched initially, with a fifth database search to ensure data saturation. Two peer-reviewed journals relevant to the study, the Journal of Dental Education and the European Journal of Dental Education, were searched, which elicited 15 studies. A further three studies were found after hand searching through reference lists of relevant articles already retrieved and another four when updating the search with new papers. Of the 112 articles found and after duplicates were removed, 71 studies were excluded by the first reviewer by title relevance and the exclusion criteria described in Table 2. After independently reviewing the remaining articles, the two reviewers excluded nine additional studies after abstract review. Thirty-two full-text studies were read by both reviewers to decide if the inclusion/exclusion criteria were met, and any disagreements were resolved through discussion and consensus culminating in a final 15 studies accepted for the review.

The studies included qualitative, quantitative and mixed methods. Three studies used online website searches to collate information on the dental school curriculum.[29-32] The majority of studies (10) used questionnaires or surveys to acquire data.[32-40] Two studies, both by Núñez et al, used semi-structured interviews,[41,42] while a further study collected bibliographical data and local information from a selected dental school.[43] Table 3 shows a summary of characteristics of the 15 studies included in the scoping review.

Fourteen articles assessed the content of the undergraduate dental curriculum relating to geriatric education[29-39,41-43] and four articles investigated attitudes, skills and knowledge of ageing or gerodontology.[38-40,42] Two of the studies involved dental students,[38,40] one study graduate dentists,[38,39] eight studies with dental school academic staff[31,33-37,41,42] and four used dental school data.[29,30,32,43] The majority of studies were set in Europe with seven originating from European countries,[29,33,34,36,38-40] three from South America,[35,41,42] two from North America,[30,37] two from Asia[32,43] and a further study from all five continents.[31]

Five themes were highlighted in the studies including (1) gerodontology curriculum content, (2) attitudes, skills and knowledge of undergraduate dental students, (3) didactic teaching, (4) elective and compulsory teaching, and (5) extra-mural learning.

3.1 | Gerodontology curriculum content

Gerodontology curriculum content describes the inclusion of the subject within the dental undergraduate curriculum. Twelve of the 15 studies yielded quantitative data and detailed gerodontology curriculum content of dental schools. Several of the studies were limited in their ability to give accurate summaries of gerodontology curricula due to the sample selection, data collection, poor response rate or limited information in the text.[29,33,34,36,39,41,42] Marchini et al used a convenience sample from selected "world regions"[31] while also adopting a database search to give an estimation about gerodontology. Summarised data from this paper (Table 4) are lacking sufficient objective information that can be compared with other studies. For example, Núñez et al used intentional sampling to include only public universities with gerodontology in the

TABLE 3 Study characteristics of included studies

First author, year, *journal*	Setting/ country/ *Data collection timeframe*	Participants	Study design	Aim	Key findings relevant to undergraduate gerodontology	Quality (using QATSDD approach) %
Attard et al (2018)[40] *European Journal of Dental Education*	University of Malta, Malta *2015-2017*	27 undergraduate dental and 8 dental hygiene students	Online questionnaires	Students' clinical activities and perspectives	55% of the students felt adequate training	50[a]
De Visschere et al (2009)[39] *European Journal of Dental Education*	Six Belgian dental schools *2004-2006*	132 of 357 new graduate dentists	Mailed questionnaires	Impact of undergraduate gerodontology training	Knowledge and attitudes towards ageing is poor.	77
Ettinger et al (2018)[37] *Gerodontology*	US *2016*	Deans or gerodontology teachers 56 of 67 dental schools	Web-based survey	To assess teaching of gerodontology	Wide variation in the teaching of gerodontology.	68
Kitagawa et al (2011)[43] *European Journal of Dental Education*	Japan *Not determined in text*	1 Dental School (Showa University School of Dentistry)	Descriptive and statistical analyses of bibliographical data and local information	An evaluation of geriatric dental education	Fourth year—43 hours. Fifth years—90 clinical hours exclusively for gerodontology.	28
Kossioni et al (2017)[36] *BioMed Central Oral Health*	Europe *2016*	Deans or other contact persons at 216 dental schools across 39 European countries.	Electronic questionnaire emailed to participants	Current status of gerodontology teaching	Gerodontology independent subject in 37.4% of schools, Clinical teaching in 64.2%	73
Léon et al, 2016 [35] *Gerodontology*	Chile *Not determined in text*	Deans from 16 out of 19 Chilean dental schools	Web-based questionnaire	Status of undergraduate gerodontology education	84% teach some aspects 37% formal course in gerodontology. Outreach service-based clinical learning 16%	59
Levy et al (2013)[30] *Journal of Dental Education*	US *Not determined in text*	62 US dental schools	Website searches	Reassess teaching of gerodontology	89% undergraduate gerodontology component. 22.6% clinical component.	55
Marchini et al (2018)[31] *Special Care in Dentistry*	Multiple countries across 5 continents *Not determined in text*	Faculty members from a selection of several countries across 5 continents	Surveys and PubMed database search	Summary of gerodontology in dental schools	Gerodontology as a stand-alone subject is not established in the majority of schools.	41
Nitschke et al (2009)[38] *Gerodontology*	Leipzig, Germany and Zürich, Switzerland *2008*	34 Leipzig undergraduate dental students and 33 Zürich undergraduate dentists	Questionnaire	Evaluation of attitude towards the clinical component of gerodontology programme	Mobile dental van experience rated the highest in positive statements.	36

(Continues)

TABLE 3 (Continued)

First author, year, *journal*	Setting/ country/ *Data collection timeframe*	Participants	Study design	Aim	Key findings relevant to undergraduate gerodontology	Quality (using QATSDD approach) %
Nitschke et al (2013)[34] *Journal of Dental Education*	Austria, Germany, and Switzerland *2004 & 2009*	20 of 37 deans and 87 of 140 department heads of Austria, Swiss, and German dental schools	Mailed questionnaire	Assess changes in undergraduate gerodontology teaching	All Swiss and two of the three Austrian dental schools offered gerodontology seminars. In Germany, six of thirty schools offered this.	59
Nitschke et al (2018)[33] *European Journal of Dental Education*	Austria, Germany, and Switzerland *2004, 2009, 2014*	18 of 35 deans and 66 of 139 department heads of Austria, Swiss and German dental schools	Mailed questionnaire	Assess changes in undergraduate gerodontology teaching	Gerodontology teaching in Switzerland is compulsory and well established. Teaching varied over time in Austria and decreased in Germany.	58
Núñez et al (2017)[41] *Brazilian Journal of Geriatrics and Gerontology*	Brazil, Peru, Argentina, Colombia, and Chile *2015*	20 professors of gerodontology or equivalent	Semi-structured interviews	To analyse the teaching of undergraduate gerodontology curriculum	Teaching is generally aligned with the National Curricular Guidelines.	73
Núñez et al (2019)[42] *Gerodontology*	Brazil, Peru, Argentina, Colombia, and Chile *2015*	20 professors of gerodontology or equivalent and 30 final year undergraduate dental students	Semi-structured interviews	To analyse undergraduate gerodontology teaching characteristics	Insufficient hours dedicated to gerodontology teaching	68
San Martin Galindo et al (2015)[29] *Current Research in Dentistry*	Spain *Not determined in text*	19 Spanish dental schools	Cross-sectional survey of websites	To assess the gerodontology education programmes	Eight of the schools offered a gerodontology course	60
Tahani et al (2019)[32] *Journal of Education and Health Promotion*	Iran *Not determined in text*	18 Iranian dental schools	Cross-sectional survey	To analyse current status of gerodontology education and facilities	Current status in Iran is inadequate. Dental schools ill-equipped for older people	50

[a]Inter-rater agreement percentage larger than 10% interval with both having 12% difference in rater scoring.

TABLE 4 Summary of gerodontology knowledge, attitude, and skills results

Author Response rate	Undergraduate gerodontology curriculum structure	Key findings	Limitations to the study
Attard et al[40] Response rate 90% (undergraduate dental students)	3rd year: 108 contact hrs, 1 session domiciliary visit 4th year: 120 contact hrs, 2 sessions of open clinic, 1 oral diagnosis clinic 5th year: 100 contact hrs, 2 sessions of open clinic, 1 oral diagnosis clinic	60% students felt adequate time at geriatric unit clinical exposure. 54% felt prepared to manage older adults in future 47% expressed emotional difficulties and challenges relating to the patients' care.	The study included 8 dental hygiene students out of the 36 participants 20% of the participants advised of an interest in gerodontology Small cohort and the only school in Malta.
De Visschere et al[39] Response rate 37% (recent graduate dentists)	Great variability for inclusion of gerodontology. Included graduates of 2004, 2005, and 2006	Low mean values for inclusion of gerodontology and also very varied. Low knowledge of gerodontology	The overall response rate was relatively poor at 37%. Large variation in gerodontology education between the schools.
Nitschke et al (2009)[38] 100% response (undergraduate dental students)	Leipzig (Germany): Introductory lectures 2nd year Extra-mural placement 3rd and 4th year 4th year elective lectures Zürich (Switzerland): 4th year: 10 h lectures 4-day clinical placement at the gerodontology outpatient clinic. 3 d with dental van 3 d at acute geriatric ward 5th year: 6 h seminars 15-hour elective revision course five weeks	Greatest positive answers came from the mobile van. Least positive answers came from the ward round placement at the acute geriatric ward.	Guiding questions used for survey. No control results to compare students not exposed to the programmes.
Núñez et al (2019)[42] Response rate 82% (professors/ equivalent and final year undergraduate dental students)	Argentina: 60 h gerodontology theory/practical Brazil (3 schools): 90 h "Integrated gerodontology clinic" theory/ practical 120 h theory/practical 54 h theory Chile (2 schools): 64 h theory/practical 81 h theory/practical Colombia: 152 h "Seniors" adult clinic theory/ practical Peru (2 schools): 87 h theory/practical 170 h "Integrated geriatric clinic" theory/ practical	Theory only gerodontology resulted in less interest with a need to allow for greater student participation. Short amount of time devoted to gerodontology insufficient to teach the content.	Intentionally selected 11 schools (9 participated) but not clear how the schools were similar in their gerodontology training and not accounting for what could be large variations. Not clear definitions of what an integrated gerodontology clinic is compared to an integrated geriatric clinic or Seniors adult clinic. Different languages used and online interviews.

curriculum,[41] stating that similar or equivalent to gerodontology met the inclusion criteria. The definition of what is similar or equivalent to gerodontology, however, was not included in the text.

Response rates varied considerably between countries, and there were two studies with no reported response rate due to either lack of information detailed in the paper[41] or due to the design of the study not necessitating responses from a third party[31] (Table 5). Kossioni et al listed responses from 29 countries in Europe with a mixed response rate ranging from 12.5% to 100%. Eleven countries did not respond to the emailed questionnaires. Although there were a large number of schools participating in the survey, information summarising numbers with tabulation of undergraduate gerodontology curriculum by geographical area showed that Northern Europe had the highest prevalence of undergraduate gerodontology with 93% and Southern Europe the lowest with 82%.[36]

Thirteen of the fifteen papers concluded that current gerodontology undergraduate curricula were inadequate[29-38,40-42] to support the needs of growing older populations. Multiple papers did not state if countries included elective or compulsory components in the course, whether there was extra-mural learning, or whether gerodontology was a stand-alone course (Table 5). In general, the inclusion of gerodontology in dental schools varied widely and reliable

TABLE 5 Summary of gerodontology curriculum content results

Country	Author, *response rate if applicable %*	Dental Schools including Gerodontology	Elective or compulsory components	Service-based/extra-mural learning	Stand-alone course
Austria	Nitschke et al (2013)[5] *66.6%* Nistchke et al (2018)[33]* *25%*	Not stated Not stated*	33.3% mandatory didactic 50% didactic*	33.3% 0%*	Not stated Not stated*
Australia	Marchini et al[31]	92%	Not stated	Not stated	Not stated
Argentina	Núñez et al (2017)[2]	Not stated	Not stated	Not stated	Not stated
Belgium	De Visschere et al,[39] *(37% of graduates from all of the 6 dental schools)* Kossioni et al[36] **40%*	68.2% 100%*	Not stated Not stated*	Not stated Not stated*	15.8% Not stated*
Brazil	Núñez 2017 Marchini et al[31]*	Not stated Not stated*	Not stated Not stated*	Not stated Not stated*	Not stated 27.7%*
Canada	Marchini et al[31]	100%	Not stated	50% (optional)	10%
Chile	Núñez et al (2019)[42] León et al,* *100%*	Not stated 84%*	Not stated 5% elective lectures*	Not stated 16%*	Not stated 32%*
China	Marchini et al[31]	3.3%	Not stated	Not stated	0.6%
Colombia	Núñez et al (2017)[41]	Not stated	Not stated	Not stated	Not stated
Croatia	Kossioni et al[36] *100%*	100%	Not stated	Not stated	Not stated
Denmark	Kossioni et al, [36] *100%*	100%	Not stated	Not stated	Not stated
Estonia	Kossioni et al, [36] *100%*	100%	Not stated	Not stated	Not stated
Finland	Kossioni et al[36] *100%*	100%	Not stated	Not stated	Not stated
FYORM	Kossioni et al[36] *100%*	100%	Not stated	Not stated	Not stated
Germany	Nitschke (2013)[5] *53.3%* Nitschke (2018)[33] * *51.9%*	Not stated 35.7%*	23% mandatory didactic 12%*	33.3% 20%*	Not stated Not stated*
Greece	Marchini et al[31] Kossioni et al[36] ** 100%*	100% 100%*	Not stated Not stated*	Not stated Not stated*	Not stated Not stated*
Hungary	Kossioni et al[36] *50%*	100%	Not stated	Not stated	Not stated
Iceland	Kossioni et al[36] *100%*	Not stated	Not stated	Not stated	Not stated
Iran	Tahani et al (2019)[32] *61.1%*	72.7%	Not stated	9%	72.7%
Ireland	Kossioni et al[36] *100%*	100%	Not stated	Not stated	Not stated
Italy	Kossioni et al[36] *31.4%*	Not stated	Not stated	Not stated	Not stated
Japan	Marchini et al[31]	100%	Not stated	82.8% (optional)	Not stated
Lithuania	Kossioni et al[36] *100%*	Not stated	Not stated	Not stated	Not stated
Malta	Kossioni et al[36] *100%* Attard* *100%*	100% 100*	Not stated 100%*	Not stated 100%*	Not stated 100%*
Moldova	Kossioni et al[36] *100%*	Not stated	Not stated	Not stated	Not stated

(Continues)

TABLE 5 (Continued)

Country	Author, *response rate if applicable %*	Dental Schools including Gerodontology	Elective or compulsory components	Service-based/extra-mural learning	Stand-alone course
Netherlands	Kossioni et al[36] *100%*	100%	Not stated	Not stated	Not stated
Nigeria	Marchini et al[31]	0%	0%	0%	0%
Norway	Kossioni et al[36] *100%*	100%	Not stated	Not stated	Not stated
Peru	Núñez et al (2017)[41]	Not stated	Not stated	Not stated	Not stated
Poland	Kossioni et al[36] *40%*	100%	Not stated	Not stated	Not stated
Portugal	Kossioni et al[36] *42.9%*	Not stated	Not stated	Not stated	Not stated
Romania	Kossioni et al[36] *40%*	Not stated	Not stated	Not stated	Not stated
Serbia Kossioni	Kossioni et al[36] *50%*	100%	Not stated	Not stated	Not stated
Slovakia	Kossioni et al[36] *50%*	100%	Not stated	Not stated	Not stated
Spain	Kossioni et al[36] *65.7%* San Martin Galindo* *100% (web-based information)*	Unclear (some schools teach it in prosthodontics or pathology dept) Not stated*	Not stated 75% mandatory*	Not stated 5.2%*	Not stated 42.1%*
South Africa	Marchini et al[31] *unknown*	20%	Not stated	Not stated	0%
Sweden	Kossioni et al[36] *75%*	100%	Not stated	Not stated	Not stated
Switzerland	Kossioni et al[36] *100%* Nitschke (2013)[5*] *50%* \ Nitschke (2018)[33**] *75%*	100% 100%* 100%**	Not stated 100% mandatory didactic with 25% offering didactic only* 100%**	Not stated 75%* (optional) 75%**	Not stated 100%* Not stated**
UK	Kossioni et al[36] *58.8%*	100%	Not stated	Not stated	Not stated
Ukraine	Kossioni et al[36] *12.5%*	Not stated	Not stated	Not stated	Not stated
USA	Levy et al (2013)[30] *100% (web-based information)* Ettinger et al (2018)[37] **83.6%* Marchini et al[31] **	89% 100%* Not stated**	81% mandatory Didactic 92.8% mandatory didactic* 57.1% mandatory clinical* Not stated**	22.6% (optional) Not stated* Not stated**	Not stated 62.5%* Not stated**

information regarding the content was difficult to gain due to poor response rates and lack of data.

3.2 | Attitudes, knowledge and skills of undergraduate dental students

The papers reporting on attitudes, skills and knowledge (Table 3) used varied methods to obtain data. De Visschere et al (2009) utilised the Ageing Semantic differential[44] and Palmore's. Facts on Ageing Quiz,[45] Nitschke et al (2009) and Attard et al (2018) used questionnaires, and Núñez et al (2019) collected data through interviews. The countries included in these papers comprised of Malta,[40] Belgium,[39] Germany and Switzerland,[38] Argentina, Colombia, Chile, Brazil and Peru.[42]

Attard et al (2018) found that 47% of students who commented about clinical placement at a geriatric unit experienced emotional difficulties. The authors attributed this to reduced exposure to older

patients during the curriculum in comparison to dental hygiene students who immediately manage frail, challenging older patients.[40] Conversely, Núñez et al (2019) found that students' attitude to older patients was positive.[42] The survey by De Visschere et al (2009) of recently graduated dentists revealed there was no impact on attitude to institutionalised older people basing this result on 8% of the total respondents.[39] Nitschke et al (2009) reported varied results regarding student attitudes to older patients dependent on the programme the students studied.[38] The Leipzig students experienced more feelings of pity and mental strain compared to the Zürich students, with the authors relating this to the Leipzig students being unable to provide treatment to residents and just monitoring the patients' deterioration of health.[38]

Assessment of students' knowledge of ageing by De Visschere et al (2009) was not based on their knowledge of gerodontology.[46] The paper found that Belgian students' knowledge of ageing was low with only 50% of the questions answered correctly[39] which is comparable to the study from the only dental school in Malta which revealed 55% of students felt prepared to manage older patients after their clinical training.[40] In an indirect exploration of students' knowledge, Núñez et al (2019) reported that gerodontology professors (or equivalent) and final-year dental students regarded the short time allocation to the subject as a weakness in the learning process.[42] With regard to the current status of geriatric teaching, they found that when the subject was taught only theoretically, there was less interest from students, and therefore, there was a need for varying the learning methods to allow more student engagement.[38,40,42] While there was conflicting evidence supporting the inclusion of gerodontology in the curriculum, overall this review found that greater time devoted to teaching the subject and increased clinical exposure impacted positively on attitudes, skills and knowledge.

3.3 | Didactic teaching

A common finding when reporting on teaching of gerodontology was that didactic teaching was often the technique utilised by dental schools.[29,32-38,43] This review is unable to report the number of schools using didactic teaching as several papers lacked this information and often only the mode of learning in the subject was discussed.[29-31,34-37] Although it was more common to find schools teaching gerodontology using lectures, the time allocated varied at different schools and the inclusion as an independent subject was not clear as some aspects of gerodontology were taught in other subjects.[30,31,33-35,37]

3.4 | Elective vs compulsory teaching

Seven papers reported on the percentage of dental schools providing a mandatory gerodontology teaching component in the undergraduate curriculum.[29,30,34-37,40] The number varied considerably depending on country, with the highest result from Switzerland and Malta at 100%[34,40] and the lowest from Nigeria at 0%.[31] The study from Spain reported 75% of schools included gerodontology education as a mandatory requirement; however, the actual result based on the number of schools in total is calculated at only a third of all schools (Table 5).[29]

3.5 | Extra-mural learning

Nine papers reported on extra-mural learning of gerodontology in the undergraduate curriculum in Europe, Iran, Chile and the US.[29,30,32-36,38,40] Elective extra-mural training components of gerodontology were reported to be offered by four countries: 50% of Canadian schools,[31] 83% of Japanese,[31] 23% of North American[30] and 75% of Swiss dental schools.[34]

In Europe, 27% of dental schools were found to offer clinical training in outreach facilities[36] which was similar to US schools at 23%.[30] The US results., however, were not specific about extra-mural placements and described the clinical component as "specific clinical experience with older adults" not including regular clinic time.[30] European results from Kossioni et al (2017) should be considered with the knowledge there are wide variations within countries as shown by results from Spain, which although reporting 13% of schools included extra-mural learning, in reality, it was only 5% when taking into account the total number of schools (Table 5).[29] Two papers concentrating studies on Switzerland, Austria and Germany found results varied depending on the year of publication with 20% of German schools offering extra-mural activities in 2018 compared with 33% in 2013 and 78% in 2009.[33,34] Similarly, varied results were reported for Austria from 0% in 2009 to 33% in 2013 and 0% in 2018 and Switzerland remaining static at 75% across 2009, 2013 and 2018.[33,34]

Two studies evaluated specific programmes which included extra-mural learning assessing attitudes and knowledge as a result of gerodontology programmes.[38,40] Nitschke et al (2009) found that the use of mobile training vans elicited positive ratings with Attard et al (2018) similarly indicating that placements in the geriatric unit elicited high approval responses.

Overall results from the included papers in the scoping review have highlighted a large variation in the methodologies, presentation of data and findings. While all of the papers in the study emphasised a greater need for the inclusion of gerodontology content in the undergraduate dental curriculum, only one study found that the knowledge and attitude of dentists to older people were not influenced by their learning experience.[39]

4 | DISCUSSION

This review of 15 papers has described the current status of gerodontology in the undergraduate dental curriculum. It has been widely acknowledged that the inclusion of gerodontology education in dental schools varies in content which may or may

not include clinical exposure to older patients.[5] This review found there are limited studies available which have reported the inclusion of gerodontology content in dental schools, and there is very little research currently investigating the attitudes, knowledge and skills of dental professionals towards gerodontology and education.

A comparison of the literature proved challenging due to a lack of linear definitions for what constitutes inclusion of gerodontology in a programme and the great variability in how gerodontology is included as a discipline of dentistry. There does not appear to be standardisation in programmes for the definition of the older patient, and this in itself needs to be taken into account when reviewing literature on gerodontology. Studies including gerodontology with "similar/equivalent"[41] did not define what the similar or equivalent content was. Commonly, gerodontology will find itself under the registered speciality umbrella of Special Needs Dentistry or Special Care Dentistry leading to a dilution of information when attempting to identify how much content is dedicated to gerodontology.[47-49] Difficulties with collection of data regarding curriculum content due to the limited information available were recognised,[43] and the numbers for clinical training noted errors in accuracy as students treating older, medically compromised patients on general clinics may not have been taken into account.[30]

The volume and content of gerodontology in the undergraduate curriculum varied widely within countries dental schools and across countries. Even within dental schools, longitudinal studies demonstrated that the content changed, and the percentage of time allocated to gerodontology was declining.[33,34] This review showed the disconnect between the need for population health to have greater inclusion of educational action for gerodontology[1,9,50] and what is actually being delivered to dental students.[5,51] Factors needing to be taken into account when interpreting the available literature included the varied economic and geographic factors, which influenced the authors' choice of participants. Several countries differentiated between the public and private dental schools [29,41,42] as well as grouping countries into zones.[36,41,42]

The overwhelming majority of authors advocated for an increase in gerodontology content in the curriculum to address the oral health needs of a growing frail and care-dependent population of older patients. The one paper identifying a lack of support for altered knowledge and attitudes towards ageing by recently graduated dentists acknowledged the large variation of gerodontology education between the dental schools in Belgium.[39] This paper, however, used only data from students who had participated in an oral health promotion training programme at one university to make the statement "this study revealed no impact of a dental undergraduate curriculum on knowledge on ageing, neither on attitude towards institutionalised elderly people as perceived by recently graduated dentists".[39] In contrast, the Nitschke et al (2009) study, with students who were able to provide treatment to older patients and students who were not able to participate, found that attitudes had improved with clinical-based learning.[38] The assessment quiz used by De Visschere et al (2009) to gain information on graduates' knowledge on ageing was not based on their knowledge of gerodontology but on general ageing and has been found to be unsuitable for use in health professional education.[46]

Results from the review have highlighted a paucity of literature in gerodontology education and a need for a standardisation of what defines inclusion of gerodontology in a dental curriculum. A call for greater inclusion of gerodontology in the dental curriculum is notable and consistent with current global opinion of experts in the field.[52,53] There is a need to address a growing population of dentate older people with oral health problems as well as the ability to provide a dental workforce equipped to manage this group. Although this scoping review investigated the dental curriculum according to papers from 2009,[54-57] it is important to note that the issues highlighted have been reported for several decades prior to this, with no evidence that the dental profession or educational institutions are moving towards addressing these problems.

A limitation of this study was the inclusion of papers with varied methodologies; however, the data surrounding education are usefully analysed by assessment of information that includes both qualitative and quantitative data. Another limitation of the study was the varying definitions of what constituted as inclusion of gerodontology by dental schools in the curriculum, as well as the data collection period for studies not being defined in the inclusion criteria.

5 | CONCLUSION

The current status of gerodontology in the dental curriculum varies globally and also between dental schools within a country, with a lack of stipulation for countries to include gerodontology as a core subject appearing to be a major barrier to implementation. There are a limited number of dental schools offering extramural clinical learning experiences. The majority of countries have insufficient gerodontology content in undergraduate training to align with the needs or a growing older, frail and care-dependent population. The need for greater emphasis on this subject as part of undergraduate learning has been identified and advocated over many years; however, the dental profession, educational institutions and public policymakers have yet to move forward with reaching the actions needed to sustain our growing older dentate population.

Limited literature was found which investigated the educational outcomes of undergraduate gerodontology education with a lack of comprehensive information available to give accurate summaries of gerodontology content in dental schools. The review found insufficient gerodontology content in the undergraduate curriculum and a need for national and international guidelines to ensure mandatory inclusion of specific gerodontology training to prepare graduates for a growing dentate frail and care-dependent population. This scoping review therefore provides the evidence to support the recommendation for greater inclusion of gerodontology in undergraduate dental education with curricular guidelines and standards for entry-to-practice dental programmes. A broader review to capture

historical changes over a longer period would be a useful addition to the literature for comparison of gerodontology education.

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CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

AUTHOR CONTRIBUTION

Dr Angie Nilsson designed the study, completed data collection, analysed the data and drafted the paper. A/Prof Louise Young assisted with the design of the study and provided extensive feedback and editing of the paper with final approval of the version to be published Prof Beverley Glass A/Prof Louise Young and A/Prof Andrew Lee assisted with the design of the study and provided feedback and editing of the paper with final approval of the version to be published.

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Appendix 2. Electronic database search strategy

Database	Search terms
CINAHL	((MH ‘Dental Health Education’) OR (MH ‘Dental Care for Aged/ED’) OR (MH ‘Students, Dental Hygiene/ED’) OR (MH ‘Students, Dental/ED’) OR (MH ‘Dental Hygienist Attitudes/ED’) OR (MH ‘Education, Dental Hygiene/ED’) OR (MH ‘Education, Dental/ED’) OR ‘dental curriculum OR dental student OR oral health OR dental health education OR dental health AND (older adults or elderly or seniors or geriatrics)’ OR (MH ‘Health Services for the Aged/ED’) OR (MH ‘Dental Clinics/ED’) OR (MH ‘Schools, Dental/ED’) OR (MH ‘American Dental Hygienists Association/ED’) OR (MH ‘Faculty, Dental/ED’) OR (MH ‘Oral Health/ED’)) AND aged care
ERIC	‘geriatric’, ‘dentistry’, ‘dental’
Google Scholar	‘gerodontology’, ‘geriatric’, ‘older adults’, ‘aged’, ‘elderly’, ‘frail’, ‘dental’, ‘education’, ‘curriculum’, ‘school’, ‘students’
Scopus	‘gerodontology’, ‘education’, ‘older adults’, ‘dental curriculum’, ‘geriatric’
Web of Science	‘gerodontology’, ‘geriatric dental education’

Appendix 3. Included Study Characteristics

First author, year, *journal*	Setting/ Country	Participants	Study design	Aim	Major findings relevant to undergraduate gerodontology	Quality (using QATSDD approach) %
Attard et al., 2018 ***European Journal of Dental Education***	University of Malta, Malta	27 undergraduate dental and 8 dental hygiene students	Online questionnaires collected between 7/15 and 3/17	To report the students' clinical activities and perspectives on their undergraduate experience.	55% of the students felt adequate training to manage all older patients. 20% students would pursue further studies in the field	50*
De Visschere et al., 2009 ***European Journal of Dental Education***	Six Belgian dental schools	132 of 357 new graduate dentists	Mailed questionnaires	To assess the impact of undergraduate gerodontology training on knowledge of ageing and on attitudes towards institutionalised older people, as perceived by recent graduates.	There are significant differences among Belgian dental schools in geriatric dental education. Attitudes of recent graduate dentists are negative, and knowledge of ageing is poor.	77
Ettinger et al., 2018 ***Gerodontology***	US	Deans or geriatric dentistry teachers of 56 out of 67 dental schools	Web based survey	To assess teaching of geriatric dentistry in US dental schools and compare with previous reports.	There is wide variation in the teaching of gerodontology. 57.1% of schools reported some form of compulsory clinical education in gerodontology.	68
Kitagawa et al., 2011	Japan	Showa University School of Dentistry	Descriptive and statistical analyses of bibliographical	An evaluation of geriatric dental education at Showa	The school's geriatric program delivered 43 hours in the fourth year.	28

European Journal of Dental Education			data and local information	University School of Dentistry.	Fifth years are assigned 90 clinical hours exclusively for geriatric dentistry.	
Kossioni et al., 2017 ***BioMed Central Oral Health***	Europe	Deans or other contact persons at 216 dental schools across 39 European countries.	Electronic questionnaire emailed to participants	To investigate the status of gerodontology teaching amongst European dental schools	Gerodontology was taught as an independent subject in 37.4% of schools, clinical teaching took place in 64.2% with 26.8% offering this in outreach facilities	73
Léon et al., 2016 ***Gerodontology***	Chile	Deans from 16 out of 19 Chilean dental schools	Web-based questionnaire	To identify the status of undergraduate geriatric dentistry education among all Chilean dental schools	84% reported teaching some aspects of geriatric dentistry. 37% of the schools gave a formal course in geriatric dentistry. Outreach service-based clinical learning was reported by 16% of all the schools	59
Levy et al., 2013 ***Journal of Dental Education***	US	62 US dental schools	Website searches	To reassess what is being taught in US dental schools in terms of older adult dental care, evaluate if more time is needed to prepare future dentists and to make suggestions for the dental curriculum	89% listed an undergraduate gerodontology component with 22.6% of all schools listing a clinical component. There was wide variation in course content and volume	55
Marchini et al., 2018	Multiple countries	Faculty members from	Surveys and PubMed	To summarise how geriatric	There is great variation in content	41

Special Care in Dentistry	across 5 continents	a selection of several countries across 5 continents	database search	dentistry has been addressed in dental schools and to provide information to aid educators in development of gerodontology programs	of gerodontology in the curriculum. Geriatric dentistry as a stand-alone subject is not established in most schools	
Nitschke et al., 2009 ***Gerodontology***	Leipzig, Germany and Zürich, Switzerland	34 Leipzig undergraduate dental students and 33 Zürich graduate dentists	Questionnaire	To evaluate undergraduate students' attitude towards the clinical component of gerodontology program in Leipzig and Zürich	Close collaboration with dental tutors and mobile dental service clinical training was rated the highest in positive statements	36
Nitschke et al., 2013 ***Journal of Dental Education***	Austria, Germany, and Switzerland	20 of 37 deans and 87 of 140 department heads of Austria, Swiss, and German dental schools	Mailed questionnaire	To assess changes in undergraduate gerodontology teaching in German-speaking countries between 2004 and 2009	All Swiss and two of the three Austrian dental schools offered gerodontology seminars. In Germany, six of thirty schools offered this. Service-based learning was available to three quarters of Swiss students and one third of Austrian and German students.	59
Nitschke et al., 2018 ***European Journal of***	Austria, Germany, and Switzerland	18 of 35 deans and 66 of 139 department heads of Austria, Swiss	Mailed questionnaire	To assess changes in undergraduate gerodontology teaching in German-	Switzerland has firmly established teaching of gerodontology where the subject is compulsory. The	58

Dental Education		and German dental schools		speaking countries between 2004 and 2014	only practical course offered in 2009 for Austrian students was not reported in 2014. There was a sharp decline from 2009 of schools in Germany offering didactic and/or practical teaching with 12 % offering dedicated lectures	
Núñez et al., 2017 ***Brazilian Journal of Geriatrics and Gerontology***	Brazil, Peru, Argentina, Colombia, and Chile	20 professors of geriatric dentistry or equivalent	Semi-structured interviews	To analyse the teaching of undergraduate gerodontology from the perspective of the National Curricular Guidelines in South American Countries	Teaching of dentistry in the five South American countries are generally aligned with the National Curricular Guidelines	73
Núñez et al., 2019 ***Gerodontology***	Brazil, Peru, Argentina, Colombia, and Chile	20 professors of geriatric dentistry or equivalent and 30 final year undergraduate dental students	Semi-structured interviews	To analyse undergraduate gerodontology teaching characteristics identified by geriatric dentistry teachers and senior students	Students felt there were insufficient hours dedicated to gerodontology teaching and felt a need for a greater practical learning component and	68
San Martin Galindo et al., 2015 ***Current Research in Dentistry***	Spain	19 Spanish dental schools	Cross-sectional survey of websites	To assess the geriatric dentistry education programs in all 19 Spanish dental schools.	Eight of the schools offered a gerodontology course one of which offered a clinical component. No school offered service-based	60

					learning at remote locations for older adults	
Tahani et al., 2019 ***Journal of Education and Health Promotion***	Iran	18 Iranian dental schools	Cross-sectional survey	To analyse current status of geriatric education and facilities	Current status in Iran is inadequate. Dental schools ill-equipped for older people	50

Appendix 4. Summary of gerodontology curriculum content results

Country	Author, ***response rate if applicable %***	Dental Schools including Gerodontology	Elective or compulsory components	Service-based/extra-mural learning	Stand-alone course
Austria	Nitschke 2013 *66.6%* Nistchke 2018* *25%*	Not stated Not stated*	33.3% mandatory didactic 50% didactic*	33.3% 0%*	Not stated Not stated*
Australia	Marchini	92%	Not stated	Not stated	Not stated
Argentina	Núñez 2017	Not stated	Not stated	Not stated	Not stated
Belgium	De Visschere *(37% of graduates from all of the 6 dental schools)* Kossioni* *40%*	68.2% 100%*	Not stated Not stated*	Not stated Not stated*	15.8% Not stated*
Brazil	Núñez 2017 Marchini*	Not stated Not stated*	Not stated Not stated*	Not stated Not stated*	Not stated 27.7%*
Canada	Marchini	100%	Not stated	50% (optional)	10%
Chile	Núñez 2017	Not stated	Not stated	Not stated	Not stated

	León* *100%*	84%*	5% elective lectures*	16%*	32%*
China	Marchini	3.3%	Not stated	Not stated	0.6%
Colombia	Núñez 2017	Not stated	Not stated	Not stated	Not stated
Croatia	Kossioni *100%*	100%	Not stated	Not stated	Not stated
Denmark	Kossioni *100%*	100%	Not stated	Not stated	Not stated
Estonia	Kossioni *100%*	100%	Not stated	Not stated	Not stated
Finland	Kossioni *100%*	100%	Not stated	Not stated	Not stated
FYORM	Kossioni *100%*	100%	Not stated	Not stated	Not stated
Germany	Nitschke 2013 *53.3%* Nitschke 2018* *51.9%*	Not stated 35.7%*	23% mandatory didactic 12%*	33.3% 20%*	Not stated Not stated*
Greece	Marchini Kossioni* *100%*	100% 100%*	Not stated Not stated*	Not stated Not stated*	Not stated Not stated*
Hungary	Kossioni *50%*	100%	Not stated	Not stated	Not stated
Iceland	Kossioni *100%*	Not stated	Not stated	Not stated	Not stated
Iran	Tehani *61.1%*	72.7%	Not stated	9%	72.7%
Ireland	Kossioni *100%*	100%	Not stated	Not stated	Not stated
Italy	Kossioni *31.4%*	Not stated	Not stated	Not stated	Not stated
Japan	Marchini	100%	Not stated	82.8% (optional)	Not stated
Lithuania	Kossioni *100%*	Not stated	Not stated	Not stated	Not stated
Malta	Kossioni *100%* Attard* *100%*	100% 100*	Not stated 100%*	Not stated 100%*	Not stated 100%*
Moldova	Kossioni *100%*	Not stated	Not stated	Not stated	Not stated
Netherlands	Kossioni *100%*	100%	Not stated	Not stated	Not stated
Nigeria	Marchini	0%	0%	0%	0%
Norway	Kossioni *100%*	100%	Not stated	Not stated	Not stated
Peru	Núñez 2017	Not stated	Not stated	Not stated	Not stated
Poland	Kossioni *40%*	100%	Not stated	Not stated	Not stated
Portugal	Kossioni *42.9%*	Not stated	Not stated	Not stated	Not stated
Romania	Kossioni *40%*	Not stated	Not stated	Not stated	Not stated
UK	Kossioni *58.8%*	100%	Not stated	Not stated	Not stated

Ukraine	Kossioni *12.5%*	Not stated	Not stated	Not stated	Not stated
USA	Levy *100% (web-based information)* Ettinger* *83.6%* Marchini**	89% 100%* Not stated**	81% mandatory didactic 92.8% mandatory didactic* 57.1% mandatory clinical* Not stated**	22.6% (optional) Not stated* Not stated**	Not stated 62.5%* Not stated**
Serbia	Kossioni *50%*	100%	Not stated	Not stated	Not stated
Slovakia	Kossioni *50%*	100%	Not stated	Not stated	Not stated
Spain	Kossioni *65.7%* San Martin Galindo* *100% (web-based information)*	Unclear (some schools teach it in prosthodontics or pathology dept) Not stated*	Not stated 75% mandatory*	Not stated 5.2%*	Not stated 42.1%*
South Africa	Marchini *unknown*	20%	Not stated	Not stated	0%
Sweden	Kossioni *75%*	100%	Not stated	Not stated	Not stated
Switzerland	Kossioni *100%* Nitschke 2013* *50%*	100% 100%* 100%**	Not stated 100% mandatory didactic with 25% offering didactic only* 100%**	Not stated 75%* (optional) 75%**	Not stated 100%* Not stated**

	Nitschke 2018** *75%*				

Appendix 5. Summary of gerodontology knowledge, attitude, and skills results

Author Response rate	Undergraduate gerodontology curriculum structure	Key findings	Limitations to the study
Attard et al. **Response rate 90% (undergraduate dental students)**	3rd year: 108 contact hrs with 1 session for removable prosthodontics and 1 session open clinic (domiciliary visit) 4th year: 120 contact hrs with 2 sessions of open clinic and 1 oral diagnosis clinic 5th year: 100 contact hrs with 2 sessions of open clinic and one oral diagnosis clinic	• 60% students felt adequate time at geriatric unit clinical exposure. 54% felt prepared to manage all types of older adults in future • 42% commented on extra-mural placement and 47% out of those expressed emotional difficulties and challenges relating to the patients' care. • Four major themes for barriers were; -Patient management -Dental treatment -Patient compliance	The study included 8 dental hygiene students out of the 36 participants, however, the response rate was high (90%) therefore the sample is likely to be representative of dental students. 20% of the participants advised of an interest in gerodontology and therefore potentially biased results. Small cohort as the one of the smallest dental schools in the world and the only one in Malta.
De Visschere et al. **Response rate 37% (recent graduate dentists)**	Great variability between all the dental students for inclusion of gerodontology. The study included exposure to gerodontology	• Low mean values for inclusion of gerodontology and very varied. • Low knowledge of geriatric dentistry.	The overall response rate was relatively poor at 37%. Limited power of 25% to detect an attitude difference of 0.15 when comparing four

	curriculum for graduates of 2004, 2005, and 2006	• Knowledge of and attitudes of dentists towards institutionalised older people were not influenced by their collaboration with a nursing home	different curriculum groups. Large variation in geriatric dentistry education between the schools.
Nitschke et al., 2009 **100% response (undergraduate dental students)**	**Leipzig (Germany):** Introductory lectures 2nd year Extra-mural placement 3rd and 4th year 4th year elective lectures **Zürich (Switzerland):** 10 hours lectures 4th year After lecture completion students attend a four-day clinical placement at the gerodontology outpatient clinic. Then three days with dental van extra-mural placement to RACFs (exam and treatment). Then three days at acute geriatric ward doing exams/screening on new patients. 5th year 6 hours of seminars doing case studies with heads of gerodontology and special care.	• Greatest positive answers came from the mobile van. Least positive answers came from the ward round placement at the acute geriatric ward (boring and one-sided). • Mental strain and feelings of pity towards patients increased with Leipzig students, possible due to the frequent monitoring of deterioration of oral health without being able to assist.	Guiding questions used for survey. No control results to compare students not exposed to the programs.

	5th year elective revision course 15 hours over five weeks.		
Núñez et al., 2019 **Response rate 82% (professors/equivalent and final year undergraduate dental students)**	Argentinian, Brazilian, Chilean, Colombian and Peruvian public dental schools that teach gerodontology or a geriatric related subject as required subject in both theory and practical. **Argentina:** 60 hours gerodontology theory/practical **Brazil (3 schools):** 'Integrated gerodontology clinic' theory/practical 90 hours Gerodontology 120 hours theory/practical Gerodontology 54 hours theory **Chile (2 schools):** Gerodontology 64 hours theory/practical Gerodontology 81 hours theory/practical **Colombia:** 'Seniors' adult clinic 152 hours theory/practical	• Theory-only gerodontology resulted in less interest with a need to allow for greater student participation. • Short amount of time devoted to gerodontology insufficient to teach the content. • Should include varied settings and more contact with older people. • Few professors were trained in special care/gerodontology, but all expressed an affinity for older people.	Intentionally selected 11 schools (9 participated) but not clear how the schools were similar in their gerodontology training and not accounting for what could be large variations. Unclear definitions of what an integrated gerodontology clinic is compared to an integrated geriatric clinic or senior's adult clinic. Different languages used and online interviews. Results not discussed with much detail and the discussion section more of background rather than discussion about results.

	Peru (2 schools): Gerodontology 87 hours theory/practical 'Integrated geriatric clinic' 170 hours theory/practical		

Appendix 6. Australian Dental Council (ADC) professional competencies of the newly qualified dentist 48

Professional competencies
Domain description 1: Professionalism covers personal values, attitudes, and behaviours
1. demonstrate that patient safety is paramount in all decisions and actions
2. demonstrate appropriate caring behaviour towards patients and respect professional boundaries between themselves and patients, patient's families, and members of the community
3. demonstrate that all interactions focus on the patient's best interests and provide patient-centred care, respect patients' dignity, rights, and choices
4. recognise professional and individual scopes of practice
5. recognise the importance of continuing professional development for all members of the dental team
6. understand the ethical principles and their application underpinning the provision of dental care
7. understand Commonwealth, State and Territory legislation relevant to practise as a dental practitioner 8. understand the principles of efficient, effective, and equitable utilisation of resources, and recognise local and national needs in health care and service delivery across Australia's geographical areas
9. provide culturally safe and culturally competent practice that includes recognition of the distinct needs of Aboriginal and Torres Strait Islander peoples in relation to oral health care provision
Domain description 2. Communication and Leadership covers the ability to work cooperatively and to communicate effectively
1. communicate and engage with patients, patient's families, and communities in relation to oral health
2. present clear information in a timely manner that ensures patients are advised of and understand care and treatment options to be provided

3. communicate with other health professionals involved in patients' care

4. engage in mentor/mentee activities and leadership within a health care team

5. recognise the importance of one's own, colleagues' and team members' health to occupational risks and its impact on the ability to practise

6. understand the importance of intra and interprofessional approaches to health care

7. understand effective information management

8. understand the principles of dispute resolution

9. communicate responsibly and professionally when using media

Domain description 3. Critical Thinking covers the acquisition and application of knowledge

1. locate and evaluate evidence in a critical and scientific manner to support oral health care

2. apply clinical reasoning and judgement in a reflective practice approach to oral health care

3. understand scientific method and the role of research in advancing knowledge and clinical practice

Domain description 4. Health Promotion covers health education and the promotion of health in the community:

1. understand the determinants of health, risk factors and behaviours that influence health

2. understand the theories and principles of health promotion

3. understand health promotion strategies to promote oral and general health

4. understand the design, implementation, and evaluation of evidence-based health promotion

Domain description 5. Scientific and Clinical Knowledge covers the underlying knowledge base required by dental practitioners:

1. understand the biomedical, physical, and behavioural sciences in relation to oral health and disease

2. understand the theories and principles of population oral health

3. understand the scientific principles and application of infection prevention and control

4. understand the scientific basis, application, and risks of using ionising radiation

5. understand the scientific basis, application, limitations, and risks of using dental materials

6. understand the principles of pharmacology, the risks, and limitations in using therapeutic agents and the implication of the Prescribing Competencies Framework on dental practice

7. understand the principles of risk management and quality improvement

Domain description 6. Patient Care:

6.1 Clinical Information Gathering

1. obtain and record a relevant history of the patient's medical, social, and oral health status

2. perform an examination for health, disease and abnormalities of the dentition, mouth, and associated structures

3. select necessary clinical, pathology and other diagnostic procedures and interpret results

4. take radiographs relevant to dental practice

5. evaluate individual patient risk factors for oral disease

6. maintain accurate, consistent, legible, and contemporaneous records of patient management and protect patient privacy

6.2 Diagnosis and Management Planning covers the identification of disease or abnormalities that require treatment or investigation

1. recognise health as it relates to the individual

2. diagnose disease or abnormalities of the dentition, mouth and associated structures and identify conditions which require management

3. determine the impact of risk factors, systemic disease and medications on oral health and treatment planning

4. formulate and record a comprehensive, patient-centred, evidence-based oral health treatment plan

5. determine when and how to refer patients to the appropriate health professional

6. obtain and record patient informed consent and financial consent for treatment

6.3 Clinical Treatment and Evaluation covers the provision of evidence-based patient-centred care

1. apply the principles of disease and trauma prevention and early intervention in the management of the dentition, mouth, and associated structures

2. apply the principles of behaviour management

3. manage a patient's anxiety and pain related to the dentition, mouth, and associated structures

4. manage surgical and non-surgical treatment of diseases and conditions of the periodontium and supporting tissues of the teeth or their replacements

5. manage surgical and non-surgical treatment of pulp and periapical diseases and conditions with endodontic treatment

6. manage the loss of tooth structure by restoring the dentition with direct and indirect restorations

7. utilise patient removable prostheses to rehabilitate, restore appearance and function, prevent injury, and stabilise the occlusion

8. utilise fixed prostheses to rehabilitate, restore appearance and function and stabilise the occlusion

9. manage oral conditions, pathology and medically related disorders and diseases associated with the dentition, mouth, and associated structures

10. manage skeletal and dental occlusal discrepancies
11. manage the removal of teeth and oral surgical procedures
12. administer, apply and/or prescribe pharmaceutical agents
13. evaluate and monitor the progress of treatment and oral health outcomes
14. manage dental emergencies
15. manage medical emergencies

Domain	Competency
Professionalism covers personal values, attitudes, and behaviours	Understanding appropriate and ethical caring behaviour towards older people
	Recognising signs of elder abuse and neglect and describing the methods of reporting it to the appropriate authorities
	Assessing oral health related quality of life in older people
	Selecting individualised patient-centred treatment options for older people
	Understanding concepts of death and dying, and theories of ageing
	Understanding the effect of loss of status, health, family, employment, income and companions on the behaviour and attitude of older people
	Understand the organisation of general and oral health care for older people in the community, hospitals, and the organisation of domiciliary care
	Explaining the important points of caution for performing dental treatment on older people requiring nursing/long-term care (including home healthcare recipients)
	Explaining in-home medical care (including homebound dentistry)
	Explaining the signs and handling of elder abuse
	Knowledge of age-related differences and considerations for Aboriginal and Torres Strait Islander older people
	Understanding the principles of efficient, effective, and equitable utilisation of resources, and recognise local and national needs in health care and service delivery across Australia's geographical areas in aged care

Communication and Leadership covers the ability to work cooperatively and to communicate effectively	Communicating effectively with the frail and care-dependent older dental patient taking into account the physical, psychological, and mental status of the person
	Assessing an older person's comprehension and competency including knowledge of the oral health-care management of people with cognitive impairment
	Performing basic support with older people and their nursing caregiver
	Communicating effectively and sharing information with all members of the aged care team (physicians, nurses, dental assistants, hygienists etc.) and the carers
	Providing oral health care to frail and care-dependent older people in a multidisciplinary context
	Performing a written referral to clarify the older person's general condition
	Knowledge of procedures in managing an older person with reduced ability to consent
	Managing older people with compromised general health and various levels of dependency and knowing when to refer
Health Promotion covers health education and the promotion of health in the community	Knowledge of the principal demographic characteristics and trends in the older population
	Knowledge of the principal socio-economic status of older people relevant to oral care
	Suggesting strategies to overcome barriers to dental care for the frail and care-dependent older person
	Providing oral education and oral hygiene instructions to the older person and particularly to older people with diminished manual dexterity
	Explaining the social environment surrounding frail and care-dependent older people
	Knowledge of age-related differences and consideration for Aboriginal and Torres Strait Islander older people
	Training auxiliaries and carers in basic skills of oral hygiene for frail and dependent older people. Training auxiliaries and carers in the perception of pain and oral impairment for dental referral
Scientific and Clinical Knowledge covers the	Explaining the physiological, psychological, and behavioural characteristics of older people
	Knowledge of physiological and pathological age-related changes and identifying the age-related changes in the oral structures

underlying knowledge base required by dental practitioners	Explaining the diseases common in older people including relevance and incidence of co-morbidity, and major neurological and psychological disturbances (memory impairment, pain perception, changes in anxiety, self-esteem, and disorientation)
	The principles of pharmaco-dynamics and pharmaco-kinetics in the older person. Drug interactions and relevance of polypharmacy. Side effects of drugs and their impact on oral health
	Explain the tools and treatment used in oral health management of frail and care-dependent older people
	Explain the systemic management practiced when performing dental treatment on frail and care-dependent older people
	The principles of management of geriatric medical conditions including knowledge of dysphagia in older people including multi-disciplinary team management of dysphagia
	Knowledge of the use of geriatric assessment scales (dementia, depression, nutrition)
	Knowledge of appropriate laboratory diagnostic tests for the most common geriatric diseases and the interpretation of the results
Patient Care	Managing all aspects of dental treatment using concepts used for the needs of older people (e.g., Minimal Intervention Dentistry, shortened dental arch)
	Diagnosing xerostomia, its aetiological factors and managing the condition in older people
	Recognising and managing the special difficulties in removable prostheses in frail and care-dependent people
	Providing adequate treatment in older peoples' homes and long-term care settings using appropriate dental equipment

INFORMED CONSENT FORM (Dental School Academics)

This administrative form has been removed

INFORMED CONSENT FORM (Consumer Representatives and Directors of Nursing)

This administrative form has been removed

INFORMED CONSENT FORM (Students and Recent Graduates)

This administrative form has been removed

INFORMATION SHEET (Dental School Academics)

PROJECT TITLE: **An Exploration of Australian Undergraduate Gerodontology Education to Support a Growing Frail and Care-Dependent Population**

You are invited to take part in a research project about gerodontology (the branch of dentistry that deals with older people) education in the undergraduate dental curriculum. The study is being conducted by Dr Maria (Angie) Nilsson and will contribute to the research project for her Doctor of Philosophy at James Cook University.

Phase 3 of the study will consist of semi-structured interviews with participating dental school academic leads in special needs dentistry or Head of Dental School. The aim is to explore academic leads' attitudes and perceptions of the gerodontology teaching currently being delivered at undergraduate dental schools. The purpose of the focus groups is to assist in developing recommendations for an undergraduate gerodontology curriculum in Australian dental schools.

If you agree to be involved in the study, you will be invited to be interviewed at a predetermined date and time in late 2021 or early 2022. The interview, with your consent, will be audio and video recorded, and should only take approximately 30 minutes of your time. The interview will be conducted using videoconference.

Taking part in this study is completely voluntary and you can stop taking part in the study at any time without explanation or prejudice. Your decision to participate or not in the study will in no way influence your current or future employment with JCU or Queensland Health nor your academic status.

If you know of others that might be interested in this study, can you please pass on this information sheet to them so they may contact me to volunteer for the study.

Your responses and contact details will be strictly confidential/anonymous. The data from the study will be used in research publications and reports including PhD thesis, journal articles, poster presentations, and conference presentations. You will not be identified in any way in these publications and presentations.

If you have any questions about the study, please contact Dr Angie Nilsson, A/Prof Louise Young, Dr Rebecca Evans, Dr Ernie Jennings, or A/Prof Andrew Lee.

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If you have any concerns regarding the ethical conduct of the study, please contact:
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James Cook University, Townsville, Qld, 4811
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INFORMATION SHEET (Students)

PROJECT TITLE: **An exploration of Australian undergraduate gerodontology education to support a growing frail and care-dependent population**

You are invited to take part in a research project about gerodontology (the branch of dentistry that deals with older people) education in the undergraduate dental curriculum. The study is being conducted by Dr Maria (Angie) Nilsson and will contribute to the research project for her Doctor of Philosophy at James Cook University.

Phase 3 (Part 2) of the study will consist of focus group sessions or interviews with participating final year dental students and recent graduates. The aim is to explore BDS or DDS dental students' and recent graduates' attitudes and perceptions of aged care oral health and education received at dental school. The purpose of the focus groups/interviews is to assist in developing recommendations for a gerodontology curriculum in Australian dental schools.

If you agree to be involved in the study, you will be invited to a focus group or interview at a predetermined date and time in late 2021 or early 2022. The focus group/interview, with your consent, will be audio recorded, and should take 20-30 minutes of your time. The focus group/interview will be conducted at a venue that will be mutually convenient for participants in the group.

Taking part in this study is completely voluntary and you can stop taking part in the study at any time without explanation or prejudice. Your decision to participate or not in the study will in no way influence your current or future employment with JCU or Queensland Health nor your academic status nor your academic status or enrolment in your dental course.

If you know of others that might be interested in this study, can you please pass on this information sheet to them so they may contact me to volunteer for the study.

Contact details will be strictly confidential; however, confidentiality cannot be provided in focus groups due to the nature of the group discussion and if you choose to withdraw data cannot be deleted. The data from the study will be used in research publications and reports including PhD thesis, journal articles, poster presentations, and conference presentations. You will not be identified in any way in these publications and presentations.

If you have any questions about the study, please contact Dr Angie Nilsson, A/Prof Louise Young, Dr Rebecca Evans, Dr Ernie Jennings, or A/Prof Andrew Lee.

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If you have any concerns regarding the ethical conduct of the study, please contact:
Human Ethics, Research Office
James Cook University, Townsville, Qld, 4811
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INFORMATION SHEET (Consumer Representatives)

PROJECT TITLE: **An exploration of Australian undergraduate gerodontology education to support a growing frail and care-dependent population**

You are invited to take part in a research project about gerodontology (the branch of dentistry that deals with older people) education in the undergraduate dental curriculum. The study is being conducted by Dr Maria (Angie) Nilsson and will contribute to the research project for her Doctor of Philosophy at James Cook University.

Phase 3 (Part 3) of the study will consist of focus groups or interviews with participating representatives of peak advocacy bodies for older people. The aim is to explore representative of consumer attitudes and perceptions of aged care oral health education that dentists receive at their undergraduate training. The purpose of the focus group/interview is to assist in developing recommendations for an undergraduate gerodontology curriculum in Australian dental schools.

If you agree to be involved in the study, you will be invited to take part in a focus group or interview at a predetermined date and time in 2022. The focus group/interview, with your consent, will be audio recorded, and should only take approximately 20-30 minutes of your time. The focus group/interview will be conducted at the College of Medicine and Dentistry at James Cook University, by videoconference, or a venue that will be mutually convenient for participants in the group.

Taking part in this study is completely voluntary and you can stop taking part in the study at any time without explanation or prejudice. Your decision to participate or not in the study will in no way influence your current or future employment with JCU or Queensland Health.

If you know of others that might be interested in this study, can you please pass on this information sheet to them so they may contact me to volunteer for the study.

Contact details will be strictly confidential; however, confidentiality cannot be provided in focus groups due to the nature of the group discussion and if you choose to withdraw data cannot be deleted. The data from the study will be used in research publications and reports including PhD thesis, journal articles, poster presentations, and conference presentations. You will not be identified in any way in these publications and presentations.

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INFORMATION SHEET (Directors of Nursing)

PROJECT TITLE: **An exploration of Australian undergraduate gerodontology education to support a growing frail and care-dependent population**

You are invited to take part in a research project about gerodontology (the branch of dentistry that deals with older people) education in the undergraduate dental curriculum. The study is being conducted by Dr Maria (Angie) Nilsson and will contribute to the research project for her Doctor of Philosophy at James Cook University.

Phase 3 (Part 3) of the study will consist of focus groups or interviews with participating Residential Aged Care Facility (RACF) Directors of Nursing (DONs). The aim is to explore RACF DONs attitudes and perceptions of aged care oral health education that dentists receive at their undergraduate training. The purpose of the focus group/interview is to assist in developing recommendations for an undergraduate gerodontology curriculum in Australian dental schools.

If you agree to be involved in the study, you will be invited to take part in a focus group or interview at a predetermined date and time in 2023. The focus group/interview, with your consent, will be audio recorded, and should only take approximately 20-30 minutes of your time. The focus group/interview will be conducted at the College of Medicine and Dentistry at James Cook University, videoconference, or a venue that will be mutually convenient for participants in the group.

Taking part in this study is completely voluntary and you can stop taking part in the study at any time without explanation or prejudice. Your decision to participate or not in the study will in no way influence your current or future employment with JCU or Queensland Health.

If you know of others that might be interested in this study, can you please pass on this information sheet to them so they may contact me to volunteer for the study.

Contact details will be strictly confidential; however, confidentiality cannot be provided in focus groups due to the nature of the group discussion and if you choose to withdraw data cannot be deleted. The data from the study will be used in research publications and reports including PhD thesis, journal articles, poster presentations, and conference presentations. You will not be identified in any way in these publications and presentations.

If you have any questions about the study, please contact Dr Angie Nilsson, A/Prof Louise Young, Dr Rebecca Evans, Dr Ernie Jennings, or A/Prof Andrew Lee.

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If you have any concerns regarding the ethical conduct of the study, please contact:
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Current Gerodontology Content in Dental School Programs

Start of Block: Participant information

Q13 Participant role at dental school

Please note it may be necessary to pause the survey to collect curriculum information from colleagues at your dental school to provide an accurate summary of the gerodontology education being provided

- o Head of school (1)
- o Special Needs academic (2)
- o Other (3) ____

Q7 Dental school location

▼ University of Queensland (1) ... James Cook University (9)

Q8 Please select which program offered at your university on completion will result in entry-to--practice

Accredited dental practitioner programs in Australia (Australian Dental Council). Please

complete a separate form for each program offered at the university which allows entry-to-practice as a dentist.

- Bachelor of Dental Science/ Dental Surgery (5 years) (1)
- Bachelor of Oral Health in Dental Science + Master of Dentistry (5 years) (2)
- Bachelor of Oral Health in Oral Health Science + Master of Dentistry (5 years) (3)
- Bachelor of Oral Health in Dental Science + Graduate Diploma of Dentistry (5 years) (4)
- Bachelor of Health Sciences in Dentistry + Master of Dentistry (5 years) (5)
- Doctor of Dental Surgery or Dental Medicine (4 years) (6)

Q10 Does the program provide gerodontology specific course content?

i.e. not included within other disciplines such as Special needs dentistry, Prosthodontics, LifeSpan Development, etc.

- o yes (1)
- o no (2)

Skip To: Q11 If Does the program provide gerodontology specific course content? i.e. not included within other disc... = yes

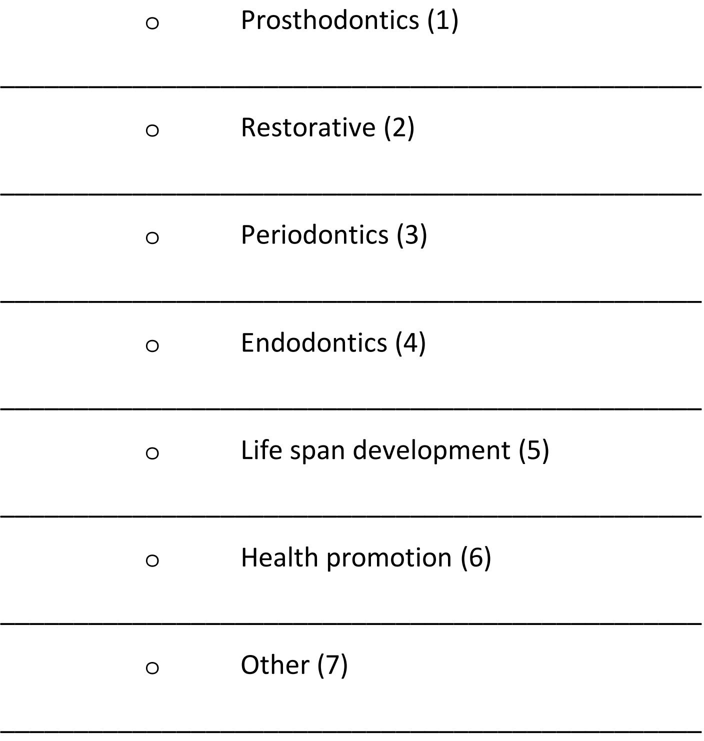
Q14 Is there gerodontology content included within other disciplines?

While there may not be specific gerodontology content, is there dedicated education for the management of older frail, and care-dependent older people?

- o Yes (1)
- o No (2)

Skip To: Q16 If Is there gerodontology content included within other disciplines? While there may not be specific... = Yes
Skip To: End of Survey If Is there gerodontology content included within other disciplines? While there may not be specific... = No

Q16 Which disciplines or subjects is the gerodontology content included and in which year of the program?



- Prosthodontics (1) ____
- Restorative (2) ____
- Periodontics (3) ____
- Endodontics (4) ____
- Life span development (5) ____
- Health promotion (6) ____
- Other (7) ____

Display This Question:
If Does the program provide gerodontology specific course content? i.e. not included within other disc... = yes

Q11 What year or years is gerodontology education provided?

- Year 1 (1)
- Year 2 (2)
- Year 3 (3)
- Year 4 (4)
- Year 5 (5)

Q12 What mode or modes of delivery is the gerodontology content delivered?

Please select all that apply

- didactic (1)
- small group seminar (2)
- problem-based learning (3)
- research project (4)
- student portfolio (5)
- blended learning (6)
- e-learning (7)
- clinical learning (8)
- service-based learning (e.g. aged care facilities, Older Person Unit, domiciliary visits) (9)
- other (10)

____

Page Break

End of Block: Participant information

Start of Block: Current education provided at dental school from benchmark

Q11 Please select if any of the following gerodontology specific competencies are included in the current education for entry-to-practice program at your dental school

	Professionalism covers personal values, attitudes, and behaviours	If this competency is provided, please give further information to include time allocated, mode of delivery and year delivered

	select all that apply (1)	provide information for all that apply (1)
Understanding appropriate and ethical caring behaviour towards older people (1)	•	
Recognising signs of elder abuse and neglect and describing the methods of reporting it to the to the appropriate authorities (2)	•	
Assessing oral health--related quality of life in older people (3)	•	
Selecting individualised patient-centred treatment options for older people (4)	•	
Understanding concepts of death and dying, and theories of ageing (5)	•	
Understanding the effect of loss of status, health, family, employment, income and companions on the behaviour and attitude of older people. (6)	•	
Understand the organisation of general and oral health care for older people in the community, hospitals, and the organisation of domiciliary care (7)	•	
Explaining the important points of caution for performing dental treatment	•	

on older people requiring nursing/long-term care (including home healthcare recipients). (8)		
Explaining in-home medical care (including homebound dentistry). (9)	•	
Explaining the signs and handling of elder abuse (10)	•	
Knowledge of age-related differences and considerations for Aboriginal and Torres Strait Islander older people (11)	•	
Understanding the principles of efficient, effective, and equitable utilisation of resources, and recognise local and national needs in health care and service delivery across Australia's geographical areas in aged care (12)	•	

Page Break

Q12 Please select, if any, the following gerodontology specific competencies are included in the current education for entry--to--practice program at your dental school

	Communication and Leadership covers the ability to work cooperatively and to communicate effectively	If this competency is provided, please give further information to include time allocated, mode of delivery and year delivered
	select all that apply (1)	provide information for all that apply (1)
Communicating effectively with the frail and care-dependent older dental patient taking into account the physical, psychological, and mental status of the person (1)	○	
Assessing an older person's comprehension and competency including knowledge of the oral health-care management of people with cognitive impairment. (2)	○	
Performing basic support with older people and their nursing caregiver. (3)	○	
Communicating effectively and sharing information with all members of the aged care team (physicians, nurses, dental assistants, hygienists etc.) and the carers (4)	○	
Providing oral health care to frail and care-dependent older people in a	○	

multidisciplinary context. (5)		
Performing a written referral to clarify the older person's general condition (6)	○	
Knowledge of procedures in managing an older person with reduced ability to consent. (7)	○	
Managing older people with compromised general health and various levels of dependency and knowing when to refer. (8)	○	

Page Break

Page Break

Q18 Please select if any of the following gerodontology specific competencies are included in the current education for entry-to-practice program at your dental school

	Health Promotion covers health education and the promotion of health in the community	If this competency is provided, please give further information to include time allocated, mode of delivery and year delivered
	select all that apply (1)	provide information for all that apply (1)

Knowledge of the principal demographic characteristics and trends in the older population (1)	○	
Knowledge of the principal socio-economic status of older people relevant to oral care (2)	○	
Suggesting strategies to overcome barriers to dental care for the frail and care-dependent older person (3)	○	
Providing oral education and oral hygiene instructions to the older person and particularly to older people with diminished manual dexterity (4)	○	
Explaining the social environment surrounding frail and care-dependent older people (5)	○	
Training auxiliaries and carers in basic skills of oral hygiene for the frail and dependent older people. Training auxiliaries and carers in the perception of pain and oral impairment for dental referral (6)	○	

Q16 Please select if any of the following gerodontology specific competencies are included in the current education for entry-to-practice program at your dental school

	Scientific and Clinical Knowledge covers the underlying knowledge base required by dental practitioners	If this competency is provided, please give further information to include time allocated, mode of delivery and year delivered
	select all that apply (1)	provide information for all that apply (1)
Explaining the physiological, psychological, and behavioural characteristics of older people. (1)	○	
Knowledge of physiological and pathological age-related changes and identifying the age-related changes in the oral structures (2)	○	
Explaining the diseases common in older people including relevance and incidence of co-morbidity, and major neurological and psychological disturbances in (memory impairment, pain perception, changes in anxiety, self-esteem, and disorientation). (3)	○	
The principles of pharmaco-dynamics and pharmaco-kinetics in the older person. Drug interactions and relevance of polypharmacy.	○	

Side effects of drugs and their impact on oral health. (4)		
Explain the tools and treatment used in oral health management of frail and care-dependent older people. (5)	○	
Explain the systemic management practiced when performing dental treatment on frail and care-dependent older people. (6)	○	
The principles of management of geriatric medical conditions, including knowledge of dysphagia in older people including multidisciplinary team management of dysphagia (7)	○	
Knowledge of use of geriatric assessment scales (dementia, depression, nutrition). (8)	○	
Knowledge of appropriate laboratory diagnostic tests for the most common geriatric diseases and the interpretation of the results (9)	○	

Page Break

Q17 Please select if any of the following gerodontology-specific competencies are included in the current education for entry--to--practice program at your dental school

	Patient Care	If this competency is provided, please give further information to include time allocated, mode of delivery and year delivered
	select all that apply (1)	provide information for all that apply (1)
Managing all aspects of dental treatment using concepts used for the needs of older people (e.g., Minimal Intervention Dentistry, shortened dental arch) (1)	○	
Diagnosing xerostomia, its aetiological factors and managing the condition in older people (2)	○	
Recognising and managing the special difficulties in removable prostheses in frail and care-dependent people. (3)	○	
Providing adequate treatment in older peoples' homes and long-term care settings using appropriate dental equipment. (4)	○	

End of Block: Current education provided at dental school from benchmark

Appendix 9. Ethics Approval

This administrative form
has been removed

Appendix 10. Publication. Australian dental school academics' perceptions of gerodontology education in the undergraduate curriculum. European Journal of Dental Education

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ORIGINAL ARTICLE

WILEY

Australian dental school academics' perceptions of gerodontology education in the undergraduate curriculum

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Abstract

Introduction: Australia's rapidly growing population of dentate, frail, care-dependent older people require graduates skilled in managing the health needs of this patient group. The perceptions of academics teaching gerodontology may inform future dental curricula recommendations. This study explored the perceptions of gerodontology education amongst Australian dental school academics.

Materials and Methods: All nine Australian dental schools providing entry-to-practice dentistry programs were invited to participate in semi-structured interviews. Academics from six dentistry programs took part, and the data were analysed using a thematic approach.

Results: The three main themes identified from interviews included 'clinical exposure', 'organisational levers', and 'sociological barriers'. The attitudes of students, as well as society and health professionals, were seen as strongly influential in preparing the workforce for managing the oral health of older people. The themes inter-linked with a knock-on effect where societal attitudes and organisational levers impact on the ability to successfully support students' preparation for gerodontology practice. Limited resources were barriers to achieving ideal learning and teaching and continued upon graduation as oral health care for older people was perceived as undervalued and under-resourced.

Conclusion: There has been a continued cycle of failure in healthcare schemes and advocacy for the improvement of oral health for older people which has contributed to the inadequate preparation of dental graduates for managing frail and care-dependent older people. Organisational, societal, and political change is needed to support the education of dental students in this area to ensure graduate dentists are competent to manage the oral care needs of this growing population.

KEYWORDS
aged care, gerodontology, special needs dentistry, undergraduate education

1 | INTRODUCTION

Dental professionals globally are experiencing the effects of an increasing population of frail, and care-dependent patients who are retaining their teeth into older age.[1-6] As the restorative cycle tends to move dentition into more complex restorative management, the older patient is more likely to have prosthodontics that are also increasingly difficult to manage if they are frail and care-dependent.[7]

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When patients transition to residential facilities, they are less likely to receive regular dental checks and maintenance, resulting in rapid deterioration of their dentition.[8] The increase in an older dentate population finds dentists needing to manage patients with increasing medical complexities controlled by polypharmacy as well as changing oral structure. This combination of decreased dental maintenance, complex medical history, and complex restorative dental work in the mouth has the potential for catastrophic outcomes affecting both oral and general health.[9–12]

In Australia, gerodontology is addressed in post-graduate training for Special Needs Dentistry (SND) with dentists being the only dental professional able to progress to specialist training in SND. While specialists in SND receive specific training in gerodontology, all dentists are deemed competent to provide health care for older people upon graduation. Therefore, there is a need to consider the readiness of newly graduated dentists to manage frail and care-dependent people. Six of the nine Australian dental schools offer undergraduate programs, and three offer a graduate entry course and all allow students to graduate with the ability to register under the National Registration and Accreditation Scheme (the National Scheme).[13] The focus of this study was the education of dental students in programs allowing them entry-to-practice as a dentist. The use of 'undergraduate' programs in this study is synonymous with all the Australian dental programs allowing entry-to-practice as a dentist on graduation.

In Australia, gerodontology is usually taught under the umbrella discipline of SND or incorporated into other dental subjects, rather than having a separate, focussed subject within curricula.[14] Each school has their own curriculum and structure accredited against the Australian Dental Council (ADC)/Dental Council (New Zealand) accreditation standards for dental practitioner programs (the Standards).[15] The current accreditation standards for Australian dental schools do not specifically require SND to be taught as a discrete subject nor is there a requirement to include gerodontology education in the curriculum.[16] The revised dental competencies, which came into effect in 2023, detail a need for demonstration of all competencies taking into account 'groups or populations at increased risk of harm or poor oral health… likely to include… ageing persons requiring additional care or residing in residential and aged care facilities' (p. 8).[17]

The perceptions of stakeholders involved in the management of the older patient's oral health are needed to develop future gerodontology education for students preparing for entry to practice as a dentist. Understanding the views of educators directly involved with delivering the SND Component (or gerodontology component if available) may identify potential gaps and strengths in the current education being provided in Australian dental schools. This may provide insights into how the workforce can be better prepared to manage the older patient through dental school education provided in the entry-to-practice programs.

This study is timely as it responds to the call for greater inclusion of gerodontology in the dental school curriculum.[18] The objective was to explore the attitudes and perceptions of dental school academics involved in teaching gerodontology in entry-to-practice programs to inform development of gerodontology education in future undergraduate dental curricula.

2 | METHODS

2.1 | Participants, setting, and ethics

All nine dental schools were invited to participate in the study. Where there was no specific gerodontology lecturer, an SND lecturer or Head of School were invited to participate. The participants were given information and consent forms prior to interviews, and all responses were de-identified. Ethics approval was obtained through the James Cook University Human Research Ethics Committee (approval number H8288).

2.2 | Data collection and analysis

A qualitative, explorative study design was used to provide broad discussion of health educators' perceptions[19] of gerodontology curricula and allow distillation of common themes.[20] Semi-structured interviewing was employed to ensure key topics were consistently discussed while allowing for in-depth answers and probing which may not have been anticipated in the initial interview guide. The framework for the interview guide used the approach of Kallio et al.[21] and was informed by relevant literature[22–30] and influenced by instruments used to measure the educational environment of dental schools.[31] The pilot interview guide (Appendices 1 and 2) used open questions with further follow-up inquiry and potential probing questions. Questions were tested with dentists involved in teaching entry-to-practice dental students to assess validity and comprehension of questions. All interviews were conducted by the first author (AN) via Microsoft Teams videoconference and transcribed using live transcription during the recording. The verbatim transcriptions were confirmed with file notes during immersion of the data and were an iterative process. All participants were offered the transcripts for reviewing and reliability checking; none of the participants requested this.

Braun and Clarke's[21] thematic analysis framework was used in data analysis which was also facilitated by NVivo 12 (QSR International) software to index and identify codes and key themes. The first author (AN) sought to find overlaps and similarities of codes through immersion with the data. Two authors (RE and LY), experienced in qualitative research methods, independently reviewed the de-identified transcriptions as reliability coders to confirm the coding used by the master coder (AN). The themes were then cross-checked by all three coders to facilitate production of final themes. This inductive analysis used an iterative process to organise the qualitative data with differences reconciled by consensus discussion.[32]

De-identification of the transcripts included removal of place names to protect participants' anonymity.

3 | RESULTS

Six dental schools responded with a staff member from each willing to participate in a semi-structured interview. Two dental schools did not respond, and one dental school declined to participate with no reason given. Participants included one Head of School, four SND lecturers, and one gerodontology lecturer. The interviews were conducted by the first author between November 2021 and April 2022.

Using Braun and Clarke's[21] framework for analysis, initial codes were generated with a codebook (Table 1) used to refer to the transcripts and determine reliability of coding with the two independent coders. The overarching themes developed are illustrated (Figure 1) showing a mind map of the stories that were woven between the themes. The final themes and sub-themes evolved from this initial thematic analysis by consensus discussion with the independent coders.

3.1 | Thematic analysis

3.1.1 | Theme 1: Clinical exposure

> Without that undergraduate clinical experience of the aged mouth...then, students aren't really that prepared.
>
> (Academic X)

TABLE 1 Codebook from the interviews.

Codes
Attitudes and ethics
Challenges of managing older people
Champions and advocates
Performance of dental schools
Inequity of subject allocation to SND or geriatric
Lack of resources
Organisational silos and interdisciplinary learning
Supervisors and mentors
Preparedness
Hands-on clinical experience
Importance of rational care planning
Knowledge on prosthetics
Standards of competency
ADC competencies
Risks to patients where scope of practice limited

> Theme 1 links the perceptions of preparedness of not just students and graduates but that of the supervisors and mentors for a future dental workforce. A need for greater clinical exposure to frail and care-dependent older people was identified. A limited pool of SND specialists and skilled supervisors added to the barriers to achieving high-quality gerodontology teaching and learning.

Clinical experience

The amount of clinical time allocated to gerodontology was seen not only as a contributing factor to preparedness in terms of skills and knowledge but also to improving attitudes of clinicians. The exposure was not just important in terms of having patient experiences with geriatric patients, but to have meaningful learning experiences associated with these exposures, whether it would be service-based learning or through mentors. Academic Y described this perception:

> If you've never spoon escalated a carious lesion, then I have zero hope that you'll be able to do that in a patient with dementia or with autism (and that's not through any fault of their own they've just not had the opportunity).
>
> (Academic Y)

Supervisors

Quality mentors and supervisors were discussed as a necessity for providing role-modelling opportunities and for teaching students appropriately. There was also the idea that these role models would select and mentor future champions for older people and graduates interested in Special Needs Dentistry. Academic X described the flow of teaching at the dental school to provide a limited number of experiences to students as 'it sort of self-selects individuals that are more interested in gerodontology'. Further to this, the importance of role-models would lead to better learning outcomes by inspiring progression, as illustrated in the following comment: 'that [clinical experience] will drive students to learn and to progress, but also inspire that deep learning rather than the surface learning' (Academic X). There was an understanding that mentoring was necessary not only before graduation but continuing past graduation as Academic Z describes 'recognizing that the graduate isn't the finished article' was weaved into the theme of organisational levers in the form of vocational training programs.

A lack of appropriately equipped supervisors was a barrier to providing quality gerodontology exposure to students. Importance was placed on clinician awareness to provide patient-centred oral health planning to people approaching frailty and with deterioration of cognitive capability. The gap in student and graduate dentist attitudes (as well as knowledge and skills) to apply rational care planning was experienced by academics. In particular, the story of

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FIGURE 1 Sub-themes mind map.

an octogenarian having dental extraction and driving home alone without the dentist considering adequate sociological support for the patient was described: 'I had a patient a couple of weeks ago that needed some teeth taking out -I was helping one of the dentists because of the treatment planning- the lady was 80 years old, and she was coming 25 kilometres for a dental appointment and coming down the freeway. And I said, "you know, are you going to be alright? You're have two teeth taken out that you've got to drive back" …and "Oh no, I'm fine!" [imitating patient saying she was fine] She's like fiercely, staunchly, independent was 81 or 82 or something but that dentist involved had not thought about that at all, you know. So, I think we really do not have our next generation very well prepared… and a lot of the stuff that we have been reading about and talking about, with this huge avalanche of older people coming towards the profession (me being one of them!) …I just do not think we are prepared for it' (Academic V).

Preparedness

References were made linking the life trajectory of the patient and lack of preparedness of dentists to manage older people. There was importance in defining the change in the patient; not to just being older chronologically, but the increasing biological, pharmacological, and medical complexities as part of the frail and care-dependent older person. This was identified as the gap in graduate preparedness with comments such as 'what we've been trying to push for a lot in some of those gerontology workshops is the pre-dependent planning… because we know that by the time they move from 75 to 80…the chances of them having a catastrophic medical event or having dementia is pretty high' (Academic Y).

Thoughts around how ideal student exposure to older people and geriatric dentistry might be described included acknowledgement that didactic teaching alone would not improve preparedness of the graduate; 'I think it is difficult to prepare people just based purely on didactic [teaching]… without that undergraduate clinical experience of the aged mouth…then, students aren't really that prepared' (Academic X). Exploring preparedness elicited direct responses from the participants with a feeling that organisational levers (Theme 2) were involved in forming the barriers as illustrated by Academic Z: 'I don't feel they're particularly well prepared. Full stop, never mind just the elderly'.

Academic Y noted that in respect to organisational levers, 'in terms of the minimum competency set', competencies could be set as a minimum to assess graduates but limitations remained in having sufficient clinical exposure to enable the assessment. These levers are explored in the second theme, 'organisational levers', with academics attempting to provide reasoning behind the failures of a prepared dental graduate workforce.

3.1.2 | Theme 2: Organisational levers

> Like Swiss cheese, there will be a lot of enablers that move into that space.
>
> (Academic Y)

The theme 'organisational levers' centred around the barriers and enablers to achieving an ideal learning space for gerodontology and developing a well-prepared workforce for older frail and care-dependent patients. This included factors associated with universities, professional organisations, and political bodies as a conduit for a 'utopic' learning scape regarding oral care needs of the target older population.

Resources in universities

Interviewees felt that many of the current barriers to providing the ideal gerodontology education could be addressed by changes within universities. Potential strategies included:

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- Improving the integration of gerodontology and Special Needs Dentistry across other disciplines within dentistry.
  - 'There's supposed to be within [institution] an interprofessional collaborative practice program...the one that's within the medical school has no dental input into it at all and the one that's within the dental school only talks about technicians and prosthetists' (Academic Z).
- Increasing resources to allow for high-quality supervision.
  - 'The problem is those [clinical placements] are very resource intensive activities. You need small groups and an academic with them, so in terms of efficiency the universities are very poorly resourced for that' (Academic X).
- Supportive structures to develop more Specialists in Special Needs Dentistry.
  - 'I believe...if I want to teach or if I want to provide individualized teaching, it needs to come from me because I'm a specialist in that area. But if you want to teach 70 students from the same cohort, it wouldn't be only me because I don't have the capacity to attend every single undergraduate clinic' (Academic Q).

Providing quality clinical exposure for students was found in the first theme of the results. However, the concept of exposure also ran through the organisational levers theme as an opportunity for universities to increase the time dedicated to teaching and clinical experience of care for frail and care-dependent older people with comments such as:

- 'It would be perhaps more useful if we were able to have a more structured approach to allocating patients. However, that then becomes very labour intensive, both in terms of allocation and the monitoring' (Academic Z).
- 'There was a time when University X were doing it well because X had a domiciliary service and the students taken along did get exposure...it was part of the undergraduate curriculum' (Academic X).

Although the academics were clear in their view that good-quality clinical exposure would improve learning outcomes, universities were perceived as reducing the clinical experiences over time. There was also discussion about formalised training programs to address gaps in graduate preparedness for gerodontology. An organisational change was suggested by Academic Z: 'The ultimate support system is something like vocational training... recognizing that the graduate is a safe beginner and needs some mentoring afterwards' with a warning that outcomes affect the dentist as well as patient in terms of safe-keeping their registration; 'you know, for as much as anything for the protection [registration] of the new graduate'.

Competencies

The need for organisations to deliver on the competencies required for accreditation of dental school programs by the Australian Dental Council (ADC)[15] was understood as a shaping mechanism for graduate attributes. The link between preparedness and organisational levers was evident when exploring the enablers and barriers to improving preparedness. The ability to assess competency to produce safe and prepared graduates was limited by the students' exposure to clinical experience as discussed in Theme 1, but the competencies themselves were seen as an enabler to drive change in organisations. Academic Z went further to identify the ADC as playing an integral part in reducing the learning gap for geriatric dentistry 'I think until the ADC actually specifies something about the age more clearly or about managing special care patients including elderly, frail...a lot of [dental] schools will just put that in the too hard basket'.

There was further discussion around the accountability of dental schools in providing evidence of specific learning for accreditation with reflections on how this compares to international dental schools. The General Dental Council in the United Kingdom (UK) was noted as including preparation to practice post-graduation. Exposure and preparedness with supported mentoring was linked, with one participant identifying vocational training programs in the UK. The compulsory Vocational General Dental Practitioner training, which includes mentoring, was reflected on as 'the ultimate support system is something like vocational training or general professional training' (Academic Z).

Recruitment and remuneration

The Medicare Benefits Schedule (MBS) as the Australian government health funding scheme has introduced schemes for accessing dental care which would target priority populations.[33] Participants felt there were levers that could be pulled at the organisational level of government including how MBS funds older people. Funding models for oral health were met with trepidation due to historic misuse of government schemes, such as the MBS Chronic Disease Dental Scheme (CDDS),[34,35] and a concern that the fee-for-service model of care was contributing to poor care. The pressures of a productivity-based healthcare system were seen as a barrier: 'everybody, regardless of whether it's community or private, a lot of our KPIs are productivity-based and trying to provide domiciliary care is going to be low productivity' (Academic X). This in turn was perceived as a driver for recruitment and inability to provide quality supervisors for students with Academic V noting, 'It may be emotionally and intellectually demanding trying to deal with a whole lot of complexities [in gerodontology]...and not financially rewarding'.

The inadequate number of specialists in Special Needs Dentistry was a self-perpetuating problem for future-proofing the workforce for an older dentate population observed by Academic Y; 'We need more [SND] specialists with additional training to be able to carry forward this work not only in tertiary centres but across all hospitals'. This was affirmed by Academic W who discussed the potential in capacity building, 'The university is looking at establishing a specialist program [in gerodontology] in the next two to three years so that will change things a lot as well... and I think once you've got your own workforce then you've got a few more options'.

This sub-theme of recruitment and remuneration linked into the third theme where the barriers to provision of an ideal gerodontology curriculum were not only due to dental schools' limited capacity to increase resources but also a lack of willingness to change due

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to the preferences of students. This is explored in the third theme 'sociological barriers'.

3.1.3 | Theme 3: Sociological barriers

> It's about what's seen to be fashionable or acceptable in the general dental community...and being a special needs specialist is "why would you want to work with that cohort of patients?"
>
> (Academic V)

The theme on sociological barriers includes the perception that students lack an interest in gerodontology which drives the inability to have an ideal curriculum from the SND academics' perspective. The value placed on SND from dental schools was lacking and a continued failure in advocacy efforts for older people was observed.

Lack of appeal

While providing dental care for older people in aged care facilities was seen as an altruistic part of the dental profession, the financial inequity and less appealing aspect of the physical work provided was seen as reasons for dentists and students to avoid being involved in gerodontology. Remuneration is discussed in this sub-theme as an attitudinal issue and later in the sub-theme 'pressure of financial rewards' in greater depth as attitudes and the financial needs of a graduating student are interwoven.

Sociological barriers to ideal learning for gerodontology were discussed by participating academics. When probed for a utopic vision of how gerodontology education might look for the entry-to-practice curriculum, the sub-theme of clinician 'comfort' in supporting treatment of frail and care-dependent older people identified a problem in trying to achieve the ideal. This was illustrated in one academic's view: 'Having undergraduate students have access to experienced clinicians who are comfortable in providing treatment in...gerodontology is where I would see the ideal world' (Academic X). Students competent on graduation to potentially go back into the workforce pool of supervisors were instead taking alternative jobs on graduation more likely to generate a better income and less strenuous. Graduates were also viewed to be seeking jobs that provided a greater source of increased clinical skills development, such as prosthodontics. These insights of comfort and preference were reflected in several participant comments with Academic W reflecting on supervisor comfort:

> Often there are practitioners who themselves aren't comfortable treating these [older] patients, let alone watching a dental student treating them.
>
> (Academic W)

The confirmation that general dentists and students are not drawn to the area of gerodontology was touched with concern that this could lead to naïve and inexperienced dental professionals providing care to older people outside their scope or competency:

> What's going to happen is that there's going to be a whole lot of clinicians... young clinicians, who go out with extended scope within a limited scope...that's a recipe for disaster, but it's happening., I'm very scared about that.
>
> (Academic Y)

Pressure of financial rewards

Concern that less money is generated by work on care-dependent older people was a notion weaved throughout the themes and sub-themes. Along with the attitudes and perceived discomfort of managing older people was the pressure of new graduates to do work that would be more financially rewarding; A conversation was recalled by one academic; 'They think about the funds that they will generate as a result of that personal income, and they want to do things that are exciting [botulinum toxin injections and orthodontics]' (Academic V). Working on the attitudes of students towards providing care to older people was important to counteracting this problem; 'I think the attitude part is very important because you've got to get past the attitude of "If I'm doing that [gerodontology], I'm not treating patients. I'm not making money"' (Academic Z).

There was a sense of urgency to remove the barrier associated with perceptions of managing older people before students entered practice. The introduction of SND into later stages of dental programs was seen as aiding the perceptions students had built about where their clinical focus would be on graduation; Academic Q considered the timing of Special Needs learning as part of this problem; 'Unfortunately SND always comes very late in year 4 when they had already made their mind about how important it is to become a dentist... to make money or how you can make more money by doing cosmetic treatment'.

Failure of advocacy and interventions

Historical health schemes set up to help manage patients with chronic diseases (CDDS) were seen as a failure in the management of older people and feeding into the poor attitudes of dentists providing reasonable care. Academic Y details the additional workload for SND Specialists: 'We found that with the chronic diseases model, the number of you know things that we were mopping up'. The movement of older people into aged care facilities and being away from society and the profession's radar was noted; 'I just think we're going to get more and more behind in caring for people in those facilities because they're hidden. They're hidden from our population they're hidden from our profession' (Academic V). This extended into the logistical problems of managing older frail and care-dependent people and the ease with which patients who do not physically present to general dental practices can lead to ignoring of the healthcare needs of this patient cohort.

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There was also a feeling that failure of health schemes did not absolve the patient from contributing to the abuse of the schemes as it was perceived that patients also sought to 'milk the system' for what they thought they were entitled to. Academic Y described the patient's part in this failure:

> I'm sure there would have been plenty of patients going in and saying, look, I'm entitled, I want to get those two crowns now because I've got this money from the government to get those two crowns that I would never have gotten for myself because they are asset rich and cash poor...and you know they're retirees and they would have said, "OK, well that's fine. Just do the filling or I'll pay for the cleans and I'll come back for the clean for my periodontitis but do this crown now".
>
> (Academic Y)

The responses associated with this theme had a defeatist tone, participants doubting that positive change and improvement would occur. This was summarised in a sense of hopelessness by one academic:

> ...Do you think it's going to get better?
>
> (Researcher AN)

> Honestly, no...I'm seeing increasing cohorts of students who think coming in paying lots of money means 'I'm going to leave with my ticket. Failure is not an option. I bought it'...I think increasingly the motivation here is, sadly, money.
>
> (Academic Z)

4 | DISCUSSION

This study sought to provide insights into the perceptions and attitudes of dental school academics to gerodontology in the entry-to-practice dental school curricula. The interview analysis found areas in the current Australian dental school curriculum that were perceived as barriers or enablers to providing the academics' ideal gerodontology curriculum at learner, organisation, and societal levels. There have been no other studies to compare the perceptions of SND academics regarding undergraduate gerodontology education. The themes arising from the interviews, however, were not dissimilar to gerontology education studies from other health professions where educators felt attitudes were an important part of learning[36] and barriers included sociological factors and limited access to experts.[37] Resources across the academics' experience with organisations meant staff were needing to do more with less; this included less skilled supervisors and less available time for teaching. There was recognition this was not necessarily limited to SND alone but challenging for teaching in general in universities. This has been recognised in other studies, not just limited to healthcare professional courses.[38,39]

The results indicated that greater resources and commitment to SND as part of the undergraduate or entry-to-practice curriculum could improve the negative attitudes and some of the sociological barriers to the preparation of the dental workforce for an older, frail, and care-dependent person. The academics felt that gerodontology was undervalued by organisations, students, and the general profession, in comparison to other dentistry disciplines, and there was a fatalistic sense the workforce would continue to be unprepared for the needs of the older population until these problems had been addressed. The sociological barriers of ageism within society, the healthcare system, and education system, have been reflected in literature on nursing education[37] as well as in medicine, highlighting attitudinal change needed to improve the learning environment.[40] There has been progress with organisational enablers for change occurring: the ADC's revised dental competencies of the newly qualified dental practitioner made a pointed change in the competencies to include social responsibility as well as professionalism.[17] Recognition of care-dependent older people in residential facilities at increased risk of harm or poor oral health continues to be the discussion point from Specialists in SND and advocates of older people.[17,41] This is perhaps where change will transpire; to set the benchmark for expectations of dental schools achieving accreditation rather than through funding of educational institutions where the financial and resource pressures exist in all disciplines.

Optimism in the discussions centred on the future champions of gerodontology and existing role models within SND, that they may propel replenishment of properly skilled supervisors. Enablers centred around the exposure students were gaining by actively learning from clinical experiences and on clinics from competent mentors and supervisors. There were opportunities noted in using rational care planning and linking subjects across the curriculum to better prepare students for gerodontology on graduation. The use of interdisciplinary learning would lend itself to deeper learning and ability to progress beyond basic knowledge and skills,[42] providing an aid to organisation efficiencies where resources are scarce,[43] and potentially improving people's health outcomes.[44]

On the other hand, there was also a pervading sense of pessimism that positive change would occur. Although the interviewees were from different Australian dental schools, the academics were unanimous in their view that the workforce was not being adequately prepared for Australia's growing older, frail, and care-dependent population. This was not limited to the preparation of managing this cohort of patients alone but extended to the teaching of SND as the umbrella speciality discipline for gerodontology. To enable replenishment of appropriately skilled supervisors and specialists, there was a lens on students who had a natural talent for this area of dentistry or were drawn towards the subject and potential future specialists in the discipline. The need to increase this pool of future champions seemed stymied by the limited resources and availability of good quality mentors for students. This

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Appendix 11. Publication. Stakeholder perceptions of gerodontology education for final year Australian dental school curricula. Journal of Dental Education

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ORIGINAL ARTICLE

Stakeholder perceptions of gerodontology education for final year Australian dental school curricula

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Abstract

Aim: The study explored the perceptions of final-year Australian dental students, directors of nursing, and consumer representatives toward geriatric education provided at Australian undergraduate dental schools. Findings will strengthen and inform future curricula design for dental schools.

Methods: Semi-structured interviews and focus groups were conducted through videoconferencing and in-person interviews, and analyzed using thematic analysis.

Results: Thematic analysis found the major themes to include relationships, curriculum variation, resources, and in-service learning experiences. The participants found gaps in the current delivery of undergraduate dental education. Solutions included greater resourcing through funding and time allocated to supervisors and a curriculum dedicated to gerodontology.

Conclusions: Healthcare professional curriculum design must consider the needs of the learners and stakeholders involved in the health of older people. The focus group participants found multiple barriers and gaps to achieving what is required to adequately prepare dental graduates for an older, frail, and care-dependent population. For curricula to be successful, policymakers and education providers must find solutions to ensure that the oral health needs of older Australians are addressed and managed appropriately.

KEYWORDS
curriculum, dental, dentist, education, gerodontology

1 | INTRODUCTION

There has been international recognition that there will be increasing pressure on the dental profession to manage the oral health of a growing population of older, frail, and care-dependent people who will also be retaining their teeth into older age.[1–5] For dentists to be prepared to manage the pool of patients who are frail and care-dependent, there is a need to ensure the education for entry-to-practice programs considers the stakeholders involved in the curriculum.[6] A needs assessment of these stakeholders such as dental school academics, dental students, aged

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care workers, and consumers, is required to inform future dental school curriculum design with the social responsibility that is expected of Australian dental schools.[7,8] This is further supported by the recent addition from the Australian Health Practitioner Regulation Agency (Ahpra) detailing requirements for the Interprofessional Collaborative Practice Statement of Intent.[9] Ahpra's recognition that team-based care improves healthcare outcomes and experiences is a step to embedding interprofessional collaboration across the health system, including through education and training.

The barriers and facilitators to the integration of oral health care for older people are complex, and the compartmentalized culture in which oral health is viewed within general health care is a problem that requires systems-level change.[10] Curriculum design for health professionals should consider the needs of the population and the needs of the learners,[6] acknowledging that the workforce for a population should be prepared for the healthcare needs of that population.[4,6] The relevant preparation would incorporate the appropriate knowledge, attitudes, and skills in gerodontology.

Gerodontology is the branch of dentistry dealing with the oral health of older people and sits under the specialist discipline of Special Needs Dentistry. Australian dental schools have a variation in program length with several dental schools having entry-to-practice programs as a four-year postgraduate course as opposed to a five-year undergraduate course.[11] On graduation from both undergraduate and postgraduate dentistry programs, the graduate can register with Ahpra as a dentist.[12] Gerodontology is not recognized as an individual specialty in Australia, and there are no mandatory requirements to include gerodontology within the curriculum. However, the Australian Dental Council (ADC) as the accrediting authority for dental (dentist) programs revised the professional competencies of the newly qualified dental practitioner in 2023 to include a need for a demonstration that all the competencies take into account "aging persons requiring additional care or residing in residential and aged care facilities".[13]

The aim of this study sought to answer the research question: "What are the perceptions of final-year Australian dental students, directors of nursing in high-care residential aged-care facilities, and consumer representatives of older people toward entry-to-practice gerodontology education?". Findings from the study along with findings of studies with other stakeholder groups, were intended to inform the design of gerodontology curricula to prepare graduate dentists for a growing older dentate population. There is currently a paucity of literature exploring gerodontology education in Australia with no studies investigating gerodontology for Australian programs for entry-to-practice as a dentist.[14]

2 | METHODS

Participants for the study included final-year students from all nine Australian dental schools enrolled in programs allowing entry-to-practice as a dentist on graduation, directors of nursing (DONs), and consumer representatives from peak bodies of advocacy groups of older people. Only students in their final year of dental school were included to provide a comparable point of exposure across much of their curriculum and any gerodontology education prior to graduation.

The focus groups aimed for group sizes of 5–8 participants as this is an optimal number to encourage in-depth, rich discussion.[15] It was recognized prior to commencement that this may not be possible logistically due to varying factors, for example, participant recruitment delays, the coronavirus disease 2019 (COVID-19) pandemic,[16] and varying participant availability. Recruitment of participants was through the researchers' networks, dental school student associations, and the Australian Dental Student Association.

The interviews were conducted between July 2022 and March 2023 using videoconferencing and one in-person semi-structured interview. Data analysis used Braun and Clarke's thematic analysis framework,[17] a widely used framework in qualitative health research.[18] Two authors (Angie Nilsson and Rebecca Evans) reviewed the data independently as de-identified transcriptions with the first author (Louise Young) using an iterative process and immersion of data to find overlaps and similarities of codes. The themes were cross-checked by all three coders to reach the final themes with a consensus agreement.[19] All interviews were conducted by the first author (Angie Nilsson) and transcribed using Microsoft Teams live transcription during the recording with verbatim confirmed with file notes. All participants were offered the transcripts for viewing and reliability checking.

The participants were given information and consent sheets prior to the interviews and all responses were de-identified. Ethics approval was obtained by the James Cook University Human Research Ethics Committee (approval number H8288).

3 | RESULTS

Seven final-year dental students, five consumer representatives from peak advocacy groups for older people, and three DONs at aged care facilities providing high-care

TABLE 1 Final themes students.

Major themes	Subthemes
Preferences for gerodontology	• Exposure • Practical learning
Barriers to gerodontology	• Time pressure • Availability of Special Needs Dentistry clinics or clinical placements • Attitudes to geriatric dentistry
Variation in learning	• Supervisor quality/experience • Undergraduate/postgraduate program and international program graduate expectations

TABLE 2 Final themes directors of nursing (DONs) and consumer representatives.

Major themes	Sub-themes
Interrelations between stakeholders	• Support of staff • Role of the aged care worker in oral health
Resources	• Unappealing work for dentists • Funding
Quality of life	• Ageism • End-of-life care
Curriculum content	• Knowledge of aging trajectory and managing the frail care-dependent older patient • On-site learning

services participated in interviews and focus groups. Of the nine Australian universities offering programs for entry-to-practice as a dentist on graduation, final-year students from seven dental schools participated in focus groups.

Trending themes from initial coding were formed by the first author (Angie Nilsson) and, through iterative discussion, adapted and agreed upon by the second and third authors (Rebecca Evans and Louise Young). Immersion into the data further with file notes and mind mapping refined key themes that addressed the research question "What are the perceptions of the stakeholders towards gerodontology education?". The final themes and associated subthemes for students are provided in Table 1 and include: 1. Preferences for gerodontology, 2. Barriers to gerodontology, and 3. Variation in learning is a major theme. Table 2 provides the themes for the DONs and consumer representatives: 1. Interrelations between stakeholders, 2. Resources, 3. Quality of life, and 4. Curriculum content also displays the sub-themes linked to each of the major themes.

3.1 | Interrelations between stakeholders

The DONs and consumer representative groups (CRs) identified a need for dental professionals to understand the role of residents, families, and aged care workers. DON3 said; *'you'd want them to have a good understanding of the role of the carers and nurses in those facilities'*, with DON2 supporting this sentiment; *'They can help us too, they can help the staff'*.

Knowledge gaps were noted by both DONs and CRs. The consumer representatives found their own experiences of managing frail, older family members pointed to a lack of oral health literacy. Consumer X referred to her mother; *'she's not educated enough in herself to take care of her teeth'*, whereas Consumer Q found the gap in education was evident with aged care staff; *'The staff (and that includes the nurses) don't understand the importance of oral health'*. This was mirrored in one DON's reflection of aged care staff's lack of knowledge of adequate oral health education within their training to prepare for managing older people's dental hygiene routine:

You always need to do education and training, so that's definitely going to be something we would be looking for [dentists providing education and training to staff] (DON1).

The data from the dental students did not focus on the relationship between aged care workers and supporting the staff and families involved in residential aged care facilities. The student focus groups revealed wide variations in experiences and explored how those variations were expressed within dental programs and across dental schools nationally and internationally.

3.2 | Curriculum variation

Students received wide variations in the amount of gerodontology content and methods of learning. They were cognizant that within their own peer groups in the same program, their preparedness was often dependent on fortuity and timing. Student 2 captured this sentiment: *'it depends on individual experiences as well, so, I've had more experiences with elderly patients than some other people just because* [of the experience on placement or clinics]'.

Supervisor variation was noted by several students with Student 5 remarking the ability to supplement didactic information provided by the program was dependent on who was supervising the clinical skills: *'I found that for us, it's very dependent on the individual supervisor'*. The student went further to detail the importance of quality supervision: *'I learned more clinically than I ever would've during our lectures, but I think if you didn't have that luck with*

supervisors, it would've been probably quite different'. Student 2, however, felt that the supervision at the school was more consistent due to the training of the supervisors although still very individual to a particular student's experience. The consistency was also attributed to the nature of the employed supervisors as they were academic staff as opposed to practicing dentists who might be supplementing their clinical work with supervising dental students:

'It depends a lot on the individual experiences of every demonstrator [supervisor], but also, we have demonstrators that are not from outside (like not general) [dentists providing supervision as part-time] and, generally speaking, all our supervisors undergo training. So, they're normally prepared to answer any questions (Student 2)'.

Continuing from inter-program variations in learning and teaching, the ability for students to choose elective placements did not exist for Students 5 and 1. When asked whether these students would find time to have elective options, Student 1 was firmly negative in the response to having additional electives. Student 5's learning experience was through individual discipline clinics and felt these were similar to electives, although being taught as compulsory components of the program. There was a consideration, however, that this did not include the ability to specifically manage special needs patients:

'We have a dedicated paeds [paediatric] clinic 1 day a week, and we used to, in previous years, have dedicated pros [prosthodontic], endo [endodontic], oral surg [oral surgery], and that sort of thing. So, I don't think it'd be bad to have half a day in the special needs department or something else' (Student 5).

Student 5 also noted the variation between didactic teaching and the timing of when students in various schools managed clinical work: *'I just noticed something based on what Student 6 was saying is that I think the timetables must be really different across all the unis, because at least for us, we don't have any lectures anymore. We finish our lectures in fourth year and now we just have 4 days of clinic a week'*. The reference had been to Student 6 contemplating the amount of time available to use for in-service learning at residential aged care facilities. With the variation to other students in the final year, it was felt that it would be reasonable to include more content into the curriculum but the barrier to in-service learning was the availability of supervisors:

'It's more I think there's not enough dentists or clinicians who are actually going to these residential facilities to do dental treatment' (Student 6).

With the first two themes relatively distinct between the two groups, there were two themes that emerged where overlapping stakeholder needs and preferences were identified. The first of these was barriers to achieving an ideal gerodontology education for final-year students due to limited resources.

3.3 | Resources

The DONs struggled with having dentists visit the facilities by identifying several barriers including proximity, financial pressure, and the challenge of managing patients outside of a dental surgery. The proximity issues were noted by DON1, *'first thing, they will be located somewhere very far, and they don't want to travel far'*.

The DONs' focus on resources was not attributed to financial pressure so much as human resources and staffing. DON3 felt there was a lack of comprehension in general, *'there's a lack of understanding between the teams and how things work... having understanding of the pressure of workloads in those places, why things don't happen necessarily the way you would want it to'*. This was recognized by consumers as well with Consumer Z noting, *'There's staff shortages because of COVID, it's worse than the situation though... I think it's always been an issue... it's a common problem that low there's a staffing problem in the residential aged care homes'*. Funding from governments was given as a factor by Consumer Q *'They're* [aged care facilities] *very limited in what they can supply for the resources that they're given by the state governments and the Commonwealth government'*. Financial barriers to residents and families were evident in Consumer X's comment, *'the affordability for the elderly, they just can't afford their dental procedures, it's just way too much it's very expensive'*.

Resourcing from the student's point of view was focused on limited time as a resource. This time issue was not only ascribed to the compacted schedule of the student curriculum but the university academics' ability to contribute time. Student 5 considered this to be an issue where dental schools and public health clinics worked in conjunction for student clinics, *'most of them* [Special Needs Dentistry specialists] *don't have the chance to supervise undergraduates because they either don't have the time, or they have to organize a collaboration between our university and the health system. So, the bureaucracy is a bit messy'*.

This barrier to education theme is linked to the ability to realize the preferred learning experiences of stakeholders through in-service learning.

3.4 | Practical learning experiences

All stakeholders voiced preferences for in-service learning with practical face-to-face experiences. This was suggested in varying forms, including mobile dental vans, with DONs 2 and 3 in agreement that using mobile dental van

services as a learning environment was necessary as part of dental student training. DON3 reflected that if dental students received in-service exposure to learning, they would be able to see the challenges as well as provide clinical interventions. These challenges were expressed as not only due to behavioral difficulties experienced by patients living with advanced dementia but also the challenges experienced by staff in the facilities, *'it would have to be practical exposure probably placement stuff…you'd want them to have a good understanding of the role of the carers and nurses in those facilities too'.*

An intention for in-service learning to be a mandatory component with an experienced supervisor was expressed by Consumer Q; *'I would make certain as part of it* [dental curriculum]*, it should be compulsory, that they do visit the places with someone with a lot of experience… they've got to see it face-to-face. That's number one* [priority]*'.* Consumer X likened practical placements in aged care facilities to an apprenticeship and as a hands-on job there was a necessity that this occurred on site, *'you go into that place* [aged care facility] *and you're taught the practical side of it. Not just on paper. So, you need that practical. In anything in life, I think it's important to have that practical'.*

While there was generalized consensus that hands-on experience was preferable, a holistic approach to learning was emphasized by Student 6 with case discussion, patient-based learning, and support by Special Needs specialist dentists giving a rounded learning experience:

Only in 5th year, did we get more information from our special needs lecturer who gave us that extra confidence in managing specific medical conditions that were, will be, might be necessary in the future (Student 6).

There was a sentiment through the focus group and interview discussion that there was futility in achieving preferred education delivery due to the lack of timing, funding, and adequate supervision.

4 | DISCUSSION

Clinical exposure and hands-on learning were preferred to didactic teaching, although didactic lectures have been recognized as providing time-poor schedules a chance to fit gerodontology components into the curriculum. The link to learning communication techniques through patient exposure strengthened the students' preferences for greater clinical experiences. This aligns with pedagogical knowledge of deep learning through practical experience[20] and should be considered when constructing educational frameworks for health professionals.[21] Further to this, meaningful learning experiences for health professionals may be varied across a student cohort to provide strategies that drive deep learning.[22]

Accreditation standards may be interpreted differently by the dental schools, allowing for students to graduate with diversity in perceived strengths and weaknesses. The variations in learning are challenging to address due to differences in course length, limited available mentors and SND lecturers, and resources to provide in-service learning in aged care facilities. Resourcing solutions could include consideration of a post-graduate internship program to address the gaps in knowledge and skills, similar to medicine.

Ahpra works with the Dental Board of Australia to ensure that Australia's registered dental practitioners are suitably trained, qualified, and safe to practice.[12] Ahpra has committed to improving health outcomes by drafting an 'Interprofessional Collaborative Practice statement of intent',[23] inviting health providers and education sectors to support the statement. This is reflected in the data from the focus group participants with a strong desire for integration and interprofessional education across dental training to the stakeholders involved in the oral health of older people. There was an emphasis on bi-directional learning with educating families, staff, and patients in oral hygiene management and the behavioral management and communication skills that dental students would gain. Modelling communities of practice[24,25] in this manner was preferred to be provided at the residence of the care-dependent older person whether it was as a mobile service or in the facility. This strengthens existing knowledge on perceptions of DONs and carers for the provision of care in RACFs[26,27] as well as the success of placement programs on student knowledge.[21,28]

Where historically healthcare may have been provided as a transactional experience,[29] the accepted collaborative model of care that is patient-centred[30,31] and empowers the consumer with their healthcare choices, is still viewed as needing further improvement.

Curriculum development should encompass the health needs of the population as well as the learner needs with evidence pointing to meaningful and practical learning experiences.[6,20,32] While it is known that learning outcomes are improved with clinical learning rather than didactic alone, it is essential that the planning of undergraduate gerodontology education in Australian dental schools considers the need to provide students with supervisors who are experienced in the management of geriatric patients. This is supported by evidence from dental school academics advocating for quality supervision in special needs dentistry[33] and a need to plan for future mentors and special needs dentistry academics. As the specialist branch of dentistry with gerodontology within its discipline, this group of specialists is essential for the future sustainability of the workforce able to manage the care of frail, older, care-dependent people.

Limitations to the study included the possibility that students participating may have had an interest in gerodontology themselves, thereby influencing the discussion with a preference for gerodontology learning. Consideration should also be given to the variations that may have occurred with clinical time allocated to students during this period as well as periods of lock-down where comparable teaching and lockdown pre-pandemic may have elicited different perceptions of stakeholders. An overarching discussion comparing other stakeholder groups, such as dental school academics involved in undergraduate gerodontology curricula, would also provide another lens to the themes identified in the study.

5 | CONCLUSION

Dental students, Directors of Nursing, and consumer representatives voiced a need for greater collaboration and improvement in education delivery to enable improvement in health outcomes and individual experiences. This was perceived as futile unless appropriate resourcing and quality supervision were supported.

There is an overwhelming growth of older, frail, and care-dependent people compelling geriatric-specific oral health care from the Australian workforce of dentists.[5,34–36] Stakeholder perceptions are required to inform a gerodontology curriculum that is appropriate to the healthcare requirements of the population. For curricula to be successful, policymakers and education providers must find solutions to prepare future dentists to ensure that the oral health needs of Australian older people are addressed and managed appropriately.

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