

WESTERN SYDNEY
UNIVERSITY



**Promoting oral health for people with
cardiovascular disease: A mixed-methods study
to inform the development of a nurse-led
Cardiovascular Oral Health (CARDIOH) program
(The CARDIOH Study)**

A thesis submitted in fulfilment of the requirements for
Doctor of Philosophy (PhD) Degree

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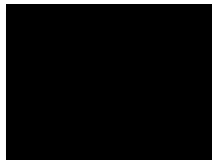
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30 June 2020

Declaration

The work presented in this thesis is, to the best of my knowledge and belief, original, except as acknowledged in the text. I hereby declare that ethical clearance was obtained for this body of research and I have not submitted any material contained herewith, either in full or in part, for a degree in this or any other institution.

Signature:



Date: 30 June 2020

Dedication

I would like to dedicate this work to my mother and father, Eliana and Julio, who inspired me to be the person I am today and to be the best that I can be in anything I do. They both showed me strength, endurance, and resilience, which are qualities I carry with me in every aspect of my life. They also gave me music, dancing and lots of happiness that I have also passed on to my children and share with other people that touch my life. I also want to dedicate this thesis to my children, Andres and Camila, who are my pride and joy and complete my life. I hope that I have given them both an example that they will follow on their own journeys.

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Table of Contents

Dedication	iii
Acknowledgements	iv
Table of Contents	v
List of Figures & Tables.....	viii
Anthology of Publications	ix
Peer-reviewed papers.....	ix
Peer-reviewed abstracts.....	ix
Conferences and presentations.....	x
Awards	xii
List of Abbreviations.....	xiii
Glossary	xiv
Preface (My story).....	xvii
Abstract	xix
Chapter 1 Introduction.....	1
1.1 Overview	1
1.2 Background.....	1
1.2.1 Cardiovascular disease	1
1.2.2 Periodontal disease	3
1.2.3 Link between periodontal disease and cardiovascular disease.....	4
1.2.3.1 Historical perspective	4
1.2.3.2 Current evidence	5
1.2.4 Mechanism of the link between periodontal disease and ACVD	8
1.2.5 Oral healthcare among people with cardiovascular disease.....	10
1.2.6 Oral healthcare in the general healthcare setting.....	10
1.2.7 The cardiac healthcare setting in Australia	12
1.2.8 The oral healthcare setting in Australia.....	12
1.3 Conclusion	14
Chapter 2 Literature Review	15
2.1 Overview: Thesis Paper 1	15
2.2 Aims: Thesis Paper1.....	15
2.3 Conclusion: Thesis Paper 1	16
2.4 Thesis Paper 1.....	17
Chapter 3 Research Gaps, Aims and Conceptual Framework.....	28
3.1 Introduction.....	28
3.2 Research Gaps	28
3.3 Aims of the Study	29
3.4 Thesis Outline.....	29
3.5 Conceptual Framework of the CARDIOH Study.....	35
3.5.1 Understanding Andersen’s model	35
3.5.2 Andersen’s model in the context of the CARDIOH Study.....	37
3.6 Conclusion	40
Chapter 4 Methodology	41
4.1 Introduction.....	41
4.2 Mixed-method Design	41
4.2.1 Rationale for a sequential exploratory mixed-method design.....	42

4.3 Phase 1 Qualitative.....	44
4.3.1 Cardiac care clinician-participants.....	44
4.3.1.1 Sampling, recruitment and setting.....	44
4.3.1.2 Data collection.....	48
4.3.1.3 Data analysis.....	49
4.3.2 Patient-participants.....	50
4.3.2.1 Sampling, recruitment and setting.....	50
4.3.2.2 Data collection.....	50
4.3.2.3 Data analysis.....	52
4.3.2.4 Study rigour.....	52
4.4 Phase 2 Quantitative.....	54
4.5 Development and Testing of the Survey.....	54
4.5.1 Investigator-developed instruments.....	57
4.5.1.2 BASAC scale, barriers to seeking frequent dental care.....	58
4.5.1.3 IPOH scale, intention to participate in oral healthcare promotion services provided by cardiac nurses.....	58
4.5.1.4 Sampling, recruitment and setting.....	61
4.5.1.5 Data collection.....	61
4.5.1.6 Sample size.....	63
4.5.1.7 Data analysis.....	63
4.6 Integration of the Qualitative and Quantitative Results.....	64
4.7 Ethical Considerations.....	65
4.7.1 Informed consent.....	66
4.7.2 Confidentiality.....	66
4.7.3 Autonomy.....	67
4.7.4 Beneficence.....	68
4.7.5 Authenticity.....	68
4.8 Conclusion.....	69
Chapter 5: Qualitative Results - Cardiac Care Clinicians.....	70
5.1 Overview: Thesis Paper 2.....	70
5.2 Aims: Thesis Paper 2.....	70
5.3 Conclusion: Thesis Paper 2.....	71
5.4 Thesis Paper 2.....	72
Chapter 6: Qualitative Results - People with CVD.....	80
6.1 Overview: Thesis Paper 3.....	80
6.2 Aims: Thesis Paper 3.....	80
6.3 Conclusion: Thesis Paper 3.....	81
6.4 Thesis Paper 3.....	82
Chapter 7: Quantitative Results - People with CVD.....	99
7.1 Overview: Thesis Papers 4 and 5.....	99
7.2 Aims: Thesis Paper 4.....	99
7.3 Conclusion: Thesis Paper 4.....	100
7.4 Thesis Paper 4.....	101
7.5 Aims: Thesis Paper 5.....	110
7.6 Conclusion: Thesis Paper 5.....	110
7.7 Thesis Paper 5.....	112
Chapter 8: Unpublished Results –Potential Uptake of Oral Healthcare Promotion Services Provided by Cardiac Nurses.....	119
8.1 Overview of Chapter 8.....	119

8.2 Perceived Capability of Cardiac Nurses to Promote Oral Healthcare	119
8.3 Intention to Participate in Oral Healthcare Promotion Services Provided by Cardiac Nurses	121
8.4 Conclusion	122
Chapter 9 Discussion	124
9.1 Introduction.....	124
Summary of the key findings	124
9.2 Study Aim 1	125
9.3 Study Aim 2	128
9.4 Study Aim 3	133
9.5 Study Aims 4.....	137
9.6 Adapting Andersen’s Model for CARDIOH	141
9.7 Strengths and Limitations.....	144
Chapter 10 Conclusion and Recommendations.....	147
10.1 Conclusion	147
10.2 Recommendations.....	148
10.2.1 Clinical practice.....	148
10.2.3 Policy.....	150
10.2.3 Research	152
References.....	154
Appendices	195
Appendix 1 Guide Focus Groups and Telephone Interviews with Cardiac Care Clinicians	196
Appendix 2 Guide for interviews with people with CVD	197
Appendix 3 CARDIOH Questionnaire (Survey).....	198
Appendix 4 SWSLHD, SLHD, WSU Human Research Ethics Committee, Approval Letters.....	206
Appendix 5 Participant Consent Form (People with CVD Interviews).....	220
Appendix 6 Participant Consent Form (People with CVD Questionnaire).....	221
Appendix 7 Participant Consent Form (Cardiac Care Clinicians)	222
Appendix 8 Participant Information Sheet (People with CVD Interviews)	223
Appendix 9 Participant Information Sheet (People with CVD Questionnaire).....	226
Appendix 10 Participant Information Sheet (Cardiac Care Clinicians)	229
Appendix 11 Participant Demographic Form (Patient Interviews).....	232
Appendix 12 Participant Demographic Form (Focus Groups and Telephone Interviews)	233
Appendix 13 Invitation to Participate Flyer (Interviews).....	234
Appendix 14 Invitation to Participate Flyer (Focus Groups).....	235
Appendix 15 Invitation to Participate Flyer (Survey/Questionnaire)	236
Appendix 16 Statement of Authors’ Contributions	237

List of Figures & Tables

Figure 1.1: Historical timeline describing oral health and its impact on systemic diseases, CVD and ACVD	7
Figure 1.2: Proposed mechanism linking periodontal infections with atherosclerosis (Adapted from Reyes et al., 2013).....	9
Figure 3.1: Thesis outline	32
Table 3.1: Aligning the aims with the study questions and the published/ unpublished results.....	34
Figure 3.2: Andersen’s conceptual framework (Andersen et al, 2007)	37
Figure 3.3: Conceptual framework of the CARDIOH Study (adapted from Andersen et al, 2007).....	39
Figure 4.1: Exploratory design of the mixed methods approach adapted from Creswell and Plano-Clark (2011).....	43
Figure 4.2: Image of the stall at national conference.....	48
Table 4.1: Description of the survey for people with CVD.....	56
Table 4.2: Scale items of the intention to participate in oral healthcare promotion services by cardiac nurses (IPOH) scale	60
Figure 4.3: Images of the stalls during data collection	62
Table 8.1: Predictors of perceived capability of cardiac nurses to promote oral healthcare (n=318)	121
Table 8.2: Predictors of intention to participate in oral health services provided by cardiac nurses (n=318).....	122

Anthology of Publications

Peer-reviewed papers

1. **Sanchez, P.**, Everett, B., Salamonson, Y., Redfern, J., Ajwani, S., Bhole, S., Bishop, J., Lintern, K., Nolan, S., Rajaratnam, R., Sheehan, M., Skarligos, F., Spencer, L., Srinivas, R., George, A. (2019). The oral health status, behaviours and knowledge of patients with cardiovascular disease in Sydney Australia: A cross-sectional survey. *BMC Oral Health*, 19(1), 12. Doi:10.1186/s12903-018-0697-x. Impact Factor (IF) 2.130/ Journal Impact Quartile (Q)1.
2. **Sanchez, P.**, Salamonson, Y., Everett, B., George, A. (2018). Barriers and predictors associated with accessing oral health care among patients with cardiovascular disease in Australia. *Journal of Cardiovascular Nursing*, 34(3), 208-214. Doi:10.1097/JCN.0000000000000559. IF 2.510/ Q1.
3. **Sanchez, P.**, Everett, B., Salamonson, Y., Ajwani, S., Bhole, S., Bishop, J., Lintern, K., Nolan, S., Rajaratnam, R., Redfern, J., Sheehan, M., Skarligos, F., Spencer, L., Srinivas, R., George, A. (2017). Perceptions of cardiac care providers towards oral health promotion in Australia. *Collegian*, 25(5), 471-478. Doi:10.1016/j.colegn.2017.11.006. IF 1.231/ Q1.
4. **Sanchez, P.**, Everett, B., Salamonson, Y., Ajwani, S., Bhole, S., Bishop, J., Lintern, K., Nolan, S., Rajaratnam, R., Redfern, J., Sheehan, M., Skarligos, F., Spencer, L., Srinivas, R., George, A. (2017). Oral health and cardiovascular care: Perceptions of people with cardiovascular disease. *PLoS One*, 12(7), e0181189. Doi:10.1371/journal.pone.0181189. IF 2.870/ Q1.
5. **Sanchez, P.**, Everett, B., Salamonson, Y., Ajwani, S., George, A. (2017). Oral healthcare and cardiovascular disease: A scoping review of current strategies and implications for nurses. *Journal of Cardiovascular Nursing*, 32(3), E10-E20. Doi: 10.1097/JCN.0000000000000388. IF 2.510/ Q1.

Peer-reviewed abstracts

6. **Sanchez, P.**, Everett, B., Salamonson, Y., Bishop, J., Lintern, K., Nolan, S., Rajaratnam, R., Redfern, J., Sheehan, M., Skarligos, F., Spencer, L., George, A. (2017). Factors affecting

access to oral healthcare for patients with cardiovascular disease in Australia.

Circulation. 136: A16286. http://circ.ahajournals.org/content/136/Suppl_1/A16286. IF 14.440/ Q1.

7. **Sanchez, P.**, Salamonson, Y., Everett, B., Ajwani, S., Bhole, S., Srinivas, R., George A. (2017). New model of oral healthcare for cardiac settings in Australia. *Journal of Dental Research*. 96 (Special Issue C): Abstract no 73. <https://iadr.abstractarchives.com/abstract/wcpd2017-2761306/new-model-of-oral-healthcare-for-cardiac-settings-in-australia>. IF 5.125/ Q1.

Conferences and presentations

International

1. **Sanchez, P.**, Everett, B., Salamonson, Y., Bishop, J., Lintern, K., Nolan, S., Rajaratnam, R., Redfern, J., Sheehan, M., Skarligos, F., Spencer, L., George, A. (2017). *Factors affecting access to oral healthcare for people with cardiovascular disease in Australia*. [Poster] The American Heart Association Annual Meeting 2017. 11-15 November 2017. Anaheim, California, USA.
2. **Sanchez, P.**, Salamonson, Y., Everett, B., Ajwani, S., Bhole, S., Srinivas, R., George, A. (2017). *New model of oral healthcare for cardiac settings in Australia*. [Poster]. 11th IADR World Congress on Preventative Dentistry (WCPD). 3-6 October 2017. New Delhi, India.

National

3. **Sanchez, P.**, George, A., Everett, B., Salamonson, Y., Ajwani, S., Bhole, S., Bishop, J., Lintern, K., Nolan, S., Rajaratnam, R., Redfern, J., Sheehan, M., Skarligos, F., Spencer, L., Srinivas, R. (2017). *Oral health care and cardiac care clinicians: Current practices and future direction*. Australian Cardiovascular Health and Rehabilitation Association ACRA 2017 Annual Scientific Meeting. 7-9 August 2017. Perth, Australia.
4. **Sanchez, P.**, George, A., Everett, B., Salamonson, Y., Ajwani, S., Bhole, S., Lintern, K., Rajaratnam, R., Redfern, J., Sheehan, M., Skarligos, F., Spencer, L., Srinivas, R. (2016) *Promoting oral health in the cardiac setting: Perception of cardiovascular patients in*

Sydney, Australia. [Moderated Poster Presentation, research abstract finalist]. Australian Cardiovascular Health and Rehabilitation Association ACRA 2016 Annual Scientific Meeting. 1-3 August 2016. Adelaide. Australia.

5. **Sanchez, P.** (2016). *CVD and oral health – Survey and discussion.* Presentation at plenary session. 2016 Australasian Cardiovascular Nursing College ACNC Conference. 4-5 March 2016. Melbourne, Australia.
6. **Sanchez, P.,** George, A., Everett, B., Salamonson, Y., Ajwani, S. (2015). *Developing a cardiovascular oral health (CARDIOH) promotion program for the cardiac rehabilitation setting: Findings from a scoping review.* [Poster]. 2015 Australasian Cardiovascular Nursing College ACNC Conference. 13-14 March 2015. Sydney, Australia.

Local

7. **Sanchez, P.,** George, A., Everett, B., Salamonson, Y. (2018). *Do nurses have a role in promoting oral health in the cardiac setting?* 2018 Health Beyond Research and Innovation Showcase. 6-7 June, William Inglis Hotel, Warwick Farm, Australia.
8. **Sanchez, P.** (2018). *A needs assessment study to develop a cardiovascular oral health (CARDIOH) program: My PhD journey.* Ingham Students Seminar Series. 21 February. IIAMR, Liverpool, Australia.
9. **Sanchez, P.,** George, A., Everett, B., Salamonson, Y. (2017). *Developing a cardiovascular oral health (CARDIOH) program for nurses: A needs assessment.* WSU School of Nursing and Midwifery Research Future's Forum. 26-27 October. WSU, Parramatta, Australia.
10. **Sanchez, P.** (2017). *Promoting oral health in the cardiac setting: Is it important and possible?* Ingham Institute Research Seminar Presentations. 12 September. IIAMR, Liverpool, Australia.
11. **Sanchez, P.,** George, A., Everett, B., Salamonson, Y. (2017). *Needs assessment for the development of a cardiovascular oral health (CARDIOH) program for nurses.* Oral presentation. 2017 Health Beyond Research & Innovation Showcase. SWSLHD & IIAMR. 7-8 June 2017. Campbelltown Catholic Club, Sydney, Australia.

12. **Sanchez, P.**, George, A., Everett, B., Salamonson, Y. (2016). *Oral health care and cardiovascular disease: Perceptions of cardiac clinicians in Sydney, Australia*. Oral presentation. Research & Health Beyond Innovation Showcase 2016. SWSLHD & IIAMR. 18-19 October 2016. Liverpool Catholic Club, Sydney, Australia.
13. **Sanchez, P.**, George, A., Everett, B., Salamonson, Y. (2016). *Oral health in the cardiovascular setting: Patient's perceptions*. WSU School of Nursing and Midwifery Research Future's Forum. 28-19 June. WSU, Parramatta, Australia.
14. **Sanchez, P.**, George, A., Everett, B., Salamonson, Y., Ajwani, S. (2015). *Developing a cardiovascular oral health (CARDIOH) promotion program for the cardiac rehabilitation setting: Findings from a scoping review*. [Poster]. Ingham Institute for Applied Medical Research Showcase 27th November 2015 Liverpool, Australia.
15. **Sanchez, P.**, George, A., Everett, B., Salamonson, Y. (2015). *Developing, implementing and evaluating a cardiovascular oral health (CARDIOH) program within a cardiac rehabilitation setting in Sydney: A mixed methods study*. WSU School of Nursing and Midwifery Research Future's Forum. 14-15 July. WSU, Parramatta, Australia.

Awards

1. **Sanchez, P.** (2018). *Winner of 3 the Minute Thesis competition*. School of Nursing and Midwifery, Western Sydney University. From cardiac care to the dental chair.
2. **Sanchez, P.** (2016). *Best Junior Presenter*. Western Sydney University Research Future's Forum: Oral health in the cardiovascular setting: Patient's perceptions.

List of Abbreviations

Abbreviation	Terminology
ABS	Australia Bureau of Statistics
ACVD	Atherosclerotic cardiovascular disease
AIHW	Australian Institute of Health and Welfare
AOR	Adjusted Odds Ratio
BASAC	Barriers to seeking frequent dental care
CALD	Culturally and Linguistically Diverse
CANPOH	Cardiac Nurses Providing Oral Healthcare
CANR	Centre for Applied Nursing Research
CARDIOH	Cardiovascular Oral Health
CDBS	Chronic Dental Benefit Scheme
CI	Confident Interval
CINAHL	Cumulative Index to Nursing and Allied Health Literature
COHORT	Centre for Oral Health Outcomes & Research Translation
CPD	Continuing Professional Development
CVD	Cardiovascular disease
IPOH	Intention to participate in oral healthcare
IQR	Inter quartile range
KMO	Kaiser-Meyer-Olkin test
MIOH	Midwifery Initiated Oral Health
NSAOH	National Survey of Adult Oral Health
NSW	New South Wales
OH	Oral health
PCA	Principal Component Analysis
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RPA	Royal Prince Alfred
SLHD	Sydney Local Health District
SPSS	Statistical Package for Social Sciences
SWSLHD	South Western Sydney Local Health District
TNF- α	Tumour necrosis factor- α
UK	United Kingdom
USA	United States of America
WHO	World Health Organisation
WSU	Western Sydney University

Glossary

Term	Definition of Terms
Access	Refers to the actual use of personal health services and everything that facilitates or impedes their use.
Andersen’s model of healthcare utilisation	Behavioural model that explores factors that impede or facilitate health-seeking behaviour.
All-cause mortality	The total number of deaths due to any condition during a specific time period. Therefore, all-cause mortality is any cause of death.
Atherosclerotic cardiovascular disease	A build-up of cholesterol plaque in the walls of arteries, causing obstruction of blood flow. Plaques may rupture, causing acute occlusion of the artery by clot. Atherosclerosis often has no symptoms until a plaque ruptures or the build-up is severe enough to block blood flow.
Cardiac care clinicians	Clinicians that work directly with people with cardiac conditions, including nurses, physiotherapists, exercise physiologists, and cardiologists.
Cardiac nurses	Nurses that work directly with people in cardiac care including in the acute, chronic, cardiac rehabilitation, community and/or cardiology clinic.
Cardiomyopathy	Disease of the heart muscle that affects the heart’s ability to effectively pump blood. Cardiomyopathy can lead to heart failure.
Cardiovascular diseases	Describes a range of conditions that involve narrowed or blocked blood vessels that can lead to myocardial infarction, angina, or stroke. Include atherosclerosis, coronary heart (artery) disease, cerebrovascular disease, peripheral artery disease, and other less frequent conditions.
Congenital heart disease/defect	Abnormalities in the structural development of the heart which occurs in approximately 8:1000 live births.
Dental care services	Oral health services offered to people including oral health assessment, management, treatment, and evaluation performed by any dental health professional.
C-reactive protein	A protein found in blood plasma, whose circulating concentrations rise in response to inflammation.
Enabling factors	Conditions that facilitate or impede the use of services.
Fibrinogen	A glycoprotein complex in the blood. During tissue and vascular injury, it is converted by thrombin to fibrin and then to a fibrin-based blood clot. Fibrin clots function primarily to occlude blood vessels to stop bleeding.

Term	Definition of Terms
Gram-negative anaerobic bacteria	Bacteria that grow and reproduce in the absence of oxygen.
Halitosis	Bad breath.
Healthcare-seeking behaviour	The decision-making processes that individuals undertake in seeking and utilising health services and the factors affecting such decisions.
Infective endocarditis	A potentially life-threatening infection of the endocardium, frequently of bacterial origin, mainly affecting the heart valves. Although short-term survival has improved with the advancement of treatments, long-term mortality and morbidity rates remain high.
Inflammatory markers	Markers in the blood that indicate an inflammatory process occurring. Some include high sensitivity C-reactive protein, fibrinogen, serum amyloid and interleukins, tumour necrosis factor- α (TNF- α), interleukin-6, and vascular and cellular fibrinogen adhesion molecules.
Interleukins (IL), interleukin-6 (IL-6)	Interleukins are a group of cytokines that play a central role in the regulation of immune and inflammatory responses to infections and tissue injuries. Contributes to host defense through the stimulation of acute phase responses, haematopoiesis, and immune reactions.
Need factors	Need or conditions that laypeople or healthcare providers recognise as requiring medical treatment.
Oral healthcare promotion/ Promoting oral healthcare	In this study, it refers to nurses providing oral health education, performing oral health screening, and providing referrals to oral health services for their patients.
Participants/Patients/People with CVD	Terms used interchangeably in relation to the participants who were living with CVD.
Periodontal disease, periodontitis	A chronic inflammation of the gum (gingiva), ligaments and bony structures that hold the tooth in place leading to bone loss.
Periodontal infection	Characterised by an outgrowth of pathogenic species in the sub gingival region which promotes a chronic infection allowing bacteria to enter the circulatory system.
Predisposing factors	Existing conditions that predispose people to use or not use services even though these conditions are not directly responsible for use.
Pro-thrombotic state	Abnormal blood coagulation that increases the risk of thrombosis or blood clot formation.

Term	Definition of Terms
Systemic diseases or conditions	Diseases that affect the entire body, rather than a single organ or body part.
Tumour necrosis factor-α (TNF-α)	An inflammatory cytokine produced during acute inflammation and responsible for a diverse range of signaling events within cells, leading to necrosis or apoptosis. The protein is also important for resistance to infection and cancers.

Preface (My story)

I was born in Chile 52 years ago and I am a proud Latin-American, but I am also a proud Australian. My family and I arrived in Australia in 1988 like many other Chileans during that period for political and economic reasons. At the time I was hesitant to leave Chile and migrate to this country. However, my parents, and particularly my mother, made the decision to move here to give me a better future.

From a very young age I have been a very active human rights defender and political activist. This occurred during a particularly repressive regime in Chile. As a result of my activism, which started when I was 13 years old, I was incarcerated at the age of 19. I believe that this, together with other life experiences, made me the person that I am today. I am resilient with a robust sense of justice and love. Not the romantic love, but love to what is around me, I appreciate the here and now. I believe that I am strong, yet sensitive at the same time. I am practical and do not like to go around things, as I prefer to get to a conclusion and resolution and then move on. I have been identified as an extrovert, but I enjoy being by myself and can adapt to different situations easily. I think that the saying: “We are what we are because of where we’ve been” is very true and I have been in many...many places. But at the same time, the fact that my parents, friends and other significant people in my life were there for many of those experiences helped me grow and influenced the way I am today.

It is interesting to look back and see how life can change in an instant and how our decisions could take us on a path we never thought we would take. For me, some of those experiences included coming to Australia, being unable to complete my studies in marine biology (in Chile), not studying medicine due to being in prison (I had a scholarship which I

could not take), marrying and having two wonderful children in Australia, studying nursing, becoming a critical care nurse, doing research, becoming an academic, and finally doing a PhD!

Some of my passions are my children, music, activism, dancing, friends, community, and my mum. My father is no longer with us, but he is in my life every day. He was not perfect, but a great man for all those who met him. I do miss him, but I know that he is in a good place.

My journey to the PhD started when I had a work-related injury and could no longer do clinical work directly with patients. At that time, I was already teaching at the university and had some interest in research. I decided to take the opportunity to work at the Centre for Applied Nursing Research and my insight into research grew, thanks to Professor Maree Johnson who took me under her wing and provided mentorship. From there, doing my honours and then commencing a PhD was the logical thing to do. Academically, and after many years of casual teaching, I finally took a permanent position as a lecturer at WSU.

Whenever I am asked about my PhD topic, I usually say that I am doing something that has a lot to do with my philosophy in life—make health accessible for all. I believe that good quality health, education, and basic resources should be accessible to everyone. No one should be disadvantaged. My PhD journey has been a great experience and I have learnt so much. My friend Sheeja once said that one of the main things we learn doing a doctorate is resilience. Perhaps it is true, as I am now probably more resilient than I have ever been.

Abstract

Background: Cardiovascular disease (CVD) is the leading cause of death globally. There is now strong evidence showing that periodontal (gum) disease is linked to atherosclerotic CVD, with inflammation as the common underlying factor. Consequently, international consensus statements recommend increasing awareness among clinicians and patients about the link between periodontal disease and CVD and including oral health screening and education in the cardiac setting. Despite these recommendations, there is limited information about the oral health perceptions, knowledge, and practices of patients with CVD. Further, the current practices of cardiac care clinicians in this area are largely unknown, particularly in the Australian context.

Purpose: The overall aim of this mixed-methods study was to explore oral healthcare for people with CVD in Australia to inform the development of a nurse-led cardiovascular oral health program. The specific aims included: i) synthesise the evidence regarding oral healthcare and CVD, and the current strategies and implications for nurses; ii) exploring the perceptions and practices of cardiac care clinicians regarding oral healthcare; iii) exploring the perceptions, predisposing, enabling and need factors among patients with CVD regarding oral healthcare; iv) the perceptions of cardiac care clinicians and patients with CVD of the capability of cardiac nurses to promote oral healthcare and patients' intentions to participate in oral healthcare services provided by cardiac nurses.

Methods: This thesis is presented as a series of five published papers. The first publication is presented as the literature review and the remaining four papers are the qualitative and quantitative results of this study. Guided by a sequential exploratory approach, participants were recruited through purposive (qualitative component) and convenience sampling

(quantitative component) techniques. Qualitative data were collected through focus groups and phone interviews with cardiac care clinicians ($n=30$) across Australia and through interviews with patients with CVD ($n=12$). Following this phase, quantitative data were collected using a cross-sectional survey of 318 patients with CVD who were attending outpatient cardiology services in the Sydney metropolitan region between 2016 and 2017. Questions in the survey included adapted instruments as well as three investigator-developed instruments. Two of these instruments were tested for their psychometric properties. Textual data were analysed using thematic analysis, and numeric data were analysed using descriptive, bivariate, and multivariate logistic regression analyses.

Results: The study findings revealed that most participants (cardiac care clinicians and patients) were unaware of the relationship between oral health and CVD. There was a high prevalence of self-reported oral health problems among patients with CVD. Over four-fifths (82%) of patients reported having at least one dental problem and 59% had seen a dentist in the last 12 months. Despite this, clinicians did not routinely discuss oral healthcare with their patients and attributed this to their knowledge gap and their limited training in this area. Not surprisingly then, only 10.7% of patients received any information regarding oral healthcare from cardiac care providers. Patients were more likely to have seen a dentist in the previous 12 months if they received oral health information (adjusted odds ratio [AOR], 5.08; 95% confidence interval [CI], 1.62–15.93) and had private health insurance (AOR, 3.33; 95%CI, 1.91–5.83).

Regarding their perceived capability, cardiac care clinicians were receptive to the idea of promoting oral health in their setting if identified barriers such as availability of resources and training were addressed. They acknowledged that cardiac nurses are the best suited to

provide this service. The study also found that most patients with CVD perceived that cardiac nurses had the capability to promote oral healthcare and more than half believed that these nurses could assist them with oral health problems and expressed high levels of intention (78%) to participate if oral health promotion services were provided by cardiac nurses.

Conclusion: This study has provided valuable insight into this neglected aspect of cardiac care, particularly in Australia. It has shown that despite the current evidence and recommendations there is limited focus on oral healthcare promotion by cardiac care clinicians. Not surprisingly, patients with CVD are not receiving adequate information in this area, which is concerning, as this has been identified as a key influencing factor for people with CVD in seeking dental care, along with accessible and affordable dental care.

A preventative nurse-led model of oral healthcare promotion services, where cardiac nurses are equipped in providing oral health information, screening and referrals to appropriate dental care services is required, so that patients with CVD receive appropriate information about oral healthcare as well as timely access to dental care.

Chapter 1

Introduction

1.1 Overview

Cardiovascular disease (CVD) is the leading cause of death worldwide, and there is growing evidence showing that periodontal disease (gum disease) may be a risk factor (Mozos & Stoian, 2019; Virtanen, et al, 2017). Furthermore, there is international consensus recommending the inclusion of oral healthcare in the care of cardiac patients (Sanz, et al., 2020). However, little is known—particularly in the Australian context—about the oral healthcare practices of people with CVD or whether cardiac care providers are promoting oral health. These gaps will be unpacked throughout this thesis using an appropriate conceptual framework and methodology.

This chapter will commence with a brief introduction to CVD and more specifically atherosclerotic cardiovascular disease (ACVD) and periodontal disease, followed by a discussion of the relationship between these two health conditions. The chapter will then provide an account of oral healthcare among people with CVD as well as an outline of the cardiac and oral healthcare settings in Australia.

1.2 Background

1.2.1 Cardiovascular disease

Cardiovascular disease is a collective term used to describe all diseases of the heart and blood vessels (Heart Foundation of Australia, 2019a). It includes conditions such as coronary heart disease, heart failure, cardiomyopathy, congenital heart disease, rheumatic

heart disease, peripheral vascular disease and stroke (Heart Foundation of Australia, 2019a). Atherosclerotic cardiovascular disease is the most common type of CVD and involves the narrowing or blockage of the vessels due to the build-up of fat, cholesterol, or other substances (plaque) in the artery walls (Heart Research Institute, 2019). Atherosclerosis, the cause of ACVD, develops when plaque builds up in the arterial walls, due to an inflammatory process, resulting in the narrowing of the arteries and making it harder for blood to flow through (National Heart Lung and Blood Institute, 2019). There are several inflammatory markers in the blood that are associated with an increased risk of developing CVD including high sensitivity C-reactive protein, fibrinogen, serum amyloid and interleukins, tumour necrosis factor- α (TNF- α), interleukin-6, and vascular and cellular fibrinogen adhesion molecules (Caúla, Lira-Junior, Tinoco, & Fischer, 2014; Flores et al., 2014; Lockhart et al., 2012; Teeuw et al., 2014). There are numerous risk factors for CVD including hypertension, cigarette smoking, limited physical activity, obesity, and poor dietary intake (National Heart Foundation of Australia, 2019). There is also growing evidence showing that periodontal disease is another potential risk factor for CVD (Aarabi, Heydecke, & Seedorf, 2018; Beck, Moss, Morelli, & Offenbacher, 2018; Dietrich et al., 2017).

Worldwide, the prevalence of CVD is high; for example, in 2015 there were an estimated 422.7 million people with CVD (Roth et al., 2017). The burden associated with CVD is equally high and is one of the leading causes of chronic disease morbidity and mortality, accounting for 17.9 million deaths globally. It is projected that by the year 2030, CVD will account for 25 million deaths worldwide (World Health Organization, 2019). In Australia, the number of people living with CVD is increasing due to population ageing and improved treatments that have resulted in people living longer with the condition (Australian Bureau

of Statistics, 2018). Between the years 2014–2015, the number of adults (18 years and over) with one or more CVD conditions was approximately 4.2 million, corresponding to 18.3% of the population (Australian Bureau of Statistics, 2018). Further, in 2017, 27% of all deaths were related to CVD making it the leading cause of death in Australia (Heart Foundation of Australia, 2019b). CVD also imposes a significant financial impact on the Australian economy due to high healthcare expenditure (10.4% of total disease expenditure) and is one of the main causes of hospitalisation counting for 576,000 people in 2016–17 (Heart Foundation of Australia, 2019b).

1.2.2 Periodontal disease

Periodontal disease, also known as periodontitis, is defined as a chronic inflammation of the gum (gingiva), ligaments and bony structures that hold teeth in place leading to bone loss (Bahekar, Singh, Saha, Molnar, & Arora, 2007). Periodontitis is considered a multifactorial condition where the presence of gram-negative anaerobic bacteria, the person's immune mechanisms and genetic predisposition are believed to play an important role in the development of the disease (Bartova et al., 2014).

Worldwide, a significant number of people have periodontal disease (Jin et al., 2016). In developed countries with reliable oral health statistics, the prevalence of periodontal disease is high in the adult population (Bartova et al., 2014; Kassebaum et al., 2017). For example, in the USA, in 2015, one in every two adults over 30 years of age had periodontal disease (Eke et al., 2015).

In Australia, the latest national statistics are from the National Survey of Adult Oral Health (NSAOH) 2017–18. This survey reports that 30% of the population aged 15 years and

over have moderate to severe periodontal disease making it the fifth most prevalent health problem. People aged 75 years and over had almost six times higher prevalence of periodontal disease. Together with dental caries, periodontal disease contributes to 90% of all tooth loss (Australian Research Centre for Population Oral Health ARCPOH, 2019).

Several risk factors predispose people to periodontal disease with some of these only recently being identified, as the condition was once believed to be an inevitable consequence of ageing (Minkle Gulati et al., 2013). These risk factors include tobacco smoking, poor oral hygiene, socio-economic, demographic and ethnic factors, malnutrition, psychological stress, alcohol consumption, diabetes mellitus and other systemic conditions (including CVD), and genetic factors (Baelum & López, 2013; Eke et al., 2015; Genco & Borgnakke, 2013; Petersen & Ogawa, 2012).

1.2.3 Link between periodontal disease and cardiovascular disease

1.2.3.1 Historical perspective

Reports of a relationship between oral health and systemic disease is not new and dates to ancient times when the mouth and teeth were considered the doorway to the body that needed to be kept meticulously clean to protect it from contamination (O'Reilly & Claffey, 2000). Inflammatory conditions such as joint pain treated by tooth extraction were first reported in ancient Greece (Genco & Williams, 2010). There are reports of the discovery of oral hygiene devices in burial crypts of royal princesses of the 12th Dynasty in ancient Egypt, while in the Middle Kingdom (2100 BC), a papyrus mentioned tooth pain linked with diseases of women's reproductive systems (Gold, 1985). Similar scriptures and evidence have been found in ancient civilizations where the mouth and teeth were highly valued.

The link between bacteria and oral hygiene was first described in 1683 by Dutch scientist Antonie von Leeuwenhoek (Davis, 1974). In 1768, Thomas Berdmore described the link between the teeth and the body by referring to inflammations that can cause systemic complications (O'Reilly & Claffey, 2000). Later, with the evolution of microbiology and other scientific and medical advances, this relationship was further studied and described. In 1818 the famous American physician Benjamin Rush described the case of a woman who was cured from rheumatism after an aching tooth was removed (O'Reilly & Claffey, 2000). In the early 1900s, there were discussions in the literature among medical professionals about oral infections being a cause of systemic diseases (Hunter, 1900). More recently, attention has focused on oral sepsis (infection) and its possible association with conditions such as diabetes, low birth weight in infants, osteopenia, and ACVD (Mozos & Stoian, 2019; Watts, 2017).

1.2.3.2 Current evidence

In the last two decades, there has been renewed interest in better understanding the relationship between periodontal disease and CVD, particularly the link between periodontal disease as a potential risk factor for ACVD. As a result, recent consistent and convincing evidence suggests that this association could be independent of other cardiovascular risk factors (Beukers, van der Heijden, van Wijk, & Loos, 2017; Hwang, Shim, Kang, & Choi, 2018). Additionally, two significant studies, a systematic review and meta-analysis of prospective and retrospective cohort studies as well as a rapid review of systematic reviews and meta-analyses published between 2005–2015, show substantial evidence of an increase in the relative risk for ACVD, morbidity and mortality in people with severe periodontal disease (Dietrich et al., 2017; Lang, Suvan, & Tonetti, 2015). To add to the empirical evidence linking poor oral health and CVD, a large prospective population-based study of Australian men and

women aged 45 years or older ($n=172,630$) found that tooth loss and self-rated health of the teeth and gums were associated with an increased risk of hospitalisations for people with ischaemic heart disease, peripheral vascular disease, and all-cause mortality (Joshy, Arora, Korda, Chalmers, & Banks, 2016). See Figure 1.1.

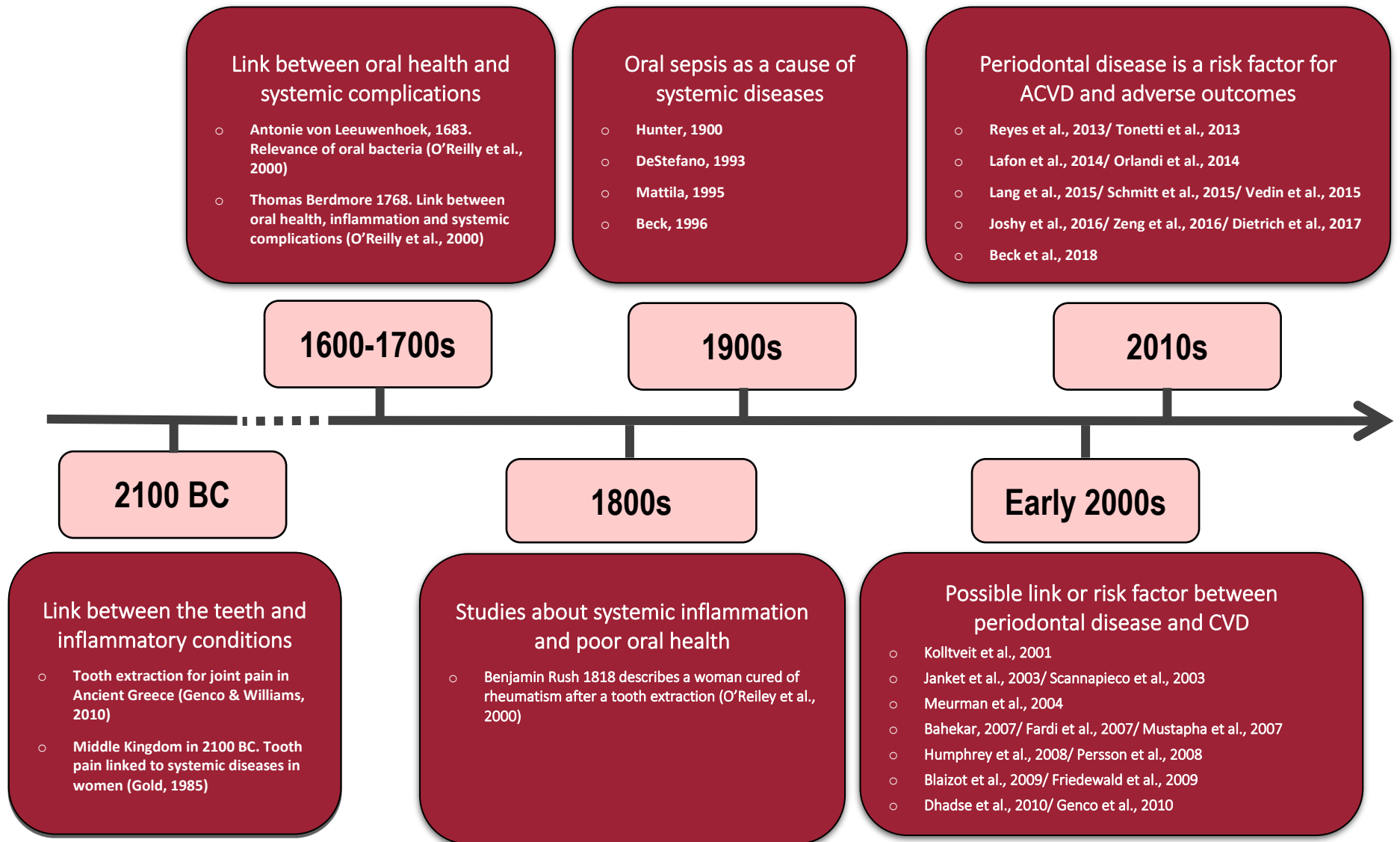


Figure 1.1: Historical timeline describing oral health and its impact on systemic diseases, CVD and ACVD

1.2.4 Mechanism of the link between periodontal disease and ACVD

While the exact biological mechanism between periodontal disease and ACVD is still being debated (Jangid, Doraiswamy, Varghese, & Malaiappan, 2015), it is known that the link is immuno-inflammatory in origin (Jangid et al., 2015; Kundoor Vinay Kumar Reddy, Kinnera, Maloth, & Sunitha, 2015).

Periodontal infection is characterised by an outgrowth of pathogenic species in the sub gingival region promoting a chronic infection that allows bacteria to enter into the circulatory system (Loos, Teeuw, & Nicu, 2016). In the active phase of periodontitis, a sum of host-related and lifestyle factors results in an unusual immune response against bacteria in the gingiva, in particular against gram-negative bacteria (Loos, Teeuw, & Nicu, 2016). Further evidence of this occurrence has been supported by studies that found periodontal bacteria present in atherosclerotic plaques and biopsies (Chew et al., 2016; Olsen, 2015). Hence, four mechanisms have been proposed: 1) a systemic inflammatory response as evidenced by increased levels of inflammatory markers such as C-reactive protein, interleukine-6, TNF- α and neutrophils; 2) a pro-thrombotic state, an abnormal blood coagulation that increases the risk of thrombosis or blood clot formation; 3) activation of an autoimmune response; and 4) dyslipidaemia, an increase in cholesterol synthesis. Collectively, these conditions may result in endothelial dysfunction resulting in inflammation and atherosclerosis (Schenkein, Papapanou, Genco, & Sanz, 2020; Tonetti & Dyke, 2013). Figure 1.2 shows the postulated mechanism linking periodontal infections to vascular tissue inflammation and atherosclerosis.

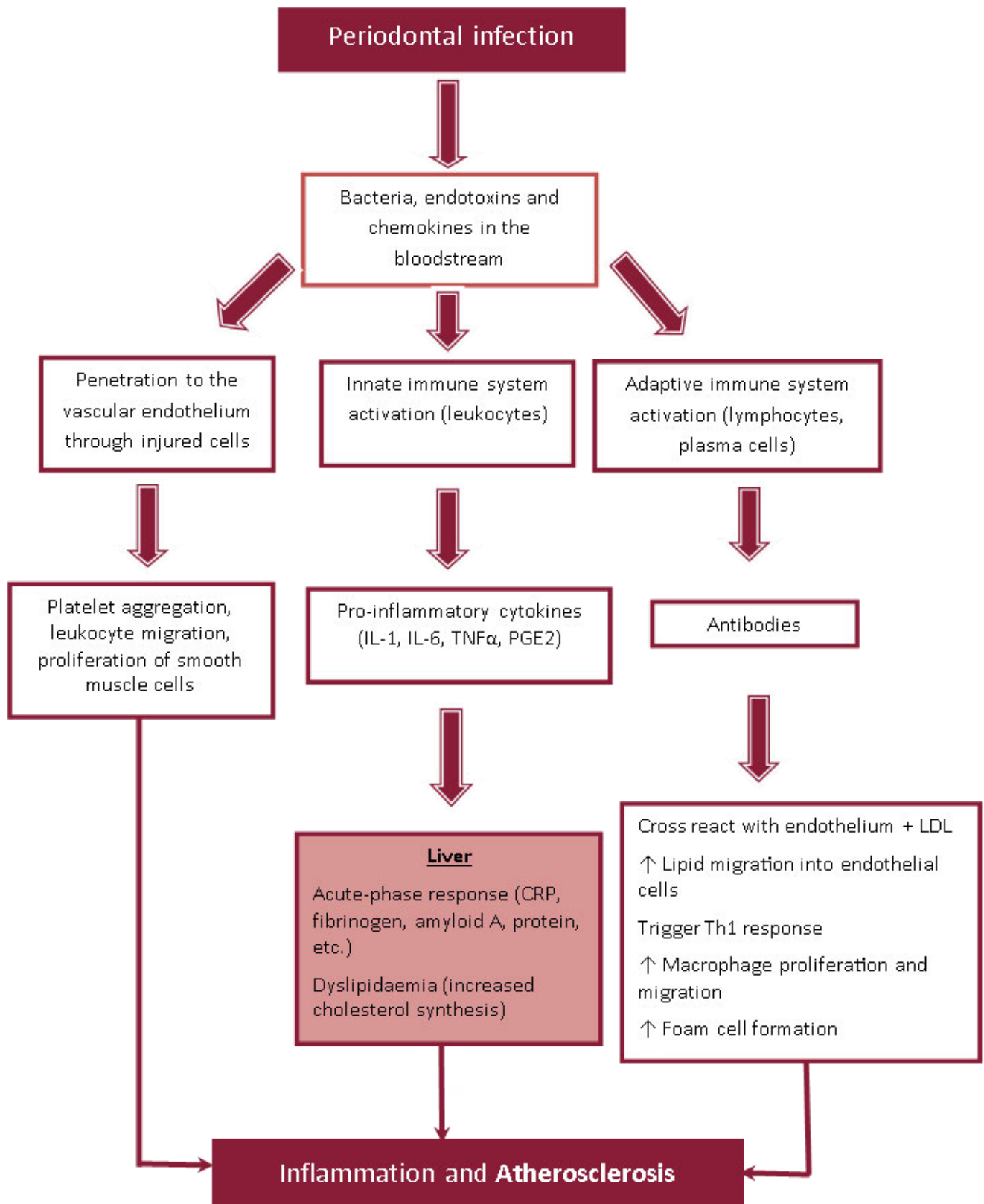


Figure 1.2: Proposed mechanism linking periodontal infections with atherosclerosis (Adapted from Reyes et al., 2013)

1.2.5 Oral healthcare among people with cardiovascular disease

There is a lack of empirical data regarding the oral health status of people with CVD. Having this information is important, as one study found that less than half (38%) of people with CVD seek dental care due to both lack of access to dental care and a limited awareness about the importance of oral health to their well-being (Virdee, 2006). A 2015 study from Iran about oral health knowledge and the attitudes of 150 patients with CVD concerning their oral health status, found a moderate level of knowledge and attitude and poor oral health practices. Additionally, the study revealed a 62% incidence of periodontal disease among the participants (Rasouli-Ghahroudi et al., 2016). Other studies reporting the oral health status, knowledge, practices and uptake of dental care services are related to paediatric cardiac patients and their carers or family (Suma, Mohan Das, Ambika, & Jairanganath, 2011; Zafar, Yasin, Siddiqi, & Naz, 2008). Poor parental oral healthcare and the lack of awareness of infectious endocarditis were major findings in these studies.

1.2.6 Oral healthcare in the general healthcare setting

Across healthcare settings the knowledge, attitudes, and practices of healthcare providers regarding oral health is suboptimal (Ahmed, Rao, Shenoy & Suprabha, 2018; Shimpi, et al., 2016; Vellayappan, Varghese, 2017). In healthcare, there is a lack of focus on oral health as this has mainly been delegated to dentists or dental professionals. There is a lack of integrated care in the area with some of the contributing factors being poor knowledge about oral health due to lack of training, and poor attitudes and practices as non-dental professionals believe that oral healthcare is not part of their clinical role. These views have been found among medical practitioners, pharmacists, nurses, and other allied healthcare professionals (Ahmed, Rao, Shenoy & Suprabha, 2018; Kaur, Kaur & Ahluwalia,

2015; Shimpi, et al., 2016; Vellayappan, Varghese, 2017). It is reported, especially among medical practitioners, that despite having knowledge of the relevance of oral health with general health, there was a lack of perceived need to refer patients to oral health services (Kaur, Kaur & Ahluwalia, 2015; Vellayappan, Varghese, 2017). A common finding is that healthcare professionals and students, particularly from medical and nursing, often have a positive attitude towards oral health during their training and are receptive to the possibility of collaboration with dental professionals (Løken, Wang & Wigen, 2016), but this is not reflected in most clinical practice settings.

In the cardiac care setting, little is known about the oral healthcare practices of clinicians. Despite increasing evidence supporting a relationship between periodontal disease and CVD, limited studies have explored the knowledge of cardiac care clinicians regarding oral health and CVD and of these, findings support a lack of awareness regarding such a relationship. For example, one study of 119 participants in the United States found that most cardiologists were unclear about the aetiology of the oral-systemic link regarding CVD (Mosley, Offenbacher, Phillips, Granger, & Wilder, 2014). However, it was found that internationally, and in Australia, it is common practice for cardiologists or cardiac care services to provide a dental referral to patients that require heart valve surgery or a heart transplant. These patients need to obtain a dental clearance prior to their surgery as they have a high risk of developing endocarditis due to oral bacterial infections (Cotti et al., 2017; Guggenheimer, Mayher, & Eghtesad, 2005). Overall, the lack of coordinated oral healthcare and referrals from general healthcare settings in Australia has been acknowledged and there are plans to address this issue in Australia's National Oral Health Plan 2015-2024 (Australian Health Ministers' Advisory Council, 2015).

As this study intended to explore oral health and CVD in Australia, the following sections will provide a general picture of the cardiac and oral healthcare settings within the Australian context.

1.2.7 The cardiac healthcare setting in Australia

In Australia, the cardiac model of care follows national guidelines (National Heart Foundation of Australia, 2018). Patients who present with an acute cardiac episode are admitted or transferred to tertiary health services for ongoing management. Depending on the diagnosis, they are managed conservatively with medications and/or an intervention. Prior to discharge, an assessment is done to determine if cardiac rehabilitation, also known as cardiac recovery, or a structured secondary prevention service, is necessary. The aim is to enable people with cardiac disease return to or adopt an active and healthy lifestyle and to prevent any recurrent cardiac events. These services could be hospital based, in primary care, the local community or at home (National Heart Foundation of Australia, 2019) (Xu & Lu, 2011). The first assessment appointment prior to starting the rehabilitation program is usually organised and attended by a cardiac nurse (Vinel, Vachon, Barthet, & Laurencin-Dalicious, 2017). Nevertheless, even though most patients attend the first assessment with the nurse, it is estimated that only 10% to 30% of patients continue with the program (Vinel et al., 2017).

1.2.8 The oral healthcare setting in Australia

Australia does not have universal oral health cover. Dental care is mainly provided by the private sector with limited dental costs covered by State or Commonwealth Governments (Australian Institute of Health and Welfare, 2020). Nevertheless, publicly funded oral healthcare services are available for Australians who are eligible, either free or

at a subsidised cost. These public dental programs are the responsibility of states or territories and vary greatly in relation to the eligibility and organisation of services between jurisdictions (Australian Institute of Health and Welfare, 2018b). There are clear inequalities between metropolitan and rural areas (Stuart, Hoang, Crocombe, & Barnett, 2017), indigenous communities (Jamieson et al., 2016), and other vulnerable communities such as people with mental disorders (Scrine, Durey, & Slack-Smith, 2019), refugees and asylum seekers in Australia (Keboa, Hiles, & Macdonald, 2016). For example, in 2015, funding for public dental care services covered treatment for approximately 20% of eligible people, leaving 80% without any public treatment (Australian Institute of Health and Welfare, 2015). The latest report of the use of dental care services in Australia by the Australian Institute of Health and Welfare indicates that some of the people who were non-eligible for public dental service in 2016–17 went to the private sector, mainly for oral or tooth pain, while others did not access any care at all (Australian Institute of Health and Welfare, 2018c).

In addition, the waiting time to access public health services is an ongoing issue. In a recent national analysis of dental waiting lists in Australia 53% of people were from metropolitan areas and 47% were from rural and remote areas (Dudko, Kruger, & Tennant, 2017). In relation to waiting times for public dental care services, some need to wait between 1 week to 1 month if they have pain of dental origin, 3 months for problems such as a missing front tooth or missing/loose denture or pain due to denture, and up to 6 to 12 months if the person has a disability, is from an institution or group home, is requesting a check-up due to sore or bleeding gums, loose teeth, oral ulcers, broken or chipped tooth, halitosis and other issues considered 'non-urgent' (NSW Government Health, 2017).

Dental costs covered by private health insurance are based on individuals or families purchasing a health insurance policy that covers all or part of the cost of visiting a private dentist (Chrisopoulos, Beckwith, & Harford, 2011). In 2013, 50% of people over five years of age had some level of private health insurance which included dental cover, with just over half of these people living in metropolitan areas (53%). Despite having private health insurance, 77% of adults with dental cover reported making their own contributions towards the cost of dental visits, and 10% reported paying their own full expenses—19% of whom reported experiencing significant financial burden. Total expenditure on dental care services in 2012–13 (excluding those in hospitals) in Australia was AU\$8,706 million. The largest source of payment for dental expenditure was individuals paying directly out of pocket for 58% of total dental costs (Australian Institute of Health and Welfare, 2016a).

1.3 Conclusion

This chapter has provided the background of the study by describing both cardiovascular and periodontal diseases and their resultant burden in the general population. It also presented evidence to support an association between periodontal disease and ACVD and highlighted the current oral healthcare practices of people with CVD and cardiac care clinicians. Finally, a description of cardiac and oral care settings in an Australian context was provided along with the challenges of accessing dental care for the general population. These issues have implications for people with CVD, thus it is important to review current strategies and recommendations in this area. This review will be presented in the next chapter, which is the first publication related to the CARDIOH Study and constitutes the literature review.

Chapter 2

Literature Review

2.1 Overview: Thesis Paper 1

The previous chapter highlighted the importance of oral healthcare for people with CVD. This chapter reports findings from a scoping review, published in the *Journal of Cardiovascular Nursing*, to identify current evidence, recommendations and emerging strategies relating to oral healthcare and management of people with CVD.

Thesis Paper 1

Sanchez, P., Everett, B., Salamonson, Y., Ajwani, S., George, A. (2017). Oral healthcare and cardiovascular disease: A scoping review of current strategies and implications for nurses. *Journal of Cardiovascular Nursing*, 32(3), E10-E20. Doi: 10.1097/JCN.0000000000000388.

2.2 Aims: Thesis Paper1

The aim of the paper was to review current literature to identify:

- 1) Evidence on the impact of periodontal treatment on CVD outcomes;
- 2) Recommendations regarding oral healthcare for people with CVD;
- 3) Evidence regarding the role of nurses in oral health promotion;
- 4) Training resources and tools available to assist nurses in oral health promotion.

2.3 Conclusion: Thesis Paper 1

The scoping review found that periodontal treatment might improve cardiac outcomes by reducing systemic inflammation and improving endothelial function. However, currently there is insufficient high-quality evidence to confirm these findings. Despite this, consensus and international recommendations in this area state that people with CVD and their healthcare providers need to be aware of the association between periodontal disease and CVD, and the implications of having gum disease with their cardiac condition. In the cardiac setting, nurses are well placed to potentially play a key role in promoting oral healthcare among people with CVD, as they are often the first point of contact when patients attend their cardiac assessment, cardiology visit, cardiac rehabilitation session or another structured secondary prevention service. Across the globe, the role of nurses promoting oral healthcare has been successfully explored in settings such as paediatrics, aged care and maternity, leading to better oral healthcare outcomes for their patients. However, the role of cardiac nurses in oral healthcare promotion has not been explored. There are also no resources or instruments available to assist nurses in promoting oral healthcare in the CVD setting.

Oral Healthcare and Cardiovascular Disease

A Scoping Review of Current Strategies and Implications for Nurses

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Shilpi Ajwani, BDS, PhD; Ajesh George, BDS, MPH, PhD

Background: There is epidemiological evidence showing an association between periodontal disease and cardiovascular disease (CVD). Despite this evidence* no comprehensive review has been undertaken to identify strategies to improve the oral health of people with CVD. **Objectives:** The aim of this review is to identify current evidence relating to the oral healthcare and management of patients with CVD. **Methods:** A scoping review was undertaken focusing on 4 key areas, namely, the impact of periodontal treatment on CVD, current recommendations regarding oral health and CVD, the role of nurses in promoting oral health, and available resources to support them. Databases were searched using a combination of keywords and search terms and 34 articles were selected. **Results:** Systematic reviews suggest that periodontal treatment may improve CVD outcomes by reducing systemic inflammation and improving endothelial function. However, there is insufficient evidence to confirm or refute these findings. International guidelines recognize the link between periodontal disease and CVD and recommend preventative strategies in this area. Non-oral health professionals, including nurses, can promote oral health and have been undertaking this role in areas like aged care and pregnancy. However, this aspect of nursing care has not been explored in the cardiac setting and no relevant training and assessment tools are available. **Conclusions:** Maintaining oral health among cardiovascular patients is important, yet it appears to be neglected during cardiac care. Cardiac nurses are in an excellent position to promote oral health but further research is required to define their role and develop supporting resources.

KEY WORDS: cardiac rehabilitation, cardiovascular disease, nurses, oral assessment tool, oral health promotion, periodontal disease

Cardiovascular disease (CVD) is one of the leading causes of death globally, with most of these deaths due to coronary heart disease and stroke.¹ Coronary heart disease is a subclass of CVD along with cerebrovascular disease, peripheral vascular disease, and heart failure.²

In recent years, CVD has declined in developed countries, although it continues to cause significant burden. For instance, in the United States between the years 2003 and 2013, the number of CVD deaths per year declined by 11.7%, yet in 2013 alone, 1 in every 3 deaths was attributable to CVD.³ In the United Kingdom, in 2014, CVD was the second most common cause of death (27%) after cancer,⁴ and in Canada, in 2012,

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1 person died of heart disease or stroke every 7 minutes.⁵ In Australia, CVD contributed to 30% of all deaths in 2013, with coronary heart disease accounting for almost half of these cases (45%).^{6,7}

Whereas a number of well-established risk factors have been linked with CVD, including high blood pressure, smoking, high cholesterol, limited physical activity, and obesity,² less well known is the role that poor oral health (mainly periodontal disease) plays as a potential risk factor for CVD.^{8–10} The idea of a relationship between poor oral health and systemic disease is not new, with inflammatory conditions such as joint pain treated by tooth extraction first reported in ancient Greece.¹¹ Over the last 20 years, there has been renewed interest in better understanding this relationship, in particular the relationship between periodontal disease and CVD.^{8,11–16} Periodontal disease is a chronic inflammation of the gum (gingiva), ligaments, and bony structures that hold the tooth in place.¹⁷

Evidence of the specific mechanisms involved in the link between periodontal disease and CVD is well detailed.^{10,18} Bacteria associated with periodontal disease can attach to atheromatous plaques, causing inflammation and damage, leading to elevated proinflammatory cytokines. This, in turn, can exacerbate systemic inflammation, leading to atheroma formation and ultimate rupture. Periodontal disease has also been linked to platelet aggregation and endothelial dysfunction, with associated elevated biomarkers such as serum C-reactive protein, interleukin-6, and tumor necrosis factor- α , all of which can contribute to increased inflammatory responses.¹⁸ Several clinical studies suggest that the prevalence of CVD seems to be highest among those individuals in whom periodontitis coexists with elevated C-reactive protein and proinflammatory cytokine levels.^{19–24}

Several systematic reviews and meta-analyses of longitudinal and interventional studies have shown that periodontal disease is a risk factor for CVD or coronary heart disease when there is elevated bacterial exposure leading to inflammation, with some studies suggesting that the association is independent of other coronary risk factors.^{9,17,25–28} Other studies found modest evidence of the link between periodontal disease with atherosclerosis, CVD, or coronary heart disease.^{13,14,29–32} Kolltveit and Eriksen³³ state that it is difficult to establish the relationship between periodontal disease and atherosclerosis because of the multifactorial origins of the 2 conditions. The association between periodontal disease and coronary heart disease was reiterated in a recent large meta-analysis of prospective cohort studies involving 230 406 participants. The analysis concluded that periodontal disease has a significant and independent association with increased risk of coronary heart disease and that epidemiological studies are necessary to confirm this link, which could have significant implications on current

clinical practice.²⁵ Furthermore, a recent longitudinal study in Australia involving 172 630 individuals with CVD showed that tooth loss and self-rated gums problems are markers for increased risk of ischemic heart disease.³⁴ Two recent large studies in the United States and Europe also showed that new cases of periodontal disease, not just those preexisting, increase the risk of future cardiovascular events.^{35,36}

Despite the growing evidence on the association between periodontal disease and CVD, no comprehensive review has been undertaken to identify strategies to improve the oral health of people with CVD. This is important as it appears that very few people with established CVD seek dental care (38%), even when they have a dental problem, with one of the barriers being lack of oral health awareness.³⁷ It is thus essential to examine current recommendations in this area as well as emerging strategies involving nurses that could address the oral health needs of CVD patients. Gathering this information will better inform cardiac care providers as oral health may not be considered a priority in CVD. The findings will also provide direction for future oral health strategies and best practices for nurses who are at the forefront of patient care in the cardiac setting.

Aim

The aim of this scoping review is to identify current evidence relating to the oral healthcare and management of patients with CVD. Specifically, this review sought to answer the following questions:

- What is the evidence of the impact of periodontal treatment on CVD outcomes?
- What are current recommendations regarding oral healthcare for all people with CVD?
- What is the evidence regarding the role of nurses in oral health promotion?
- What training resources and tools are available to assist nurses in oral health promotion?

Methodology

Design

A scoping review methodology was selected to examine the extent of literature available, summarize the findings, and identify gaps in the literature.^{38,39} The review was undertaken using the Arksey and O'Malley methodology framework.³⁹ The need for this scoping review arose as a result of the intricacy of the focal concept, the scope of the research questions, and the range of available literature on the topic. This method was selected because it is suited to the gathering of a diverse body of studies, in this case qualitative and quantitative studies as well as consensus statements, recommendations, guidelines, and other related literature. Another advantage

is that the scoping review process is not linear and restrictive but iterative, allowing researchers to go back and forth and redefine search terms and research questions based on initial findings.³⁹

Data Extraction

With the assistance of a health librarian, an initial literature review of available relevant articles was undertaken using the following databases: CINAHL, MEDLINE, Embase, Cochrane Central, Joanna Briggs Institute, Health Collection for Australian publications, PubMed Central, and Conference Papers Index–ProQuest. To identify unpublished literature, reports, discussion papers, and conference proceedings, databases and registers including the National Technical Information Service and the Health Management Information Consortium were searched. Clinical trial databases and government sites were also explored. Finally, the reference lists and bibliographies of all relevant studies were hand searched for further references.

As each database had its own unique indexing terms, individual search strategies were developed for each database. A combination of keywords and search terms using Boolean operators, truncation, phrase searching, and Medical Subject Headings were used in the search strategies. Keywords included *oral health*, *periodontitis*, *periodontal disease*, *periodontal treatment*, *cardiovascular disease*, *heart disease*, *oral health education and/or promotion*, *oral health assessment/tool*, and *nurses/cardiac care clinicians*. The search included all relevant published and unpublished literature available in the English language, including abstracts/full text and qualitative/quantitative studies.

Study Selection

All literature relating to the study aim and research questions were selected. Literature including adult inpatients and outpatients and where abstracts were available in English was included in the search. No filter for the date was placed to ensure that all relevant articles were identified. Literature relating to children, dentistry, dental professionals (dentists/hygienists), and oral/dental hygiene was excluded from the search. Key information, including authors, year of publication, study setting and population, outcome measures, and recommendations/results, was extracted from each article and summarized using tables. Only Level 1 evidence studies (meta-analysis and systematic reviews) were chosen to answer the first research question (impact of periodontal treatment on cardiovascular outcomes). The second area focused on international recommendations and/or consensus statements as well as government policies and guidelines regarding oral healthcare for patients with CVD. The third focus area (the role of nurses promoting oral health) included Level 1

evidence (systematic reviews), literature reviews, trials, and best practice guidelines. In the last focus area (oral health training resources and tools to assist nurses in oral health promotion), trials, pilot studies, cross-sectional studies, and best practice recommendations were searched. The last 2 focus areas initially targeted studies in the cardiac setting; however, as the preliminary search revealed no results, the research questions were revised and the focus was expanded to other healthcare settings.

Results

In the initial search, a total of 3846 potentially relevant articles were found. After screening for relevance and removal of duplicates and nonrelevant articles based on the inclusion/exclusion criteria and review of title and abstract, 3787 articles were excluded. Full-text versions of the remaining 59 articles were obtained and reviewed by 2 of the authors (PS, AG). After further exclusion of 25 articles, a final selection of 34 papers was then sorted into the 4 focus areas (Figure).

Impact of Periodontal Treatment on Cardiovascular Outcomes

Evidence of the impact of periodontal disease treatment on CVD outcomes has been reviewed in several systematic reviews and meta-analyses. This review identified 10 relevant studies.^{19,20,22,40–46} To evaluate the methodological quality of the systematic reviews and meta-analyses, the tool Assessment of Multiple Systematic Reviews was used.⁴⁷ Of the studies selected, 6 were rated as high quality, 3 as medium quality, and 1 study as low quality by 2 reviewers (PS, AG) (Table 1).

Cardiovascular outcomes explored in the studies included biomarkers related to systemic inflammation, which affects endothelial function contributing to atherosclerosis.⁴⁸ Although 1 older study did not find evidence that periodontal treatment can reduce C-reactive protein levels,⁴² 7 more recent systematic reviews and meta-analyses studies showed improvement in endothelial function associated with reduction of inflammatory markers, especially C-reactive protein.^{19,20,22,41,44–46} One study found short-term reduction in C-reactive protein levels with a stronger periodontal treatment effect on people with existing comorbidities, especially CVD and diabetes.⁴⁰ Three studies showed improvement of other biomarkers associated with atherosclerotic disease: interleukin-6, tumor necrosis factor- α , fibrinogen, cholesterol levels, and triglycerides.^{20,22,46}

Overall, the evidence found, including a recent Cochrane review, does not support or refute whether periodontal treatment can prevent recurrent cardiovascular events or CVD in the long-term, and there is no evidence available on primary CVD prevention.^{20,22,43}

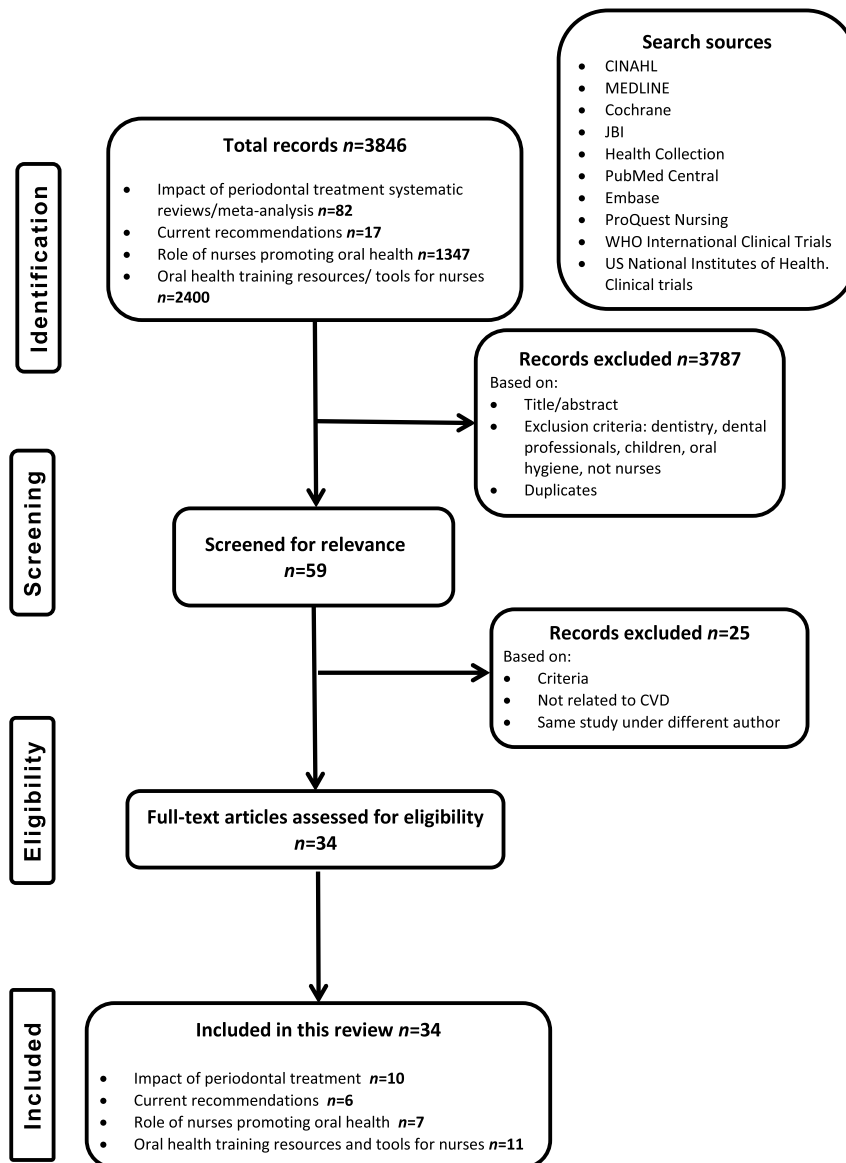


FIGURE. Search flowchart.

Current Recommendations Regarding Oral Healthcare for Patients With Cardiovascular Disease

Most of the recommendations in this area originate from the United States and Europe. The *American Journal of Cardiology* and *Journal of Periodontology* consensus report⁴⁹ recognizes the link between periodontal disease and CVD and recommends treatment and preventative approaches to reduce the risk of primary and secondary cardiovascular events. The report also states that prospective studies are needed to determine the effectiveness of periodontal treatment on CVD outcomes, but on the basis of current data, it is important to reduce inflammatory markers associated with periodontal disease to decrease the risk of CVD. It is now recommended that patients at risk should be informed

about the association between atherosclerotic CVD and periodontal disease, have early assessment to identify risk factors, and receive early dental and medical evaluations.⁴⁹ The American Heart Foundation has also released a scientific statement on this topic, acknowledging the strong evidence supporting an association between periodontal disease and CVD (Level of Evidence A) and its public health importance.⁵⁰ The statement, which is endorsed by the World Heart Foundation and The American Dental Association Council, does also confirm the limited evidence supporting any causative relationship.⁵⁰

A European consensus report, supported by the European Society of Cardiology, recognizes that inflammatory responses in certain susceptible persons may contribute to cardiovascular events and that periodontal treatment may reduce CVD risk.⁵¹ The

TABLE 1 Impact of Periodontal Treatment on Cardiovascular Outcomes

Author(s)	Study Type	CVD Outcomes	Conclusion	Quality Score ^a
Demmer et al, 2013 ⁴⁰	MA/SR of RCT	Systemic inflammation: CRP	Anti-infective periodontal treatment has a short-term modest reduction in systemic CRP. Treatment effects are stronger for studies including patients with comorbidities (CVD, diabetes) compared with "healthy" people.	11 (high quality)
Freitas et al, 2010 ⁴¹	MA/SR of RCT	Systemic inflammation: CRP	Nonsurgical periodontal treatment significantly reduces serum levels of CRP, which is related to coronary events.	7 (medium quality)
Ioannidou et al, 2006 ⁴²	MA/SR of RCT and single cohort studies	Systemic inflammation: CRP	Systemic inflammation is present in people with PD. Evidence does not support that periodontal treatment can reduce systemic CRP levels, elevated in PD.	8 (high quality)
Lam et al, 2011 ²⁰	SR of oral health promotion interventions	Systemic inflammation: CRP and IL-6 levels; endothelial function	Periodontal treatment and oral health promotion activities improve periodontal health, reduces inflammatory markers, and improves endothelial function in the short-term. The impact of these on secondary CV events was not determined.	5 (medium quality)
Li et al, 2014 ⁴³	SR of RCT/quasi-RCT	Occurrence and recurrence of CVD	Evidence does not support or refute whether periodontal therapy prevents CVD recurrence. There is no evidence available on primary prevention.	11 (high quality)
Moura et al, 2010 ¹⁹	MA/SR	Systemic inflammation: CRP	Periodontal therapy is associated with a reduction in CRP level. Further research is needed on the possible impact of periodontitis on CVD events.	7 (medium quality)
Orlandi et al, 2014 ⁴⁴	MA/SR of intervention trials	Endothelial function	There is association between increased intima media thickness, flow mediated dilatation and PD. There is beneficial effect of periodontal treatment on flow-mediated dilatation, therefore, endothelial function, supporting studies of periodontal treatment on CV outcomes.	10 (high quality)
Paraskevas et al, 2008 ⁴⁵	MA of pilot trials	Systemic inflammation: CRP	Periodontal therapy resulted in a weighted mean reduction in serum CRP of 0.5 (95% CI, 0.08–0.93) mg.	10 (high quality)
Teeuw et al, 2014 ²²	MA/SR of intervention and non-intervention trials	Atherosclerotic profile; Endothelial function	Consistent reports indicate that periodontal treatment improves endothelial function and reduces biomarkers of atherosclerotic disease (CRP, IL-6, TNF- α), fibrinogen, total cholesterol, HDL-C, triglycerides, and HbA _{1c} , particularly those with established CVD and/or diabetes.	9 (high quality)
Tonetti, 2009 ⁴⁶	SR of intervention trials	Systemic inflammation: CRP; IL-6, fibrinogen; endothelial function	Intensive periodontal treatment decreases systemic inflammation and improves endothelial function, which may contribute to the prevention of atherosclerosis.	2 (low quality)

Abbreviations: CRP, C-reactive protein; CV, cardiovascular; CVD, cardiovascular disease; HbA_{1c}, glycosylated hemoglobin test or hemoglobin A_{1c}; HDL-C, high-density lipoprotein cholesterol; IL-6, interleukin-6; MA, meta-analysis; PD, periodontal disease; RCT, randomized control trial; SR, systematic review; TNF- α , tumor necrosis factor- α .

^aScored using the "A Measurement Tool to Assess Systematic Reviews" (8–11, high quality; 4–7, medium quality; 0–3, low quality).

consensus states that clinicians should be aware of the potential association and its clinical implications.⁵¹ A more recent consensus report by the European Federation of Periodontology and the American Academy of Periodontology⁵² confirms strong epidemiological evidence between periodontal disease and increased risk of CVD. The report emphasizes that primary prevention of periodontal disease is desirable and a highly important strategy. Furthermore, identification of people at risk and periodontal disease diagnosis may contribute to cardiovascular risk stratification.⁵²

In Australia, no specific recommendations regarding oral health for people with CVD exist, and current practice guidelines for cardiac care clinicians in both the acute and rehabilitation settings do not address oral health.^{53,54} The new Australian National Oral Health plan recognizes the association between oral health and chronic diseases and incorporates goals to improve oral health, especially periodontal disease among the population (Table 2).⁵⁵

Role of Nurses in Promoting Oral Health

Cardiovascular patients with poor oral health are likely to benefit from clinicians' involvement, by raising their awareness of the risks associated with periodontal dis-

ease, performing oral assessments, and providing dental referrals if necessary. Nurses, in particular, are in an ideal position to take up this role as they interact with patients more regularly than any other health provider and have a closer ongoing relationship.⁵⁶ Non-oral health professionals such as nurses have played an important role in promoting oral health in other systemic conditions across various developed countries.⁵⁶⁻⁵⁹ For example, studies show that nurses are capable of providing oral health education, assessment, and referrals in the areas of aged care, dementia,^{60,61} and maternal oral health.⁵⁶ Furthermore, midwives and nurse practitioners in the United States have been promoting oral health as part of antenatal care for young pregnant women involved in the Rochester Adolescent Maternity Program.⁶² In Australia, child and family health nurses are playing an active role in promoting oral health as part of the Early Childhood Oral health program.^{63,64} Oral health guidelines have also been successfully implemented into midwifery practice as part of the Midwifery Initiated Oral Health program and have been shown to significantly improve the uptake of dental services, knowledge, and quality of life of pregnant women in Australia.⁶⁵⁻⁶⁷

Despite evidence showing the capacity of non-oral health professionals to promote oral health, no studies

TABLE 2 Current Recommendations Regarding Oral Health Care for Patients with CVD

Author	Publication Location	Details of Publication	Outcomes and Recommendations
Australian Government, 2015 ⁵⁵	Australia	Australia's National Oral Health Plan 2015-2024	Recognizes the association between oral health with CVD and other chronic diseases. It incorporates goals to improve oral health, especially PD among the population.
Bouchard et al, 2010 ⁵¹	Europe	Consensus. European Society of Cardiology	There is evidence of association between PD and CVD. There is no convincing evidence that periodontal treatment can influence cardiac health. However, oral health should be promoted to prevent CVD.
Friedewald et al, 2009 ⁴⁹	United States	Consensus report. Editors of <i>The American Journal of cardiology & Journal of Periodontology</i>	There may be an independent link between periodontitis and increased risk of CVD. Patients with periodontitis should be informed of risk and be referred for medical evaluation.
Kinane and Bouchard, 2008 ⁸⁶	France	Consensus report. Sixth European Workshop on Periodontology	There is a link between PD and CVD. Clinicians should be aware of the potential relationship and its clinical ramifications.
Lockhart et al, 2012 ⁵⁰	United States	Scientific statement. American Heart Foundation, endorsed by the American Dental Association and the World Heart Foundation	There is Level A evidence supporting an association between PD and ASVD independent of known confounders. There is no evidence that periodontal treatment can prevent ASDV. The relationship between PD and ASDV is of public health importance.
Tonetti and Dyke, 2013 ⁵²	Italy	Consensus report. EFP/AAP Workshop on Periodontitis and Systemic Diseases	There is consistent and strong evidence that PD increases the risk for CVD. Primary prevention is desirable. Diagnosis of periodontitis may contribute to cardiovascular risk stratification.

Abbreviations: ASVD, atherosclerotic vascular disease; CVD, cardiovascular disease; EFP/AAP=European Federation of Periodontology and American Academy of Periodontology; PD, periodontal disease.

were identified that focused on cardiac care nurses undertaking this role. Reports from Australia also suggest that oral health is not routinely addressed by cardiac care clinicians during clinical practice.⁶⁸ There are many possible reasons why cardiac nurses may not be actively promoting oral health. One reason could be that nurses view oral healthcare as unpleasant and time-consuming.^{69,70} Nurses may also have limited knowledge and training in oral health⁶⁵ and therefore may not be confident to discuss oral health during clinical practice.^{66,71,72} Another possibility could be that nurses, particularly those in acute cardiac settings, may not view oral health as a priority because of time constraints and the lack of conclusive evidence indicating the benefits of periodontal treatment on cardiovascular outcomes (Table 3).⁵⁰

Oral Health Training Resources and Tools to Assist Nurses in Oral Health Promotion

A review of the literature shows that there are very few oral health education programs that help build the capacity of nurses to promote oral health among their patients. Those that do exist have originated from Australia, United States, Turkey, and Sweden and have focused primarily on training nurses and health providers in the aged care setting,^{72–75} pregnancy,^{65,67,76,77} and early childhood period.⁶⁴ Most of these programs have been professional development activities offering continuing professional development points for health professionals.^{64,67,75,77} One of these programs involved an evidence-based education program to equip midwives in Australia to provide oral health education, assessment, and referrals to pregnant women.⁷⁸ The program was evaluated and shown to significantly improve the knowledge and confidence of midwives to promote oral health.⁶⁷ Oral health education and training resources

have resulted in significant improvement in nurses' knowledge, confidence, attitudes, and motivation,^{67,72–74,76} demonstrating that nurses are receptive to education and training in this area. Despite the above programs, no oral health training programs have been identified that are specifically developed for cardiac care clinicians.

Another potential barrier for cardiac care nurses to promote oral health is the lack of access to reliable, valid, and easily implemented oral health assessment tools. Currently, some tools do exist for non-dental health professionals. This includes the Oral Health Assessment Tool, a modified version of the Kayser-Jones Brief Oral Health Status Examination tool,^{79,80} which was developed and validated by Chalmers in Australia and found to be reliable for nurses to assess and refer aged and cognitively impaired residents in long-term facilities.⁸¹ The tool consists of 8 categories with a scoring from 0 = healthy, 1 = oral changes, or 2 = unhealthy in each assessment category.⁸¹ Another tool is The Holistic and Reliable Oral Assessment Tool for assessing older hospitalized patients, which was developed in England. This tool, which includes 9 items each rated on a 4-point Likert scale, was also found to be reliable and valid for nurses.⁸² An oral assessment tool has also been developed for dietitians and other healthcare workers in Australia to facilitate dental referral of people with human immunodeficiency virus.⁸³ This tool, which consists of 3 items, was shown to have a sensitivity of 84% and a specificity of 55%. Finally, an oral assessment tool also exists for midwives to identify dental problems and provide referrals to pregnant women. This 2-item tool assesses common dental problems during pregnancy and frequency of dental visits and has shown good sensitivity (98%) and positive predictive value (88%).⁸⁴ However, no assessment tools

TABLE 3 Role of Nurses in Promoting Oral Health

Author	Study Location	Study Type	Conclusion
Chalmers et al, 2005 ⁸¹	United States	Systematic review	There is evidence to support nurses promoting oral health for adults with dementia. An oral health assessment tool was recommended.
Clemmens and Kerr, 2008 ⁵⁶	United States	Literature review	Nurses have an essential role in women's oral health promotion, education and screening.
George et al, 2010 ⁶⁵	Australia	Systematic review	There is a potential role for midwives to provide oral health assessments, education, and referrals for pregnant women.
Heilbrunn-Lang et al, 2015 ⁶⁶	Australia	Pre-post mixed design	The evaluation of an oral health education program for midwives showed that with relevant training, it is feasible and acceptable for midwives to incorporate oral health into their practice in Australia.
Nyongesa, 2013 ⁶¹	United States	Pilot of an oral health program	Trained nurses in aged care can effectively assess, document, and refer residents using an appropriate oral health assessment tool.
Stevens et al, 2007 ⁶²	United States	Oral health guidelines for prenatal care	Guidelines based on The Rochester Adolescent Maternity Program recommend that oral health promotion should be included as standard care for registered nurses in prenatal programs.
The Joanna Briggs Institute, 2015 ⁸⁰	Australia	Best practice recommendations	Trained nurses can undertake oral health assessment and refer older adults in long-term care facilities to the dentist. The Brief Oral Health Status Examination tool was found to be the most reliable assessment tool for older adults with cognitive impairment.

were identified in this review that have been developed and tested for use by cardiac care clinicians (Table 4).

Discussion

The aim of this scoping review is to identify current evidence relating to the oral healthcare and management of patients with CVD. The findings from this scoping review reaffirm what is well documented in the literature,^{9,17,25,26,85} that periodontal disease is a potential risk factor for CVD. Although there is still debate on the effectiveness of periodontal treatment in improving cardiovascular outcomes,^{20,22,43} the general consensus, internationally,^{49,51,52,86} is that all cardiovascular patients should receive oral health education about the importance of oral health along with risk assessment and dental referrals if required. This is especially important as existing evidence indicates a lack of awareness among cardiovascular patients regarding the importance of oral health and are seldom seeking dental care.³⁷ There are also suggestions that cardiac care clinicians are not addressing oral health-

care in clinical practice.⁶⁸ Nonetheless, these views are based on a few studies; clearly, further research is warranted to explore current perceptions, practices, and knowledge of cardiac care clinicians regarding oral health.

Nevertheless, current findings do suggest that cardiac care clinicians need to play a more active role in oral healthcare to reduce the inflammation that can result from periodontitis. This review has, for the first time, put forward the case for cardiac nurses to take up this role owing to their unique position and close interaction with patients.

This review has shown that nurses and other non-oral health professionals can be trained in providing oral healthcare, evidenced by their roles in addressing the oral health needs of aged patients, pregnant women and children across various countries. Therefore, cardiac nurses with targeted cardiac-specific oral health training can play a vital role addressing the oral health needs of their patients. Before such a strategy can be initiated by cardiac care nurses, key barriers may need to be addressed. The study findings have revealed that no specific education and training is currently available to

TABLE 4 Oral Health Training Resources and Tools to Assist Nurses in Oral Health Promotion

Author	Study Location	Study Type	Conclusion
Oral health training resources			
Frenkel et al, 2002 ⁷²	United Kingdom	Randomized control trial	The oral health program significantly improved nurses' knowledge ($P < .003$) and attitude ($P < .001$).
George et al, 2016 ⁶⁷	Australia	Pre-post test design	After the oral health education program, midwives' knowledge and confidence improved in promoting prenatal oral health.
King, 1992 ⁷³	Australia	Pilot of an education program	Aged care nurses' behavior and knowledge improved after attending the program.
Öcek et al, 2003 ⁷⁶	Turkey	Pre-post mixed design	After the oral health education program, midwives' knowledge and motivation improved in providing education to mothers and pregnant women.
Wårdh et al, 2002 ⁷⁴	Sweden	Pilot of an oral health education model	Aged care nurses who attended additional dental clinical placement experience and served as dental care aids gave higher priority to oral health than did nurses who received only traditional oral health education.
Oral health assessment tools			
Chalmers et al, 2005 ⁸¹	Australia	Cross-sectional study	The oral health assessment tool was reliable and valid for use by nurses among aged care residents, including the cognitively impaired.
Dickinson et al, 2001 ⁸²	England	Cross-sectional study	The Holistic and Reliable Oral Assessment Tool was a reliable assessment tool for nurses which can also be used as an oral hygiene indicator for older medically ill hospitalized patients.
George et al, 2014 ⁸⁴	Australia	Pilot of a screening tool	A two-item oral health screening tool was found to be reliable and valid to be used by midwives in the antenatal setting.
Jeganathan et al, 2010 ⁸³	Australia	Pilot of a screening tool	The three-item tool (questionnaire) to screen people living with HIV is valid and sensitive to be used by non-dental health professionals.
Kayser-Jones et al, 1995 ⁷⁹	United States	Pilot of a screening tool	Nurses in aged care can effectively learn to evaluate the oral health of residents using the Brief Oral Health Status Examination (BOHSE) tool.
The Joanna Briggs Institute, 2015 ⁸⁰	Australia	Best practice recommendations	Trained nurses can undertake oral health assessment and refer older adults in long-term care facilities to the dentist. The BOHSE tool was found to be the most reliable assessment tool for older adults with cognitive impairment.

What's New and Important

- Periodontal disease can contribute to adverse outcomes in patients with CVD.
- Although the effectiveness of periodontal treatment is still being debated, it is now recommended that all cardiac care providers need to promote oral health.
- Cardiac nurses are in a unique position to promote oral health. Further research is needed to equip nurses in this area and to develop relevant training resources for this group of clinicians.

build capability in cardiac care nurses to address oral health. Developing such a resource is an important first step in developing a preventative oral health program for cardiovascular patients as many cardiac care clinicians, especially nurses, lack adequate oral health knowledge.^{70,71}

It is also equally important to develop and validate an appropriate oral health assessment tool for cardiac care nurses, as this review has identified a gap in this area. Although few tools are available for non-oral health professionals, none have been validated for the cardiac setting. The tool needs to be brief, practical, and easy to administer, considering the busy nature of the cardiac setting, and this new tool could include the 2- or 3-item tools piloted in the antenatal and HIV setting.^{83,84}

The timing of the oral health assessment needs to be considered, taking into account the acute and rehabilitation phases of cardiac care. Incorporating oral healthcare in the acute phase may not be effective, as patients may not see this as a priority and hence not be receptive to receiving oral health advice. Therefore, oral health promotion may need to be addressed outside the acute phase of the patient's care such as in the pre-hospitalization or posthospitalization period.

Finally, it is essential to ensure that an affordable and appropriate dental referral pathway is in place before cardiac care nurses incorporate oral health guidelines into their practice. Although cost has not been highlighted in this review as a barrier for people with CVD, it is an issue that needs to be considered especially in countries where universal access to public dental services is not available.

Conclusion

Promoting and maintaining oral health among cardiovascular patients are important because of the strong association between periodontal disease and CVD. Although a causal link has not been confirmed between periodontal disease and CVD, the general consensus is that cardiovascular patients need to be made aware of this association and its potential implications. Cardiac nurses are in an ideal position to promote oral healthcare among their patients, but further research is re-

quired to define their role and develop training resources and assessment tools to support them.

REFERENCES

1. World Health Organization. CVDs. Fact sheet N 317 2011. 2015. <http://www.who.int/mediacentre/factsheets/fs317/en/>. Accessed May 3, 2016.
2. American Heart Association. What is CVD? 2015. http://www.heart.org/HEARTORG/Caregiver/Resources/What-isCardiovascularDisease/What-is-Cardiovascular-Disease_UCM_301852_Article.jsp. Accessed October, 2015.
3. Mozaffarian D, Benjamin EJ, Go AS, et al. Executive summary: heart disease and stroke statistics—2016 update: a report from the American Heart Association. *Circ*. 2016; 133(4):447–454.
4. Townsend N, Bhatnagar P, Wilkins E, Wickramasinghe K, Rayner M. *Cardiovascular Disease Statistics 2015*. London: British Heart Foundation; 2015.
5. Heart and Stroke Foundation Canada. Statistics Canada. 2016. <http://www.heartandstroke.com/site/c.ikiIQLcMWJtE/b.3483991/k.34A8/Statistics.htm>. Accessed June 6, 2016.
6. National Heart Foundation of Australia. Information for professionals: data and statistics. 2014. <http://heartfoundation.org.au/about-us/what-we-do/heart-disease-in-australia>. Accessed October 23, 2014.
7. Australian Institute of Health and Welfare. *Cardiovascular Disease, Diabetes and Chronic Kidney Disease—Australian Facts: Mortality*. Canberra, Australia: AIHW; 2014. Cardiovascular, Diabetes and Chronic Kidney Disease series no. 1. Cat. no. CDK 1.
8. Dhadse P, Gattani D, Mishra R. The link between periodontal disease and CVD: how far we have come in last two decades? *J Indian Soc Periodontol*. 2010;14(3):148.
9. Humphrey LL, Fu R, Buckley DI, Freeman M, Helfand M. Periodontal disease and coronary heart disease incidence: a systematic review and meta-analysis. *J Gen Intern Med*. 2008;23(12):2079–2086.
10. Kebschull M, Demmer R, Papapanou P. “Gum bug, leave my heart alone!”—epidemiologic and mechanistic evidence linking periodontal infections and atherosclerosis. *J Dent Res*. 2010;89(9):879–902.
11. Genco RJ, Williams RC. *Periodontal Disease and Overall Health: A Clinician's Guide*. Yardley, PA: Professional Audience Communications; 2010.
12. Buhlin K, Gustafsson A, Pockley AG, Frostegård J, Klinge B. Risk factors for CVD in patients with periodontitis. *Eur Heart J*. 2003;24(23):2099–2107.
13. Janket S-J, Baird AE, Chuang S-K, Jones JA. Meta-analysis of periodontal disease and risk of coronary heart disease and stroke. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2003;95(5):559–569.
14. Meurman JH, Sanz M, Janket S-J. Oral health, atherosclerosis, and CVD. *Crit Rev Oral Biol Med*. 2004;15(6):403–413.
15. Taylor B, Tofler G. Evidence for an association between periodontal disease and CVD. *Ann R Australas Coll Dent Surg*. 2002;16:82–83.
16. Humagain M, Nayak D, Uppoor A. Periodontal infections and CVD: Is it a mere association? *Kathmandu Univ Med J (KUMJ)*. 2005;4(3):379–382.
17. Bahekar AA, Singh S, Saha S, Molnar J, Arora R. The prevalence and incidence of coronary heart disease is significantly increased in periodontitis: a meta-analysis. *Am Heart J*. 2007;154(5):830–837.
18. Teles R, Wang CY. Mechanisms involved in the association between periodontal diseases and CVD. *Oral Dis*. 2011;17(5): 450–461.

19. Moura FA, Alexandre RG, Manoel BC, et al. Periodontal therapy and biomarkers related to cardiovascular risk. *Minerva Stomatol.* 2010;59(5):271–283.
20. Lam OL, Zhang W, Samaranyake LP, Li LS, McGrath C. A systematic review of the effectiveness of oral health promotion activities among patients with CVD. *Int J Cardiol.* 2011;151(3):261–267.
21. Bokhari SAH, Khan AA, Butt AK, et al. Non-surgical periodontal therapy reduces coronary heart disease risk markers: a randomized controlled trial. *J Clin Periodontol.* Nov 2012;39(11):1065–1074.
22. Teeuw WJ, Slot DE, Susanto H, et al. Treatment of periodontitis improves the atherosclerotic profile: a systematic review and meta-analysis. *J Clin Periodontol.* 2014;41(1):70–79.
23. Gomes-Filho IS, Freitas Coelho JM, da Cruz SS, et al. Chronic periodontitis and C-reactive protein levels. *J Periodontol.* 2011;82(7):969–978.
24. Flores ME, Montenegro MM, Furtado MV, Polanczyk CA, Rösing CK, Haas AN. Periodontal status affects C-reactive protein and lipids in patients with stable heart disease from a tertiary care cardiovascular clinic. *J Periodontol.* 2014;85(4):545–553.
25. Leng W-D, Zeng X-T, Kwong J, Hua X-P. Periodontal disease and risk of coronary heart disease: an updated meta-analysis of prospective cohort studies. *Int J Cardiol.* 2015;201:469.
26. Blaizot A, Vergnes JN, Nuwwareh S, Amar J, Sixou M. Periodontal diseases and cardiovascular events: meta-analysis of observational studies. *Int Dent J.* 2009;59(4):197–209.
27. Persson GR, Persson RE. CVD and periodontitis: an update on the associations and risk. *J Clin Periodontol.* 2008;35(s8):362–379.
28. Mustapha IZ, Debrey S, Oladubu M, Ugarte R. Markers of systemic bacterial exposure in periodontal disease and CVD risk: a systematic review and meta-analysis. *J Periodontol.* 2007;78(12):2289–2302.
29. Fardi A, Papadimitriou D. Periodontal and atherosclerosis-induced diseases. *Int Angiol.* 2007;26(3):197.
30. Khader YS, Albashaireh ZS, Alomari MA. Periodontal diseases and the risk of coronary heart and cerebrovascular diseases: a meta-analysis. *J Periodontol.* 2004;75(8):1046–1053.
31. Madianos PN, Bobetsis GA, Kinane DF. Is periodontitis associated with an increased risk of coronary heart disease and preterm and/or low birth weight births? *J Clin Periodontol.* 2002;29(s3):22–36.
32. Scannapieco FA, Bush RB, Paju S. Associations between periodontal disease and risk for atherosclerosis, CVD, and stroke: a systematic review. *Ann Periodontol.* 2003;8(1):38–53.
33. Kolltveit KM, Eriksen HM. Is the observed association between periodontitis and atherosclerosis causal? *Eur J Oral Sci.* 2001;109(1):2–7.
34. Joshy G, Arora M, Korda R, et al. Is poor oral health a risk marker for incident cardiovascular disease hospitalisation and all-cause mortality? Findings from 172 630 participants from the prospective 45 and Up Study. *BMJ Open.* 2016;6(8):e012386.
35. Rydén L, Buhlin K, Ekstrand E, et al. Periodontitis increases the risk of a first myocardial infarction: a report from the PAROKRANK Study. *Circulation.* 2016;133(6):576–583 CIRCULATIONAHA. 115.020324.
36. Yu YH, Chasman DI, Buring JE, Rose L, Ridker PM. Cardiovascular risks associated with incident and prevalent periodontal disease. *J Clin Periodontol.* 2015;42(1):21–28.
37. Virdee P. Improve uptake of care. *Br Dent J.* 2006;201(3):132–133.
38. Davis K, Drey N, Gould D. What are scoping studies? A review of the nursing literature. *Int J Nurs Stud.* 2009;46(10):1386–1400.
39. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol.* 2005;8(1):19–32.
40. Demmer RT, Trinquart L, Zuk A, et al. The influence of anti-infective periodontal treatment on C-reactive protein: a systematic review and meta-analysis of randomized controlled trials. *PLoS One.* 2013;8(10):e77441.
41. Freitas COTd, Gomes-Filho IS, Naves RC, et al. Influence of periodontal therapy on C-reactive protein level: a systematic review and meta-analysis. *J Appl Oral Sci.* 2012;20(1):1–8.
42. Ioannidou E, Malekzadeh T, Dongari-Bagtzoglou A. Effect of periodontal treatment on serum C-reactive protein levels: a systematic review and meta-analysis. *J Periodontol.* 2006;77(10):1635–1642.
43. Li C, Lv Z, Shi Z, Zhu Y, Wu Y, Li L. Periodontal therapy for the management of CVD in patients with chronic periodontitis. *Cochrane Database Syst Rev.* 2014;8.
44. Orlandi M, Suvan J, Petrie A, et al. Association between periodontal disease and its treatment, flow-mediated dilatation and carotid intima-media thickness: a systematic review and meta-analysis. *Atherosclerosis.* 2014;236(1):39–46.
45. Paraskevas S, Huizinga JD, Loos BG. A systematic review and meta-analyses on C-reactive protein in relation to periodontitis. *J Clin Periodontol.* 2008;35(4):277–290.
46. Tonetti MS. Periodontitis and risk for atherosclerosis: an update on intervention trials. *J Clin Periodontol.* 2009;36(s10):15–19.
47. Sharif MO, Janjua-Sharif F, Ali H, Ahmed F. Systematic reviews explained: AMSTAR-how to tell the good from the bad and the ugly. *Oral Health Dent Manag.* 2013;12(1):9–16.
48. Loos BG, Teeuw WJ, Nicu EA. Plausible mechanisms explaining the association of periodontitis with CVDs. In: Pedersen AML, ed. *Oral Infections and General Health.* the Netherlands: Springer International; 2016:19–33.
49. Friedewald VE, Kornman KS, Beck JD, et al. The *American Journal of Cardiology* and *Journal of Periodontology* editors' consensus: periodontitis and atherosclerotic CVD. *J Periodontol.* 2009;80(7):1021–1032.
50. Lockhart PB, Bolger AF, Papapanou PN, et al. Periodontal disease and atherosclerotic vascular disease: does the evidence support an independent association? A scientific statement from the American Heart Association. *Circulation.* 2012;125(20):2520–2544.
51. Bouchard P, Boutouyrie P, D'Aiuto F, et al. European workshop in periodontal health and CVD consensus document. *Eur Heart J Suppl.* 2010;12(B):B13–B22.
52. Tonetti MS, Dyke TE. Periodontitis and atherosclerotic CVD: consensus report of the Joint EFP/AAP Workshop on Periodontitis and Systemic Diseases. *J Clin Periodontol.* 2013;40(s14):S24–S29.
53. Heart Foundation. Improving cardiac rehabilitation in Australia. 2014. <http://www.heartfoundation.org.au/information-for-professionals/Clinical-Information/Cardiac-rehabilitation/Pages/default.aspx>. Accessed November, 2015.
54. Government of South Australia. Cardiac rehabilitation: a model of care for South Australia—an overview. In: *Statewide Cardiology Clinical Network*, ed. South Australia, Australia: Government of South Australia; 2011.
55. Australian Government. *Healthy Mouths, Healthy Lives: Australia's National Oral Health Plan 2015–2024*. Adelaide, South Australia: Council of Australian Government Health Council; 2015.

56. Clemmens DA, Kerr AR. Improving oral health in women: nurses' call to action. *MCN Am J Matern Child Nurs.* 2008; 33(1):10–14.
57. Office of Disease prevention and Health promotion. *Healthy People 2020.* 2016. <https://www.healthypeople.gov/>. Accessed December 5, 2016
58. National Health Service England. *Improving Dental Care and Oral Health—A Call To Action—National Stakeholder Event Summary Report.* London, England: NHS England; 2014.
59. NSW Ministry of Health. *Oral Health 2020: A strategic framework for dental health in NSW.* New South Wales, Australia: Centre for Oral Health Strategy NSW; 2013.
60. Chalmers J, Pearson A. A systematic review of oral health assessment by nurses and carers for residents with dementia in residential care facilities. *Spec Care Dentist.* 2005;25(5): 227–233.
61. Nyongesa N. *Implementing an evidence-based oral health assessment tool (OHAT) in a nursing home [PhD Dissertation]* [dissertation/thesis]. Fargo, ND: North Dakota State University; 2013.
62. Stevens J, Iida H, Ingersoll G. Implementing an oral health program in a group prenatal practice. *J Obstet Gynecol Neonatal Nurs.* 2007;36(6):581–591.
63. Veale M, Ajwani S, Johnson M, Nash L, Patterson T, George A. The early childhood oral health program- perceptions of child and family health nurses in South Western Sydney. *BMC Oral Health.* 16(56). doi: 10.1186/s12903-016-0213-0.
64. Maher L, Phelan C, Lawrence G, Dawson A, Torvaldsen S, Wright C. The Early Childhood Oral Health Program: promoting prevention and timely intervention of early childhood caries in NSW through shared care. *Health Promot J Austr.* 2012;23(3):171–176.
65. George A, Johnson M, Blinkhorn A, Ellis S, Bhole S, Ajwani S. Promoting oral health during pregnancy: current evidence and implications for Australian midwives. *J Clin Nurs.* 2010; 19(23–24):3324–3333.
66. Heilbrunn-Lang AY, de Silva AM, Lang G, et al. Midwives' perspectives of their ability to promote the oral health of pregnant women in Victoria, Australia. *BMC Pregnancy Childbirth.* 2015;15(1):110.
67. George A, Lang G, Johnson M, et al. The evaluation of an oral health education program for midwives in Australia. *Women Birth.* 2016;29(3):208–213.
68. Australian Health Ministers' Conference. *Australia's National Oral Health Plan 2015–2024 Healthy Mouths Healthy Lives* [Consultation Draft]. Australia: Australian Health Minister; 2014:1–91. Version 2.8.
69. Allen Furr L, Binkley CJ, McCurren C, Carrico R. Factors affecting quality of oral care in intensive care units. *J Adv Nurs.* 2004;48(5):454–462.
70. Kuramoto C, Watanabe Y, Tonogi M, et al. Factor analysis on oral health care for acute hospitalized patients in Japan. *Geriatr Gerontol Int.* 2011;11(4):460–466.
71. British Society for Disability Oral Health, Griffiths J, *Guidelines for the Development of Local Standards of Oral Health Care for Dependent, Dysphagic, Critically and Terminally Ill Patients.* 2000. <https://books.google.com.au/books?id=LlbCtgAACAAJ>. Accessed December 5, 2016.
72. Frenkel H, Harvey I, Needs K. Oral health care education and its effect on caregivers' knowledge and attitudes: a randomised controlled trial. *Community Dent Oral Epidemiol.* 2002;30(2):91–100.
73. King PL. *A Dental Health Education Program for Caregivers of Elderly People in Nursing Homes.* Sydney, Australia: Department of Preventative Dentistry Faculty of Dentistry University of Sydney; 1992.
74. Wårdh I, Berggren U, Hallberg LR-M, Andersson L, Sörensen S. Dental auscultation for nursing personnel as a model of oral health care education: development, baseline, and 6-month follow-up assessments. *Acta Odontol.* 2002; 60(1):13–19.
75. Australian Government Department of Social Services. *Better Oral Health in Residential Care. Staff Portfolio. Education and Training Program.* South Australia: Dental Service; 2008.
76. Öcek ZA, Eden E, Soyer MT, Çiçeklioglu M. Evaluation of a dental health education program for midwives. *J Public Health Dent.* 2003;63(4):255–257.
77. Quinonez R, Boggess K. Prenatal Oral Health program [online]. 2016. Online program for pregnant women. <http://www.prenataloralhealth.org/>. Accessed February, 2016.
78. George A, Duff M, Johnson M, et al. Piloting of an oral health education programme and knowledge test for midwives. *Contemp Nurse.* 2014;46(2):180–186.
79. Kayser-Jones J, Bird WF, Paul SM, Long L, Schell ES. An instrument to assess the oral health status of nursing home residents. *Gerontologist.* 1995;35(6):814–824.
80. The Joanna Briggs Institute. *Oral Assessment Tools: Older Adults. [Evidence Summaries] JBI1558.* 2015. <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=jbi&AN=JBI1558>. Accessed December 5, 2016.
81. Chalmers J, King P, Spencer A, Wright F, Carter K. The oral health assessment tool—validity and reliability. *Aust Dent J.* 2005;50(3):191–199.
82. Dickinson H, Watkins C, Leathley M. The development of the THROAT: the holistic and reliable oral assessment tool. *Clin Eff Nurs.* 2001;5(3):104–110.
83. Jeganathan S, Purnomo J, Houtzager L, Batterham M, Begley K. Development and validation of a three-item questionnaire for dietitians to screen for poor oral health in people living with human immunodeficiency virus and facilitate dental referral. *Nutr Diet.* 2010;67(3):177–181.
84. George A, Ajwani S, Johnson M, et al. Developing and testing of a midwifery oral health screening tool for pregnant women. *Health Care Women Int.* 2014.
85. Bartova J, Sommerova P, Lyuya-Mi Y, et al. Periodontitis as a risk factor of atherosclerosis. *J Immunol Res.* 2014;2014.
86. Kinane D, Bouchard P. Periodontal diseases and health: consensus report of the sixth European workshop on periodontology. *J Clin Periodontol.* 2008;35(s8):333–337.

Chapter 3

Research Gaps, Aims and Conceptual Framework

3.1 Introduction

The preceding chapters provided the background and literature review for the study. This chapter will detail the research gap based on current evidence and the aims of the study. In addition, this chapter presents the conceptual framework, based on a behavioural model of health services use that includes contextual as well as individual characteristics, and how these influence health behaviours.

3.2 Research Gaps

The review of the literature identified several gaps relating to the oral healthcare of people with CVD. It is clear that there is a paucity of research globally in this area despite recommendations advocating the need for increased awareness among people with CVD and cardiac clinicians concerning the link between periodontal disease and CVD. From an Australian perspective, there is no information about the oral health status, perceptions, behaviours, or knowledge of people with CVD. Further, little is known about the perceptions, practices, and knowledge of cardiac care providers regarding oral healthcare. Cardiac nurses are well-positioned to promote oral healthcare, but this role has not been fully explored in the Australian cardiac context. Considering the challenges of accessing dental care in Australia it is important to better understand the current situation regarding oral healthcare for people with CVD to help inform possible preventative strategies involving cardiac care providers.

3.3 Aims of the Study

The broad aim of the CARDIOH Study was to explore oral healthcare for people with CVD to inform the development of a nurse-led cardiovascular oral health program.

The specific aims were to:

- 1) Synthesise the evidence regarding oral healthcare and CVD, and the current strategies and implications for nurses.
- 2) Explore the knowledge, attitudes, and practices of cardiac care clinicians regarding oral healthcare.
- 3) Explore the predisposing, enabling, and need factors as well as the behaviours of people with CVD regarding oral healthcare.
- 4) The perceptions of cardiac care clinicians and patients with CVD of the capability of cardiac nurses to promote oral healthcare and patients' intention to participate in oral healthcare services provided by cardiac nurses.

3.4 Thesis Outline

This thesis will be presented as a combination of chapters and publications. An overview of the thesis as well as the study aim, and research questions aligned with the publications and unpublished results are provided in Figure 3.1 and Table 3.1.

Chapter 1 presented the introduction and background of the thesis. It set the scene for the study by outlining the major concepts and setting of the study.

Chapter 2 presented the first publication from the CARDIOH Study—Thesis Paper 1—a scoping review of the literature published in the Journal of Cardiovascular Nursing. This paper explored current evidence, recommendations and emerging strategies relating to oral healthcare and management of people with CVD.

Chapter 3 outlines the rationale of the thesis and the gaps in our knowledge that initiated the study along with the broad and specific study aims and questions. See Figure 3.1 and Table 3.1. In addition, this chapter discusses the conceptual framework underpinning this study. It also presents the proposed adapted Andersen’s model in the context of the CARDIOH Study by outlining the potential factors that determine the oral healthcare-seeking behaviour of people with CVD.

Chapter 4 provides a comprehensive discussion of the study design selected and rationale for selecting a mixed methods approach. It also presents an overview of the research methodology used for the different components of the study. This chapter also describes the investigator-developed instruments used for the survey, including its psychometric testing.

Chapter 5 presents the qualitative findings regarding the perceptions of the cardiac care clinicians. These results are presented as—Thesis Paper 2—published in the journal Collegian. This paper reports the oral healthcare knowledge, practices, beliefs, and attitudes of cardiac care clinicians. It also presents the perception of cardiac care clinicians in relation to providing oral healthcare in their setting.

Chapter 6 presents qualitative findings from the perspectives of people with CVD as a publication. Thesis Paper 3 is an article published in the journal PLoS One. This qualitative paper presents the oral healthcare knowledge, experiences, and behaviours of people with

CVD. It also explores their perceptions about the challenges and enablers in accessing oral healthcare services and their feelings about receiving oral health education, assessment, and referral from cardiac care clinicians in the cardiac setting.

Chapter 7 presents the quantitative findings from the survey of people with CVD. This chapter is presented as two publications. Thesis Paper 4 is a quantitative article published in the journal BMC Oral Health. This descriptive paper presents results exploring the oral health status, behaviours, and knowledge of people with CVD regarding oral health and CVD. Thesis Paper 5 is an article published in the Journal of Cardiovascular Nursing. This paper presents the findings from the cross-sectional survey regarding the barriers and predictors associated with accessing oral healthcare among people with CVD in Australia.

Chapter 8 presents the unpublished results including the patients' perceived capability of cardiac nurses to promote oral healthcare, and their intention to participate in oral healthcare promotion services provided by cardiac nurses.

Chapter 9 presents a comprehensive discussion of the major findings. It also discusses the effectiveness of the adapted Andersen's model used to understand the relationship between contextual characteristics, individual characteristics, and the oral health seeking behaviour of people with CVD. This chapter also outlines the strengths and limitations of the study.

Chapter 10 presents the conclusion, recommendations, and directions for future research in the area of oral healthcare promotion delivered by nurses in the cardiac setting.

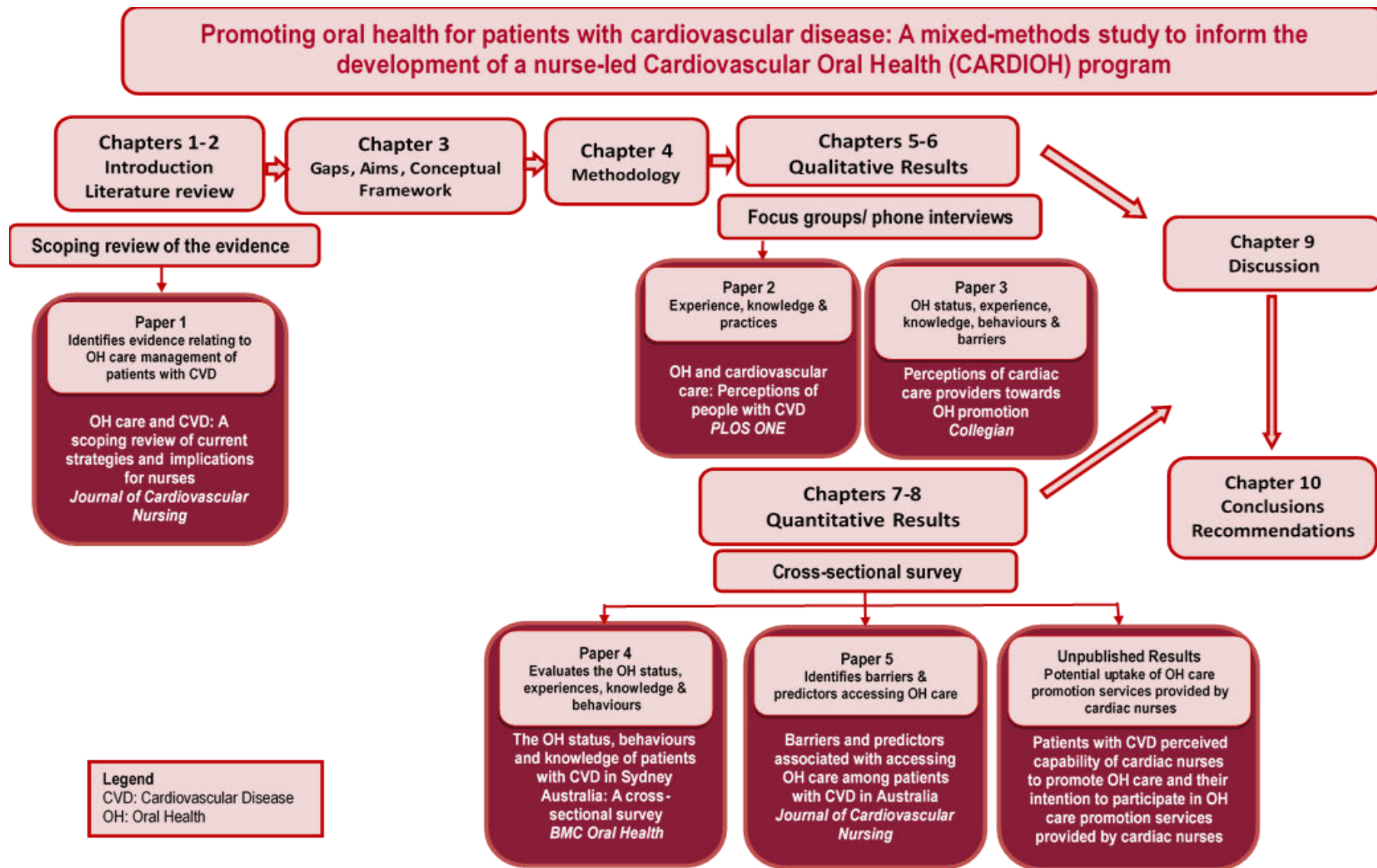


Figure 3.1: Thesis outline

Aims	Study Questions	Thesis Papers
<p>➤ The evidence regarding oral healthcare and CVD, and the current strategies and implications for nurses.</p>	<ul style="list-style-type: none"> ▪ What is the evidence of the impact of periodontal treatment on CVD outcomes? ▪ What are the current recommendations regarding oral healthcare for all people with CVD? ▪ What is the evidence regarding the role of nurses in oral health promotion? ▪ What training resources and tools are available to assist nurses in oral health promotion? 	<p>Thesis Paper 1: Oral healthcare and cardiovascular disease: A scoping review of current strategies and implications for nurses.</p>
<p>➤ The knowledge, attitudes, and practices of cardiac care clinicians regarding oral healthcare.</p>	<ul style="list-style-type: none"> ▪ What are the experiences of cardiac care providers regarding the oral health of people with CVD? ▪ How knowledgeable are cardiac care providers about oral health and its potential impact on cardiovascular outcomes? ▪ What oral health practices are being undertaken by cardiac care providers during clinical practice? ▪ What are the perceptions of cardiac care providers about promoting oral health education, assessment, and referrals to people with CVD? 	<p>Thesis Paper 2: Perceptions of cardiac care providers towards oral health promotion in Australia.</p>
<p>➤ The predisposing, enabling, and need factors as well as the behaviours of people with CVD regarding oral healthcare.</p>	<ul style="list-style-type: none"> ▪ What are the experiences and behaviours of people with CVD towards oral health? ▪ What is the knowledge of people with CVD about oral health and its impact on cardiovascular outcomes? ▪ What barriers and facilitators exist for people with CVD to access oral health services? ▪ What are the current oral healthcare practices of people with CVD in the cardiac setting? ▪ What do people with CVD feel about receiving oral health education, assessment and referral from cardiac care clinicians in the cardiac setting? 	<p>Thesis Paper 3: Oral health and cardiovascular care: perceptions of people with cardiovascular disease.</p>

Aims	Study Questions	Thesis Papers
	<ul style="list-style-type: none"> ▪ What is the prevalence of self-reported oral health problems among adult patients with CVD? <hr/> ▪ What are the reported oral health behaviours of patients with CVD? <hr/> ▪ What is the perceived level of knowledge regarding oral health and CVD in these patients? <hr/> ▪ What is the prevalence of accessing oral healthcare among patients with CVD? <hr/> ▪ What are the perceived barriers to accessing oral healthcare? <hr/> ▪ What predictive factors are associated with a dental visit in the last 12 months? 	<p>Thesis Paper 4: The oral health status, behaviours and knowledge of patients with cardiovascular disease in Sydney Australia: A cross-sectional survey.</p> <hr/> <p>Thesis Paper 5: Barriers and predictors associated with accessing oral healthcare among patients with cardiovascular disease in Australia.</p>
<p>➤ The perceptions of cardiac care clinicians and patients with CVD of the capability of cardiac nurses to promote oral healthcare and patient’s intention to participate in oral healthcare services provided by cardiac nurses.</p>	<ul style="list-style-type: none"> ▪ What are the perceptions of cardiac care providers about promoting oral health education, assessment, and referrals to people with CVD? <hr/> ▪ What is the patients’ with CVD perceived capability of cardiac nurses to promote oral healthcare? ▪ What is the patients’ with CVD intention to participate in oral healthcare promotion services provided by cardiac nurses? 	<p>Thesis Paper 2: Perceptions of cardiac care providers towards oral health promotion in Australia.</p> <hr/> <p>Perceptions of patients with CVD not yet published. Presented as unpublished results in Chapter 9.</p>

Table 3.1: Aligning the aims with the study questions and the published/ unpublished results

3.5 Conceptual Framework of the CARDIOH Study

As described in Chapter One, people with periodontal disease not only have an increased risk of developing ACVD but those diagnosed with ACVD also have an increased risk of hospitalisation and mortality (Dietrich et al., 2017; Lang et al., 2015). Understanding the factors that influence an individual's oral healthcare behaviours, including self-care practices and use of dental care services, could inform measures to address the poor health outcomes experienced by this group.

The overall aim of the CARDIOH Study was to explore oral healthcare for people with CVD to inform the development of a nurse-led cardiovascular oral health program. As such, understanding the feasibility and acceptability of such a program was necessary and so a model that was able to measure both contextual factors (feasibility) and individual factors (acceptability) was needed. Ronald Andersen's Behavioural Model of Health Services Use ('Andersen's Model') was selected, as it offered a conceptual basis for not only informing the design of the CARDIOH Study but understanding the likely facilitators and barriers—at both organisation and individual level, to developing an oral healthcare promotion service provided by cardiac nurses.

3.5.1 Understanding Andersen's model

Used extensively in studies of healthcare utilisation (Babitsch, Gohl, & Von Lengerke, 2012), the model was first developed by Ronald Andersen in 1968 to explain the use of formal personal health services (Andersen, 1995) and the psycho-socio-economic factors that influenced health service use. Described as a multilevel model that combines both contextual and individual determinants of health services use (Babitsch et al., 2012), it divides contextual characteristics into the same components as individual characteristics.

These characteristics are labelled as predisposing, enabling and need components and, despite the model undergoing several modifications, these three components remain a central feature of the current model (Figure 3.2). A brief description of the model's components is presented below.

Contextual characteristics refer to the environment and circumstances of healthcare access and include organisation and provider-related factors (Andersen et al., 2007). Contextual characteristics are divided into predisposing, enabling and need components. For example, conditions that predispose people to use (or not use) health services, enabling conditions that facilitate or pose barriers to the use of services, and need conditions that people (or health professionals) recognise as requiring treatment (Andersen et al., 2007). Contextual predisposing characteristics could be the demographic, social beliefs of adults with CVD (or cardiac health professionals); the contextual enabling characteristics could be the ratio of dentists to people in the community, and contextual need characteristics could be the proportion of adults with CVD.

Similarly, individual characteristics are also divided into the same three components as contextual characteristics but refer to the individual. Individual predisposing characteristics could include age, gender, and educational level; individual enabling characteristics could include family income, insurance status or oral health beliefs; and individual need characteristics could include a perceived need for dental treatment.

The final components of Andersen's model are health behaviours and outcomes. Health behaviours are generally considered to be personal health practices (Andersen et al., 2007), for example, oral self-care practices and use of healthcare (e.g. dental) services. The main focus of Andersen's model is on the health behaviour of individuals and their use of

healthcare services, and the resulting health outcomes and satisfaction with the services provided (Andersen et al., 2007).

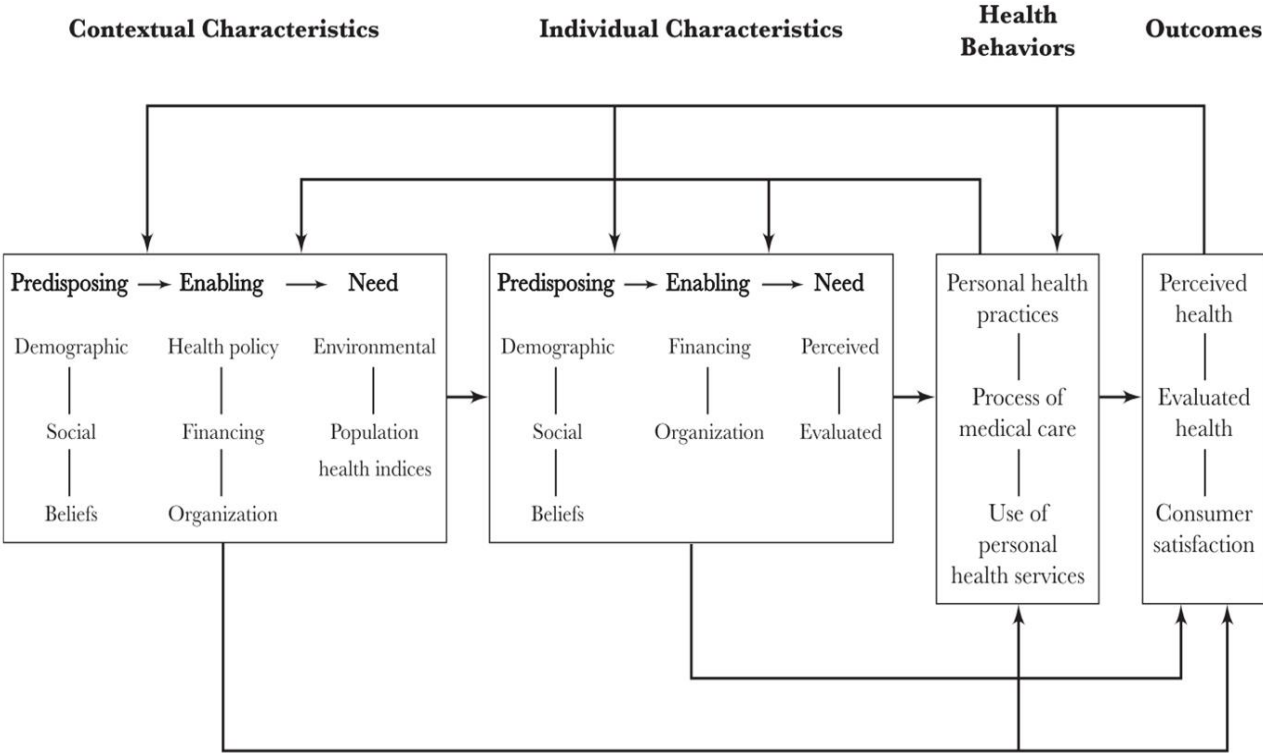


Figure 3.2: Andersen’s conceptual framework (Andersen et al, 2007)

3.5.2 Andersen’s model in the context of the CARDIOH Study

Contextual characteristics such as the healthcare system, current health policies and the practices of cardiac care clinicians are proposed as factors that could influence the behaviour of people with CVD in accessing oral healthcare and, subsequently, their health status. In addition, decision makers, in this case people with CVD make decisions on issues concerning their health according to their perception of the severity of their concern and susceptibility, if no action is taken. People weigh the benefits of taking action versus

inaction—in effect, conducting an internal calculation of the benefits or risks of behavioural change and hence, decide whether to act or not (Green & Murphy, 2014).

In order to engage in preventative action, people with CVD need to perceive that they have (or may have) a problem. People need to consider if the problem is serious enough to adopt or change their behaviour such as engaging in regular oral hygiene and accessing oral healthcare if necessary. Additionally, for cardiac care clinicians and people with CVD to engage in any strategy or program to improve the utilisation of dental care services they need to perceive that it is useful and relatively easy to use. Therefore, the perceived capability of cardiac nurses to promote oral healthcare and the intention to participate in an oral healthcare promotion services program, led by cardiac nurses, was also included in the model, and explored in this study. Furthermore, identifying the unmet needs, perceptions and practices of cardiac care clinicians, especially cardiac nurses, as a determinant to oral healthcare utilisation is essential. In this revised model, cardiac care clinicians and people with CVD are the main stakeholders. In summary, the adapted model provided a comprehensive framework of components to help structure the different phases of this study and address the study aims as illustrated in Figure 3.3.

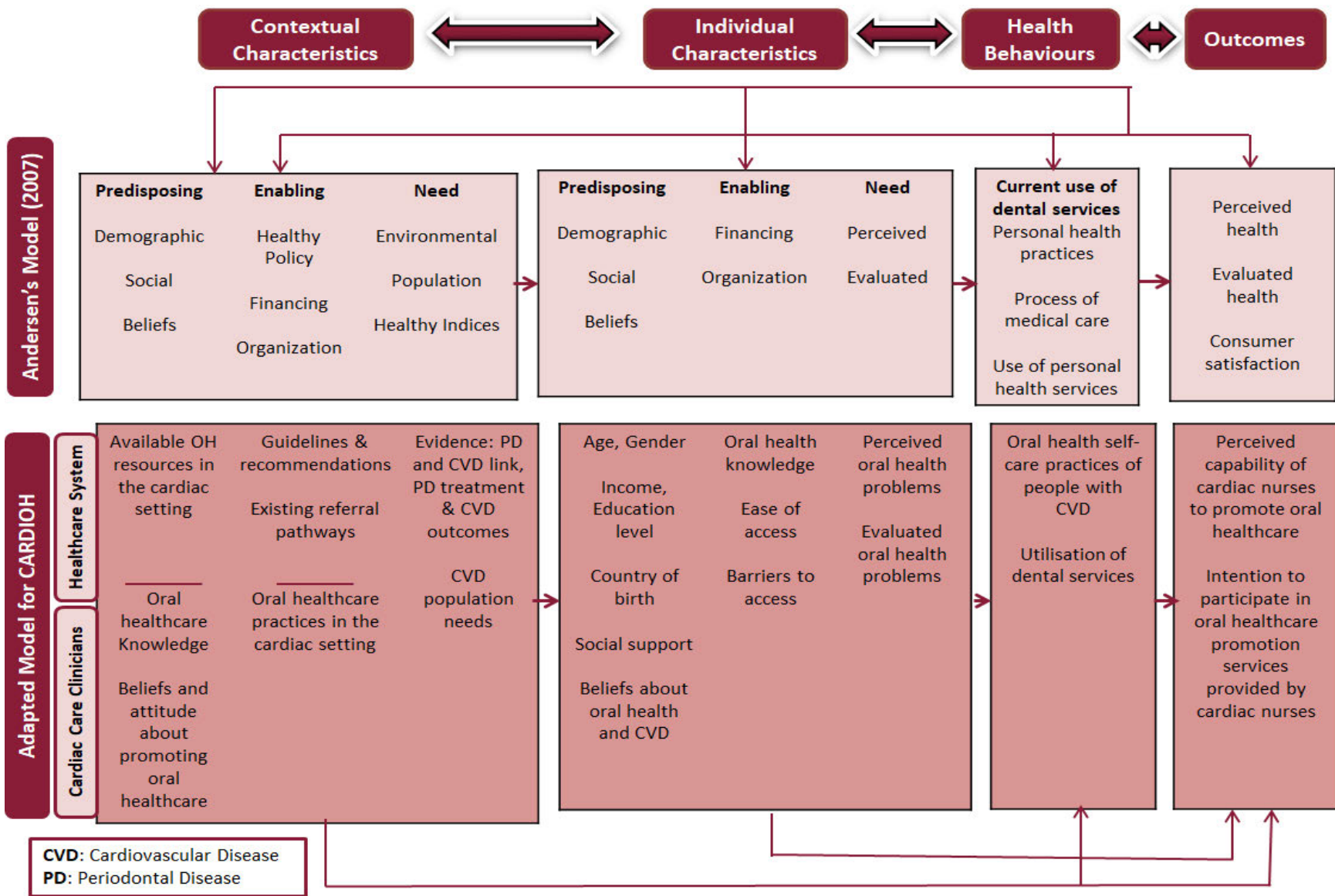


Figure 3.3: Conceptual framework of the CARDIOH Study (adapted from Andersen et al, 2007)

3.6 Conclusion

This chapter provided the research gaps based on current evidence and the aims of the CARDIOH study. Additionally, this chapter has outlined the conceptual framework selected for this study. The adapted Andersen's model of healthcare utilisation provided the framework to address the study aims. The following chapter presents the research approach and methods used within this study.

Chapter 4

Methodology

4.1 Introduction

The previous chapter described the research gap, overall study aims, research questions, and the conceptual framework selected for this study. An outline was provided to illustrate where the aims and research questions were addressed in this thesis within the specific thesis chapters and publications. This chapter will discuss the methodology used to address the study aims. Justification for the research approach and choice of design will be presented, followed by a detailed description of the study methods. The qualitative and quantitative components of this mixed-methods study are detailed separately.

4.2 Mixed-method Design

The overall aim of the CARDIOH Study was to explore oral healthcare for people with CVD to inform the development of a nurse-led cardiovascular oral healthcare program. To achieve this, a pragmatic approach was needed, drawing on both qualitative (interpretative) and quantitative (positivist) approaches to answer different research questions within the one study. That is, to explore and evaluate the perspectives of both cardiac care clinicians and people with CVD regarding oral healthcare and the potential uptake and scope of a nurse-led cardiovascular oral healthcare program.

Using both qualitative and quantitative methods allow for the investigation of intricate processes and systems in health and healthcare. It helps to confirm the accuracy of findings and provides a greater understanding of the processes linked to outcomes. In short, it is a

powerful instrument where the constructs under investigation are difficult to measure (Creswell & Plano-Clark, 2011).

4.2.1 Rationale for a sequential exploratory mixed-method design

A sequential exploratory mixed-method design was selected as the most suitable approach as it enabled the researcher to first explore the perceptions of cardiac care clinicians and of people with CVD by using a qualitative approach (one-on-one, telephone and focus group interviews), and then use a quantitative approach (survey) to examine the knowledge, attitudes, and practices of cardiac care clinicians regarding oral healthcare (Freshwater & Cahill, 2012).

An exploratory sequential design involves the collection and analysis of qualitative data, which is then used to inform a subsequent quantitative data collection phase. This design is also useful for the development of survey tools or instruments that are inadequate or non-existent (Onwuegbuzie, Bustamante, & Nelson, 2010), which was the case in the CARDIOH Study, and the primary reason for selecting an exploratory sequential design (Figure 5.1). In this type of design, more weight is usually placed on the qualitative phase than the quantitative phase (Creswell, 2013) and the quantitative results often served to validate and corroborate the qualitative findings from the first phase (Creswell, 2013).

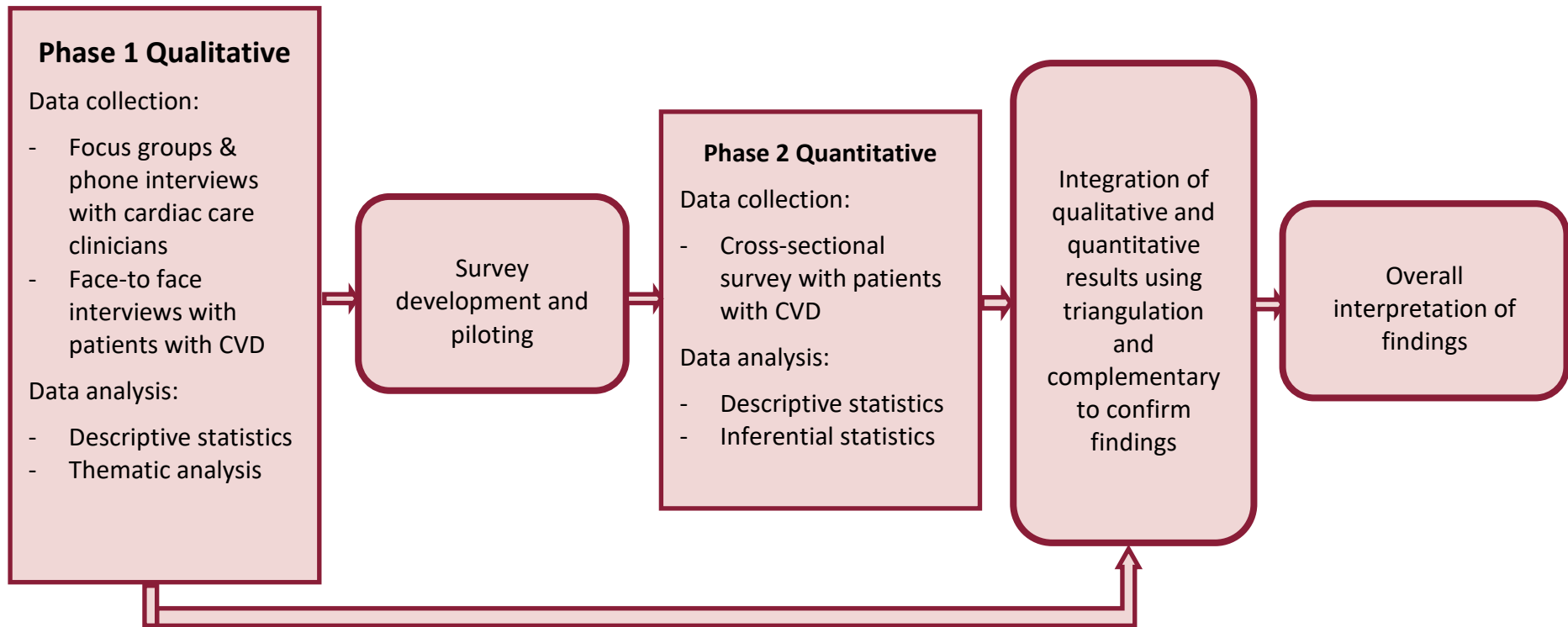


Figure 4.1: Exploratory design of the mixed methods approach adapted from Creswell and Plano-Clark (2011)

4.3 Phase 1 Qualitative

Phase One applied a qualitative methodology to (i) explore patients with CVD and cardiac care clinicians' perceptions and views regarding oral healthcare and (ii) the acceptability and feasibility of a nurse-led cardiovascular oral healthcare program in their setting. Methods relating to participant selection, setting, data collection and analyses are presented for cardiac care clinician-participants first followed by patient-participants.

4.3.1 Cardiac care clinician-participants

4.3.1.1 Sampling, recruitment and setting

Purposive sampling was used to recruit cardiac care clinicians to participate in focus groups and phone interviews. This approach allowed selecting participants who had specific and vast experience in diverse areas of the cardiac care setting (Lavrakas, 2008).

Recruitment for the focus groups was achieved by distributing flyers and information about the project to potential participants via managers, educators, and cardiac rehabilitation coordinators in both inpatient and outpatient cardiac units at four participating hospitals (Appendix 14). Focus groups were selected as a method of data collection to obtain a broad range of information, perceptions, and opinions of the group. This served to enhance the overall richness of the data and to generate a shared understanding of the study components (Mallinckrodt, Miles, & Recabarren, 2015). This method also facilitated easy access to the clinicians as a group due to constraints on their time and availability.

Recruitment for the telephone interviews was achieved by inviting cardiac care clinicians who were attending a national cardiovascular nursing conference in Australia. At the conference, the doctoral candidate presented the project and invited participants during a plenary session. The doctoral candidate also arranged to have a stall with information

about the project and other oral healthcare issues (Figure 5.2). Those who expressed interest in participating provided their consent and a convenient time for the telephone interview. Telephone interviews were a practical and convenient method to obtain data from cardiac care clinicians from different cardiac settings across Australia. Data was collected between January and March 2016.

Focus groups took place in four large metropolitan hospitals in Sydney, Australia. The selected hospitals were located in both affluent and disadvantaged areas. Two hospitals (Liverpool and Fairfield) were located in the South Western Sydney region which is one of the most culturally and linguistically diverse regions in Australia (PHN South Western Sydney, 2020). Over half the region speaks a language other than English at home (Australian Bureau of Statistics, 2020), with the most common language (after English) being Arabic (PHN South Western Sydney, 2020). Communities in this region display some of the highest levels of disadvantage in the Sydney metropolitan region, with lower than state average median household incomes and high concentrations of social housing (SWSLHD, 2013). The region also has high rates of chronic health conditions, with dental conditions and congestive heart failure among the top five conditions resulting in potentially preventable hospital admissions in 2010–2011 (SWSLHD, 2013).

The SWSLHD Cardiovascular Stream provides a wide range of clinical services including cardiology, cardiac diagnosis, intervention, rehabilitation and ambulatory services, and cardiothoracic surgery. The demand for cardiovascular services for the LHD is expected to increase significantly (by over 40%) leading to 2021-2022 due to increase in population in the region, hence plans are underway to expand the cardiac services provided (SWSLHD, 2018). Both Liverpool and Fairfield hospitals offer a cardiac rehabilitation program that runs

for 6–7 weeks throughout the year. They also offer a cardiac ambulatory service for people with heart failure (SWSLHD, 2018).

The other two hospitals (Royal Prince Alfred and Balmain) were located in a densely populated, and fast-growing region including Ashfield, Burwood, Canada Bay, the Inner West Council and Strathfield, part of Canterbury-Bankstown and the western and southern parts of the City of Sydney. The Royal Prince Alfred and Balmain hospitals are located in an affluent area of the Sydney Local Health District (SLHD) region with 95% of its services being provided to SLHD residents. The area has a strong employment base (64% employed full time), extensive health, sporting facilities and education. In 2016, the population was 640,000, 21% more (110,000) than in the previous 10 years with a young population with the greatest proportion of people between 20–44 years of age than the rest of the state (Sydney Local Health District, 2018). In the 2016 census (Sydney Local Health District, 2018), 45% of people were born overseas and 58% spoke a language other than English at home. Of the people who were born overseas, China was the most common country and Mandarin was the most common non-English language spoken at home. In addition, the number of people from India has increased significantly in the area. Overall, residents of this region are well-educated. In 2016, 76% had completed year 12 or equivalent and 30% had a bachelor degree or higher (Sydney Local Health District, 2018).

Royal Prince Alfred Hospital is a public hospital that provides a wide range of services to more people than any other public hospitals in NSW. It treats more than one thousand people on a daily basis. The hospital also provides a range of speciality and allied health services to a large number of residents who come from the whole SLHD region for

outpatient services such as cardiology clinics and cardiac rehabilitation (Sydney Local Health District, 2018).

Balmain Hospital is a community-based facility dedicated to aged care, rehabilitation, and general practice (Sydney Local Health District, 2020). In the years 2013–2014 most patients who attended Balmain hospital spoke English at home (91%) and 66% were born in Australia (Sydney Local Health District, 2015). Balmain offers cardiac rehabilitation programs to local residents and residents from other areas of the SLHD.

The cardiac rehabilitation program is offered in both Royal Prince Alfred and Balmain hospitals and runs for 6–7 weeks and throughout the year (Sydney Local Health District, 2020).

Cardiac care clinician-participants were mainly cardiac nurses ($n=27$), physiotherapists ($n=2$) and an exercise physiologist ($n=1$) from diverse areas of Australia including NSW, Queensland, South Australia, and Victoria. Cardiac care clinician-participants were also from diverse settings such as cardiac rehabilitation and ambulatory services, acute inpatient and outpatients, and chronic cardiac care.



Figure 4.2: Image of the stall at national conference

4.3.1.2 Data collection

Semi-structured interviews were conducted via four focus groups and eight telephone interviews to explore the perceptions of cardiac care clinicians towards oral healthcare and the potential for cardiac care clinicians, especially cardiac nurses, to promote oral healthcare. Both the focus group and telephone interviews were conducted by the doctoral candidate. The interview guide for the focus groups and telephone interviews followed a similar structure (Appendix 1). The interview guide aligned with contextual characteristics related to the adapted Andersen’s model (Andersen et al., 2007) which considers the healthcare system and cardiac care clinician’s characteristics including their oral healthcare knowledge, beliefs, attitudes, and practices. See Figure 4.2.

Data was collected between January–March 2016. All interviews and focus groups were audio-taped and lasted between 30–45 minutes. Demographic details of participants were obtained at the beginning of the data collection. Data collection was undertaken until

no substantially new information was acquired and data saturation was achieved (Fusch & Ness, 2015).

Focus groups

Four focus groups were conducted by the doctoral candidate, two of which were initially conducted with an experienced interviewer to support and guide the candidate. Interviews occurred at a mutually convenient time and place for participants. Focus groups were selected as a method of data collection with cardiac care providers of the four metropolitan hospitals to obtain the group's broad range of information, perceptions, and opinions.

Telephone interviews

Telephone interviews were a practical and convenient method to obtain data from the different cardiac settings across Australia where participants were practicing. During the phone interviews participants were advised to be in a quiet place, as interviews were audio-recorded. The interviewer conducted the phone call in a private office. There were no problems with the audio connection during the phone interviews which were conducted using a desk telephone on loudspeaker and a digital audio-recorder. Interviewees were reminded that the interview was being audio-recorded and their consent was confirmed.

4.3.1.3 Data analysis

The software NVivo 11 was used to facilitate coding and categorising the transcribed text (QRS International Pty Ltd, 2015). The doctoral student and a senior research investigator independently analysed and coded the transcripts and through consensus, a list of themes and subthemes including relevant quotes from participants was developed and put into a coding sheet. Later, through discussion, two other senior investigators reviewed

the coding for further consensus and defining of the themes (Braun & Clarke, 2006). The characteristics of the cardiac care clinician-participants as well as further details of the methods for this qualitative component of the study are presented in Chapter 5, Thesis Paper 2.

4.3.2 Patient-participants

4.3.2.1 Sampling, recruitment and setting

Purposive sampling was used to select patients with CVD attending cardiac rehabilitation at three public hospitals in Sydney, Australia to participate in face-to-face interviews. These patients had diverse experiences in the cardiac setting throughout the length of diagnosis which made them “experts” about the phenomenon studied: oral healthcare and CVD. Flyers advertising the study were distributed among the cardiac rehabilitation units (Appendix 13). Nurses working in these units also distributed flyers and informed participants about the study during the patient’s cardiac rehabilitation sessions.

Eleven interviews took place prior or soon after the cardiac rehabilitation session in the cardiac rehabilitation interview room at Liverpool, Fairfield, and Balmain hospitals as this was a convenient time for participants. One interview was undertaken in the residence of a participant who had a mobility problem. Of the four hospitals in the study, only three participated in the interviews with patient-participants as data saturation was achieved before recruiting from the fourth hospital.

4.3.2.2 Data collection

Semi-structured interviews were used to obtain a broad range of information, perceptions, and opinions of the people with CVD. One-on-one interviews were selected as the most appropriate approach to collect data due to the potentially sensitive nature of the

information shared by the participants. For some participants talking about their personal information as well as their general health and/or oral health may have been embarrassing, potentially deterring them from sharing relevant information in a larger group. Interviews were undertaken by the doctoral candidate and an interview guide with prompts used to ensure the study aims were explored (Appendix 2). The interview guide was developed and adapted for this population considering the factors that determine people's health seeking behaviours as per Andersen's model (Andersen et al., 2007). The interview guide included questions related to the participant's individual characteristics, healthcare behaviours and the potential uptake of a nurse-led cardiovascular oral healthcare program.

Duration of the audio-taped interviews was between 30–45 minutes. Data collection was undertaken until no significant new information was acquired and data saturation was achieved (Fusch & Ness, 2015).

Additional strategies were implemented during data collection for participants who did not speak English. Initially, the interview guide was pilot tested on two participants, one Australian and a Spanish speaker for cultural acceptability prior to use. The transcriptions of the two interviews were discussed by the doctoral candidate and two supervisors and the guide was subsequently adjusted in accordance with their feedback. A professional healthcare interpreter was made available for two participants, while a healthcare worker and a family member interpreted the questions and translated for another two participants. Allowing participants to speak in their own language helped to enhance rapport and trust from the participants and aided in obtaining a more detailed description of their experiences. The interviews in languages other than English included Mandarin, Vietnamese, Arabic and Spanish.

4.3.2.3 Data analysis

The audio-recordings were professionally transcribed, and data was analysed using thematic analysis with the assistance of the qualitative software package NVivo Version 11 (Braun & Clarke, 2006; Saldaña, 2015; QRS International Pty Ltd, 2015). For the interviews that used translators, it was decided that transcriptions would only be done on sections of the interviews that were in English due to budget limitations for the doctoral candidate.

4.3.2.4 Study rigour

To enhance the rigour of Phase One, the interview guide was reviewed by a panel of experts with experience in qualitative research (Guba & Lincoln, 1994). In addition, prolonged engagement, member checking, and peer debriefing was employed (Lincoln & Guba, 1985). Prolonged engagement to maintain credibility was provided by the doctoral candidate who was a registered nurse working in the clinical area as a clinician and educator for more than twenty-five years. Due to this, the researcher had a good understanding of the complexity of the settings where the study took place. This helped in gaining rapport and trust with patients, clinicians, and other staff in the cardiac setting. Mutual trust occurred by direct engagement and communication with participants (cardiac care clinicians and people with CVD). In many cases, cardiac care clinicians facilitated the engagement and communications between the researcher and the participants.

Credibility was also achieved by sharing the findings with the participants (member checking) to ensure their key statements were captured accurately. For example, key points were further discussed or reiterated during interviews, and with the focus groups, to ensure credibility of the data. All interviews facilitated the emergence of common themes, which were internally discussed between the doctoral candidate and two supervisors. Clarification

of data obtained was also discussed with some of the participants to ensure the information obtained during the interview was accurate (Morse, 2015). For confirmability and to reduce bias, interviews were audio-recorded so data could be checked and rechecked independently by members of the research team. An audit trail of all methodological processes was kept. The qualifications, credentials and experiences of the data collectors and researchers were clearly identified in the corresponding publications. Additionally, de-identified data and extracts from transcripts were published as part of the journal articles to support the confirmability of the study (Lincoln & Guba, 1985).

For transferability of all findings to other cardiac care areas, participants, both people with CVD and cardiac care clinicians, were recruited from diverse cardiac settings, areas and backgrounds as well as affluent and disadvantaged areas (Cope, 2014). Furthermore, transferability was enhanced by clearly describing the context and methodology of all components of this study. The descriptions of the study settings, characteristics of the participants, time frames and approaches to data collection have been clearly outlined in the publications of this study. Sufficient contextual information has been provided in this thesis and the publications associated with the study, allowing the reader to determine the extent of transferability. Dependability ensures that the findings of the research are consistent and can be replicated (Lincoln & Guba, 1985). In this study, dependability was ensured by provision of a detailed description of all aspects of this project including the research process, methods, data collection and analyses. These details would enable future researchers to repeat the study in a similar or different context.

4.4 Phase 2 Quantitative

Phase 2 used a quantitative approach, a cross-sectional survey approach to (i) evaluate the oral health status, experiences, knowledge, and behaviours of patients with CVD, (ii) identify the barriers and predictors associated with patients with CVD accessing oral healthcare, and (iii) identify the intention of patients with CVD to participate in the oral health promotion services offered by cardiac nurses. An overview of the quantitative study methods follows, commencing with the development and testing of the survey instrument, followed by the setting, participants, sample size calculation and data analysis. Additional information related to the methods for this phase of the study is presented in Chapter 7, Thesis Papers 4 and 5.

4.5 Development and Testing of the Survey

The survey was adapted from an instrument originally developed to assess the oral health status, behaviour, and knowledge of pregnant women (George et al., 2013). The items were developed based on Andersen's conceptual model of healthcare utilisation and adapted for this study, as outlined in Chapter 4 Figure 4.2. Items in the survey were further refined and/or adapted from the findings of the qualitative phase of the study (Figure 5.1). In addition, there were three investigator-developed instruments, developed specifically for the population in this study –patients with CVD. The three instruments included: a) the Barriers for Seeking Frequent Dental Care BASAC scale, which measured the barriers to seeking frequent dental care for patients with CVD; b) the Cardiac Nurses Promoting Oral Healthcare CANPOH scale, which measured the participants' perceived capability of cardiac nurses to promoting oral healthcare; and c) the Intention to Participate in Oral Healthcare

IPOH scale, which measured the patients with CVD intention to participate in oral healthcare promotion services provided by cardiac nurses (Table 4.1).

As per the adapted conceptual model, the survey included items related to the components including patient characteristics, health behaviours and the potential uptake of a nurse-led cardiovascular oral health program. The components and details of the instruments used in the survey are presented in Table 4.1. The full survey is presented in Appendix 3.

Components of Andersen Model	Factors Measured	Description	Response Format
Individual (patient) Characteristics	Socio demographic characteristics: (Predisposing factors)	13-Items: Age, ethnicity, language, diagnosis, education, income, etc.	Open-ended questions In check-box format
	Oral health knowledge (Enabling factors)	12-item scale: General and specific cardiovascular oral health knowledge	True/ False/ Don't know
	Oral health knowledge received (Enabling factors)	1-item scale: Information received If Yes, there were 3 further questions	Yes/ No If Yes: give details
	Oral health self-care practices (Enabling factors)	Frequency of brushing, products used	6-option check-box
	Social support (Enabling factors)	5-item scale: social, network and family support to access dental care	Yes/ No
	Oral health issues: General status (Need factors)	Description of the teeth and mouth health status	5-option check-box
	Oral health issues: specific issues (Need factors)	7-item scale: Health of teeth, gums or mouth	Yes/ No
Health Behaviour	Ease of accessing dental care (Use of dental care services)	1-item scale: Rating the easy of accessing dental care	11-point scale
	Barriers to access [BASAC: Investigator-developed scale] (Use of dental care services)	11-item scale: Reasons for not seeing a dentist frequently	7-point Likert scale
	Utilisation of dental care services (Use of dental care services)	1-item scale: Frequency of dental visit. Every 12 months or less	Yes/ No Other options
	Utilisation of dental care services (Use of dental care services)	Type of dental practice: Public, private, armed service, etc.	6-option check-box
Outcomes	Perceived capability of cardiac nurses promoting oral healthcare [CANPOH: Investigator-developed scale] (Uptake of oral health services)	4-item scale: Perceptions about cardiac nurses capability to promote oral healthcare in their setting	Yes/ No/ Don't know
	Intention to participate in oral healthcare by cardiac nurses [IPOH: Investigator-developed scale] (Uptake of oral health services)	7-item scale: Willingness to participate in oral health promotion services provided by cardiac nurses	7-point Likert scale

Table 4.1: Description of the survey for people with CVD

To establish face and content validity, the survey was reviewed by an expert panel consisting of clinicians, academics, and educators in the field of dentistry, cardiology, nursing and physiotherapy ($n=15$). Their agreement on the survey items were canvassed through qualitative feedback (Pandey & Chawla, 2016). A careful revision of items was undertaken based on their feedback. This included deletion of some items that were not relevant or editing of existing items. For example, in section A Question 1 of the survey (Appendix 3), *'Do you currently have any of the following problems with your teeth, gums or mouth?'* the term *'Dry mouth'* was added as an additional option as suggested by the dental experts. The survey was further refined after piloting it with six patients with CVD (not participating in the study) to ensure readability and relevance (Patten, 2016). An example of the changes to the survey after piloting with patients was in section F Question 12.11 *'Bad breath is not a sign of gum disease'*. Due to some confusion, the question was changed to *'Bad breath is a sign of gum disease'*.

4.5.1 Investigator-developed instruments

The investigator-developed instruments, the BASAC scale and the IPOH scale, were tested for their validity and reliability. The construct validity of the scales was tested using exploratory factor analysis and multivariate logistic regression analysis. The internal consistency of the scales was calculated using Cronbach's alpha (Cronbach's α) and a value of >0.7 was considered as a cut-off value for reliability (Tavakol & Dennick, 2011). The Kaiser-Meyer-Olkin (KMO) test measures sampling adequacy, in which a value of >0.6 indicates that the data is appropriate for factoring correlations (Tabachnik & Fidell, 2013). The Bartlett's test of sphericity ($p<0.05$) in the analysis rejects the null hypothesis and concludes that there are sufficient correlations among the items of the scale, and that the data sets are appropriate for factor analysis (Bartlett, 1954). Principal Component Analysis (PCA) was used

to examine the patterns of interrelationships among items in order to reduce the items into the minimum number of components (Jolliffe, 2011).

4.5.1.2 BASAC scale, barriers to seeking frequent dental care

The psychometric properties of the BASAC scale showed that it had good internal consistency (Cronbach's $\alpha = 0.82$). Item generation, reliability, and validity of the BASAC scale is presented in Chapter 6, Thesis Paper 3.

4.5.1.3 IPOH scale, intention to participate in oral healthcare promotion services provided by cardiac nurses

The participants' intention to participate in oral health promotion services provided by cardiac nurses was measured using the IPOH scale. This instrument was developed and tested for this study and consisted of five items. See Table 4.1 for details on the items of this scale. For individual items, see Appendix 3, Section H, Question 15.

Items of this scale were generated and contextualised from the results of the qualitative phase of this study, outlined in Chapter 5, Thesis Paper 2 and Chapter 6, Thesis Paper 3.

The KMO test measuring sampling adequacy indicated that the data was appropriate for factoring correlations (KMO=0.88). The Bartlett's test concluded that there were sufficient correlations among the items in the scale, and that the data set was appropriate for factor analysis ($p < 0.05$). Eigenvalue was 4.2 and accounted for 85% of the variance. Cronbach's α coefficient of the overall 5 IPOH index items was 0.95 (Cronbach's $\alpha = 0.95$), indicating good internal consistency of the scale. PCA indicated that all items loaded into one component (0.90 to 0.94) indicating that this was a one-component solution.

The overall Cronbach's α of the IPOH items was 0.95 and the value did not increase if any of the items were deleted. The Corrected Item-Total Correlation ranged from 0.84 to 0.91, indicating that all five items contributed to the internal consistency of the scale.

The psychometric measurements showed that the IPOH scale had overall good internal consistency, indicating the instrument factorial validity was reliable to measure the participants' intention to engage in oral health services provided by cardiac nurses.

A summary of the factorial validity and reliability testing of the IPOH scale is presented in Table 4.2.

Item	Question	Communalities	Factor loading	Corrected item	Cronbach's α if item deleted
<i>Intention to participate in oral healthcare promotion services provided by cardiac nurses, IPOH scale (Overall Cronbach's $\alpha=0.95$)</i>					
1	Cardiac nurses asking questions to determine the oral health of the patient	0.88	0.94	0.91	0.94
2	Cardiac nurses offering dental advice	0.85	0.92	0.89	0.94
3	Cardiac nurses promoting oral health information resources such as leaflets, pamphlets or other material	0.78	0.88	0.86	0.95
4	Cardiac nurses visually checking the mouth and teeth of the patient	0.75	0.86	0.84	0.95
5	Cardiac nurses referring the patient to a dentist	0.80	0.89	0.87	0.94

Table 4.2: Scale items of the intention to participate in oral healthcare promotion services by cardiac nurses (IPOH) scale

4.5.1.4 Sampling, recruitment and setting

In this quantitative component of the study, a convenience sampling approach was used to recruit patients with CVD attending various outpatient cardiology services including four cardiac rehabilitation units, three public cardiology clinics and one private clinic located across South Western and Sydney regions. Having various sites ensured a broad representation of people with CVD. Convenience sampling was selected as the most appropriate, as the patients with diverse CVD conditions who were attending these services were easily accessible (Hedt & Pagano, 2011). The recruitment sites were in both affluent and disadvantaged areas of Sydney, similar to the qualitative phase. A description of the study areas was provided in section 4.3 of this chapter. The socio-demographic characteristics of the sample are presented in Chapter 7, Thesis Paper 4.

4.5.1.5 Data collection

Stalls containing dental products and information were located at all public and private study sites. Patients waiting for their medical appointment or those attending their cardiac rehabilitation program were given information and, if interested, invited to complete the anonymous survey. Patients were provided with dental products and/or information regardless of their participation in the study. One of the clinics, located in a public hospital in the Sydney region (Royal Prince Alfred), was attended by a large number of patients, therefore, for this site two dental clinicians volunteered to assist the doctoral candidate with data collection on two occasions. To ensure consistency, these clinicians were trained by the doctoral candidate and a senior researcher participating in the project, and the doctoral candidate was present at the site to oversee the data collection. The presence of dental

clinicians was invaluable, as there were occasions when patients or their carers had questions about dental care or needed advice.

To expedite the process, some data collection in the Sydney region was done by one of the trained dental clinicians, while the doctoral candidate collected data in the South Western Sydney sites. A total of 318 participants attending cardiology services between December 2016 to March 2017 completed the survey. Initially, there was an attempt to record the people who declined to participate in the study and the reasons for their refusal. However, due to the data collection approach and the dynamics of the different sites (busy), it was not possible to keep a count of the people who refused to participate.



Figure 4.3: Images of the stalls during data collection

4.5.1.6 Sample size

Due to the lack of equivalent published research in this area, the uptake of oral health services in another Australian vulnerable population (pregnant women) was used to inform the sample size for this study. In a study by George et al. (2013), 30% of pregnant women reported having visited a dentist in the previous 12 months. In view of the fact that people with CVD are older and more likely to have dental problems, it was estimated that 40% of respondents would have had a dental visit. Therefore, using the calculation $N=10 k/p$ (where N = the minimum number of cases needed, k = the number of predictor variables, and p = the proportion of dental visits in the last 12 months) (Peduzzi, Concato, Kemper, Holford, & Feinstein, 1996), the minimum number of cases required was 250. Allowing for 20% missing data, a sample size of 300 was required.

4.5.1.7 Data analysis

Quantitative data was analysed using the Statistical Package for the Social Sciences (SPSS) Version 24 software (IBM Corp, 2016). Descriptive statistics including mean and standard deviation were computed for continuous variables, and frequency and percentage for categorical variables were calculated and tabulated. Median and inter quartile range (IQR) were calculated for non-normally distributed data. Bivariate (Pearson) analysis, exploratory factor analysis with principal axis factoring, and scree plot were used. The internal consistency of scales was computed using Cronbach's alpha and multivariate logistic regression analysis (backward method) to examine the predictors associated with visiting a dentist in the preceding 12 months. Results were summarised as adjusted odds ratios (AOR) with 95% confidence intervals (CI). Nagelkerke R^2 was used to determine the strength of association of variables in the model. The Hosmer-Lemeshow test was used to determine the goodness of fit of the model.

4.6 Integration of the Qualitative and Quantitative Results

At the completion of this mixed-methods study, findings were discussed using the principles of triangulation and complementarity (Creswell & Plano-Clark, 2011).

Triangulation seeks the convergence and corroboration of all the results from the different methods investigating the same phenomenon (Creswell & Plano-Clark, 2011; Greene, Caracelli, & Graham, 1989). On the completion of data analysis, data triangulation was undertaken by bringing together all qualitative and quantitative results by comparing and contrasting the findings (Hussein, 2009). Triangulation served to offer a more comprehensive understanding of the phenomenon studied. More specifically, triangulation was one of the validity measures as it aided in corroborating the findings that could not be interpreted by either qualitative or quantitative results on their own (Hussein, 2009). In this study, a combination of different research methods and techniques were employed to balance each other out: a quantitative versus a qualitative phase, individual interviews versus focus groups of cardiac care clinicians, face-to-face interviews versus remote (phone) interviews, short engagement (survey) versus long engagement (interviews) with patient with CVD. Another example of triangulation used in the study is that the research was conducted in successive layers of details, commencing with a broad perspective of the issue by reviewing current evidence and then moving on to exploring the perspectives of cardiac care clinicians and patients with CVD through interviews which provided better insight for the next step which was exploring the same issue further through a survey. Finally, using the survey with a large sample size helped triangulate and validate the findings from the earlier scoping review and qualitative research.

Complementary aims to understand human behaviour utilising discrete but related study methods and involves the processes of elaboration, expansion, enhancement, illustration, and clarification of the phenomenon (Carroll & Rothe, 2010; Creswell & Plano-Clark, 2011). An example of complementarity in this study was the methods used to collect qualitative data from cardiac care clinicians. Clinicians were interviewed through focus groups and, to further elaborate, expand and enhance the data collected, one-on-one interviews were carried with other cardiac care clinicians from across the country. Further, qualitative methods were initially used to explore the content and specific meaning of the perceptions, experiences, and behaviours of patients with CVD and cardiac care clinicians in relation to oral healthcare. This was complemented by quantitative methods which were used to examine the factors and relationships that influenced the oral healthcare-seeking behaviours of a larger group of patients with CVD. This approach enabled a better understanding of the phenomena (oral healthcare practices of patients with CVD and cardiac care clinicians) due to clarification and illustration of the context and complexity of the situation.

4.7 Ethical Considerations

The study obtained approval from the South Western Sydney Local Health District (SWSLHD) Human Research Ethics Committee for the qualitative phase first [Approval HREC/15/LPOOL/410] and later for the quantitative phase [Approval LNR/16/LPOOL/499] as well as the Sydney Local Health District (SLHD) Human Research Ethics Committee for Royal Prince Alfred and Balmain hospitals qualitative phase [Approval SSA/15/RPAH/600-601] and quantitative phase [Approval LNRSSA/16/RPAH/688]. The study received reciprocal approval

from the Western Sydney University (WSU) Human Research Ethics Committee [approval H11433], in accordance with the requirements of the relevant sites (Appendix 4).

4.7.1 Informed consent

To ensure the decision of the individual to participate in the study was voluntary and that all participants were sufficiently informed and understood all aspects of the proposed research and its implications (including benefits and risks), informed consent was obtained (National Health and Medical Research Council, 2007). Information for patients clearly explaining the purpose of the study, and the consent forms, were given to participants. These documents informed participants of both phases of the study and that they had the right to withdraw from the study at any time, without any consequences or ramifications. Templates used for the consent and participant's information were from the SWSLHD (Appendixes 5-10). As required, contact details of the primary researcher were given to all prospective participants if they required further information or wanted to withdraw from the study. In addition to written consent, verbal consent was further obtained prior to audio recording of telephone interviews.

4.7.2 Confidentiality

The study respected the participant's confidentiality, their rights and privacy at all times. Prior to participation, all participants were assured that their confidentiality would be always maintained. This was covered in the participant's information sheet and the written consent form. In addition, confidentiality was again verbally discussed and ensured before participation in the study. This included not sharing any identification details of the participants. Identifiable information was only used for the purpose of contacting participants for interviews or to organise focus groups. After contact, any details were

deleted. Anonymity of the participants was maintained in all presentations and/or publications by using pseudonyms and removing all identifiable information from the data presented. Furthermore, the consent forms of all participants, the completed surveys and the researcher's field notes were kept in a locked cabinet in a locked room at the Ingham Institute for Applied Medical Research (Centre for Oral Health Outcomes & Research Translation (COHORT)). All digital data was saved on a computer under a security password, only accessible by the principal researcher and selected members of the research team.

4.7.3 Autonomy

The notion of autonomy refers to the person's right to decide. Participants in the study were over the age of 18 and were able to make informed decisions and decide whether to participate or not in the study. Through the information provided, participants were made aware of their right to withdraw from the study at any time without any consequences. The principle of justice refers to the participant's right to be treated fairly and with respect. Prospective and consenting participants were always treated with respect. They were given information about the study in a timely manner and offered further information if required. Additionally, the name and contact of the principal researcher was given to all participants in case they had any further queries about the study. Participants who did not speak English as a first language and wanted to participate in the interviews, were provided with an interpreter. For the survey, only participants who had a translator (interpreter or companion) who could help them in responding to questions were invited to participate in the study. This was to make sure that participants were fully informed before they agreed to participate.

4.7.4 Beneficence

Beneficence refers to “doing good”. This study aimed to do good by exploring the oral health experiences of patients and cardiac care clinicians, and their behaviours and practices with the purpose of improving the oral health of patients with CVD. Improvement of patients’ oral health could potentially also improve cardiovascular outcomes. It is hoped that dissemination of the study findings will inform policy makers to incorporate oral health in the cardiac setting. In addition, researchers ensured that no harm was inflicted on participants of the CARDIOH Study. Although it was not anticipated that this study would cause harm or distress, participants were made aware that if there was any uneasiness during their participation, to inform the researcher and support would be offered via counselling. During interviews or talks with focus groups, the potential for harm was minimised by conducting the sessions in a respectful and sensitive manner. In addition, information regarding oral healthcare services was given to patients who requested it or to those who required immediate oral healthcare attention. In some cases, cardiac care clinicians were made aware of the participant’s oral health concerns so they could organise referral to dental care services.

4.7.5 Authenticity

Authenticity refers to the researcher being truthful, genuine, and credible in both the conduct and evaluation of the research (Bush, 2012). In this study, the researcher described the participant’s experience faithfully and fairly, representing the essence of the enquiry. Apart from the participants’ lived experiences, the research must also consider the larger social, health and even political implications of the study. As the study sought the participants’ input to inform the development of a nurse-led cardiovascular oral health program, participants were empowered by this research. The health, social and political

implications of this research will be addressed in the last chapter of this thesis with the report on the study implications.

4.8 Conclusion

This chapter outlined the research methodology and methods used in the different phases of the study. The development and testing of the survey as well as how integration of the results was undertaken was also discussed. In addition, the ethical considerations in the conduct of the study were detailed in this chapter. The next three chapters present the study findings including four published papers and a section of unpublished results.

Chapter 5: Qualitative Results - Cardiac Care Clinicians

5.1 Overview: Thesis Paper 2

The previous chapter presented the study approach and methods. This chapter presents the first of the qualitative findings relating to cardiac care clinicians. This aspect relates to the contextual characteristic component of the adapted Andersen's model which could influence people with CVD's oral healthcare seeking behaviour (Figure 3.3). These results are presented as a qualitative paper published in Collegian.

Thesis Paper 2

Sanchez, P., Everett, B., Salamonson, Y., Ajwani, S., Bhole, S., Bishop, J., Lintern, K., Nolan, S., Rajaratnam, R., Redfern, J., Sheehan, M., Skarligos, F., Spencer, L., Srinivas, R., George, A. (2017). Perceptions of cardiac care providers towards oral health promotion in Australia. *Collegian*, 25(5), 471-478. Doi:10.1016/j.colegn.2017.11.006.

5.2 Aims: Thesis Paper 2

The aim of this paper was to explore current perceptions, knowledge and practices of cardiac care providers and their role in promoting oral health.

The study questions addressed in this paper were:

- 1) What are the experiences of cardiac care providers regarding oral health of patients with CVD?
- 2) How knowledgeable are cardiac care providers about oral health and its potential impact on cardiovascular outcomes?

- 3) What oral health practices are being undertaken by cardiac care providers during clinical practice?
- 4) What are the perceptions of cardiac care providers about promoting oral health education, assessment, and referrals to patients with CVD?

5.3 Conclusion: Thesis Paper 2

This paper, 'Perceptions of cardiac care providers towards oral health promotion in Australia' identified that cardiac care clinicians, particularly cardiac nurses, often encounter patients with poor oral health. However, they do not routinely discuss oral healthcare with their patients. A lack of oral health knowledge among cardiac care clinicians and a lack of resources were highlighted as key barriers. Cardiac care clinicians were comfortable with promoting oral health if they were supported in the role and if barriers such as training, availability of appropriate oral health resources, time constraints and referral pathways were addressed. A key finding was that participants felt that cardiac nurses working in both the acute and outpatient settings were most ideally suited to promote oral health of cardiac patients.

The following chapter presents the second of the qualitative findings relating to people with CVD.

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Perceptions of cardiac care providers towards oral health promotion in Australia



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ABSTRACT

Background: There is increasing evidence linking poor oral health with cardiovascular disease and it is recommended that health professionals managing people with cardiac disease (cardiac care providers) promote oral health in their practice. However, the current perceptions of cardiac care providers regarding this aspect of clinical practice are unknown in Australia.

Aim: To explore oral health perceptions, knowledge and practices of cardiac care providers and their role in promoting oral health.

Methods: A qualitative study involving focus groups and semi-structured telephone interviews was undertaken with cardiac care providers (27 nurses, two physiotherapists, one exercise physiologist) across Australia between January–March 2016. Interviews/focus groups were transcribed and thematically analysed.

Findings: Most participants encountered a number of patients with poor oral health and highlighted barriers seeking dental care, including access, cost and lack of awareness. However, oral health was not routinely discussed with patients except when cardiac valve surgeries were required. Many participants were unaware of the relationship between oral health and cardiovascular disease. Overall, participants were comfortable with promoting oral health if barriers such as training, time constraints and referral pathways were addressed. Practical suggestions regarding timing of training, preferred content and delivery format were also provided.

Discussion: Cardiac care providers have limited oral health knowledge and are not routinely promoting oral health. However, they are receptive to promoting oral health with adequate support.

Conclusion: Cardiac care providers need to be adequately trained and supported to promote oral health to their patients. Supportive strategies could include training, resources and formalised referral pathways.

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1. Introduction

One of the most common causes of death and disease burden worldwide is cardiovascular disease (CVD) (World Health Organisation, 2015). An association between periodontal diseases,

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Summary of relevance

Problem

Little is known about the perceptions, knowledge and practices of cardiac care providers in Australia regarding oral health care in the cardiac setting

What is already known

Poor oral health is linked with cardiovascular disease and it is recommended that cardiac care providers promote oral health among their patients.

What this paper adds

Cardiac care providers have limited knowledge about oral health and are not routinely discussing this topic with patients except when cardiac valve surgery is required. Cardiac care providers are comfortable in promoting oral health provided barriers such as training, time constraints and referral pathways are addressed.

CVD and adverse outcomes has been highlighted in numerous studies and confirmed by several meta-analyses and systematic reviews (Humphrey, Fu, Buckley, Freeman, & Helfand, 2008; Leng, Zeng, Kwong, & Hua, 2015). Furthermore, a recent large study involving 60,174 participants indicated periodontitis as an independent risk factor for atherosclerotic CVD (Beukers, Heijden, Wijk, & Loos, 2017).

Systemic inflammation has been implicated in the aetiology of CVD because inflammation accelerates atherogenesis which in turn increases the risk of vascular events (Caúla, Lira-Junior, Tinoco, & Fischer, 2014). Periodontal disease affects the tissues and structures around the teeth resulting in chronic oral inflammation and increases levels of cytokines linked to the inflammatory response (Tonetti & Dyke, 2013). Due to this growing body of evidence it is recommended internationally that cardiac care providers should be aware of the association between periodontal disease and CVD and include oral health education, risk assessment and referrals in cardiac care practice (Bouchard et al., 2010; Friedewald et al., 2009; Tonetti & Dyke, 2013). Although the effectiveness of periodontal treatment in improving cardiovascular outcomes has not been confirmed (Sanchez, Everett, Salamonson, Ajwani, George, 2017) it is suggested that raising oral health awareness, undertaking assessment and managing periodontal disease may contribute to decreasing the risk of further complications in CVD (Papapanou, 2015; Tonetti & Dyke, 2013).

The role of non-dental health professionals in promoting oral health has gained traction in recent years. Several models of oral health care have been proposed and developed for nurses and allied health professionals in areas such as aged care and dementia (Chalmers & Pearson, 2005), maternity and women's health (Clemmens & Kerr, 2008; George et al., 2016), early childhood (Maher et al., 2012); and people with human immunodeficiency virus (Jeganathan, Purnomo, Houtzager, Batterham, & Begley, 2010). In midwifery, for instance, the Midwifery Initiated Oral Health (MIOH) program has put Australian midwives at the forefront of perinatal oral health care by incorporating oral health education, assessment and referrals into routine midwifery practice (George et al., 2016). The program has improved midwives' knowledge and confidence to promote oral health which in turn has translated into improved oral health outcomes for pregnant women (George et al., 2016).

Despite current recommendations regarding oral health care in the cardiac setting (Bouchard et al., 2010; Friedewald et al., 2009; Tonetti & Dyke, 2013) there has been limited research focussing on current practices in this area. To our knowledge, no study has explored the views of cardiac care providers towards oral health promotion among patients with CVD. This view is further supported by a recent scoping review which highlighted the need for further

research to define the role of cardiac care providers in oral health care (Sanchez, Everett, Salamonson, Ajwani, George, 2017). Gaining further knowledge in this area would greatly assist in shaping future preventative oral health programs in the cardiac care setting.

2. The study

2.1. Aim

The aim of this study was to explore current perceptions, knowledge and practices of cardiac care providers regarding oral health. The research questions are as follows:

- What are the experiences of cardiac care providers regarding oral health of patients with CVD?
- How knowledgeable are cardiac care providers about oral health and its potential impact on cardiovascular outcomes?
- What oral health practices are being undertaken by cardiac care providers during clinical practice?
- What are the perceptions of cardiac care providers about providing oral health education, assessment and referrals to patients with CVD?

3. Methods

3.1. Design

A qualitative needs assessment was undertaken to answer the research questions

3.2. Sampling and recruitment

Purposive sampling was used to recruit cardiac care providers and invite them to participate in either a focus group or telephone interview. Recruitment for the focus groups was achieved by distributing information about the project to potential participants via managers, educators and cardiac rehabilitation coordinators in both inpatient and outpatient cardiac units at four large metropolitan hospitals in Sydney, Australia. The selected hospitals were located in both the affluent and disadvantaged areas of Sydney. Recruitment for the telephone interviews was achieved by inviting cardiac care nurses who were attending a national cardiovascular nursing conference in Australia. At the conference the lead researcher had a stall with information about the project and other oral health information. Conference attendees were invited to approach the stall for further information and/or if they were interested in taking part in the study. Those who expressed interest in participating provided their consent and a convenient time for the telephone interview.

3.3. Data collection

Four focus groups were conducted by experienced interviewers (PS, SA, AG) at a mutually convenient time and place for participants. Focus groups were selected as a method of data collection with cardiac care providers of the four metropolitan hospitals to obtain the group's broad range of information, perceptions and opinions. This method also facilitated easy access to the clinicians as a group due to their time constraints. In addition, eight telephone interviews were conducted by an experienced interviewer (PS). Interviews were undertaken until data saturation was reached. Telephone interviews were a practical and convenient method to obtain data from the different cardiac settings across Australia where participants were practicing. The telephone inter-

view participants were from the Australian states of New South Wales, Queensland, Victoria and South Australia.

All interviews and focus groups were audio-taped and lasted between 20 and 60 min. Demographic details of participants were obtained at the beginning of the data collection. Both the focus group and interview guide followed the same structure and format focusing on the study aim and research questions (Table 1). All data was collected between January and March 2016.

3.4. Ethical considerations

The project was approved by the Sydney and South Western Sydney Local Health District Human Research Ethics Committees (HREC/15/LPOOL/410). All interested participants were provided with an overview of the study along with an information sheet before obtaining written consent. Pseudonyms were used in all the study descriptions, reports and documents to ensure anonymity.

3.5. Data analysis

The audio-recordings of the focus groups and telephone interviews were professionally transcribed and thematically analysed (Braun & Clarke, 2006) with the assistance of the qualitative software package NVivo Version 11. They were initially coded by two of the researchers (PS, AG) into themes and subthemes that reflected the views of participants in relation to the study questions. Initially focus group data was coded separate to the interview data in case distinctive themes emerged. Once similar themes were identified it was decided by consensus of four researchers (PS, AG, BE, YS) to merge the themes into common ones. Other levels or subthemes emerged from the main themes once underlying ideas were clear (Saldaña, 2015). Further consensus was achieved with two other study investigators (BE, YS) and a final coding table was generated. A table, including relevant quotes from participants was then developed by the lead investigator (PS).

3.6. Rigour

To enhance the trustworthiness of the study, steps were undertaken to address credibility, transferability, dependability and confirmability (Cope, 2014). Credibility was achieved by organising various focus groups and telephone interviews with several cardiac care providers of different areas and settings to reach common emerging themes that were validated by participants during discussion. Transferability of the findings was ensured by involving participants from a diversity of cardiac settings to answer the study questions. In addition, sufficient information about the participants and settings was provided. Dependability of the findings was achieved by the involvement of four experienced researchers from the team analysing the data independently prior to reaching consensus. Confirmability to reduce any bias in the study was obtained by audio-recording of all interviews. A professional service to transcribe all audio-recorded data was utilised. Audio and transcription files, kept in password protected files, were obtained therefore data could be traced back if necessary.

4. Findings

4.1. Demographic characteristics

A total of 30 participants took part in the study. Of these, 27 (90%) were cardiac nurses, with two physiotherapists and one exercise physiologist. The mean age of participants was 42.9 years (*SD* 9.84, Range 24–59). Most participants were female ($n = 26$, 86.7%) which is consistent with the population of nurses working in Australia (AIHW, 2016a, 2016b). Participants worked in diverse cardiac care

settings and most had extensive cardiac care experience with 19 (63%) working for more than 10 years in cardiac care. Table 2 shows the pseudonyms used for the focus groups and telephone interviews throughout the paper as well as further demographic characteristics of participants.

Table 3 shows the three themes and resultant sub-themes that emerged from the study, including: 1) Experiences and knowledge regarding oral health and CVD, 2) current oral health practices in the cardiac care setting, and 3) perceptions about promoting oral health in the cardiovascular setting.

4.1.1. Experiences and knowledge regarding oral health and CVD

4.1.1.1. *Perceived oral health status of patients.* Most participants ($n = 27$) reported encountering varying numbers of patients with poor oral health. Some identified specific types of problems according to the population of patients under their care:

“Majority of them have dentures and most are pretty good, but I would say three out of 10 [have poor oral health]. People with missing teeth, bad breath, people with just unclean looking teeth. If you get a dose of bad breath, then you notice it” (AN, Phone Interview)

“I reckon probably over 50 per cent would need some sort of dental advice. They are not being able to eat...chew food” (MR, Phone Interview)

Participants identified that patients in certain geographical areas and disadvantaged groups had more dental problems. However, occasionally patients who were financially better off also presented with poor oral health:

“With the Indigenous patients probably most of them would have bad oral health issues... maybe 80 per cent” (DI, Phone Interview)

“On our ward we get people with endocarditis... teeth are really rotted with the methadone; A lot of people with bad oral hygiene, poor teeth, bad teeth or no teeth, smelly breath” (ER, Phone Interview)

“The majority of my patients are wealthy. You can have multi-millionaires who need to go to a dentist badly...Not very often” (HE, Phone Interview)

4.1.1.2. *Perceived barriers for patients to seek oral health care.* A number of perceived barriers were identified for patients to seek dental care with the most common being cost and difficulties accessing the public dental service.

“The people that aren't on a Health Care Card [Government support] or aren't on a pension are going to have to go to their own dentist and you know how much that costs” (FR, Focus Group 2)

“There's a huge waiting list. We've tried to put a referral in to the public dental system here. But they could wait for six months” (MR, Phone Interview)

Other barriers highlighted included patients' lack of awareness about the importance of oral health and not seeing oral health as a priority:

“Patients might not see oral health as an important aspect of their recovery or their health. Yes, so it may not be a high priority” (CL, Phone Interview)

4.1.1.3. *Current knowledge and training in oral health.* Majority of participants ($n = 24$) reported having limited or no knowledge about the relationship between oral health and CVD, and therefore could not see the relevance. Some participants were aware that patients having valve surgery needed a dental check-up before the surgery

Table 1
Guide for focus groups and telephone interviews with cardiac care providers.

Questions
1. What do you know about the topic of oral health and CVD? Do you think oral health is important for cardiac patients, why/why not?
2. Do you currently talk about oral health with cardiac patients? What do you exactly say, when do you say this? Is it part of your assessment? Do you initiate the topic or patients? Elaborate
3. Do you encounter patients with poor oral health? If yes, how many out of 10 patients would have poor oral health?
4. What type of oral health complaints do you usually encounter from cardiac patients?
5. Do you currently refer cardiac patients to a dentist? How do you make this referral? If so, do you follow up at the next appointment? Elaborate
6. Do you think it is appropriate to provide oral health education, assessment and referral in the cardiac setting?
7. When do you think would be the best time to provide this in the cardiac setting?
8. What are your views about cardiac nurses providing oral health education, assessment and referrals to their patients?
9. Do you foresee any problems in undertaking this additional task? Elaborate
10. What do you think could be some of the barriers for patients receiving oral health education, assessment and referrals?
11. In relation to educating patients. What do you think would be the best way to provide oral health education to cardiac patients? (Verbally and others brochure etc.) Do you currently have any health promotional resources about oral health that you can use?
12. Do you feel that you have the knowledge and confidence to provide oral health education, assessment and referrals to patients in the cardiac setting? What would be required? Elaborate
13. If an oral health education/training program were to be developed for cardiac care nurses what information do you think should be included in the program?
14. If a program is developed how you do think would be the best way to deliver this program to nurses? How would you get nurses to complete the program?
15. Do you think other cardiac care clinicians can play a role in promoting oral health among patients in the cardiac setting?
16. Are there any other comments or suggestions you would like to make on this topic?

Table 2
Participants' demographic characteristics.

Pseudonym	Interview type	Participant information
LO, MA, LI, CH, LI, SA, VI, IS, CA, SU, FR, BO	Focus Groups 1 & 2 (n = 12)	Nurses (n = 11) and exercise physiologist (n = 1) from acute and chronic cardiac services from 2 large public metropolitan hospitals. Mean age 39.5 years (SD 9.634). Mean cardiac experience 10.7 years (SD 9.5).
LE, RO, EL, KI, TR, AN, RA, LZ, VI, RH	Focus Groups 3 & 4 (n = 10)	Nurses (n = 8) and physiotherapists (n = 2) from cardiac services from 2 large public metropolitan hospitals. Mean age 41.3 (SD 9.233) years. Mean cardiac experience 13.6 years (SD 8.422).
CL	Phone Interview 1	Female, age 52, >20years cardiac experience, nurse manager, interventional cardiology from a large metropolitan teaching and referral hospital.
AN	Phone Interview 2	Male, age 39, 3 years cardiac experience, nurse, acute cardiac unit from a large public metropolitan hospital.
DI	Phone Interview 3	Female, age 54, >20years cardiac experience, nurse, professional national heart organisation.
ER	Phone Interview 4	Female, age 48, 14 years cardiac experience, nurse, acute cardiac unit from a large metropolitan tertiary referral hospital.
GI	Phone Interview 5	Female, age 36, 2 years cardiac experience, nurse, heart failure service from a private metropolitan teaching hospital.
MR	Phone Interview 6	Female, age 59, 42 years cardiac experience, nurse, acute cardiac and rehabilitation service from a public regional referral hospital.
PA	Phone Interview 7	Female, age 56, 6 years cardiac experience, nurse, cardiac rehabilitation from a public regional referral hospital that serves two states.
HE	Phone Interview 8	Female, age 54, 10 years cardiac experience, nurse, cardiac rehabilitation from a private rehabilitation hospital.

Table 3
Themes and sub themes from the findings.

Main Themes	Sub Themes
1. Experiences and knowledge regarding oral health and CVD	1.1 Perceived oral health status of patients 1.2 Perceived barriers for patients to seek oral health care
2. Current oral health practices in the cardiac care setting	Current knowledge and training in oral health 2.1 Oral health promotion 2.2 Risk assessment and referrals
3. Perceptions about promoting oral health in the cardiovascular setting	3.1 Acceptability 3.2 Barriers for clinicians 3.3 Suggested strategies to promote oral health

as part of current protocols but did not fully understand the link between oral health and CVD:

"I didn't realise there was a risk in cardiovascular disease...when I read something about inflammation. I was like huh?" (RO, Focus Group 4)

"I have understood the need of patients to get their teeth checked before valve surgery but I've never put two and two together" (ER, Phone Interview)

Nearly all participants (n = 28) highlighted their lack of oral health training:

“Physically looking at a tooth or a gum and assessing it for gum disease, I do not feel that I have that qualification or that knowledge base” (HE, Phone Interview)

“Certainly not in our physio [physiotherapist] training [oral health care] and I’m talking about the risk” (RO, Focus Group 4)

4.1.2. Current oral health practices in the cardiac care setting

4.1.2.1. *Oral health promotion.* Most participants ($n=23$) agreed that oral health is rarely discussed with their patients as part of routine practice. Some of the contributing factors identified were a lack of available resources to promote oral health *“I haven’t seen any oral health promotion resources in the cardiac setting”* (GI, Phone Interview) and the fact that oral health was not part of their scope of practice:

“From an exercise physiologist point of view, I think probably not as important. The patients just want to talk about exercise and nothing else” (FR, Focus Group 2)

“I’ve never really educated patients or made them aware of it, having regular dental check-ups” (CA, Focus Group 2)

Few participants ($n=7$) also highlighted that medical officers did not discuss oral health as part of cardiac care:

“We don’t talk about oral health with the patients. . . I’ve never heard a doctor mention anything to a patient about oral health” (ER, Phone Interview)

“I read a lot of notes and also from time to time I have to do audits across the LHD [Local Health District]. I’ve never seen any medical person or anybody actually write anything about that [poor oral health] as a risk factor” (VI, Focus Group 1)

However, many participants ($n=21$) mentioned that they discussed oral health in cases where patients required valve surgery or if they had a valve replaced as any oral infection increases the risk of valvular complications:

“If I know they’ve got a valve, that’s when I think about it. Like it triggers me to think about oral hygiene but otherwise I wouldn’t have” (GI, Phone Interview)

4.1.2.2. *Risk assessment and referrals.* Assessing the patient’s oral health is not part of the routine assessments in the cardiac care setting except when patients complain of a problem:

“Don’t assess and don’t even go there with the conversation. . . but if they tell me there’s a problem I will pursue it” (VI, Focus Group 4)

In situations where an oral health concern was voiced by patients some participants ($n=11$) did give advice to patients about seeing a dentist or referring them by providing the contact information for dental services:

“I don’t assess for oral health unless I see or they say something that makes me concerned. So I have referred quite a few people to the central number to get dental appointments” (CA, Focus Group 2)

“I sometimes advise them to see their dentist” (SU, Focus Group 2); *“I’ve seen it [referral] done a couple of times, but it’s very rare”* (AN, Phone Interview)

Participants mentioned that formally referring patients to dental services is normally done by the medical team but nurses are the ones that usually identify the problem and inform the doctor(s). Nurses also remind doctors when patients need to have a dental check before valve surgery:

“To be honest, that [referrals] is usually up to the medical team. The nursing staffs are given a checklist prior to surgery. If a dental referral is not done then you can gently remind the medical team” (BO, Focus Group 1)

Another issue identified was that there is no follow-up of patients who were referred or advised to seek dental care:

“The ones that are non-urgent we’d set up the appointment in the system before they’re discharged and then it’s up to them. . . there’s no follow-through to see did they get there” (MR, Phone interview)

4.1.3. Perceptions about promoting oral health in the cardiovascular setting

4.1.3.1. *Acceptability.* Most cardiac care providers ($n=28$), particularly nurses, were open to the idea of promoting oral health in their setting:

“Cardiac patients have no idea of the importance of oral health care. So definitely I’m in for it” (CH, Focus Group 1)

A number of participants felt that nurses were ideally suited for the role of oral health promotion:

“From a nursing point of view as long as it can be fitted in with the timeframe within the assessment then I think oral health certainly should be included. But coming from an exercise physiologist point of view I don’t think it would be a priority” (FR, Focus Group 2)

“I think the nurse is in the best position to promote oral health . . . it fits with the nursing description because we are working more closely with patients on a day-to-day basis” (CL, Phone Interview)

4.1.3.2. *Barriers for clinicians promoting oral health.* Participants were comfortable with the idea of providing oral health education, assessment and referrals to patients provided key barriers were addressed such as their lack of knowledge and training in this area:

“I wouldn’t feel comfortable doing an oral health assessment and a referral. But with basic education I’m comfortable with that” (PA, Phone Interview)

Time constraint was another key barrier mentioned by participants. Any proposed oral health assessment would need to be short to ensure adherence by clinicians:

“I’m sure nurses wouldn’t mind if the assessment was very quick. But as soon as it starts getting into detailed and into a questionnaire and asking the patients more questions it won’t be done” (ER, Phone Interview)

“Everything needs to be simple, screening and referral will need to be simple. People need to be engaged and need to see the need for doing it” (FR, Focus Group 2)

4.1.3.3. *Suggested strategies to promote oral health.* Most participants ($n=26$) noted that the acute phase of hospitalisation was not the best time to promote oral health. At the time of discharge or during cardiac management programs like rehabilitation were identified as best times to promote oral health:

“In the cardiac rehab area it could be touched upon because in the busy acute hospital it’s really another thing to do” (MR, Phone Interview)

“It might be good to introduce oral health in hospital and then again bring it up in phase 2 of cardiac rehab” (LE, Focus Group 3)

Participants also discussed the type and content of oral health training they would prefer as well as resources that would support them in promoting oral health:

“Online learning package would be the best way. It could be added into training programs that are delivered in cardiovascular disease and rehabilitation” (HE, Phone Interview)

“I would be happy to have a pack on oral health education to incorporate it within my cardiac education session talk to the patients” (SU, Focus Group 2)

One suggestion to promote the oral health training among clinicians was to provide training certificates or formal recognition for their training:

“For the nursing staff maybe a video presentation and maybe a few questions at the end. . . they could get a certificate at the end of it [training] and then that could also go for the professional development hours as well, CPD [Continuous Professional Development] points” (ER, Phone Interview)

Providing oral health resources and information via relevant national and international professional organisations was also suggested. They highlighted that promotion of oral health via these avenues would facilitate contact with a larger group of cardiac care providers with the potential to reach a larger population of patients with CVD:

“Online website such as the Heart Foundation, they have brochures that can be printed. . . it’s important that people get the same message from a number of sources: If they hear it from their cardiac rehab nurse, from their cardiologist, from their dentist and they read it online they would take more notice” (PA, Phone Interview)

Other strategies proposed to promote oral health included providing access to oral health DVDs in cardiac inpatient and outpatient waiting rooms:

“If they had to sit down in cardiac rehab education and hear something about oral health they’re probably going to think oh, actually this is probably much more important than I had previously thought rather than if we just gave them a brochure or something” (BO, Focus Group 1)

Finally, the potential for other cardiac care providers to promote oral health was discussed. Most participants believed that all clinicians directly involved with patients with CVD, including medical staff, dietitians, physiotherapists and speech pathologists had a role in oral health promotion:

“I think it’s important to include dietitians, exercise physiologists, physiotherapists, educators. . . it would be good if we’re all on the same page” (CA, Focus Group 2)

“Definitely the speech pathologists because they actually do the oral assessments for swallowing, especially when people come in after a stroke” (MR, Phone Interview)

5. Discussion

The focus of this study was to explore, for the first time in Australia, the perceptions, knowledge and current practices of cardiac care providers regarding oral health in the cardiac care setting. Cardiac care in Australia is delivered across various settings and populations (AIHW, 2016a, 2016b) and so it was important the study sample was representative of this diversity. Participants in the study were clinicians working in different socioeconomic and geographical areas, in different public and private hospitals, in acute and chronic areas, inpatient and outpatient areas across Australia. Furthermore, most participants ($n=19$) had significant cardiac care experience (>10years) and thus were well suited to provide input into the areas being explored.

Although there is no specific data on the oral health status of people with CVD in Australia the findings from this study suggest that cardiac care providers are encountering a number of patients with poor oral health. This finding is further supported by a recent qualitative study of patients with CVD where 50% of the patients reported having oral health problems (Sanchez, Everett, Salamonson, Ajwani, Bhole et al., 2017). The types of problems identified by the cardiac care providers in this study were consistent with the problems identified previously by patients with CVD, including bleeding gums, missing teeth, sensitive teeth and halitosis (bad breath) (Sanchez, Everett, Salamonson, Ajwani, Bhole et al., 2017). Despite having dental problems, the findings suggest that patients with CVD are not regularly seeking dental care which was reiterated in a recent Australian study (Sanchez, Everett, Salamonson, Ajwani, Bhole et al., 2017). However, there is no specific information available on the uptake of dental services among people with CVD in Australia. Reports from the general population indicate that only 44% of Australian adults consult a dentist regularly (every 6–12 months) (Australian Institute of Health and Welfare AIHW, Chrisopoulos, Harford, & Ellershaw, 2016). Internationally, the uptake of dental services appears to be lower with a study in the United Kingdom showing only 38% attendance of patients with high risk of endocarditis (Virdee, 2006).

Various barriers for patients seeking dental care were identified by the cardiac care providers with the most notable being dental treatment costs. Financial burden is often cited as a reason why people do not seek regular dental care or do not comply with recommended treatment (AIHW et al., 2016). A significant waiting time to access public dental services was another barrier highlighted. This is a common issue facing people from lower socioeconomic groups who are eligible for free dental services in Australia (AIHW et al., 2016). The lack of affordable and accessible dental care for patients with CVD who are socioeconomically disadvantaged is a concern, as the incidence of periodontal disease is higher among these population groups (AIHW et al., 2016; AIHW, 2014). It is therefore important for appropriate dental referral pathways to be established for patients with CVD before any preventative strategies can be implemented. Adding to the barriers is the lack of awareness of the importance of oral health for patients with CVD. If there is a lack of awareness, oral health can be perceived as less important for patients who may have other issues that take priority.

The findings from this study have provided valuable insight into the oral health knowledge of cardiac care providers. Although some participants were aware of the relevance of oral health when patients undergo valve replacement, they were unsure of the relationship between oral health and CVD. In general, cardiac care providers’ knowledge about the link between periodontal disease and CVD was poor. This lack of oral health knowledge has also been previously reported among other non-dental health professionals like antenatal care providers (George et al., 2012). The limited knowledge in this area was also reflected in the clinical practice with no regular oral health education being provided to patients with CVD. As highlighted by participants, it also seems that doctors do not initiate conversations about oral health in their practice.

The cardiac care providers in this study also reported receiving no oral health training in their undergraduate training. In Australia, oral health is not included in current undergraduate nursing or other non-dental allied health courses and further work is needed in this area (Australian Education Network, 2016). However, some progress has been made particularly in the United States where oral health has been incorporated into nursing courses as part of a national strategy to improve the quality of oral health and reduce disparities (Dolce, Haber, & Shelley, 2012). In addition, an oral health module has been successfully incorporated into an undergraduate midwifery course for students at an Australian university (Duff et al., 2017).

Despite the emphasis on the link between oral health and serious chronic conditions including CVD at national level in Australia (Council of Australian Government Health Council, 2015), this awareness has not been translated to current clinical practice. Participants reported lack of resources and information about oral health in their setting. This lack of resources, in addition to lack of appropriate oral health training among cardiac care providers, is likely to contribute to their lack of knowledge. In Australia, current practice is not aligned with international guidelines that recommend that oral health care is incorporated into the cardiac care setting (Bouchard et al., 2010; Friedewald et al., 2009; Lockhart et al., 2012; Tonetti & Dyke, 2013), despite a push from government bodies and policy makers to ensure oral health is considered in complex medical conditions such as CVD (Council of Australian Government Health Council, 2015).

Despite the numerous barriers identified in this study, cardiac care providers in Australia reported that they are receptive to the idea of promoting oral health amongst their patients. In particular, the findings support a recent review which shows that cardiac nurses are well placed to provide oral health care to patients with CVD especially in the area of assessments (Sanchez, Everett, Salamonson, Ajwani, George, 2017). It has been well established that nurses can play a major role in primary, secondary and tertiary health care and their contribution to health reform is undisputable (Dolce et al., 2012; Clemmens & Kerr, 2008). Although the role of cardiac nurses in promoting oral health has not been explored in Australia (Sanchez, Everett, Salamonson, Ajwani, George, 2017), nurses/midwives have been utilised to provide oral health care in other settings like early childhood, antenatal care and aged care (Chalmers & Pearson, 2005; Clemmens & Kerr, 2008; George et al., 2016; Maher et al., 2012) suggesting similar models of care could be explored in the cardiac care setting.

The findings also suggest that other non-dental clinicians involved in the care of cardiac patients such as physiotherapists, dietitians and speech pathologists could also play a role in various aspects oral health promotion. In Australia a range of cardiac care providers work with patients throughout the health care continuum and within diverse settings therefore they may (in varying capacities) provide oral health education, risk assessments and referrals as part of an integrated approach to oral health care. The suggestion by some participants that cardiologists and other medical professionals should also promote oral health to their patients should also be considered.

In order for cardiac care providers to start promoting oral health, it is important to address the key barriers highlighted in this study, namely lack of oral health knowledge and time constraints. Similar issues have been identified by nurses in other settings that affect the promotion and the quality of oral health services delivered to patients in the acute setting. These have included time limitations (Allen Furr, Binkley, McCurren, & Carrico, 2004), low level of confidence (Heilbrunn-Lang et al., 2015) and limited knowledge and training (George et al., 2016). Based on the findings, a strategy to overcome these barriers is to develop a comprehensive oral health training program for cardiac care providers inclusive of a simple oral health assessment tool and oral health promotional (written and online) material. In addition, as an incentive, the training program should provide some type of recognition for clinicians in the form of an accreditation certificate and/or continuous professional development (CPD) points, required to satisfy nurses' registration requirements in Australia (Nursing and Midwifery Board of Australia, 2015). A salient example is the midwifery initiated oral health education program, developed for midwives in Australia and endorsed as a continuous professional development program, which have shown to significantly improve the oral health knowledge and confidence of midwives to promote oral health (George et al., 2016; Heilbrunn-Lang et al., 2015). Furthermore, the program

has been accepted by midwives and is being translated into practice (Heilbrunn-Lang et al., 2015). Potentially a similar program, endorsed by professional organisations such as the Australian College of Nursing or the Australian Physiotherapy Association, could be developed for Australian cardiac care providers. It is also important that any oral assessment being proposed is simple, effective and easily implementable. A recent scoping review has identified potential validated tools for the cardiac care setting that could be further explored when developing the training program (Sanchez, Everett, Salamonson, Ajwani, George, 2017).

Participants also provided vital information about the best time to educate, assess and refer patients. The suggested time for oral health promotion was during the non-acute time such as at discharge from hospital or during multidisciplinary cardiac management programs. For patients, during the acute phase of their cardiac condition oral health may not take priority. Time constraints for nurses during hospitalisation would influence the effectiveness of oral health promotion. During multidisciplinary cardiac management programs patients generally have regular contact with members of the cardiac program team and this would be an ideal time to promote oral health. Unfortunately in Australia attendance to cardiac management programs is poor with about 30% attendance following a cardiac event (Johnson, Inder, Nagle, & Wiggers, 2010) so additional strategies need to address this issue to reach the wider cardiac population. Perhaps when patients are discharged from hospital after an acute cardiac episode may be a good time for a rapid oral health assessment by the nurse. Some of these suggestions were reiterated by patients in a recent study (Sanchez, Everett, Salamonson, Ajwani, Bhole et al., 2017) however further research is needed to confirm the best time to deliver oral health education, assessment and referrals in the cardiac care setting.

6. Limitations

Although the small sample size limits the generalisability of the study, we believe the findings provide a valuable insight into the perceptions and practices regarding oral health care among cardiac care providers in Australia and pave the way for further research to be undertaken. Additional information in this important area can be captured by undertaking a survey of cardiac care providers in Australia to ascertain their current oral knowledge and practices in the cardiac setting. The survey should target general practitioners and cardiologists as well to obtain an additional perspective on this topic.

7. Conclusion

Cardiac care providers in Australia encounter a number of patients with dental problems. They have identified they are not promoting oral health regularly or undertaking any risk assessments except when patients require a dental check-up prior to having valve surgery. Cardiac care providers are receptive to the idea of promoting oral health however have highlighted they do not have adequate knowledge about the importance of oral health among patients with CVD nor do they have appropriate training, resources and time to discuss oral health. Patients with CVD are also perceived to have limited oral health awareness and difficulty accessing affordable dental services. There is a need for comprehensive oral health training to be developed for cardiac care providers along with appropriate resources, screening tools and formalised affordable referral pathways for cardiac care settings.

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Conflict of interest

No conflict of interest has been declared by the authors.

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References

- Australian Institute of Health and Welfare AIHW, Chrisopoulos, S., Harford, J., & Ellershaw, A. (2016). *Oral health and dental care in Australia: Key facts and Figs. 2015*. Canberra: AIHW.
- Australian Institute of Health and Welfare AIHW. (2014). *Cardiovascular disease, diabetes and chronic kidney disease. Australian facts: Mortality. (Cat. no.CDK 1)*. Canberra: AIHW.
- Australian Institute of Health and Welfare AIHW. (2016a). *Workforce: Health workforce*. [Retrieved February, 2016, from: <http://www.aihw.gov.au/workforce/>]
- Australian Institute of Health and Welfare AIHW. (2016b). *Cost of dental care..* Retrieved December, 2016, from: <http://www.aihw.gov.au/dental/cost/>
- Allen Furr, L., Binkley, C. J., McCurren, C., & Carrico, R. (2004). Factors affecting quality of oral care in intensive care units. *Journal of Advanced Nursing*, 48(5), 454–462. <http://dx.doi.org/10.1111/j.1365-2648.2004.03228.x>
- Australian Education Network. (2016). *Australian universities guide..* Retrieved November, 2016, from: <http://www.australianuniversities.com.au/>
- Beukers, N. G., van der Heijden, G. J., van Wijk, A. J., & Loos, B. G. (2017). Periodontitis is an independent risk indicator for atherosclerotic cardiovascular diseases among 60 174 participants in a large dental school in the Netherlands. *Journal of Epidemiology and Community Health*, 71(1), 37–42. <http://dx.doi.org/10.1136/jech-2015-206745>
- Bouchard, P., Boutouyrie, P., D'Aiuto, F., Deanfield, J., Deliaris, E., Fernandez-Avilés, F., & Sanz, M. (2010). European workshop in periodontal health and cardiovascular disease consensus document. *European Heart Journal Supplements*, 12(B) <http://dx.doi.org/10.1093/eurheartj/suq001>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <http://dx.doi.org/10.1191/1478088706qp0630>
- Cañal, A. L., Lira-Junior, R., Tinoco, E. M. B., & Fischer, R. G. (2014). The effect of periodontal therapy on cardiovascular risk markers: A 6-month randomized clinical trial. *Journal of Clinical Periodontology*, 41(9), 875–882. <http://dx.doi.org/10.1111/jcpe.12290>
- Chalmers, J., & Pearson, A. (2005). A systematic review of oral health assessment by nurses and carers for residents with dementia in residential care facilities. *Special Care in Dentistry*, 25(5), 227–233. <http://dx.doi.org/10.1111/j.1754-4505.2005.tb01654.x>
- Clemmens, D. A., & Kerr, A. R. (2008). Improving oral health in women: Nurses' call to action. *MCN: The American Journal of Maternal/Child Nursing*, 33(1), 10–14. <http://dx.doi.org/10.1097/01.NMC.0000305651.94118.6b>
- Cope, D. G. (2014). *Methods and meanings: Credibility and trustworthiness of qualitative research. Oncology Nursing Forum*, 41(1), 89–91.
- Council of Australian Government Health Council. (2015). *Healthy mouths, healthy lives: Australia's national oral health plan 2015–2024*. Adelaide SA: Retrieved from: <http://www.coaghealthcouncil.gov.au/Portal/0/Australia%27s%20National%20Oral%20Health%20Plan%202015-2024.uploaded%20170216.%20pdf>
- Dolce, M. C., Haber, J., & Shelley, D. (2012). Oral health nursing education and practice program. *Nursing Research and Practice*, 1–5 (ID149673). <https://doi.org/10.1155/2012/149673>
- Duff, M., Dahlen, H. G., Burns, E., Priddis, H., Schmied, V., & George, A. (2017). Designing an oral health module for the Bachelor of Midwifery program at an Australian University. *Nurse Education in Practice*, 23, 76–81. <http://dx.doi.org/10.1016/j.nepr.2017.02.005>
- Friedewald, V. E., Kornman, K. S., Beck, J. D., Genco, R., Goldfine, A., Libby, P., ... & Roberts, W. C. (2009). The American Journal of Cardiology and Journal of Periodontology editors' consensus: Periodontitis and atherosclerotic cardiovascular disease. *Journal of Periodontology*, 80(7), 1021–1032. <http://dx.doi.org/10.1902/jop.2009.097001>
- George, A., Duff, M., Ajwani, S., Johnson, M., Dahlen, H., Blinkhorn, A., Ellis, S., & Bhole, S. (2012). Development of an online education program for midwives in Australia to improve perinatal oral health. *The Journal of Perinatal Education*, 21(2), 112–122. <https://doi.org/10.1891/1058-1243.21.2.112>
- George, A., Lang, G., Johnson, M., Ridge, A., de Silva, A. M., Ajwani, S., ... & Heilbrunn-Lang, A. Y. (2016). The evaluation of an oral health education program for midwives in Australia. *Women and Birth*, 29, 208–213. <https://doi.org/10.1016/j.wombi.2015.10.004>
- Heilbrunn-Lang, A. Y., de Silva, A. M., Lang, G., George, A., Ridge, A., Johnson, M., ... & Gilmour, C. (2015). Midwives' perspectives of their ability to promote the oral health of pregnant women in Victoria, Australia. *BMC Pregnancy and Childbirth*, 15(1), 110. <http://dx.doi.org/10.1186/s12884-015-0536-x>
- Humphrey, L. L., Fu, R., Buckley, D. I., Freeman, M., & Helfand, M. (2008). Periodontal disease and coronary heart disease incidence: A systematic review and meta-analysis. *Journal of General Internal Medicine*, 23(12), 2079–2086. <http://dx.doi.org/10.1007/s11606-008-0787-6>
- Jeganathan, S., Purnomo, J., Houtzager, L., Batterham, M., & Begley, K. (2010). Development and validation of a three-item questionnaire for dieticians to screen for poor oral health in people living with human immunodeficiency virus and facilitate dental referral. *Nutrition & Dietetics*, 67(3), 177–181. <http://dx.doi.org/10.1111/j.1747-0080.2010.01452.x>
- Johnson, N. A., Inder, K. J., Nagle, A. L., & Wiggers, J. H. (2010). *Attendance at outpatient cardiac rehabilitation: Is it enhanced by specialist nurse referral? The Australian Journal of Advanced Nursing*, 27(4), 31. ProQuestID609127514.
- Leng, W.-D., Zeng, X.-T., Kwong, J., & Hua, X.-P. (2015). Periodontal disease and risk of coronary heart disease: An updated meta-analysis of prospective cohort studies. *International Journal of Cardiology*, 201, 469–472. <http://dx.doi.org/10.1016/j.ijcard.2015.07.087>
- Lockhart, P. B., Bolger, A. F., Papapanou, P. N., Osinbowale, O., Trevisan, M., ... & Levison, M. E., ... & Gewitz, M. H. (2012). Periodontal disease and atherosclerotic vascular disease: Does the evidence support an independent association? A scientific statement from the American Heart Association. *Circulation*, 125(20), 2520–2544. <http://dx.doi.org/10.1161/CIR.0b013e31825719f3>
- Maher, L., Phelan, C., Lawrence, G., Dawson, A., Torvaldsen, S., & Wright, C. (2012). The Early Childhood Oral Health Program: Promoting prevention and timely intervention of early childhood caries in NSW through shared care. *Health Promotion Journal of Australia*, 23(3), 171–176. <http://dx.doi.org/10.1071/HE12171>
- Nursing and Midwifery Board of Australia. (2015). *Fact sheet: Continuing professional development*. Retrieved 12 July, 2015, from: <http://www.nursingmidwiferyboard.gov.au/Codes-Guidelines-Statements/FAQ/CPD-FAQ-for-nurses-and-midwives.aspx>
- Papapanou, P. N. (2015). Systemic effects of periodontitis: Lessons learned from research on atherosclerotic vascular disease and adverse pregnancy outcomes. *International Dental Journal*, 65(6), 283–291. <http://dx.doi.org/10.1111/idj.12185>
- Saldaña, J. (2015). *The coding manual for qualitative researchers* (3rd ed.). London: Sage.
- Sanchez, P., Everett, B., Salamonson, Y., Ajwani, S., Bhole, S., Bishop, J., ... & George, A. (2017). Oral health and cardiovascular care: Perceptions of people with cardiovascular disease. *PLoS One*, 12(7), e0181189. <http://dx.doi.org/10.1371/journal.pone.0181189>
- Sanchez, P., Everett, B., Salamonson, Y., Ajwani, S., & George, A. (2017). Oral health care and cardiovascular disease: A scoping review of current strategies and implications for nurses [Online January 31, 2017]. *Journal of Cardiovascular Nursing*, 32(3), E10–E20. <http://dx.doi.org/10.1097/JCN.0000000000000388>
- Tonetti, M. S., & Dyke, T. E. (2013). Periodontitis and atherosclerotic cardiovascular disease: Consensus report of the Joint EFP/AAP Workshop on Periodontitis and Systemic Diseases. *Journal of Clinical Periodontology*, 40(s14), S24–S29. <http://dx.doi.org/10.1111/jcpe.12089>
- Virdee, P. (2006). Improve uptake of care. *British Dental Journal*, 201(3), 132–133. <http://dx.doi.org/10.1038/sj.bdj.4813891>
- World Health Organisation Cardiovascular diseases (CVDs): WHO 2015; 2015 [updated January 2015]. Available from: <http://www.who.int/mediacentre/factsheets/fs317/en/>.

Chapter 6: Qualitative Results - People with CVD

6.1 Overview: Thesis Paper 3

The previous chapter described the qualitative findings from cardiac care clinicians which related to the contextual characteristics' component of the Adapted Andersen Model. This chapter presents the qualitative findings of patients with CVD relating to the next component from the adapted model—patient characteristics which could influence people with CVD's oral healthcare seeking behaviour (Figure 3.3). These results are presented as a qualitative paper published in PLoS One.

Thesis Paper 3

Sanchez, P., Everett, B., Salamonson, Y., Ajwani, S., Bhole, S., Bishop, J., Lintern, K., Nolan, S., Rajaratnam, R., Redfern, J., Sheehan, M., Skarligos, F., Spencer, L., Srinivas, R., George, A. (2017). Oral health and cardiovascular care: Perceptions of people with cardiovascular disease. *PLoS One*, 12(7), e0181189.
Doi:10.1371/journal.pone.0181189.

6.2 Aims: Thesis Paper 3

The aim of this paper was to explore the perception of patients with CVD towards oral health and the potential for cardiac care clinicians to promote oral health.

The study questions addressed in this paper were:

- 1) What are the experiences and behaviours of patients with CVD towards oral health?

- 2) What is the knowledge of patients with CVD about oral health and its impact on cardiovascular outcomes?
- 3) What barriers and facilitators exist for patients with CVD to access oral health services?
- 4) What are the current oral healthcare practices in the cardiac setting?
- 5) What do patients with CVD feel about receiving oral health education, assessment, and referral from cardiac care clinicians in the cardiac setting?

6.3 Conclusion: Thesis Paper 3

The publication ‘Oral health and cardiovascular care: Perceptions of people with cardiovascular disease’ identified a lack of oral health awareness among patients with CVD, particularly regarding the importance of oral healthcare and its impact on cardiovascular outcomes. Oral health is rarely discussed in the cardiac setting. Barriers deterring patients from seeking oral healthcare included a lack of awareness and cost. Participants were interested in receiving further oral health information and were open to the idea of cardiac care clinicians, especially nurses, promoting education, assessment, and referrals to ongoing dental care.

The issue of oral health training for non-dental clinicians and how to address existing barriers were highlighted by the patients. As this study used a sequential exploratory design, these qualitative findings provided the basis for the quantitative phase of the study, which was the development of a survey to further explore the factors influencing the uptake of dental care services by patients with CVD. The following chapter presents the quantitative results, as two publications, from the survey of patients with CVD.

6.4 Thesis Paper 3

RESEARCH ARTICLE

Oral health and cardiovascular care: Perceptions of people with cardiovascular disease

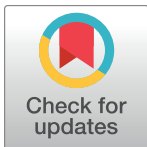
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Abstract

Main objective

The aim of this study was to explore the perception of patients with cardiovascular disease towards oral health and the potential for cardiac care clinicians to promote oral health.

Method

A needs assessment was undertaken with twelve patients with cardiovascular disease attending cardiac rehabilitation between 2015 and 2016, in three metropolitan hospitals in Sydney, Australia. These patients participated in face-to-face semi-structured interviews. Data was analysed using thematic analysis.

Results

Results suggested that while oral health was considered relevant there was high prevalence of poor oral health among participants, especially those from socioeconomic disadvantaged background. Awareness regarding the importance of oral health care its impact on cardiovascular outcomes was poor among participants. Oral health issues were rarely discussed in the cardiac setting. Main barriers deterring participants from seeking oral health care included lack of awareness, high cost of dental care and difficulties in accessing the public dental service. Findings also revealed that participants were interested in receiving further information about oral health and suggested various mediums for information delivery. The concept of cardiac care clinicians, especially nurses providing education, assessment and

referrals to ongoing dental care was well received by participants who felt the post-acute period was the most appropriate time to receive oral health care advice. The issues of oral health training for non-dental clinicians and how to address existing barriers were highlighted by participants.

Relevance to clinical practice

The lack of oral health education being provided to patients with cardiovascular disease offers an opportunity to improve care and potentially, outcomes. In view of the evidence linking poor oral health with cardiovascular disease, cardiac care clinicians, especially nurses, should be appropriately trained to promote oral health in their practice. Affordable and accessible dental care services for people with cardiovascular disease should be considered and offered by health services in Australia.

Introduction

Cardiovascular disease (CVD) is one of the leading causes of chronic disease morbidity and mortality in industrialised countries [1]. According to the World Health Organisation, 31% of all deaths globally are due to CVD [2]. Contributing risk factors of CVD include family history, diabetes, hypertension, hyperlipidaemia, tobacco use, limited physical activity, obesity and poor dietary intake [3]. Additionally, there is also growing evidence that another potential risk factor for CVD is periodontal disease [1, 4, 5].

Periodontal disease is a common chronic inflammatory condition characterised by destruction of the tooth supporting structures due to bacterial infection [6]. The prevalence of periodontal disease is high in the adult population of developed countries [7, 8]. In the USA, the Centre for Disease Control and Prevention reported that between 2009 and 2010, one in every two adults over 30 years had periodontal disease [9]. In Australia, the prevalence rates of periodontitis ranges from 35–53% for those aged above 45 years [10]. Periodontal disease is considered a multifactorial condition where the presence of anaerobic gram-negative bacteria, the person's immune mechanisms and genetic predisposition are believed to play an important role [7]. Contributing risk factors include a rapidly aging population, as well as lifestyle factors, such as tobacco use, poor nutrition and stress [9, 11]. Another concerning factor is that in many developing and some developed countries where periodontal health is unsatisfactory, the focus by dental professionals is mainly on treating the condition rather than on prevention periodontal disease [12].

Over the last decade there is increasing evidence linking periodontal disease with CVD and its adverse outcomes [4, 8, 13, 14]. Several studies have demonstrated that inflammatory process reaction in atherosclerotic lesions may be the link between periodontal disease and CVD [5, 15–19]. The current view is that periodontitis leads to entry of bacteria into the circulatory system which in turn activates a host inflammatory response resulting in exacerbation, maturation and, ultimately, atheroma formation thereby increasing the risk of CVD [14, 20]. One study found that among those with established coronary heart disease, periodontal disease increased the likelihood of a recurrent coronary event by nearly 1.5 times [21]. A joint consensus report of the European Federation of Periodontology and American Academy of Periodontology concluded that the evidence supporting an increased risk for future CVD among

those with periodontal disease was strong and that the association was independent of other cardiovascular risk factors [14].

A recent Australian study involving 172,630 individuals with CVD concluded that tooth loss and self-rated gum problems were markers for increased risk of ischaemic heart disease [22]. Although this study used proxy measures like tooth loss for periodontitis another recent study involving 60,174 participants in the Netherlands clinically diagnosed periodontitis and found that it had an independent association with atherosclerotic CVD [23]. Similar associations have been reported in systematic reviews and meta-analyses [1, 17, 24–27].

In light of current evidence there is growing emphasis to include oral health as part of cardiovascular care. Unfortunately international reports suggest that only a few with CVD seek dental care due to lack of dental care access, as well as lack of oral health awareness [28].

Although the effectiveness of periodontal treatment in improving cardiovascular outcomes has not been confirmed [18, 29, 30], there is international consensus that patients with CVD need to be made aware of the importance of oral health and recommended that a risk assessment and referral to see a dentist be provided [8, 14, 31, 32]. A recent scoping review has also shown that nurses who are involved in providing cardiac care could play a more active role in delivering preventative oral health care [33].

There is a paucity of research and strategies focusing on oral health care and CVD [33] and to our knowledge, no study has explored the views of patients with CVD towards oral health in the in-hospital or outpatient cardiac setting. Gathering this information could inform future preventative oral health programs in this area. The aim of this study was to explore the perception of patients with CVD towards oral health and the potential for cardiac care clinicians to promote oral health. The research questions included:

- What are the experiences and behaviours of patients with CVD towards oral health?
- What is the knowledge of patients with CVD about oral health and its impact on cardiovascular outcomes?
- What barriers and facilitators exist for patients with CVD to access oral health services?
- What are current oral health care practices in the cardiac setting?
- What do patients with CVD feel about receiving oral health education, assessment and referral from cardiac care clinicians in the cardiac setting?

Materials and methods

Design

This study is part of a larger project seeking to develop a cardiovascular oral health program for cardiac care clinicians to provide oral health assessment, education, and referrals for patients with CVD. As an initial step, a needs assessment was undertaken to explore the perceptions of patients with CVD regarding oral health. A qualitative approach using semi-structured interviews was utilised to answer the research questions.

Sampling and setting

Purposive sampling was used for the selection of study participants. Flyers advertising the study were distributed among cardiac rehabilitation units at three large metropolitan hospitals (Liverpool, Fairfield and Balmain) in Sydney, Australia. Nurses working in these units also distributed the flyers and informed participants about the study during their cardiac rehabilitation recovery.

Interested participants were invited to take part in face-to-face semi-structured interviews. Patients with CVD who were <18 years of age or had a mental or intellectual disability were excluded from the study. The study information sheet was given to interested participants and written consent forms were obtained together with contact details and preferred times to conduct the interviews. Ethics approval for the study was obtained from the South Western Sydney Local Health District Ethics Committee; reference number HREC/15/LPOOL/410.

Data collection

The semi-structured interviews were conducted between December 2015 and January 2016 at a place and time that was mutually suitable for participants and interviewer. Interviews were audio-taped and lasted between 30 and 45 minutes. A professional healthcare interpreter was used for participants who did not speak English. The interviews were conducted by an experienced researcher and an interview guide was used ([S1 Text](#)). At the beginning of the interview participants were allowed to ask questions and were asked to provide brief demographic details. Main topics explored included: perceptions and the importance of oral health, oral health status and behaviours of patients, barriers and facilitators for patients in oral health care, current oral health care practices in the cardiac setting and the acceptability and credibility of cardiac nurses engaging in promoting oral health. Data collection was undertaken until data saturation was reached [[34](#)].

Data analysis

Interviews were recorded, professionally transcribed (and where necessary, translated) and thematically analysed using QSR International's NVivo 11 software to facilitate coding and categorising sections of the text [[35–37](#)]. The main researcher, a doctoral student with extensive clinical and research experience, and a senior research investigator independently analysed and coded the transcripts and through consensus a list of themes, subthemes including relevant quotes from participants was developed. Pseudonyms were used when presenting quotes from participants. Transcripts and demographic data have been provided as supporting files ([S2 Text](#), [S1 Dataset](#)).

Results

Demographic characteristics

Twelve participants took part in the interviews. Their mean age was 60.33 years (*SD*: 12.49) ranging from 39 to 78 years. Ten (83%) participants were male and just over half were born overseas. Most participants ($n = 11$) were diagnosed as having Ischaemic Heart Disease as per the World Health Organisation classification [[38](#)] and were attending cardiac rehabilitation (a 6–8 week exercise and education program in the post-acute phase of their cardiac condition or after discharge from hospital). The main reason for hospitalisation was surgical intervention which included coronary artery bypass graft, cardiac stent, aortic aneurysm repair and valve replacement. Two participants were last admitted for medical reasons involving end-stage cardiomyopathy and a myocardial infarction. Seven (58%) of the participants were from low to middle income families (\$40,000–\$80,000) while four (30%) were from high income families (>\$120,000). Eight participants (67%) were not working at the time of the interview, and seven (58%) had a level of education equivalent to year 12 or less. The majority of participants ($n = 9$) were receiving government health support and less than half (42%) had private health insurance ([Table 1](#)).

Table 1. Socio demographic characteristics of participants (n = 12).

Characteristic	Frequency
Age years, Mean (SD)	60.3 (12.49)
Gender (Male), n,%	10 (83.3)
Country of birth, n,%	
Australia	5 (41.7)
Overseas	7 (58.3)
Cardiac diagnosis (as per ICD-10 [38]), n,%	
Ischaemic Heart Disease	11 (91.7)
Cardiomyopathy (Heart Failure)	1 (8.3)
Diagnosed in the last year, n,%	9 (75.0)
Reason for hospitalisation, n,%	
Coronary artery bypass graft	6 (50.0)
Cardiac stent(s)	2 (16.7)
Aortic aneurysm repair	1 (8.3)
Valve replacement	1 (8.3)
End stage cardiomyopathy	1 (8.3)
Myocardial infarction	1 (8.3)
Main language spoken, n,%	
English	8 (66.7)
Other	4 (33.3)
Combine annual income, n,%	
< \$40,000	5 (41.7)
\$40,000-\$80,000	2 (16.7)
>\$120,000	4 (33.3)
Preferred not to answer	1 (8.3)
Not employed, n,%	8 (66.7)
Highest education, n,%	
Year 12 or less	7 (58.3)
Tertiary education	5 (8.3)
Has private health insurance, n,%	5 (41.7)
Has government health support, n,%	9 (75.0)

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The main themes that emerged from the interviews were focused on the participant’s experience regarding oral health and CVD. This included their oral health status, behaviour and current knowledge, barriers and facilitators maintaining their oral health, their perception about oral health practices, and the role of cardiac care clinicians in promoting oral health in the cardiac setting (Table 2).

Experience regarding oral health and CVD

Oral health status and behaviour. Six (50%) of the participants reported having dental problems varying from bad breath, tooth ache, swollen gums: “. . . it can get swollen at times” (Janette, female, 78 years), and loose or painful teeth. These participants were low to middle income families. Some participants stated:

“. . . the gums have receded lower. They’ve opened up some of the lower part of the teeth”
(Mike, male, 68 years).

Table 2. Main themes and sub themes from the interviews.

Main Themes	Sub Themes
Experience regarding oral health and CVD	<ul style="list-style-type: none"> • Oral health status and behaviour • Current knowledge
Maintaining oral health	<ul style="list-style-type: none"> • Barriers • Facilitators
Oral health care in the cardiac setting	<ul style="list-style-type: none"> • Current practices • Promoting oral health • Role of cardiac care clinicians

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Four (30%) participants reported that their dental problems impacted on their ability to eat: “Yes, I eat on the other side” (Allan, male, 71 years), and personal relationships:

“I’ll walk up to my wife and she’ll say oh get away from me your breath stinks . . . Obviously I must have something else that needs looking at” (Andrew, male, 65 years).

Eight (67%) of the participants had seen a dentist in the last 12 months while two had not seen a dentist for more than 7 years and one participant with full dentures had not seen a dentist for 20 years: “The only reason I saw a dentist after I had my teeth out was to get replacement teeth” (Janette, female, 78 years).

Nine (75%) participants did not see the need to visit the dentist if there was no dental problem: “Until I get a toothache I don’t worry about it. Well I didn’t see one for 49 years” (Tony, male, 49 years), or if they have no natural teeth:

“The only reason I saw a dentist after I had my teeth out was to get replacement teeth. So there was no other reason for me to see him and that would have been about 20 years ago” (Janette, female, 78 years)

Oral hygiene behaviours varied across participants. Although most participants said they brushed their teeth daily ($n = 10$, 83%) there were a couple ($n = 2$) that were less attentive: “when I’m in the shower. . .at least every second day” (Tony, male, 49 years). Five (42%) participants flossed infrequently: “When I can remember I floss” (William, male, 39 years), while another participant engaged in more aggressive measures to maintain their oral health: “Sometimes I treat my teeth with oxygenated water but with low volume. . .diluted. Rinse them” (Julio, male, 63 years).

Current knowledge. Seven (58%) participants were unaware of the relationship between oral health and CVD: “Never heard of oral health with being a relationship to heart—it’s never been discussed with me” (Mike, male, 68 years), and did not think that poor oral health could affect cardiac outcomes: “I wouldn’t think so” (Andrew, male, 65 years). Five participants (42%) had a general idea about oral health and CVD but were unsure of the details:

“When I go to my local dentist he does have sign up in his reception saying that there is a link. I didn’t understand the details” (Steve, male, 51 years).

The main source of information for these participants was the dental professional:

“They told me that the oral health or the health of the teeth affects the internal organs. . . That is what the dental nurse explained to me” (Danny, male, 71 years).

“This dentist told me that studies found that there is some linkage with heart attack when you teeth are not clean. . .” (Lisa, female, 48 years).

However, two (17%) participants who had poor oral health prior to being diagnosed with a cardiac condition reported receiving conflicting information from dental professionals:

“I told her [dentist] that I had a stroke and heart attack and she told me no, that one thing [oral health] had nothing to do with the other” (Julio, male, 63 years).

All participants were keen to receive further oral health information and often tried to source it on their own as no information was provided in this area: *“No information packs or anything, just Google”* (William, male, 39 years).

Maintaining oral health

Barriers. Nine (75%) participants identified cost as a major barrier to access dental care:

“I think it’s just more the obstacle in regards to the finance. I don’t see many people wanting to go and see a dentist and pay [AU] \$250. I just don’t see it logical for someone and then their rent is \$500 a week” (William, male, 39 years).

“It is firstly expensive, it cost me money it is private and did not want to do it. I don’t have extra a few hundred dollars to do this thing” (Lisa, female, 48 years).

Other issues included difficulties making an appointment such as waiting on the phone for a long time to get through to the public dental service:

“When I call they do not respond immediately and it takes time. I called from home and I was not successful. . . She [rehabilitation nurse] then told me that at the next exercise day she was going to call [the public dental service] and wait while my husband was exercising. She put the phone on speaker and she called, she called, she called. . . until they answered” (Wife of participant–Julio, male, 63 years).

Some participants identified not being aware of a public dental service. Four (33%) participants, in view of their cardiac problem, did not consider oral health a priority as a participant stated: *“I’ve got heart failure; I don’t think rotten teeth or a sore tooth is going to be anything of a hassle for me”* (William, male, 39 years).

Lack of awareness was another identified barrier ($n = 5$, 42%):

“I’d never heard of it before. . . I’ve still got all my teeth so my attitude was why I should go to a dentist?” (Tony, male, 49 years).

Lack of transport was a problem to some ($n = 3$, 25%) of the participants:

“Because I am not driving, I don’t know my way around very well. I have issues with transport” (Danny, male, 71 years).

One participant was concerned about his lack of mobility and attending dental care:

“Well I haven't been to the dentist since I've lost the leg. So I don't know what the challenge is going to be to get in there and then get into his chair” (Mike, male, 68 years).

Five (42%) participants simply did not like visiting the dentist due to previous bad experiences including pain or discomfort associated with dental treatment, long waiting times and managing multiple medical appointments:

“. . . waiting, pain. Look, between us I don't like sitting and waiting for a doctor, any doctor. . . waiting one hour, half hour. I have three doctors: my GP [general practitioner], my back specialist, my heart specialist. . . all the time I go to doctors. I must visit three doctors so I don't like to make it four” (Allan, male, 71 years).

One participant feared that dental treatment could lead to complications as his medication included anticoagulants:

“I was on blood thinners, so I didn't really want him to pull a tooth out while I was on blood thinners” (Andrew, male, 65 years).

Facilitators. Factors that helped participants seek oral health care included receiving financial or other support such as transport or having private health insurance:

“I'm covered. I am in the defence force so all my medical treatment is covered by them so I can get in very easily most times to see a dentist” (Carl, male, 49 years).

Being independent was a facilitator to access dental care. Social support as well as having facilities with transport was also identified by participants:

“My wife is a vital part of my present life because she transports me from one place to another and she is my support” (Julio, male, 63 years).

A male participant talked about having a state concession card for transport which facilitated his medical appointments including visiting a dentist:

“The bus goes past my door. I only have to walk down two houses to get on the bus, lets me out the front of the hospital. Couldn't be easier, it's [AU] \$2.50 and on the one ticket” (Andrew, male, 65 years)

Awareness and the perceived importance of oral health care were other facilitators for some participants:

“I've been brought up that way; you take proactive care of your teeth. . . it is part of my lifestyle” (Steve, male, 51 years).

Oral health care in the cardiac setting

Current practices in the cardiac setting. Nine (75%) participants highlighted that oral health was not discussed during their cardiac care and ten participants (83%) had never received any oral health promotional material from cardiac care providers: *“Absolutely nothing on oral health”* (Janette, female, 78 years).

The only times when oral health was discussed was when it was initiated by the patient:

“All started when my wife told the rehabilitation nurse about my teeth problem and she gave her the telephone number of the dentist here in the hospital” (Julio, male, 63 years).

Or if they had diabetes mellitus:

“I’m a diabetic as well and one of the doctor’s said that diabetes and oral health, there was a link between them. But I don’t know anything else” (Andrew, male, 65 years).

Oral health was also discussed when patients needed valve replacement surgery as they were required to see a dentist as part of current pre-surgical admission protocol ($n = 2$, 17%):

“. . .the only thing I came across the link was in the package they gave me before surgery. . .in particular in regards to valve replacement” (Carl, male, 49 years).

However, one participant reported not being provided a proper explanation on why he needed to see a dentist.

“The surgeon’s secretary rang me and said the doctor would like you to go see a dentist to make sure there’s no infection in the gums and that. . . about a week before [cardiac surgery]. I was amazed with that. I’m on the phone going what? Dentist? What for? You know I’ve got sore heart not sore teeth. I was shocked. Yeah, I didn’t know” (Tony, male, 49 years).

Promoting oral health in the cardiac setting. Eleven (92%) participants thought the best time to talk about oral health was after the acute phase of their condition has passed. Another appropriate time was when discharged from hospital or during cardiac rehabilitation: *“. . .leaving the hospital we should definitely get something”* (Janette, female, 78 years), *“I think at the start of rehab it will probably be the best time”* (Carl, male, 49 years), *“it is important to get informed during rehabilitation”* (Julio, male, 63 years).

Participants suggested a variety of ways of receiving oral health information from nurses or other cardiac clinicians such as leaflets: *“Leaflets. . .so I can sit down and have a read of it over a coffee”* (Steve, male, 51 years), in electronic form, via the media or during cardiac education sessions:

“. . . in the media in relation to TV we could get an ad out there. Because there is nothing telling anyone about this problem that there is a link to the teeth and that causing problems for people with heart disease. I think they [people] do need to know, especially on TV” (Mike, male, 68 years).

“Yes, because all the talks that we have [in the cardiac setting] relate to our cardiac health and this one [oral health] doesn’t, is missing” (Janette, female, 78 years)

Two (17%) participants also suggested having information about oral health and CVD at the dentist: *“That could be started at the dental point and carried on throughout”* (Mike, male, 68 years).

One participant commented on how important it was to have oral health awareness:

“If people don’t understand that if you do not brush your teeth you are going to have a heart attack they will be more motivated. I would’ve not done it if my friend did not drag me and force me into seeing the dentist. I was probably not going to see him for a long time. Now I see

that it was very good because my heart probably would have taken longer to heal up if I didn't clean up properly" (Lisa, female, 48 years).

Role of cardiac care clinicians promoting oral health. All participants were receptive to cardiac nurses promoting oral health in the cardiac setting and were comfortable with the idea of nurses educating, assessing and referring patients to oral health professionals when necessary:

"I will take advice from someone that's a cardiac nurse in regards to my teeth. . . I feel comfortable coming to the nurses most definitely" (William, male, 39 years).

". . .because you're in and out of the hospital with programs and stuff, you're quite familiar with some of the nurses, so all ears for whatever they have to say" (wife of participant—William, male, 39 years).

One participant was mainly comfortable with nurses assessing his oral health as long as there were no dental interventions: *"as long as she [nurse] doesn't shove things in my mouth that turn around and taste rotten"* (Mike, male, 68 years).

Other cardiac care clinicians identified by participants to have a role promoting oral health were physiotherapists: *"all the nurses and physios that were in rehabilitation are absolutely brilliant; it is fine if they tell me about my oral health"* (Carl, male, 49 years).

However, some participants ($n = 4$) were unsure if they have enough training to promote oral health: *"I don't know if they are trained enough to explain. . ."* (Robert, male, 72 years).

Discussion

The findings from this study show oral health problems are prevalent with half of the participants reporting dental issues at the time of the interview. As well the interviews showed that some of the barriers to access dental care include the financial burden associated with dental visits and lack of oral health awareness or misinformation and difficulty accessing public dental services. Facilitators include having financial and social support. People with CVD are receptive towards receiving oral health information, assessment and referral by cardiac care clinicians in the cardiac setting.

The incidence of oral health problems is not surprising as Australians with lower incomes are more likely to have oral health problems such as untreated tooth decay and missing teeth and the incidence is higher in older adults. Further, according to national statistics more than a third of the Australian population above 45 years suffer moderate to severe periodontal disease [10].

Over half the participants in this study reported seeing a dental professional in the last 12 months, two of which were for mandatory checks prior to having valve replacement surgery. This is consistent with a previous study that reported poor oral health practices among people with heart disease [39]. Although one study reported that only 38% of people with CVD sought dental care [29], no specific Australian data on the oral health status or uptake of dental services is available for patients with CVD. More general data on the oral health status of Australians show that about 44% adults have regular (every 6 to 12 months) dental visits [10].

The financial burden associated with dental visits and treatment was identified by most participants as a major barrier to seeking dental care. Results from the Australian National Dental Telephone Interview Survey report that from 1994 to 2013, there has been a steady increase in the proportion of adults avoiding oral health care visits and following recommended treatment due to cost, even when they have private health insurance [10]. In Australia, the cost of a dental

visit can vary greatly from dentist to dentist as regulations via regulatory agencies do not extend to pricing [40, 41]. Exacerbating the problem is the difficulty accessing public dental services as these are only available to people with health care card or pension card holders [42]. In the current study, two participants mentioned having to wait for long periods on the phone to organise an appointment, and another two participants were not aware that they could access the public system for dental care. The issue of disadvantaged people having serious access problems and extensive waiting times to the public dental care system is not new, and has been previously identified in the Australian context [43].

The study findings also indicate a lack of awareness or misinformation regarding oral health and CVD. Even though some participants had some idea of a possible connection between poor oral health and CVD they were unaware of the relevance of this link. Some participants described receiving incorrect information from dental professionals when enquiring about a possible link between their poor oral health and current cardiac problems. Unfortunately there are no comparable studies that have explored the oral health awareness of people with CVD or the knowledge among dental professionals. Looking beyond the CVD setting, many patients in maternity, palliative care, immune-compromised and with diabetes are also unaware of the importance of oral health [44–47]. Perhaps of greater concern are the findings from several studies that reported dentists were also often unaware of the impact of poor oral health on systemic conditions [13, 48–50]. The issues of lack of oral health awareness, access to public dental service and cost highlighted in this study have also been reported as significant barriers for pregnant women seeking dental care [51, 52]. This may indicate that access issues to dental care is not isolated to people with CVD but is also a common problem among other people with other health conditions where poor oral health is associated with negative health outcomes.

This lack of oral health awareness among CVD patients is likely due to the limited amount of dental care information provided by their clinicians. Participants reported that no information about oral health was provided during their cardiac appointments or other healthcare encounters, except the mandatory visit to the dentist in heart valve surgery, as part of current protocols [53]. However, even in these situations patients were not provided with a proper explanation as to why they needed to visit a dentist. This lack of discussion is consistent with findings of a recent scoping review which highlighted a lack of emphasis on oral health by cardiac care clinicians or cardiac health professionals [34].

Facilitators for accessing oral health care identified in the study included having financial support and/or private health insurance. In Australia coverage of dental costs by private health insurance is based on individuals or families purchasing a health insurance policy, which covers all or part of the cost of visiting a private dentist. The Australian national dental telephone interview survey in 2013 reported that people with private health insurance have better oral health, access dental services more often and follow treatment compared to people that attend public oral health services [10].

Social support was identified as an important component to people accessing medical care especially among those requiring instrumental support during the acute, recovery or maintenance phase of their condition [54], for example, a spouse to provide transport to all health-related appointments.

This study has also for the first time explored the perceptions of people with CVD towards oral health care in the cardiac setting. Most participants preferred to receive oral health education after the acute phase of their condition or on discharge from the hospital or during the cardiac recovery or rehabilitation time [55, 56]. Unfortunately attendance to cardiac rehabilitation is poor with only about 30% uptake on referrals [57] therefore development of an oral health program needs to address this issue to reach the wider cardiac population. Participants

voiced that they would like resources and information in a variety of ways including written (leaflets, booklets, posters), electronic (email, internet) or through the media (patient information, advertisement). In Australia, as in other developed countries, almost 60% of adults have low individual health literacy therefore oral health information resources need to be tailored to the intended consumers and be easy to navigate, understand and use [58]. As patients worry about seeing a dentist when they have just started anticoagulant therapy, education about the importance of maintaining their oral health and having regular dental check-ups needs to be addressed.

The potential for cardiac care clinicians to promote oral health was also explored in this study. All participants were receptive to nurses providing education, assessing their oral health and referring them to dental services if necessary. Some commented that they would also be receptive of other cardiac care clinicians such as physiotherapists providing oral health education. Even though the role of nurses or other cardiac care clinicians promoting oral health in the cardiac setting has not been explored in Australia [59] or internationally, the nurses' role in oral health has been pursued in other settings such as maternity, paediatric and aged care [60–67]. Nurses have a close relationship with cardiac patients in the acute setting for several days, and require assessment by the cardiac nurse prior to discharge. In the outpatient settings, patients who attend phase II cardiac rehabilitation work closely with the nurse(s), physiotherapist(s) or exercise physiologist for at least 6 to 8 weeks; therefore it is not surprising that participants would feel comfortable with cardiac care clinicians promoting oral health. However, some participants were unsure if nurses possess sufficient training to be able to promote oral health therefore this issue would need to be addressed to prepare nurses to undertake this role. In the United States of America (USA) oral health training was incorporated in 2012 as a national initiative in nursing training to improve the quality of oral health and reduce disparities [68]. However, in Australia undergraduate nursing programs do not include oral health training [69]. Other potential barriers that need to be taken into consideration if oral health promotion training is to be provided by nurses may include time constraints in the acute setting [70, 71], low level of confidence [64, 72, 73], and limited knowledge and training [52].

Encouraging cardiac care clinicians to raise oral health awareness has the potential to improve the oral health status and behaviours of patients with CVD. A systematic review of the effectiveness of oral health promotion among patients with CVD found that oral health promotion activities, including raising awareness, seems to improve periodontal health and have a positive effect on the behaviours and knowledge of patients as well as health care staff in the cardiac setting (29). Although improving the oral health of people with CVD may not necessarily reduce cardiovascular outcomes in the long term [14, 30, 31, 74–76] it will reduce the presence of infection and bacterial load in the body which is always beneficial for patients with CVD [31]. In addition, maintaining good oral health will reduce the need for people with CVD, especially those with reduced cardiac functioning, to undergo emergency dental interventions like extractions [77]. These procedures are invasive and can lead to stress and increased circulatory dynamics putting them at higher risk of heart failure [78].

Conclusions

Findings from this study suggest that many patients with CVD have dental problems yet they lack awareness of the importance of oral health and its potential impact on cardiovascular outcomes. Exacerbating the issue is limited oral health advice being provided in the cardiac setting and difficulty accessing timely and affordable dental services. Cardiac care providers could play an important role in promoting oral health in the post-acute phase provided they are formally trained in this area. Preventative oral health programs need to be developed in the

cardiac setting that involve cardiac care providers and address dental referral pathways. Such programs could potentially provide people with CVD in Australia the opportunity to receive appropriate oral health education, assessment and referrals.

Limitations

This study involves a small number of mostly male participants with CVD attending cardiac rehabilitation in three different hospitals in Sydney Australia therefore results may not be generalisable to other Australians with similar conditions. However a larger quantitative study involving patients with CVD is being undertaken to confirm the results of this study.

Supporting information

S1 Text. Interview guide.

(PDF)

S2 Text. Interview transcripts.

(PDF)

S1 Dataset. Demographic data.

(XLSX)

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References

1. Humphrey LL, Fu R, Buckley DI, Freeman M, Helfand M. Periodontal disease and coronary heart disease incidence: a systematic review and meta-analysis. *J Gen Intern Med.* 2008; 23(12):2079–86. <https://doi.org/10.1007/s11606-008-0787-6> PMID: 18807098
2. D'Aiuto F, Orlandi M, Gunsolley JC. Evidence that periodontal treatment improves biomarkers and CVD outcomes. *J Clin Periodontol.* 2013; 40(s14):S85–S105.

3. American Heart Association. What is Cardiovascular Disease? 2015 [cited 2015 October]. Available from: http://www.heart.org/HEARTORG/Caregiver/Resources/WhatisCardiovascularDisease/What-is-Cardiovascular-Disease_UCM_301852_Article.jsp.
4. Dhadse P, Gattani D, Mishra R. The link between periodontal disease and cardiovascular disease: How far we have come in last two decades? *J Indian Soc Periodontol*. 2010; 14(3):148. <https://doi.org/10.4103/0972-124X.75908> PMID: 21760667
5. Kepschull M, Demmer R, Papapanou P. “Gum bug, leave my heart alone!”—epidemiologic and mechanistic evidence linking periodontal infections and atherosclerosis. *J Dent Res*. 2010; 89(9):879–902. <https://doi.org/10.1177/0022034510375281> PMID: 20639510
6. Caúla AL, Lira-Junior R, Tinoco EMB, Fischer RG. The effect of periodontal therapy on cardiovascular risk markers: a 6-month randomized clinical trial. *J Clin Periodontol*. 2014; 41(9):875–82. <https://doi.org/10.1111/jcpe.12290> PMID: 25041550
7. Bartova J, Sommerova P, Lyuya-Mi Y, Mysak J, Prochazkova J, Duskova J, et al. Periodontitis as a Risk Factor of Atherosclerosis. *Journal of Immunology Research*. 2014. <https://doi.org/10.1155/2014/636893> PMID: 24741613
8. Friedewald VE, Kornman KS, Beck JD, Genco R, Goldfine A, Libby P, et al. The American Journal of Cardiology and Journal of Periodontology editors’ consensus: Periodontitis and atherosclerotic cardiovascular disease. *J Periodontol*. 2009; 80(7):1021–32. <https://doi.org/10.1902/jop.2009.097001> PMID: 19563277
9. Eke PI, Dye BA, Wei L, Slade GD, Thornton-Evans GO, Borgnakke WS, et al. Update on Prevalence of Periodontitis in Adults in the United States: NHANES 2009–2012. *J Periodontol*. 2015; 86(5):611–22. <https://doi.org/10.1902/jop.2015.140520> PMID: 25688694
10. Australian Institute of Health and Welfare, Chrisopoulos S, Harford J, Ellershaw A. Oral health and dental care in Australia: key facts and figures 2015. Canberra: AIHW, 2016 28 January 2016. Report No.: Cat. no. DEN 229.
11. Petersen PE, Ogawa H. The global burden of periodontal disease: towards integration with chronic disease prevention and control. *Periodontol 2000*. 2012; 60(1):15–39. <https://doi.org/10.1111/j.1600-0757.2011.00425.x> PMID: 22909104
12. Kandelman D, Arpin S, Baez RJ, Baehni PC, Petersen PE. Oral health care systems in developing and developed countries. *Periodontol 2000*. 2012; 60(1):98–109. <https://doi.org/10.1111/j.1600-0757.2011.00427.x> PMID: 22909109
13. Genco RJ, Williams RC. Periodontal disease and overall health: a clinician’s guide. Yardley, Pennsylvania, USA: Professional Audience Communications; 2010.
14. Tonetti MS, Dyke TE. Periodontitis and atherosclerotic cardiovascular disease: consensus report of the Joint EFP/AAP Workshop on Periodontitis and Systemic Diseases. *J Clin Periodontol*. 2013; 40(s14): S24–S9.
15. Flores MF, Montenegro MM, Furtado MV, Polanczyk CA, Rösing CK, Haas AN. Periodontal Status Affects C-Reactive Protein and Lipids in Patients With Stable Heart Disease From a Tertiary Care Cardiovascular Clinic. *J Periodontol*. 2014; 85(4):545–53. <https://doi.org/10.1902/jop.2013.130255> PMID: 23805809
16. Gomes-Filho IS, Freitas Coelho JM, da Cruz SS, Passos JS, Teixeira de Freitas CO, Aragão Farias NS, et al. Chronic periodontitis and C-reactive protein levels. *J Periodontol*. 2011; 82(7):969–78. <https://doi.org/10.1902/jop.2010.100511> PMID: 21189085
17. Moura FA, Alexandre RG, Manoel BC, Luciancencov PC, Patel K, Suvan J, et al. Periodontal therapy and biomarkers related to cardiovascular risk. *Minerva Stomatol*. 2010; 59(5):271–83. PMID: 20502435
18. Teeuw WJ, Slot DE, Susanto H, Gerdes VE, Abbas F, D’Aiuto F, et al. Treatment of periodontitis improves the atherosclerotic profile: a systematic review and meta-analysis. *J Clin Periodontol*. 2014; 41(1):70–9. <https://doi.org/10.1111/jcpe.12171> PMID: 24111886
19. Teles R, Wang CY. Mechanisms involved in the association between periodontal diseases and cardiovascular disease. *Oral Dis*. 2011; 17(5):450–61. <https://doi.org/10.1111/j.1601-0825.2010.01784.x> PMID: 21223455
20. Loos B. G., Teeuw W. J., & Nicu E. A. Plausible Mechanisms Explaining the Association of Periodontitis with Cardiovascular Diseases. In Pedersen A. M. L. (Ed.), *Oral Infections and General Health* (pp. 19–33). The Netherlands: Springer International. 2016.
21. Dorn JM, Genco RJ, Grossi SG, Falkner KL, Hovey KM, Iacoviello L, et al. Periodontal disease and recurrent cardiovascular events in survivors of myocardial infarction (MI): the Western New York Acute MI Study. *J Periodontol*. 2010; 81(4):502–11. <https://doi.org/10.1902/jop.2009.090499> PMID: 20367093

22. Joshy G, Arora M, Korda R, Chalmers J, Banks E. Is poor oral health a risk marker for incident cardiovascular disease hospitalisation and all-cause mortality? Findings from 172 630 participants from the prospective 45 and Up Study. *BMJ Open*. 2016; 6(8):e012386. <https://doi.org/10.1136/bmjopen-2016-012386> PMID: 27577588
23. Beukers N. G., van der Heijden G. J., van Wijk A. J., & Loos B. G. Periodontitis is an independent risk indicator for atherosclerotic cardiovascular diseases among 60 174 participants in a large dental school in the Netherlands. *J Epidemiol Community Health*. 2017; 71(1), 37–42. <https://doi.org/10.1136/jech-2015-206745> PMID: 27502782
24. Bahekar AA, Singh S, Saha S, Molnar J, Arora R. The prevalence and incidence of coronary heart disease is significantly increased in periodontitis: a meta-analysis. *Am Heart J*. 2007; 154(5):830–7. <https://doi.org/10.1016/j.ahj.2007.06.037> PMID: 17967586
25. Blaizot A, Vergnes JN, Nuwwareh S, Amar J, Sixou M. Periodontal diseases and cardiovascular events: meta-analysis of observational studies. *Int Dent J*. 2009; 59(4):197–209. PMID: 19774803
26. Khader YS, Albashaireh ZS, Alomari MA. Periodontal diseases and the risk of coronary heart and cerebrovascular diseases: a meta-analysis. *J Periodontol*. 2004; 75(8):1046–53. <https://doi.org/10.1902/jop.2004.75.8.1046> PMID: 15455730
27. Leng W-D, Zeng X-T, Kwong J, Hua X-P. Periodontal disease and risk of coronary heart disease: An updated meta-analysis of prospective cohort studies. *Int J Cardiol*. 2015; 201(2015):469–72.
28. Virdee P. Improve uptake of care. *Br Dent J*. 2006; 201(3):132–3. <https://doi.org/10.1038/sj.bdj.4813891> PMID: 16902527
29. Lam OL, Zhang W, Samaranyake LP, Li LS, McGrath C. A systematic review of the effectiveness of oral health promotion activities among patients with cardiovascular disease. *Int J Cardiol*. 2011; 151(3):261–7. <https://doi.org/10.1016/j.ijcard.2010.11.014> PMID: 21176980
30. Li C, Lv Z, Shi Z, Zhu Y, Wu Y, Li L. Periodontal therapy for the management of cardiovascular disease in patients with chronic periodontitis. *Cochrane Database Syst Rev*. 2014; (8):CD009197. <https://doi.org/10.1002/14651858.CD009197.pub2> PMID: 25123257
31. Bouchard P, Boutouyrie P, D'AIUTO F, Deanfield J, Deliargyris E, Fernandez-Avilés F, et al. European workshop in periodontal health and cardiovascular disease consensus document. *Eur Heart J Suppl*. 2010; 12(B).
32. Kinane D, Bouchard P. Periodontal diseases and health: consensus report of the sixth European workshop on periodontology. *J Clin Periodontol*. 2008; 35(s8):333–7.
33. Sanchez P, Everett B, Salamonson Y, Ajwani S, George A. Oral health care and cardiovascular disease: A scoping review of current strategies and implications for nurses. *J Cardiovasc Nurs*. 2017; 32(3):E10–E20. <https://doi.org/10.1097/JCN.0000000000000388> PMID: 28145980
34. Fusch PI, Ness LR. Are we there yet? Data saturation in qualitative research. *Qual Rep*. 2015; 20(9):1408–16.
35. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006; 3(2):77–101.
36. QRS International Pty Ltd. NVivo qualitative data analysis software. Version 11. 2015.
37. Vaismoradi M, Turunen H, Bondas T. Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nurs Health Sci*. 2013; 15(3):398–405. <https://doi.org/10.1111/nhs.12048> PMID: 23480423
38. World Health Organization. International Statistical Classification of Diseases and Related Health Problems 10th Revision: World Health Organization; 2016.
39. Rasouli-Ghahroudi AA, Khorsand A, Yaghobee S, Rokn A, Jalali M, Masudi S, et al. Oral health status, knowledge, attitude and practice of patients with heart disease. *ARYA Atheroscler*. 2016; 12(1):1–9. PMID: 27114731
40. Australian Dental Association. Dental Practice Survey 2013–2014 Australia2016 [cited 2016 December]. Available from: <http://www.ada.org.au/Professional-Information/Benchmarking/Dental-Practices/Dental-Practice-Survey-2013-2014>.
41. CHOICE Australia. Down in the mouth over dentist fees? Australia2013 [cited 2016 December]. Available from: <https://www.choice.com.au/health-and-body/dentists-and-dental-care/dental-treatment/articles/dental-fees>.
42. Australian Institute of Health and Welfare. Cost of dental care Australia2016 [cited 2016 December]. Available from: <http://www.aihw.gov.au/dental/cost/>.
43. Schwarz E. Access to oral health care—an Australian perspective*. *Community Dent Oral Epidemiol*. 2006; 34(3):225–31. <https://doi.org/10.1111/j.1600-0528.2006.00301.x> PMID: 16674755

44. George A, Johnson M, Duff M, Ajwani S, Bhole S, Blinkhorn A, et al. Midwives and oral health care during pregnancy: perceptions of pregnant women in South-Western Sydney, Australia. *J Clin Nurs*. 2012; 21(7–8):1087–96. <https://doi.org/10.1111/j.1365-2702.2011.03870.x> PMID: 22007929
45. Bowyer V, Sutcliffe P, Ireland R, Lindenmeyer A, Gadsby R, Graveney M, et al. Oral health awareness in adult patients with diabetes: a questionnaire study. *Br Dent J*. 2011; 211(6):E12. <https://doi.org/10.1038/sj.bdj.2011.769> PMID: 21941301
46. Petersen PE. Global policy for improvement of oral health in the 21st century—implications to oral health research of World Health Assembly 2007, World Health Organization. *Community Dent Oral Epidemiol*. 2009; 37(1):1–8. <https://doi.org/10.1111/j.1600-0528.2008.00448.x> PMID: 19046331
47. Campbell PC, Sheriff D. Awareness and method of oral health care among people living with human immunodeficiency virus infection and acquired immune deficiency syndrome attending Federal Medical Centre, Abeokuta, Nigeria 2015 [cited 2017 January]. Available from: <<http://johoe.kmu.ac.ir/johoe/index.php/johoe/article/view/163>>.
48. Ghapanchi J, Shahidi SP, Kamali F, Zamani L, Ebrahimi H. Knowledge and Attitude of General Dentists and Last-year Students Regarding the Management of Medically Compromised Patients in Shiraz, Iran. *Br J Med Med Res*. 2016; 11(2):1–6.
49. Song M, O'Donnell JA, Bekhuis T, Spallek H. Are dentists interested in the oral-systemic disease connection? A qualitative study of an online community of 450 practitioners. *BMC Oral Health*. 2013; 13(65):1–11.
50. Vieira C, Caramelli B. The history of dentistry and medicine relationship: could the mouth finally return to the body? *Oral Dis*. 2009; 15(8):538–46. <https://doi.org/10.1111/j.1601-0825.2009.01589.x> PMID: 19619191
51. George A, Ajwani S, Johnson M, Dahlen H, Blinkhorn A, Bhole S, et al. Developing and testing of a mid-wifery oral health screening tool for pregnant women. *Health Care Women Int*. 2014; 36(10):1160–74. <https://doi.org/10.1080/07399332.2014.959170> PMID: 25299615
52. George A, Johnson M, Blinkhorn A, Ellis S, Bhole S, Ajwani S. Promoting oral health during pregnancy: current evidence and implications for Australian midwives. *J Clin Nurs*. 2010; 19(23–24):3324–33. <https://doi.org/10.1111/j.1365-2702.2010.03426.x> PMID: 20955483
53. SLHD Sydney Cardiothoracic Surgeons. Heart Valve Surgery Booklet [Information Booklet]. In: Royal Prince Alfred Hospital, editor. Sydney 2016.
54. Andersen R. Revisiting the behavioral model and access to medical care: does it matter? 1995 [cited 2016 December]. Available from: <http://www.jstor.org/stable/2137284>.
55. Government of South Australia. Cardiac rehabilitation: a model of care for South Australia—an overview. In: Statewide Cardiology Clinical Network, editor. South Australia, Australia: Government of South Australia; 2011.
56. Heart Foundation. Directory of NSW/ACT Cardiovascular Health Services. Version 15. NSW: Heart Foundation. 2014. [cited 2016 December]. Available from: <http://www.acra.net.au/wp-content/uploads/2015/03/Heart-Foundation-Directory-of-NSW-Cardiovascular-Health-Services-Version-15-January-2014.pdf>.
57. Johnson NA, Inder KJ, Nagle AL, Wiggers JH. Attendance at outpatient cardiac rehabilitation: is it enhanced by specialist nurse referral? *Aust J Adv Nurs*. 2010; 27(4):31.
58. Australian Commission on Safety and Quality in Health Care. Consumers, the health system and health literacy: Taking action to improve safety and quality [Consultation Paper]. In: ACSQHC, editor. Sydney 2013.
59. Australian Government. Healthy Mouths, Healthy Lives: Australia's National Oral Health Plan 2015–2024. In: Council CoAGCH, editor. Adelaide SA: COAG Health Council 2015; 2015. p. 1–105.
60. Chalmers J, Pearson A. A systematic review of oral health assessment by nurses and carers for residents with dementia in residential care facilities. *Spec Care Dentist*. 2005; 25(5):227–33. PMID: 16454098
61. Clemmens DA, Kerr AR. Improving oral health in women: nurses' call to action. *MCN Am J Matern Child Nurs*. 2008; 33(1):10–4. <https://doi.org/10.1097/01.NMC.0000305650.56000.e8> PMID: 18158520
62. George A, Bhole S, Johnson M, Blinkhorn A, Dahlen H, Ellis S, et al. Improving maternal oral health in Australia through midwifery-dental collaboration. 10th World Congress on Preventive Dentistry 2013; Budapest, Hungary 2013.
63. George A, Lang G, Johnson M, Ridge A, de Silva AM, Ajwani S, et al. The evaluation of an oral health education program for midwives in Australia. *Women Birth*. 2016; 29(3):208–13. <https://doi.org/10.1016/j.wombi.2015.10.004> PMID: 26552339

64. Heilbrunn-Lang AY, de Silva AM, Lang G, George A, Ridge A, Johnson M, et al. Midwives' perspectives of their ability to promote the oral health of pregnant women in Victoria, Australia. *BMC Pregnancy Childbirth*. 2015; 15(1):110.
65. Maher L, Phelan C, Lawrence G, Dawson A, Torvaldsen S, Wright C. The Early Childhood Oral Health Program: promoting prevention and timely intervention of early childhood caries in NSW through shared care. *Health Promot J Austr*. 2012; 23(3):171–6. PMID: [23540315](#)
66. National Health Service England. Improving Dental Care and Oral Health—A Call To Action—National Stakeholder Event Summary Report. London: NHS England, 2014. [Cited 2016 December]. Available from: <https://www.nidcr.nih.gov/DataStatistics/SurgeonGeneral/NationalCalltoAction/nationalcalltoaction.htm>.
67. Stevens J, Iida H, Ingersoll G. Implementing an oral health program in a group prenatal practice. *J Obstet Gynecol Neonatal Nurs*. 2007; 36(6):581–91. <https://doi.org/10.1111/j.1552-6909.2007.00189.x> PMID: [17973702](#)
68. Dolce MC. Integrating oral health into professional nursing practice: an interprofessional faculty tool kit. *J Prof Nurs*. 2014; 30(1):63–71. <https://doi.org/10.1016/j.profnurs.2013.06.002> PMID: [24503317](#)
69. Australian Education Network. Australian Universities Guide [Website]. Australia2016 [cited 2016 November]. Available from: <http://www.australianuniversities.com.au/>.
70. Allen Furr L, Binkley CJ, McCurren C, Carrico R. Factors affecting quality of oral care in intensive care units. *J Adv Nurs*. 2004; 48(5):454–62. <https://doi.org/10.1111/j.1365-2648.2004.03228.x> PMID: [15533083](#)
71. Kuramoto C, Watanabe Y, Tonogi M, Hirata S, Sugihara N, Ishii T, et al. Factor analysis on oral health care for acute hospitalized patients in Japan. *Geriatr Gerontol Int*. 2011; 11(4):460–6. <https://doi.org/10.1111/j.1447-0594.2011.00709.x> PMID: [21592269](#)
72. Griffiths J, Lewis D. Guidelines for the oral care of patients who are dependent, dysphagic or critically ill. *JDOH*. 2002; 3(1):30–3.
73. Frenkel H, Harvey I, Needs K. Oral health care education and its effect on caregivers' knowledge and attitudes: a randomised controlled trial. *Community Dent Oral Epidemiol*. 2002; 30(2):91–100. PMID: [12000349](#)
74. Ioannidou E., Malekzadeh T., & Dongari-Bagtzoglou A. Effect of periodontal treatment on serum C-reactive protein levels: a systematic review and meta-analysis. *J Periodontol*. 2006; 77(10), 1635–42. <https://doi.org/10.1902/jop.2006.050443> PMID: [17032104](#)
75. Lockhart P. B., Bolger A. F., Papapanou P. N., Osinbowale O., Trevisan M., Levison M. E., Gewitz M. H. Periodontal disease and atherosclerotic vascular disease: does the evidence support an independent association? A scientific statement from the American Heart Association. *Circulation*. 2012; 125(20), 2520–2544. <https://doi.org/10.1161/CIR.0b013e31825719f3> PMID: [22514251](#)
76. Demmer R. T., Trinquart L., Zuk A., Fu B. C., Blomkvist J., Michalowicz B. S., Desvarieux M. The influence of anti-infective periodontal treatment on C-reactive protein: a systematic review and meta-analysis of randomized controlled trials. *PloS One*. 2013; 8(10), e77441. <https://doi.org/10.1371/journal.pone.0077441> PMID: [24155956](#)
77. Niwa H, Sato Y, Matsuura H. Safety of dental treatment in patients with previously diagnosed acute myocardial infarction or unstable angina pectoris. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2000; 89:35–41. PMID: [10630939](#)
78. Montebugnoli L, Prati C. Circulatory dynamics during dental extractions in normal, cardiac and transplant patients. *J Am Dent Assoc*. 2002; 133:468–72. PMID: [11991464](#)

Chapter 7: Quantitative Results - People with CVD

7.1 Overview: Thesis Papers 4 and 5

This chapter presents the results of the survey of people with CVD. In the CARDIOH study the survey was informed by and developed in response to the qualitative findings. The quantitative data not only confirmed the qualitative findings, but also generated findings in its own right. In the adapted Andersen's model (Figure 3.3), these results represent individual characteristics, including predisposing, enabling and need factors as well as the health behaviours of patients with CVD. The quantitative results include two publications in the journals BMC Oral Health and the Journal of Cardiovascular Nursing.

Thesis Paper 4

Sanchez, P., Everett, B., Salamonson, Y., Redfern, J., Ajwani, S., Bhole, S., Bishop, J., Lintern, K., Nolan, S., Rajaratnam, R., Sheehan, M., Skarligos, F., Spencer, L., Srinivas, R., George, A. (2019). The oral health status, behaviours and knowledge of patients with cardiovascular disease in Sydney Australia: A cross-sectional survey. *BMC Oral Health*, 19(1), 12. Doi:10.1186/s12903-018-0697-x.

7.2 Aims: Thesis Paper 4

The broad aim of this paper was to explore the oral health status, behaviours, and knowledge of patients with CVD.

The study questions addressed in this paper were:

- 1) What is the prevalence of self-reported oral health problems among adult patients with CVD?

- 2) What are the reported oral health behaviours of patients with CVD?
- 3) What is the perceived level of knowledge regarding oral health and CVD in these patients?

7.3 Conclusion: Thesis Paper 4

The publication 'The oral health status, behaviours and knowledge of patients with cardiovascular disease in Sydney Australia: A cross-sectional survey' supports many of the qualitative findings presented in Thesis Papers 2 and 3. The survey results indicate that patients with CVD have a high prevalence of oral health problems, yet many lack knowledge about oral health. Importantly, patients are not currently receiving oral health information from cardiac care providers and combined with many reporting difficulties accessing dental care services, the findings reinforce the need for further research to develop oral health strategies in this area.

7.4 Thesis Paper 4

RESEARCH ARTICLE

Open Access



The oral health status, behaviours and knowledge of patients with cardiovascular disease in Sydney Australia: a cross-sectional survey

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Abstract

Background: Periodontal disease is a risk factor for atherosclerotic cardiovascular disease and it is recommended internationally that patients with cardiovascular disease should engage in preventative oral health practices and attend regular dental care visits. This study aimed to explore the oral health status, behaviours and knowledge of patients with cardiovascular disease.

Methods: A cross-sectional questionnaire containing 31 items was administered to patients with cardiovascular disease from cardiac rehabilitation and outpatient clinics in Sydney Australia in 2016–2017.

Results: Of the 318 patients surveyed, 81.1% reported having at least one oral health problem. Over a third (41.2%) of participants had not seen a dentist in the preceding 12 months and 10.7% had received any oral healthcare information in the cardiac setting. Those with valvular conditions were more likely to have received information compared to those with other cardiovascular conditions (40.6% versus 7.4%, $p < 0.001$). Only half of the participants had adequate oral health knowledge.

Conclusions: Despite a high incidence of reported oral health problems, many patients lacked knowledge about oral health, were not receiving oral health information from cardiac care providers and had difficulty accessing dental services. Further research is needed to develop oral health strategies in this area.

Keywords: Cardiovascular disease, Oral health behaviours, Oral health knowledge, Oral health status, Periodontal disease

Background

There is an association between periodontal disease and the prevalence of cardiovascular disease (CVD) with growing evidence suggesting that periodontal disease is a risk factor for atherosclerotic cardiovascular disease (ASCVD) [1–3]. Periodontal disease or periodontitis is a chronic inflammatory disease affecting the tooth supporting tissues and bone. It is caused by a host response

against bacterial infection involving the oral cavity and dental plaque leading to tooth loss [4]. Periodontitis contributes to the global burden of chronic oral diseases and is a major public health problem worldwide [5–8]. In Australia, periodontitis is the fifth most common health challenge with a prevalence of 23% for moderate to severe types of the disease with higher incidence in males (26.8% compared with 19.0%) and in older people (53.4% at age > 65) [9].

It has been suggested that systemic inflammation triggered by periodontitis is linked to ASCVD. Bacteria that cause periodontitis enter the blood stream leading to a systemic host-mediated inflammatory response, which contributes to atheroma formation, maturation and

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exacerbation [2]. Exacerbating the situation is the common adverse effects on the oral cavity of a number of medications used for the treatment of ASCVD including xerostomia or dry mouth, hypo salivation, and taste disturbances [10, 11]. There is also increasing evidence that periodontal treatment could reduce systemic inflammation [12–14] although its effectiveness in improving long term CVD outcomes is still uncertain [15]. Nevertheless, international consensus statements recognise the relevance of the association between periodontal disease and ASCVD and recommend preventative oral health approaches to be adopted in cardiac care settings [2, 7, 16] and that all patients with CVD engage in preventative oral health practices and attend regular dental care to reduce cardiovascular risks [16–18].

Despite these recommendations, research reports about the oral health status and practices of adults with CVD are limited. In a cross-sectional study involving 150 adult Iranian patients with heart disease, the authors found that oral health practices were poor and patients' knowledge was moderate [19]. Most studies in this area have focused on children with cardiac diseases and their parents/caregivers. These studies showed poor oral health status among the children and inadequate oral health knowledge and practices among their parents [20–23]. Overall, research and understanding about the oral health status, behaviours and knowledge of adults with CVD is limited, particularly in Australia. Therefore, the aim of this study was to describe the self-reported oral health status, behaviours and knowledge of adult patients with CVD in the Australian setting. Research questions were:

1. What is the prevalence of self-reported oral health problems among adult patients with CVD?
2. What are the reported oral health behaviours of patients with CVD?
3. What is the perceived level of knowledge regarding oral health and CVD in these patients?

Methods

Design

A quantitative cross-sectional questionnaire of patients with CVD was undertaken.

Sampling and setting

The convenience sample consisted of 318 patients who were attending outpatient cardiology services in Sydney Australia between December 2016 and March 2017. Outpatient services included four cardiac rehabilitation sites, two public cardiology clinics and one private clinic in both affluent and disadvantaged locations in the Sydney region. Recruitment from these sites ensured patients with varied CVD conditions and socio-economic status were included in the sample. Inclusion criteria were people: a) with a

diagnosis of CVD; b) over 18 years old; and c) who were English-speaking. Exclusion criteria were those people with limited English language and those who did not have an interpreter or a family member present who could interpret the questionnaire at the time of data collection. Ethical approval was obtained by the Sydney and South Western Sydney Local Health District Human Research Ethics Committees (LNR/16/LPOOL/499).

Data collection procedure

Flyers advertising the study were distributed across waiting rooms of the study sites. Interested participants were directed to a dental stall which was set up at in the waiting rooms. An experienced researcher and dental professional explained the purpose of the project to patients who approached the stall. If patients indicated interest, they were provided with a self-administered questionnaire to complete while waiting for their medical appointment. Participation was voluntary and oral health information and dental products were provided to patients regardless of study participation. Written consent was obtained from all participants. Completion of the questionnaire took between 10 and 15 min.

The questionnaire tool

The study questionnaire was adapted from an existing validated instrument which was developed to assess the oral health status, behaviour and knowledge in pregnant women [24]. Only some items were revised for the study population. Item generation for the questionnaire was guided by Andersen's model [25] to assess the factors influencing access to dental care among people with CVD. The questionnaire contained items relating to respondents' reported oral health status, oral health care behaviours and perceptions, their confidence in dental self-care, oral health knowledge and beliefs, information received about oral health since cardiac diagnosis, and social and family support. Socio-demographic data was also collected. Some additional knowledge items included oral health related side effects of commonly prescribed cardiac medications [10, 11, 26]. The questionnaire also included items reported elsewhere including barriers to seeking dental care [24]. To establish face and content validity, the questionnaire was reviewed by an expert panel consisting of clinicians, academics and educators in the field of dentistry, cardiology and physiotherapy and their agreement of the survey items were sought through qualitative feedback [27]. Minor revision of items was undertaken based on feedback received. The questionnaire was then piloted with six patients with CVD (not participating in the study) to ensure readability and relevance [28] and further refined. An additional file shows the questionnaire tool completed by participants of the study [see Additional file 1].

Sample size

The oral health behaviour - uptake of dental services by people with CVD, was used for the sample size estimation. However, due to the lack of this information in Australia, the uptake of oral health services among another vulnerable population (pregnant women) who are impacted by poor oral health (pregnant women) in Australia and patients with CVD internationally was used to inform the sample size. In a recent Australian study 30% of pregnant women were reported to have visited the dentist in the last 12 months even when they had dental problems [29]. Given that people with CVD were older and thus, more likely to have dental problems, we estimated that 40% of responders would have had a dental visit in the preceding 12 months. Further, one international study showed 38% of patients with CVD had seen a dentist regularly [30]. Hence the sample size was calculated as 250. Allowing for 20% missing data, a sample size of 300 was required.

Data analysis

The data was analysed using Statistical Package for the Social Sciences (SPSS) Version 24 software [31]. Descriptive statistics such as mean and standard deviation for continuous variables and frequency and percentage for categorical variables were calculated and tabulated. Median and inter quartile range (IQR) were calculated for non-normally distributed data. Bivariate (Pearson) analysis was undertaken to determine the correlation between the participant's socio demographics, self-reported oral health status and behaviour characteristics with their level of oral health knowledge. The total score was aggregated.

Results

Demographic characteristics

A total of 318 participants completed the study. Sixty percent of the participants were males and the age of participants ranged from 18 to 94 years (mean 63.7, *SD* 14.5). More than half of the participants were born outside Australia (57.9%) and spoke a language other than English (58.2%). Two thirds were not working at the time of the questionnaire (67.8%) and almost half (49%) had low combined income of AUS\$ < 40,000. Most participants had secondary or tertiary education (85.8%) and two thirds were living with a partner (67.4%). In relation to their cardiac diagnosis, coronary artery disease was the most common CVD condition among the participants (73.6%) with others (not mutually exclusive) suffering from hypertension, arrhythmias, heart failure and valvular conditions [32]. Coronary artery disease was more prevalent in males compared to females (64.1%, *n* = 150 versus 54.9%, *n* = 84). Almost half of the participants (45.4%) were eligible for public or free dental service either via holding a health care card or being a member of the defence force (Table 1).

Table 1 Sociodemographic and clinical characteristics of people with cardiovascular disease (*n* = 318)

Variables	Frequency (%)
Age, mean (<i>SD</i>) in years	
Gender	
Male	191 (60.1)
Country of birth	
Australia	134 (42.1)
Marital status ^a	
Living with a partner	213 (67.4)
Language spoken at home	
English	133 (41.8)
Employment status ^a	
Not working	213 (67.8)
Highest educational achievement ^a	
Up to primary schooling	45 (14.2)
Secondary schooling	118 (37.2)
Tertiary studies	154 (48.6)
Income ^a	
< \$40,000	157 (49.4)
\$40,000 to \$79,999	62 (19.5)
\$80,000 to \$120,000	34 (10.7)
> \$120,000	25 (7.9)
Preferred not to answer	40 (12.6)
Private Health Insurance ^a	
Yes	118 (37.2)
Eligible for public or free dental service ^a	
Yes	144 (45.4)
Cardiovascular condition(s) (not mutually exclusive)	
Coronary artery disease	234 (73.6)
Hypertension	109 (34.3)
Arrhythmias	94 (29.6)
Heart failure	43 (13.5)
Valvular condition	32 (10.1)
Years since cardiac diagnosis, mean (IQR) Range	7.80 (11.0) 0–50
Other co-morbidities as per ICD-10 [31] (<i>n</i> = 239)	
Circulatory system (hypertension/vascular disorders)	75 (31.4)
Endocrinology/metabolic (diabetes/thyroid/renal failure)	74 (31.0)
Musculoskeletal/connective tissue (arthritis/osteoporosis/Lupus)	30 (12.6)
Neoplasms (prostate/breast other cancers)	14 (5.9)
Others (respiratory/digestive/ears/eyes/mental health)	46 (19.2)

^aMissing data (range 1–4)

Self-reported oral health status and behaviour

More than half of the participants with CVD claimed to having a good to excellent oral health status (56.1%) but the majority (81.8%) reported having at least one oral health problem at the time of the study, with over a third (41.8%) admitting that their oral health problem affected what they ate. Some of the main concerns reported (multiple responses) included teeth that did not look right (broken, crooked or discoloured) (41.0%), dry mouth (40.1%) and sensitive teeth (32.5%). Other problems reported included missing teeth and dentures that did not fit (11.6%). There was no significant difference between participants reporting oral health problems and their socio-economic status. However, those who had private health insurance, lower income, had been diagnosed for more than four years and were older (> 65 years), had more self-reported problems. The majority of respondents (83.4%) noted that their dental health was important compared to their overall health. Many participants reported cleaning their teeth or dentures twice or more times per day (60.4%). Fluoride toothpaste was used by the majority of participants (90.9%) but only a third (34.6%) used dental floss or other aids to clean between their teeth (Table 2). Participants had a high confidence score in managing their oral health with a mean of 12 out of the maximum rating of 15.

Over half of the respondents had visited a dentist in the last 12 months (58.8%), and over one quarter of the participants reported their last dental visit was greater than two years prior to completing the questionnaire. The main dental services used by participants were private dentists (70.3%) compared to 21.8% who attended the public dental service. Only 10.7% received any information since their cardiac diagnosis (Table 2). Of all the participants with valvular conditions ($n = 32$) less than half (40.6% $n = 13$) reported receiving any oral health information but overall they were more likely to have received information compared to those with other cardiovascular conditions (40.6% versus 7.4%, $p < 0.001$).

Oral health knowledge

The mean correct responses for the 12 knowledge items was 6.2% (median 6, *SD* 2.8) indicating that only half of the participants had adequate oral health care knowledge. No significant difference in the oral health knowledge was observed among participants based on their socio demographic factors. However, the Pearson correlation revealed that there was a weak correlation ($r = 0.115$, $p = 0.041$) between the oral health knowledge and the participant's level of education. Similarly, a weak correlation ($r = 0.121$, $p = 0.031$) was observed between the participant's knowledge and whether they received oral health information in the cardiac setting. Areas of high awareness were about the need for regular dental visits when having a cardiac condition, regular flossing and

common signs of gum disease (loose teeth, bad breath) (68–75% correct responses). Areas where knowledge was poor included the effect of cardiac medications on dry mouth and gum overgrowth as well as the relationship between poor oral health and an existing cardiac condition (12–53% correct responses) (Fig. 1).

Discussion

The main purpose of this study was to gain insight into the oral health status, behaviour and knowledge of people with CVD.

Demographic characteristics of sample

The study sample reflected an even spread of participants from two ethnically and financially diverse areas in Sydney. Around half the participants in this study were from a lower socioeconomic group, were born overseas and spoke a language other than English at home. In Australia people with low income (AUS\$ < 61,035) are entitled to cheaper public transport, medicines and are eligible to public oral health services [33, 34]. Forty-five percent of participants in the study were eligible for public dental service which is consistent with population data in New South Wales (47%) [34]. Half of the participants completed year 12 or equivalent studies which is similar to population data for the study setting where 45.6% participants reported having secondary education or less [35, 36]. The study participants had similar characteristics with the Australian population of people with CVD in relation to a higher prevalence of males (6.9% compared to 4.6% for women) and similar types of cardiac conditions including coronary heart disease, heart failure and diseases of arteries/arterioles/capillaries [37].

Self-reported oral health status and behaviour

In the study sample the number of participants who reported having at least one oral health problem (81.8%) was of concern. While there is no specific data on the oral health status of patients with CVD, a report on oral health and dental care in Australia found 22.9% of dentate people aged 15 and over had moderate or severe periodontal disease [38]. Prevalence was higher in older adults; in those aged 45–64, rates were 35.3% increasing to 53.4% in those aged 65 and over [38]. Given atherosclerotic cardiovascular disease is associated with aging [1–3] it is likely that many of those with periodontal disease also had ASCVD.

In the current study 41.8% of participants reported their oral health problem affected what they ate which is higher than Australian data (23% of people aged over 65 years) [38]. Apart from the impact on quality of life [39] restricting foods because of pain and difficulty chewing could result in reduced intake of recommended hard foods such as fruits and vegetables which are essential for the prevention and management of CVD [40].

Table 2 Oral health status and behaviour of people with cardiovascular disease (*n* = 318)

Variables	Frequency (%)
Oral health status ^a	
Excellent	15 (4.7)
Very good	60 (18.9)
Good	103 (32.5)
Fair	99 (31.2)
Poor	40 (12.6)
Self-reported oral health problems	
One problem or more	260 (81.8)
Type of oral health problems ^b	
Teeth that don't look right (broken, crooked, discoloured)	130 (41.0)
Dry mouth	127 (40.1)
Sensitivity	103 (32.5)
Cavities	93 (29.3)
Toothache	65 (20.5)
Bleeding/swollen/painful gums	58 (18.3)
Loose teeth	46 (14.5)
Other problems	37 (11.6)
Dental problem affects what you eat	
Yes	133 (41.8)
Use of partial or full dentures	
Yes	16 (5.0)
Importance of oral health compared to overall health ^a	
Low importance (0–4)	23 (7.3)
Neutral (5)	29 (9.2)
Important to extremely important (6–10)	262 (83.4)
How often do you brush your teeth/dentures	
Few times a week	14 (4.4)
Less than once per day	6 (1.9)
Once a day	103 (32.4)
Twice or more times a day	192 (60.4)
Never	3 (0.9)
Oral hygiene products used ^b	
Fluoride toothpaste	289 (90.9)
Dental floss or other aids	110 (34.6)
Mouthwash	93 (29.2)
Sugar free chewing gum	36 (11.3)
None	10 (3.1)
Seen a dentist in the last 12 months	
Yes	187 (58.8)
When was your last dental visit	
< 1 year	187 (58.8)
> 1 year to 2 years	43 (13.5)
> 2 years to 5 years	43 (13.5)

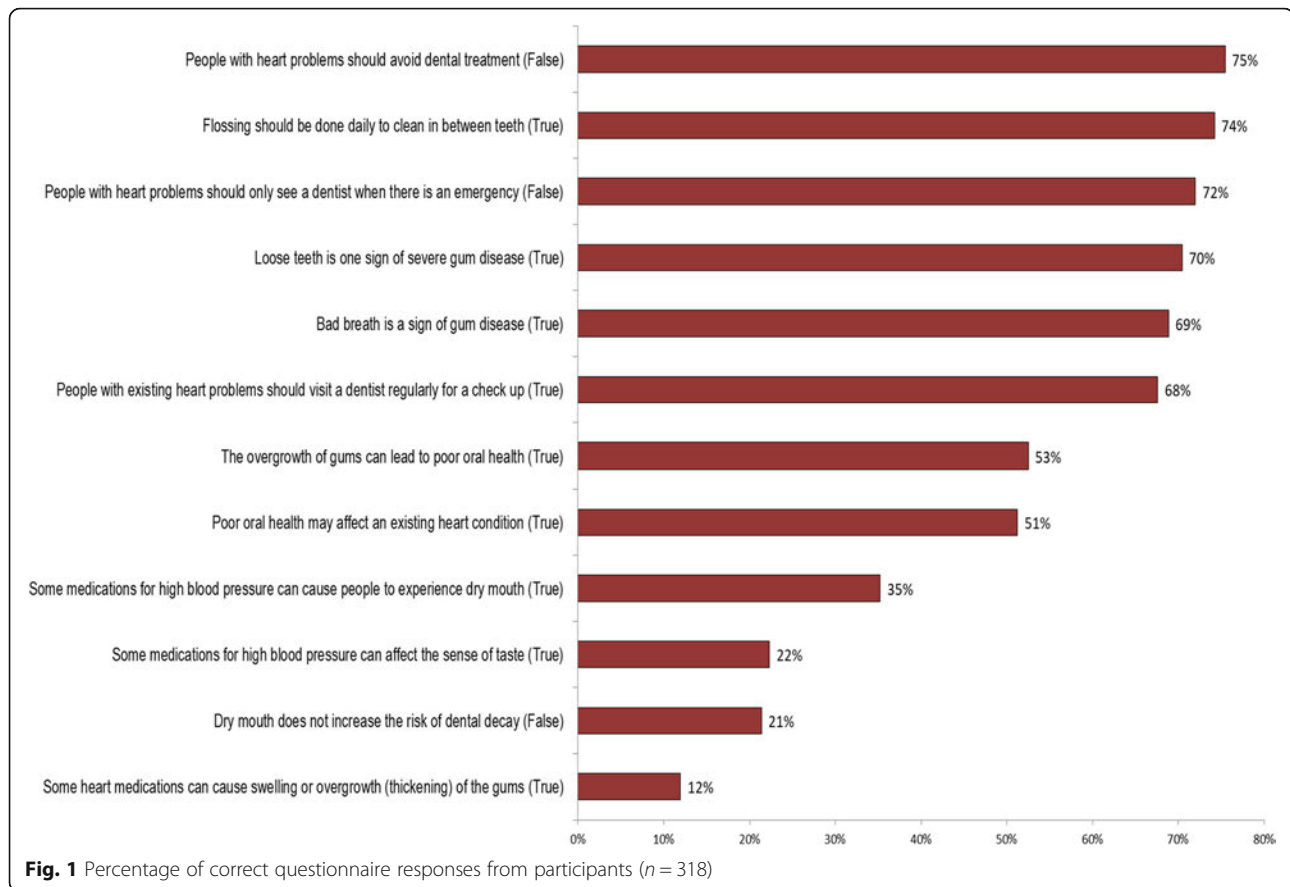
Table 2 Oral health status and behaviour of people with cardiovascular disease (*n* = 318) (*Continued*)

Variables	Frequency (%)
> 5 years	39 (12.3)
Don't know	6 (1.8)
Where do you most often see the dentist ^a	
Private clinic	222 (70.3)
Public clinic or hospital (government funded)	69 (21.8)
Other	16 (5.1)
Don't know	9 (2.8)
Received information about oral health care since diagnosis ^a	
Yes	34 (10.7)

^aMissing data (range 1–4); ^bMultiple responses

Overall, compared with the Australian general population the incidence of self-reported problems in the study sample was higher. One of the main reasons for this could be the poor socioeconomic status of nearly half the participants and their limited access to private health insurance. It is well documented in Australia that people with reduced income (<AUS\$60,000) and those not having private health insurance are more likely to have oral health problems such as untreated tooth decay and missing teeth, and the incidence is higher in older adults > 45 years [38]. Another contributing factor could be that patients in the sample had multiple co-morbidities such as endocrinology and metabolic disorders, including diabetes, which is associated with a high incidence of periodontal disease [41]. Furthermore, even though data on medications was not collected, it is likely that the participants in the study were taking a variety of cardiac medications putting them at a higher risk for gingival and periodontal pathology [10, 11, 42]. A common issue associated with calcium channel blocker agents is gingival enlargement (hyperplasia) which can lead to tooth loss due to increased incidence of periodontal disease [43, 44]. Beta-blockers are associated with mucosal lesions [45]. The problems identified in the study sample reflect the type and incidence of oral health problems linked to cardiac medications. In the study only 5% of participants used partial or full dentures but this can also be associated with problems such as denture-associated stomatitis and other mucosal lesions with systemic consequence [46].

In Australia there is no data on the oral health care uptake for people with CVD but oral health seeking behaviour of Australian general population from 2013 reported 55.2% of adults aged 22–44 visited the dentist in the previous 12 months with the number increasing as people were older, (63.8% for age 45–64 and 70.1% for age > 65) [38]. The uptake of dental services by the study participants in the previous 12 months was lower for the same age groups but the age trend was similar, increasing by age. To our



knowledge only one study internationally has explored the uptake of dental services among patients with CVD and the reported rate (38%) was lower than this study (59%) [30]. Participants had a high confidence level in oral self-care (mean 13, SD 2.2, range 2–15) and it was encouraging to see that two thirds reported good oral hygiene habits such as regular tooth brushing and flossing. This is particularly important as studies show that these habits are associated with reduced risk factors for CVD [47–49].

Of concern however was that only 10.7% of participants reported receiving any oral health information since being diagnosed with a cardiac condition. Even in participants with a valvular condition who are required to have dental clearance prior to surgery [50, 51], less than half reported receiving information. People who require dental clearance should be provided with oral health information. These findings confirm earlier qualitative reports [52] and strongly suggest that people with cardiac conditions are not receiving any oral health information in the cardiac setting. It is also possible that people with CVD who had limited knowledge about the potential impact of poor oral health on cardiac condition (51%) may not have prioritised any oral health information provided. Recent studies have also identified potential barriers that could be contributing to this problem

which include lack of oral health awareness by patients and cardiac care clinicians, lack of training by clinicians, limited oral health resources on CVD, as well as time constraints among cardiac care providers [15, 24].

Oral health knowledge

It is worrying that only half the participants knew the impact of oral health and ASCVD. Unfortunately, there is no comparable population data about the oral health knowledge of people with CVD in Australia. Looking into other populations in Australia it has been shown that a number of pregnant women (53%) are unaware of the association between poor oral maternal health and pregnancy outcomes [29]. Similar observations have been reported internationally though, with studies showing a lack of knowledge around the relationship between oral health and heart conditions among caretakers of children with heart diseases (49–90%) as well as patients with CVD (42%) [19–23]. The poor knowledge observed in this study could be linked to the lack of oral health resources and information provided in the cardiac setting. Despite current national oral health plans, there is limited availability of evidence based oral health promotional resources in the cardiac setting [18, 53]. It appears current policies and guidelines are not meeting the oral

health needs of people with cardiovascular conditions [53]. This is supported by a recent scoping review which found that in Australia, as well as internationally, people with CVD are not offered routine oral health education, assessment and prompt referral when treatment may be required [15].

Limitations

Data reported in this study is based on self-reported information of patients who sought cardiac health service from two local health areas in the Sydney region, so this limits the ability to determine the actual prevalence of oral health problems among this population. However, the two areas had a diverse population and hence we have a reasonable level of generalisability. In addition, even though the use of convenience sampling limits the generalisability (external validity) of the findings of this study, we do not believe convenience sampling poses a significant threat to the internal validity of this study, as this sampling method has been mathematically shown to be as accurate as random sampling when recruiting patients attending clinics for their health appointment [54]. Another study limitation is that some people with limited English language may have been excluded from the study even though all attempts were made to include those using professional interpreters or family members. As such the findings may not be generalizable to culturally and linguistically diverse populations with CVD who have oral health problems. Due to the lack of existing tools to explore this aspect of cardiac care, the questionnaire used for this study was not validated and hence further research is needed to confirm the study findings. In summary, the scope of this paper was to present descriptive data related to knowledge, oral health status and behaviour. Multivariate statistical analysis examining the predictors of accessing oral health care for this population has been undertaken and reported elsewhere [55]. Despite these limitations the findings do provide valuable insight into this under researched area and pave the way for future validation studies to be undertaken using the study questionnaire.

Recommendations

To address some of the issues identified in this study a multidimensional approach is needed. The development and incorporation of evidence-based oral health resources for cardiac care clinicians and patients are needed in the cardiac setting. The availability of information and resources influence behavioural choices therefore if oral health is promoted among people with cardiac conditions perhaps they would be more knowledgeable and proactive regarding their oral health. It is also essential to identify barriers that may be impeding access to oral health care for people with CVD and explore their perceptions of incorporating oral health in

the cardiac setting. A number of other factors need to be considered when developing strategies in this area and include the affordability and accessibility of dental care for people with CVD. Future related studies should also consider obtaining information regarding cardiac medications used by people with CVD due to the common adverse effects it can have on the oral cavity.

Conclusions

There is limited data concerning the oral health status and behaviour of people with CVD. Our findings suggest that people with CVD may have a high prevalence of self-reported oral health problems and poor knowledge about the importance of oral health particularly about the link between periodontal disease and CVD and the effect that some cardiac medications may have on oral health. Results of this study also suggest that people with CVD may not be receiving adequate oral health information from cardiac care providers after diagnosis. Exacerbating this situation could be the limited uptake of dental services and access to affordable dental care among people with CVD. Further research is warranted to confirm the study findings and the need for strategies to improve the oral health of people with CVD.

Additional file

Additional file 1: Participant questionnaire. This file includes the questionnaire completed by participants in the study (PDF 269 kb)

Abbreviations

ASCVD: Atherosclerotic cardiovascular disease; CVD: Cardiovascular disease; ICD-10: International Statistical Classification of Diseases and Related Health Problems 10th Revision; IQR: Inter quartile range; SPSS: Statistical Package for the Social Sciences

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Availability of data and materials

The de-identified datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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Authors' contributions

PS, YS, BE, JR, AG contributed to the study conception, design, data analysis, manuscript preparation and important intellectual content. SA, SB, JB, KL, SN, RR, MS, FS, LS, RS contributed with the data collection, analysis, manuscript preparation and revision as well as intellectual content. All authors have read and approved the final manuscript.

Authors' information

Not applicable.

Ethics approval and consent to participate

Ethical approval was obtained by the Sydney and South Western Sydney Local Health District Human Research Ethics Committees (LNR/16/LPOOL/499). Subjects were invited to participate in the study and those consenting in writing were provided with the self-administered questionnaire to complete.

Consent for publication

Not applicable.

Competing interests

No conflict of interest has been declared by the authors.

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References

- Beukers NG, van der Heijden GJ, van Wijk AJ, Loos BG. Periodontitis is an independent risk indicator for atherosclerotic cardiovascular diseases among 60 174 participants in a large dental school in the Netherlands. *J Epidemiol Community Health*. 2017;71(1):37–42.
- Tonetti MS, Dyke TE. Periodontitis and atherosclerotic cardiovascular disease: consensus report of the joint EFP/AAP workshop on periodontitis and systemic diseases. *J Clin Periodontol*. 2013;40(s14):S24–S9.
- Papapanou PN. Systemic effects of periodontitis: lessons learned from research on atherosclerotic vascular disease and adverse pregnancy outcomes. *Int Dent J*. 2015;65(6):283–91. <https://doi.org/10.1111/idj.12185>.
- Genco RJ, Borgnakke WS. Risk factors for periodontal disease. *Periodontol* 2000. 2013;62(1):59–94. <https://doi.org/10.1002/JPER.18-0538>.
- Petersen PE, Ogawa H. The global burden of periodontal disease: towards integration with chronic disease prevention and control. *Periodontol* 2000. 2012;60(1):15–39. <https://doi.org/10.1038/s41467-018-07805-7>.
- Eke PI, Dye BA, Wei L, Slade GD, Thornton-Evans GO, Borgnakke WS, et al. Update on Prevalence of Periodontitis in Adults in the United States: NHANES 2009–2012. *J Periodontol*. 2015;0:1–18.
- Baehni P, Tonetti M. Conclusions and consensus statements on periodontal health, policy and education in Europe: a call for action—consensus view 1. *Eur J Dent Educ*. 2010;14(s1):2–3.
- El Kholy K, Genco RJ, Van Dyke TE. Oral infections and cardiovascular disease. *Trends Endocrinol Metab*. 2015;26(6):315–21. <https://doi.org/10.1016/j.tem.2015.03.001>.
- Chrisopoulos S, Harford J. Oral health and dental care in Australia: key facts and figures 2012. Australian Institute of Health and Welfare. 2013. Cat. No. DEN 224. Canberra: AIHW.
- Torpet LA, Kragelund C, Reibel J, Nauntofte B. Oral adverse drug reactions to cardiovascular drugs. *Crit Rev Oral Biol Med*. 2004;15(1):28–46.
- Nonzee V, Manopatanakul S, S-oP K. Xerostomia, hyposalivation and oral microbiota in patients using antihypertensive medications. *J Med Assoc Thai*. 2012;95(1):96. https://doi.org/10.1007/978-3-319-43896-2_6.
- Demmer RT, Trinquart L, Zuk A, Fu BC, Blomkvist J, Michalowicz BS, et al. The influence of anti-infective periodontal treatment on C-reactive protein: a systematic review and meta-analysis of randomized controlled trials. *PLoS One*. 2013;8(10):e77441. <https://doi.org/10.1371/journal.pone.0077441>.
- Orlandi M, Suvan J, Petrie A, Donos N, Masi S, Hingorani A, et al. Association between periodontal disease and its treatment, flow-mediated dilatation and carotid intima-media thickness: a systematic review and meta-analysis. *Atherosclerosis*. 2014;236(1):39–46. <https://doi.org/10.1016/j.atherosclerosis.2014.06.002>.
- Teeuw WJ, Slot DE, Susanto H, Gerdes VE, Abbas F, D'Aiuto F, et al. Treatment of periodontitis improves the atherosclerotic profile: a systematic review and meta-analysis. *J Clin Periodontol*. 2014;41(1):70–9. <https://doi.org/10.1111/jcpe.12171>.
- Sanchez P, Everett B, Salamonson Y, Ajwani S, George A. Oral healthcare and cardiovascular disease: a scoping review of current strategies and implications for nurses. *J Cardiovasc Nurs*. 2017;32(3):E10–20. <https://doi.org/10.1097/JCN.0000000000000388>.
- Friedewald VE, Kornman KS, Beck JD, Genco R, Goldfine A, Libby P, et al. The American journal of cardiology and journal of periodontology editors' consensus: periodontitis and atherosclerotic cardiovascular disease. *J Periodontol*. 2009;80(7):1021–32. <https://doi.org/10.1902/jop.2009.097001>.
- Bouchard P, Boutouyrie P, D'Aiuto F, Deanfield J, Deliairgyris E, Fernandez-Avilés F, et al. European workshop in periodontal health and cardiovascular disease consensus document. *Eur Heart J Suppl*. 2010;12(B), doi: <https://doi.org/10.1021/acs.inorgchem.8b02861>.
- NSW Ministry of Health. Oral Health 2020: A Strategic Framework for Dental Health in NSW. In: Centre for Oral Health Strategy NSW, editor. New South Wales Australia. 2013.
- Rasouli-Ghahroudi AA, Khorsand A, Yaghobee S, Rohn A, Jalali M, Masudi S, et al. Oral health status, knowledge, attitude and practice of patients with heart disease. *ARYA Atherosclerosis*. 2016;12(1):1.
- Rai K, Hegde A. Oral health status of children with congenital heart disease and the awareness, attitude and knowledge of their parents. *J Clin Pediatr Dent*. 2009;33(4):315–8. <https://doi.org/10.17796/jcpd.33.4.2j108w0225241867>.
- Suma G, Mohan Das U, Ambika G, Jairanganath. Oral health status of normal children and those affiliated with cardiac diseases. *J Clin Pediatr Dent*. 2011;35(3):315–8. <https://doi.org/10.17796/jcpd.35.3.b316g17n57445473>.
- Da Silva D, Souza I, Cunha M. Knowledge, attitudes and status of oral health in children at risk for infective endocarditis. *Int J Paediatr Dent*. 2002;12(2): 124–31. <https://doi.org/10.1046/j.1365-263X.2002.00335.x>.
- Zafar S, Yasin S, Siddiqi A, Naz F. Oral health status of paediatric cardiac patients: a case-control study. *Int Dentistry Sa*. 2008;10:6.
- Sanchez P, Everett B, Salamonson Y, Ajwani S, Bhole S, Bishop J, et al. Perceptions of cardiac care providers towards oral health promotion in Australia. *Collegian*. 2017. <https://doi.org/10.1016/j.collegn.2017.11.006>.
- Anderson R. Revising the behavioural model and access to medical care: does it matter? *J Health Soc Behav*. 1995;36(1):1–10 doi:2137284.
- Habbab K, Moles D, Porter S. Potential oral manifestations of cardiovascular drugs. *Oral Dis*. 2010;16(8):769–73. <https://doi.org/10.1111/j.1601-0825.2010.01686.x>.

27. Pandey S, Chawla D. Using qualitative research for establishing content validity of e-lifestyle and website quality constructs. *Qual Mark Res Int J*. 2016;19(3):339–56. <https://doi.org/10.1108/QMR-05-2015-0033>.
28. Patten ML. Questionnaire research: a practical guide. NY USA: Routledge; 2016. <https://doi.org/10.1080/87565641.2016.1243113>.
29. George A, Johnson M, Blinkhorn A, Ajwani S, Bhole S, Yeo A, et al. The oral health status, practices and knowledge of pregnant women in South-Western Sydney. *Aust Dent J*. 2013;58(1):26–33. <https://doi.org/10.1111/adj.12024>.
30. Virdee P. Improve uptake of care. *Br Dent J*. 2006;201(3):132–3. <https://doi.org/10.1038/sj.bdj.4813891>.
31. IBM SPSS. Statistics for windows version 24.0. IBM Corp: Armonk NY; 2016.
32. World Health Organization. International Statistical Classification of Diseases and Related Health Problems 10th Revision: World Health Organization; 2016.
33. Australian Government Department of Human Services. Income test for low income health care card Australia 2017 [updated 27 August 2017]. <https://www.humanservices.gov.au/individuals/enablers/income-test-low-income-health-care-card>. Accessed 9 Sep 2017.
34. Centre for Oral Health Strategy. Eligibility of persons for public oral health care in NSW: Policy directive. Doc No PD2017_027. Publication date 15 August 2017. File number DG17/4367.
35. SWSLHD. Health profile of local communities 2014. Sydney: SWSLHD; 2014. https://doi.org/10.1007/978-3-319-02475-2_2.
36. Sydney Local Health District. A Picture of Health Sydney Local Health District Health Profile 2015. Sydney Australia: NSW Government. p. 2015.
37. Nichols M, Peterson K, Herbert J, Alston L, Allender S. Australian Heart Disease Statistics 2015: National Heart Foundation of Australia; 2016.
38. Australian Institute of Health and Welfare, Chrisopoulos S, Harford J, Ellershaw A. Oral health and dental care in Australia: key facts and figures 2015. Canberra: AIHW; 2016 28 January 2016. Report No.: Cat. no. DEN 229.
39. Chapple IL, Van der Weijden F, Doerfer C, Herrera D, Shapira L, Polak D, et al. Primary prevention of periodontitis: managing gingivitis. *J Clin Periodontol*. 2015;42(S16). <https://doi.org/10.1016/j.jeururo.2018.11.013>.
40. Eckel RH, Jakicic JM, Ard JD, de Jesus JM, Miller NH, Hubbard VS, et al. 2013 AHA/ACC guideline on lifestyle management to reduce cardiovascular risk: a report of the American College of Cardiology/American Heart Association task force on practice guidelines. *J Am Coll Cardiol*. 2014;63(25 part B):2960–84.
41. Southerland JH, Moss K, Taylor GW, Beck JD, Pankow J, Gangula PR, et al. Periodontitis and diabetes associations with measures of atherosclerosis and CHD. *Atherosclerosis*. 2012;222(1):196–201. <https://doi.org/10.1016/j.atherosclerosis.2012.01.026>.
42. Kumar P, Mastan K, Chowdhary R, Shanmugam K. Oral manifestations in hypertensive patients: a clinical study. *J Oral and Maxillofac Pathol: JOMFP*. 2012;16(2):215. <https://doi.org/10.4103/0973-029X.99069>.
43. Fardal Ø, Lygre H. Management of periodontal disease in patients using calcium channel blockers—gingival overgrowth, prescribed medications, treatment responses and added treatment costs. *J Clin Periodontol*. 2015; 42(7):640–6. <https://doi.org/10.1111/jcpe.12426>.
44. Nagata T, Ninomiya M, Mihara C, Kido J, Nishikawa S, Kataoka M. Etiology of drug-induced gingival overgrowth. *Current Issues in Periodontics*. 2016;37.
45. Clayton R, Chaudhry S, Ali I, Cooper S, Hodgson T, Wojnarowska F. Mucosal (oral and vulval) lichen planus in women: are angiotensin-converting enzyme inhibitors protective, and beta-blockers and non-steroidal anti-inflammatory drugs associated with the condition? *Clin Exp Dermatol*. 2010; 35(4):384–7. <https://doi.org/10.1111/j.1365-2230.2009.03581.x>.
46. Ajwani S, Mattila KJ, Tilvis RS, Ainamo A. Periodontal disease and mortality in an aged population. *Spec Care Dentist*. 2003;23(4):125–30. <https://doi.org/10.1111/j.1754-4505.2003.tb00297.x>.
47. Reichert S, Schlitt A, Beschow V, Lutze A, Lischewski S, Seifert T, et al. Use of floss/interdental brushes is associated with lower risk for new cardiovascular events among patients with coronary heart disease. *J Periodontol Res*. 2015; 50(2):180–8. <https://doi.org/10.1111/jre.12191>.
48. De Oliveira C, Watt R, Hamer M. Toothbrushing, inflammation, and risk of cardiovascular disease: results from Scottish health survey. *Br Med J*. 2010;340.
49. Kuwabara M, Motoki Y, Ichiura K, Fujii M, Inomata C, Sato H, et al. Association between toothbrushing and risk factors for cardiovascular disease: a large-scale, cross-sectional Japanese study. *BMJ Open*. 2016;6(1): e009870. <https://doi.org/10.1136/bmjopen-2015-009870>.
50. Gandhi N, Silvey G. How important is dental clearance for elective open heart operations? *Ann Thorac Surg*. 2015;99(1):377. <https://doi.org/10.1016/j.athoracsur.2014.04.145>.
51. Stefanac S. Having heart surgery? Why good dental health matters [website]. Michigan USA: Michigan Health; 2016. <http://healthblog.uofmhealth.org/heart-health/having-heart-surgery-why-good-dental-health-matters>. Accessed 11 Sep 2017
52. Sanchez P, Everett B, Salamonson Y, Ajwani S, Bhole S, Bishop J, et al. Oral health and cardiovascular care: perceptions of people with cardiovascular disease. *PlosOne*. 2017;12(7):e0181189. <https://doi.org/10.1371/journal.pone.0181189>.
53. Council of Australian Government Health Council. Healthy Mouths, Healthy Lives: Australia's National Oral Health Plan 2015–2024. In: COAG Health Council. Adelaide SA; 2015. p. 1–105.
54. Hedt B. L, M Pagano. Health indicators: eliminating bias from convenience sampling estimators. *Stat Med* 2011;30(5):560–568, doi: <https://doi.org/10.1002/sim.3920>.
55. Sanchez P, Salamonson Y, Everett B, George A. Barriers and predictors associated with accessing oral health care among patients with cardiovascular disease in Australia. *Journal of Cardiovascular Nursing*. 2018; JCN-D-18-00125. In Print.

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Thesis Paper 5

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7.5 Aims: Thesis Paper 5

The aim of this paper was to identify the barriers to and predictors of seeking oral healthcare among patients with CVD.

The study questions addressed in this paper were:

- 1) What is the prevalence of accessing oral healthcare among patients with CVD?
- 2) What are the perceived barriers to accessing oral healthcare?
- 3) What predictive factors are associated with a dental visit in the last 12 months?

7.6 Conclusion: Thesis Paper 5

The publication, 'Barriers and predictors associated with accessing oral healthcare among patients with cardiovascular disease in Australia,' highlighted key issues of affordability for dental care as well as a lack of oral health awareness. Despite a high prevalence of self-reported oral health problems, just over half of the patients with CVD are seeking regular dental care. A relevant finding was that receiving information (knowledge) about oral health in the cardiac setting was a significant predictor of seeking dental care services for patients with CVD. The findings also identified that there is a need for greater emphasis on oral health in the cardiac care setting as well as an appropriate dental referral pathway for cardiac patients.

The next chapter presents the remaining unpublished quantitative results from the survey.

7.7 Thesis Paper 5

Barriers and Predictors Associated With Accessing Oral Healthcare Among Patients With Cardiovascular Disease in Australia

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Background: Periodontal disease is associated with cardiovascular disease, and patients should be aware of this risk and seek dental care. **Objective:** In this study, the authors sought to identify the barriers and predictors for seeking oral healthcare among patients with cardiovascular disease. **Methods:** With the use of a cross-sectional descriptive study design, 307 patients with cardiovascular disease attending cardiac rehabilitation/outpatient cardiac clinics were surveyed between 2016 and 2017 in Sydney, Australia. Survey items included the prevalence of accessing dental services and a new “barriers to seeking frequent dental care” scale. **Results:** Most respondents (81%) reported at least 1 oral health problem, yet only 10% received any oral health information and more than half (58%) saw a dentist in the preceding 12 months. The barriers to seeking frequent dental care scale was internally consistent (Cronbach’s $\alpha = 0.82$) with 2 subscales, identified as personal-related and system-related barriers to accessing oral healthcare. Respondents were more likely to have seen a dentist in the previous 12 months if they received oral health information (adjusted odds ratio [AOR], 5.08; 95% confidence interval [CI], 1.62–15.93), had private health insurance (AOR, 3.33; 95% CI, 1.91–5.83), reported low barriers (AOR, 2.68; 95% CI, 1.61–4.47), or were born overseas (AOR, 2.13; 95% CI, 1.25–3.63). **Conclusions:** The accessibility and affordability of dental care, as well as lack of oral health awareness, are key barriers and predictors for patients with cardiovascular disease accessing dental care. Greater emphasis on oral health is needed in the cardiac setting, along with appropriate dental referral pathways.

KEY WORDS: Periodontal diseases, cardiovascular diseases, oral health, health services, oral, health barriers

Oral healthcare is important for people diagnosed with cardiovascular disease (CVD), and international guidelines recommend that health professionals provide oral health advice, risk assessment and dental referrals in the cardiac setting.^{1,2} Patients with CVD

need to be aware of the negative impact that poor oral health, particularly periodontal disease, can have on cardiovascular outcomes.³ Periodontal disease is a common oral chronic inflammatory condition affecting the tooth supporting tissues and bone.⁴ It is associated

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with atherosclerotic CVD, including myocardial infarction, stroke, peripheral vascular disease, coronary heart disease, and cardiovascular mortality.³ This association has been linked to a systemic inflammatory response to periodontal bacteria, leading to the formation, development, and rupture of atheroma.⁵

Research also shows that periodontal treatment can have a positive effect on inflammatory biomarkers (C-reactive protein, interleukin-6, tissue necrosis factor- α , and fibrinogen) and on endothelial function by reducing systemic inflammation and increasing carotid-intima-media thickness, therefore improving flow-mediated dilatation.⁶ In addition, there is evidence to suggest that periodontal treatment favorably impacts on low-density and high-density lipoprotein cholesterol as well as triglyceride levels.⁷ Although recent systematic reviews have not found conclusive evidence to support the benefits of periodontal treatment on long-term CVD outcomes,⁸ the beneficial effects on CVD biomarkers highlight the importance of early recognition and management of periodontal pathologies in this population.

Despite current evidence and recommendations in this area, studies show that patients with CVD have limited oral health knowledge and few seek dental care even when they have poor oral health.^{9,10} This issue is particularly evident in Australia, with a recent qualitative study of patients with CVD suggesting that the main barriers to seeking dental care are lack of awareness, high cost of dental treatment, and difficulty accessing public dental services.¹⁰ Known factors that influence health-seeking behavior include sociodemographic characteristics and economic and access factors.^{11,12} Therefore, to address these issues, it is important to confirm the key factors deterring patients with CVD from seeking dental care in Australia.

Aim

The aim of this study is to identify the barriers and predictors associated with accessing oral healthcare among patients with CVD in Australia.

The study questions include the following:

1. What is the prevalence of accessing oral healthcare among patients with CVD?
2. What are the perceived barriers to accessing oral healthcare?
3. What predictive factors are associated with a dental visit in the last 12 months?

Methods

Study Design

A cross-sectional descriptive design was used for the study.

Setting, Sample and Data Collection

A structured, self-administered questionnaire was distributed to interested patients diagnosed with CVD

attending cardiac appointments (outpatient and rehabilitation) across 4 metropolitan hospitals and 4 private and public cardiology clinics in Sydney, Australia, between December 2016 and March 2017. The study sites were located across both affluent and disadvantaged areas of Sydney to ensure representative sampling was from diverse areas and had varied socioeconomic status. Dental stalls containing oral sample products, leaflets, and information about the project were located in the waiting rooms of each of the 8 sites. The stalls were manned by data collectors, which included the chief investigator (P.S.) and 2 dental assistants who were trained in data collection. Patients approaching the stall were offered oral health information and products, and the purpose of the project was explained by the data collectors. Participation was voluntary, and dental health products and information were provided regardless of study participation. Completion of the questionnaire took approximately 15 minutes. The inclusion criteria included people with a diagnosis of CVD who were English speaking and older than 18 years. People who had limited English and who did not have a person (family member or certified interpreter) who could interpret the questionnaire at the time of data collection were excluded from the study. Ethical approval was obtained by the Sydney Local Health District and South Western Sydney Local Health District human research ethics committees (LNR/16/LPOOL/499).

The Questionnaire

The questionnaire reported in this article included sociodemographic and clinical information, prevalence of accessing dental services, and perceived barriers for not seeking frequent dental care. These items were developed based on Andersen's model of healthcare utilization, which is a conceptual model that outlines 3 broad factors that influence the use of health services, namely, predisposing factors (age, ethnicity, and health beliefs), enabling factors (access to health insurance and family support), and need (perceived and actual need for healthcare services).¹³ A period of 12 months was selected as the minimum time for a dental visit as recommended in Australia.¹⁴ Other information collected in the questionnaire, including oral health status, knowledge, and behaviors, have been reported elsewhere¹⁵ (see Supplemental Digital Content, <http://links.lww.com/JCN/A71>: Questionnaire).

Item generation for the barriers to seeking frequent dental care (BASAC) scale was derived from 2 previous qualitative Australian studies that were undertaken in the same study setting. These studies explored patients' and cardiac care clinicians' perceptions of barriers to seeking dental care.^{10,16} Their responses guided the development of the 11-item BASAC scale used in this questionnaire. Items included personal-related and system-related barriers to accessing regular dental care.

An expert panel of clinicians, academics, and educators in the fields of dentistry, cardiology, and allied health reviewed the initial questionnaire for content validity. The instrument was then piloted with 6 patients with CVD (not participating in the study). The panel undertook a final review of the questionnaire for clarity and readability. This resulted in some minor changes to the wording of the items. All 11 items of the BASAC scale were retained and placed on a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*) for participants' responses.

Statistical Analysis

Data were analyzed using SPSS version 24.¹⁷ The factor structure of the 11-item BASAC scale was examined using exploratory factor analysis with principal axis factoring, and scree plot was used to determine the number of factors to be extracted. The internal consistency of this scale was computed using Cronbach's α . Multivariate logistic regression analysis (backward method) was performed using 10 variables to examine for predictors that were associated with visiting a dentist in the last 12 months. Before inclusion in the regression model, continuous variables were dichotomized at the median value as none of these variables were normally distributed. The included variables were (a) age (up to 69 years/>69 years); (b) gender (male/female); (c) private health insurance status (yes/no); (d) country of birth (Australian born/born overseas); (e) dental problems (nil/ ≥ 1 dental problem); (f) oral health knowledge score (up to 12/>12); (g) the median score of the system-related barrier subscale, used to indicate "low" and "high" system-related barriers (up to 3.3/> 3.3); (h) the median score of the personal-related barrier subscale, used to indicate "low" and "high" personal-related barriers (up to 1.5/>1.5); (i) social support score (up to 4/>4); and (j) information received about oral health (yes/no). Results were summarized as adjusted odds ratios (AORs) with 95% confidence intervals (CIs). Nagelkerke R^2 was used to determine the strength of association of variables in the model, and the Hosmer-Lemeshow test, to determine the goodness of fit of the model.

Because of the lack of relevant research in Australia, the uptake of dental services in other populations at risk of poor oral health (like pregnant women) was used to inform the sample size estimation. In a recent study, 30% of pregnant women in Australia were reported to have visited the dentist in the last 12 months.¹⁸ In view of those with CVD being older and more likely to have dental problems, we estimated that 40% of respondents would have had a dental visit. Hence, the sample size calculation, based on Peduzzi et al (1996) of $N = 10 k/p$ (where N is the minimum number of cases needed, k is the number of predictor variables, and p is the proportion of dental visits in the last 12 months),¹⁹

the minimum number of cases required was 250. Allowing for 20% missing data, a sample size of 300 was required.

Results

Characteristics of the Respondents

A total of 318 patients responded to the survey, of which 307 surveys were completed with no missing data. The mean (SD) age of responders was 63 (14.6) years, and approximately two-thirds (63%) had coronary artery disease. More than half of the participants (52.8%) reported oral health problems related to periodontal disease, including bleeding gums; swollen gums; painful gums; and loose, missing, and/or sensitive teeth. Other

TABLE 1 Characteristics of Respondents (n = 307)

Variables	
Age in years, mean [median] (SD) (range, 18–94)	63.4 [65] (14.6)
Sex, n (%)	
Male	185 (60.3)
Country of birth, n (%)	
Australia	132 (43.0)
Marital status, n (%)	
Living with a partner	205 (67.2)
Language spoken at home, n (%)	
English	180 (58.6)
Employment status, n (%)	
Not working	207 (68.1)
Income, n (%)	
<AU\$40 000	151 (49.2)
AU\$40 000–AU\$80 000	59 (19.2)
AU\$80 000–AU\$120 000	34 (11.1)
>AU\$120 000	24 (7.8)
Preferred not to answer	39 (12.7)
Private health insurance, n (%)	
Yes	112 (36.6)
Eligible for public dental service, n (%)	
Yes	131 (45.5)
Cardiovascular condition(s) (not mutually exclusive), n (%)	
Coronary artery disease	194 (63.2)
Arrhythmias	92 (30.0)
Heart failure	41 (13.4)
Valvular condition	31 (10.1)
Self-reported oral health problems, n (%)	
≥ 1 problem	250 (81.4)
Seen a dentist in the last 12 mo, n (%)	
Yes	179 (58.3)
Received oral health information since cardiac diagnosis, n (%)	
Yes	32 (10.4)
Not seeking frequent dental care, mean [median] (SD) (range, 1–7)	2.3 [2.1] (1.1)
System barriers, median (range: 1–7)	3.3
Personal barriers, median (range 1–7)	1.5
Have support to access dental care, mean [median] (SD) (range, 1–5)	4.0 [4.0] (1.2)

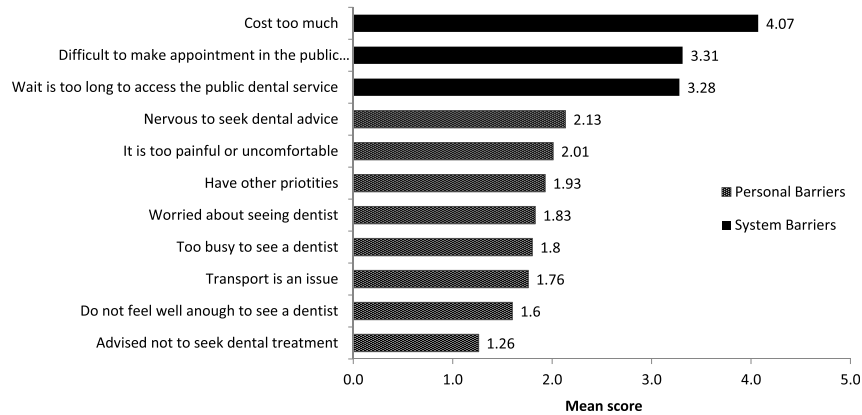


FIGURE 1. Reasons for not seeking frequent dental care among responders (1–7 Likert scale: 1 = strongly disagree to 7 = strongly agree).

problems, not mutually exclusive, included cosmetic-related issues (31.8%), such as broken, crooked, and/or discolored teeth, and tooth decay–related issues (23%), such as cavities and toothache. Dry mouth was reported by 40% of the participants. More than half (58%) had seen a dentist in the last 12 months, and of these, 70% had visited a private dental clinic. Table 1 summarizes the other characteristics of respondents.

Reliability and Validity of the BASAC Scale

Factor analysis determined 2 factors that aligned with the theoretically postulated number of constructs. The first factor with 8 items was related to personal-related barriers (Eigenvalue, 4.1) and accounted for 24.3% of variance, whereas the second factor with 3 items was related to system barriers (Eigenvalue, 1.7) and accounted for 19.2% of the variance. All 11 items of the BASAC scale loaded significantly on these 2 factors, with factor loadings ranging from 0.40 to 0.71 for the personal-related barriers factor and loadings of 0.59 to 0.90 for the system-related barriers factor. The Cronbach's α coefficient of the overall 11-item BASAC scale was .82, with .80 for the 8-item personal-related subscale and .83 for the 3-item system-related subscale, indicating good internal consistency of the scale and subscales.

Barriers to Dental Visits

Figure 1 illustrates the mean scores for each of the 11 items of the BASAC scale, indicating reasons for not

seeing the dentist in the previous 12 months. Results indicate that system-related barriers such as cost and accessing the public dental service rated higher than personal issues.

Predictors of Dental Visits

As shown in Table 2, 4 variables emerged as significant and independent predictors of having seen a dentist in the previous 12 months. These were (a) having received information about oral health (AOR, 5.08; 95% CI, 1.62–15.93); (b) having private health insurance (AOR, 3.33; 95% CI, 1.91–5.83); (c) low system-related barriers (AOR, 2.68; 95% CI, 1.61–4.47); and (d) being overseas-born (AOR, 2.13; 95% CI, 1.25–3.63). These factors explained 21.8% of the total model variance (Nagelkerke $R^2 = 0.218$). The Hosmer-Lemeshow goodness-of-fit test had a χ^2 of 2.027 ($df = 7, P = .958$), indicating a good model fit.

Discussion

The purpose of this study was to identify the barriers and predictors associated with accessing oral health-care among patients with CVD in Australia. Exploring this aspect of cardiac care is important, as there is a high prevalence of self-reported oral health problems among this population compared with the Australian general population.¹⁴ Possible reasons for this trend have been discussed in an earlier related study and include poor socioeconomic status, multiple comorbidities, and the

TABLE 2 Independent Predictors of Seeing a Dentist in the Last 12 Months

Variables	Coefficient (B)	SE	Adjusted Odds Ratio (95% CI)	P
Seen by dentist in the last 12 months				
Received information since diagnosis	1.62	0.58	5.08 (1.62–15.93)	0.005
Have private health insurance	1.20	0.29	3.33 (1.91–5.83)	<0.001
Having low barriers	0.99	0.26	2.68 (1.61–4.47)	<0.001
Non-Australian-born	0.76	0.27	2.13 (1.25–3.63)	0.005

Nagelkerke $R^2 = 0.218$, Hosmer-Lemeshow goodness of fit for the model, $\chi^2 = 2.03$, 7 df ($P = .958$).

Abbreviation: CI, confidence interval.

side effects of cardiac medications, such as dry mouth, putting them at higher risk of dental problems.¹⁰ The findings from this study confirm that despite more than 80% reporting dental problems, only 58% of patients with CVD are seeking regular dental care. Unfortunately, there is no comparable population data on oral healthcare uptake for people with CVD in Australia. Available data from the Australian general population indicate that in 2013, 60% of adults 15 years or older had a dental visit in the previous 12 months.¹⁴

The newly developed 11-item BASAC scale was found to be valid and reliable in identifying barriers for not seeking regular dental care in the Australian cardiac population. The findings revealed that system-related barriers were more of a challenge than personal-related issues, with cost and accessibility to dental services identified as major issues by responders. Financial and organizational barriers have been identified worldwide as a major reason for people not seeking regular dental care or for not complying with recommended treatment.²⁰ In Australia, oral healthcare is available through numerous pathways. Most Australians (approximately 85%) attend dental care privately, where patients pay the full cost of the service, which can be very expensive and unaffordable for many Australian families.²¹ The other pathway is using private health insurance, where the dental cost is partially reimbursed, but the cost of having such policies is very expensive and rising.²² In 2015, people with health insurance paid more benefits for dental services than any other type of general treatment,²³ and in 2013, almost 20% of insured adults who had paid for their own dental expenses stated that it caused a large financial burden.²¹

For people with low income, government-subsidized dental care is available through public dental services, but the level of subsidy varies between population groups and between Australian states and territories.²⁴ In our study, even though data were collected from affluent and disadvantaged geographical areas, almost 50% of the respondents were from low-income households (<AU\$40 000 per year), and only 37% had private health insurance. This suggests that many in the study sample relied on government welfare benefits.

The long waiting time to access public dental services among people who qualify for this assistance is an important barrier in both metropolitan and rural areas in Australia.²⁵ Despite the government's attempt to target the issue, in recent years, there has been increased demand for subsidized dental care, with a subsequent increase in waiting list numbers.²⁵ These issues were highlighted in this study with respondents rating waiting times to make a dental appointment and to be seen by a public dental service as significant barriers. This could explain why most participants in the study accessed a private dentist (70%), which is consistent with the general Australian population.¹⁴ Similar barriers

were cited in an earlier qualitative study with patients with CVD and in other populations like pregnant women and children.^{10,26,27}

It is important to note that personal-related barriers to accessing regular dental care, such as being nervous, worried, or fear of visiting a dentist, were rated low among study respondents even though these issues are commonly cited barriers in the general population and have been previously reported in the cardiac population.^{10,28} Further research may need to be undertaken to confirm the extent to which personal-related barriers influence the uptake of dental services by people with CVD.

The most significant predictor of seeing a dentist was receiving information about oral health in the cardiac setting. People with CVD who received information were 5 times more likely to have seen a dentist within the previous 12 months than those who had not received information. Evidence shows that awareness is an important factor affecting attitudes and utilization of dental services by cardiac and other vulnerable populations.^{9,29} What is concerning is that only 10% of the respondents received any information about oral health and there was minimal discussion in cardiac care. This could be attributed to the lack of oral health resources for the cardiac setting and the limited oral health training available for cardiac clinicians in Australia.^{8,16} The lack of information on oral health during clinical care seems to be consistent in other populations, including pregnancy and diabetes.^{30,31} Improving knowledge of the links between oral health and CVD is essential to overcome any personal barriers patients may have, as they would understand the importance of oral health as an integral part of their cardiac care and overall health.

Another strong predictor for seeking dental care was having private health insurance, which is understandable considering that the main barriers cited by the respondents were financial constraints and the cost of dental care. Contributing to the problem is the difficulty accessing public dental services, which has already been discussed. Health-seeking behavior is determined by psychosocial and environmental or system factors. These dictate people's perceptions and barriers in making healthy lifestyle choices and the use of healthcare services.¹¹ Therefore, it makes sense that this was a significant predictor for the respondents' oral health-seeking behavior.

Finally, non-Australian-born respondents were more than twice as likely to have seen a dentist in the last 12 months compared with responders who were Australian born. In Australia, there are no available data about dental visit patterns for this population. However, a possible explanation for this result is a well-known phenomenon called the "healthy immigrant effect," which explains that people born overseas may come with better health practices than the host country with several studies, showing that immigrants

What's New and Important

- Incorporating oral health in the cardiac care setting is important for patients with CVD.
- Despite international guidelines and recommendations, oral health promotion is not occurring in the Australian cardiac care setting.
- Accessibility, affordability, and lack of oral health awareness are key barriers and predictors for patients with CVD accessing dental care.

have better general and oral health on arrival to their new place, and over time, their health deteriorates to similar or worse than that of their host country.^{32,33} Furthermore, it is feasible that migrants who move to places such as Australia have better general health, including oral health, than do the native born for reasons such as having to go through vigorous health requirements before being admitted to the country.

In summary, the findings have confirmed low uptake of dental services among patients with CVD in Australia and identified accessibility/affordability of dental care as well as lack of oral health awareness as key barriers to and predictors of accessing dental healthcare. These findings have important implications for other countries and greatly inform future strategies, policies, and research areas to address this underexplored area of cardiac care. In countries that have healthcare systems different from that in Australia, it is important to undertake further research to confirm whether similar barriers to oral healthcare exist for people with CVD, and the BASAC scale could be a useful resource to facilitate this. In countries that do have a universal healthcare system, it is vital that policies are in place to ensure that people with CVD, especially those disadvantaged, have access to appropriate and affordable oral healthcare services.²⁰ In addition, more strategies are necessary to raise oral health awareness in the cardiac setting, such as the development of oral health promotional resources, evidence-based guidelines, and providing training to cardiac care clinicians like nurses so they can incorporate oral healthcare into their practice. Recent efforts in the United States to roll out an oral health nursing curriculum is a step in the right direction in addressing current gaps in cardiac practice.³⁴ Similar measures could be implemented in other countries to address the inadequate oral health training among cardiac care providers.

Limitations

A limitation of the study is that participants who had limited English and did not have access to a family member or interpreter to assist were excluded from the study, and so the findings may not be relevant to culturally and linguistically diverse populations with

CVD. Another limitation is that we only sampled patients with CVD who live in the metropolitan area in Australia. Hence, a study of other cohorts across a range of demographic areas including regional areas would ensure the generalizability of the findings. Nevertheless, the 2 settings in the study had a diverse population in terms of socioeconomic status and ethnicity and hence a reasonable level of generalizability could be proposed.

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REFERENCES

1. Lockhart PB, Bolger AF, Papapanou PN, et al. Periodontal disease and atherosclerotic vascular disease: does the evidence support an independent association?: a scientific statement from the American Heart Association. *Circ*. 2012;125:2520–2544.
2. Tonetti MS, Dyke TE. Periodontitis and atherosclerotic cardiovascular disease: consensus report of the Joint EFP/AAP Workshop on Periodontitis and Systemic Diseases. *J Clin Periodontol*. 2013;40:S24–S29.
3. Zeng XT, Leng WD, Lam YY, et al. Periodontal disease and carotid atherosclerosis: a meta-analysis of 17,330 participants. *Int J Cardiol*. 2016;203:1044–1051.
4. Genco RJ, Borgnakke WS. Risk factors for periodontal disease. *Periodontol* 2000. 2013;62:59–94.
5. Teles R, Wang CY. Mechanisms involved in the association between periodontal diseases and cardiovascular disease. *Oral Dis*. 2011;17:450–461.
6. Orlandi M, Suvan J, Petrie A, et al. Association between periodontal disease and its treatment, flow-mediated dilatation and carotid intima-media thickness: a systematic review and meta-analysis. *Atherosclerosis*. 2014;236:39–46.
7. Teeuw WJ, Slot DE, Susanto H, et al. Treatment of periodontitis improves the atherosclerotic profile: a systematic review and meta-analysis. *J Clin Periodontol*. 2014;41:70–79.
8. Sanchez P, Everett B, Salamonson Y, Ajwani S, George A. Oral healthcare and cardiovascular disease: A scoping review of current strategies and implications for nurses. *J Cardiovasc Nurs*. 2017;32:E10–E20.
9. Rasouli-Ghahroudi AA, Khorsand A, Yaghobee S, et al. Oral health status, knowledge, attitude and practice of patients with heart disease. *ARYA Atheroscler*. 2016;12:1–9.
10. Sanchez P, Everett B, Salamonson Y, et al. Oral health and cardiovascular care: perceptions of people with cardiovascular disease. *PLoS One*. 2017;12:e0181189.
11. Mackian S, Bedri N, Lovel H. Up the garden path and over the edge: where might health-seeking behaviour take us? *Health Policy Plan*. 2004;19:137–146.
12. Liu L, Zhang Y, Wu W, Cheng R. Characteristics of dental care-seeking behavior and related sociodemographic factors in a middle-aged and elderly population in northeast China. *BMC Oral Health*. 2015;15:66.
13. Andersen RM. Revisiting the behavioral model and access to medical care: does it matter. *J Health Soc Behav*. 1995;36(1): 1–10.
14. Australian Institute of Health and Welfare, Harford JE, Islam S. Adult oral health and dental visiting in Australia: results from the National Dental Telephone Interview Survey 2010. Dental

- Statistics and Research Series no. 65. Cat. no. DEN 227. Canberra: AIHW; 2013. <https://www.aihw.gov.au/getmedia/39d5d2ac-8873-4cb8-9fb2-f68095e014fb/14803.pdf.aspx?inline=true>. Accessed November 22, 2018.
15. Sanchez P, Everett B, Salamonson Y, et al. Factors affecting access to oral healthcare for patients with cardiovascular disease in Australia. *Circulation*. 2017;136.
 16. Sanchez P, Everett B, Salamonson Y, et al. Perceptions of cardiac care providers towards oral health promotion in Australia. *Collegian*. 2017;25:471–478.
 17. IBM Corp. *IBM SPSS Statistics for Windows*. 24.0 ed. IBM Corp: Armonk, NY; 2016.
 18. Johnson M, George A, Dahlen H, et al. The midwifery initiated oral health-dental service protocol: an intervention to improve oral health outcomes for pregnant women. *BMC Oral Health*. 2015;15:2.
 19. Peduzzi P, Concato J, Kemper E, Holford TR, Feinstein AR. A simulation study of the number of events per variable in logistic regression analysis. *J Clin Epidemiol*. 1996;49:1373–1379.
 20. Kandelman D, Arpin S, Baez RJ, Baehni PC, Petersen PE. Oral health care systems in developing and developed countries. *Periodontol 2000*. 2012;60(1):98–109.
 21. Australian Institute of Health and Welfare. *Oral Health and Dental Care in Australia 2015: Cost of Dental Care*. Australia: AIHW; 2016.
 22. Australian Prudential Regulation Authority APRA. *Private Health Insurance Quarterly Statistics*. Australia: APRA; 2016.
 23. Australian Government and Private Health Insurance Ombudsman. *Average Dental Charges for Privately Insured Services in 2015 Australia: Australian Government*. 2018. <https://www.privatehealth.gov.au/healthinsurance/whatiscovered/averagedental.htm#dentalCharges>. Accessed November 22, 2018.
 24. House of Representatives. *Bridging the Dental Gap: Report on the Inquiry Into Adult Dental Services*. Australia: The Parliament of the Commonwealth of Australia; 2013.
 25. Australian Institute of Health and Welfare. *A Discussion of Public Dental Waiting Times Information in Australia: 2013–14 to 2016–17*. Canberra: AIHW; 2018.
 26. George A, Johnson M, Duff M, et al. Midwives and oral health care during pregnancy: perceptions of pregnant women in South-Western Sydney, Australia. *J Clin Nurs*. 2012;21:1087–1096.
 27. Veale M, Ajwani S, Johnson M, Nash L, Patterson T, George A. The early childhood oral health program: a qualitative study of the perceptions of child and family health nurses in South Western Sydney, Australia. *BMC Oral Health*. 2016;16(1):56.
 28. Jowett N, Cabot L. Patients with cardiac disease: considerations for the dental practitioner. *Br Dent J*. 2000;189:297–302.
 29. Campbell PC, Sheriff D. Awareness and method of oral health care among people living with human immunodeficiency virus infection and acquired immune deficiency syndrome attending Federal Medical Centre, Abeokuta, Nigeria. *J Oral Health Oral Epidemiol*. 2015.
 30. George A, Johnson M, Blinkhorn A, Ajwani S, Ellis S, Bhole S. Views of pregnant women in South Western Sydney towards dental care and an oral-health program initiated by midwives. *Health Promot J Austr*. 2014;24:178–184.
 31. Poudel P, Griffiths R, Wong VW, Arora A, George A. Knowledge and practices of diabetes care providers in oral health care and their potential role in oral health promotion: a scoping review. *Diabetes Res Clin Pract*. 2017;130:266–277.
 32. Calvasina P, Muntaner C, Quiñonez C. The deterioration of Canadian immigrants' oral health: analysis of the Longitudinal Survey of Immigrants to Canada. *Community Dent Oral Epidemiol*. 2015;43:424–432.
 33. Kennedy S, Kidd MP, McDonald JT, Biddle N. The healthy immigrant effect: patterns and evidence from four countries. *J Int Migr Integr*. 2015;16:317–332.
 34. Dolce MC, Haber J, Shelley D. Oral health nursing education and practice program. *Nurs Res Pract*. 2012; ID 149673. doi:10.1155/2012/149673.

Chapter 8: Unpublished Results – Potential Uptake of Oral Healthcare Promotion Services Provided by Cardiac Nurses

8.1 Overview of Chapter 8

The previous chapter presented findings related to the patients' individual characteristics and their health behaviour. One of the aims of this study was to explore the potential role for cardiac nurses to promote oral healthcare in the cardiac setting. This was initially explored through focus groups and interviews with cardiac care clinicians (Thesis Paper 2) and interviewing patients with CVD (Thesis Paper 3). According to the conceptual framework (adapted Andersen's model, Figure 4.2), two factors that could influence the uptake of oral healthcare services by patients with CVD are their perceived capability of cardiac nurses to promote oral healthcare and their intention to participate in oral healthcare services provided by cardiac nurses. This chapter reports on these two factors based on the results of the survey of people with CVD. Descriptive and inferential statistics were used to analyse the data. These findings have not yet been published.

8.2 Perceived Capability of Cardiac Nurses to Promote Oral Healthcare

The survey of patients with CVD sought to examine their perception of the capability of cardiac nurses to promote oral healthcare including providing advice, identifying oral health problems, providing a dental referral, and whether cardiac nurses had sufficient oral health knowledge to provide oral health advice. Using a *Yes, No, Don't know* response format, the four questions included: 1) Do you think cardiac nurses could assist you in identifying oral

health problems? 2) Would you consider oral health advice given by cardiac nurses? 3) Do you think cardiac nurses have sufficient knowledge about oral health to advise you? 4) Would you make an appointment to see a dentist if you were provided a dental referral by a cardiac nurse?

Bivariate Pearson correlations were used to analyse the magnitude of the relationship between the participants' perceived capability of cardiac nurses and socio-demographic variables. Logistic regression was then computed to identify predictors of perceived capability of cardiac nurses to promote oral healthcare. Prior to including continuous variables in the regression model, variables were dichotomised at the median value as they were not normally distributed (Iacobucci et al., 2015).

Of the 318 survey respondents, more than half (59.43%) had high scores (Score ≥ 3) ($\bar{x}=3$, $M=2.57$, $SD=1.26$) which reflected their beliefs that cardiac nurses were capable of promoting oral healthcare in the cardiac setting.

Results in Table 8.1 indicate two statistically significant predictors of the participants' perceived capability of cardiac nurses to promote oral healthcare: a) participants who had higher levels of oral health knowledge (Adjusted Odds Ratio [AOR]: 2.10 95%CI: 1.20 to 3.49); and b) participants in the lower educational achievement group (AOR: 2.00 95%CI: 1.14 to 3.49).

Variables	B	SE	Adjusted odds ratio (95% CI)	p-value
Age - >65 years old	0.11	0.30	1.11 (0.63-1.99)	0.715
Gender - Male	-0.17	0.27	0.85 (0.50-1.44)	0.535
Australian-born	-0.36	0.35	0.70 (0.35-1.39)	0.304
English - First language	-0.20	0.35	0.82 (0.42-1.61)	0.558
Income combined - >AU\$60,000 per annum	0.02	0.35	1.02 (0.52-2.01)	0.957
Education – Up to high school education	0.69	0.29	2.00 (1.14-3.49)	0.016*
Oral health knowledge - >6 (maximum score 12)	0.72	0.27	2.10 (1.20-3.49)	0.008*

CI denotes Confidence Interval; Hosmer-Lemeshow goodness-of-fit for the model, chi-square=3.098, $df=8$ ($p=0.928$); Nagelkerke's $R^2 = 0.072$; $p > 0.05$

Table 8.1: Predictors of perceived capability of cardiac nurses to promote oral healthcare (n=318)

8.3 Intention to Participate in Oral Healthcare Promotion Services Provided by Cardiac Nurses

The intention to participate in oral healthcare provided by cardiac nurses was measured in the survey by asking participants to rate from 1-7 (very unlikely-very likely) the following items: 1) Cardiac nurses asking questions to find out about your oral health; 2) Cardiac nurses offering you dental advice; 3) Cardiac nurses providing you with oral health information resources such as leaflets, pamphlets or others; 4) Cardiac nurses visually checking your mouth and teeth; 5) Cardiac nurses referring you to a dentist.

Results indicated that 78% of the responders had high scores (Score ≥ 29) ($\bar{x}=29$, $M=26.94$, $SD=9.03$), indicating just over three quarters of participants would participate in oral healthcare promotion services provided by cardiac nurses.

Findings indicate there were no statistically significant predictors, suggesting that there were no group differences in the high self-reported willingness to participate in oral healthcare promotion services provided by cardiac nurses (Table 8.2).

Variables	B	SE	Adjusted odds ratio (95% CI)	p-value
Age - >65 years old	0.09	0.28	1.10 (0.63-1.91)	0.753
Gender - Male	0.01	0.00	1.01 (0.60-1.69)	0.968
Australian-born	0.10	0.34	1.11 (0.57-2.15)	0.768
English - First language	-0.21	0.34	0.81 (0.42-1.56)	0.529
Income combined - >AU\$60,000 per annum	-0.10	0.34	0.91 (0.47-1.76)	0.772
Education – Up to high school education	0.51	0.28	1.66 (0.97-2.85)	0.066
Oral health knowledge - >6 (maximum score 12)	0.47	0.26	1.60 (0.96-2.66)	0.069

CI denotes Confidence Interval; Hosmer-Lemeshow goodness-of-fit for the model, chi-square=4.635, $df=8$ ($p=0.796$); Nagelkerke's $R^2 = 0.041$; $p > 0.05$

Table 8.2: Predictors of intention to participate in oral health services provided by cardiac nurses ($n=318$)

8.4 Conclusion

This section presented the results in relation to the participants' perceived capability and intention to participate in oral healthcare promotion services provided by cardiac nurses. Results indicated that participants believed that cardiac nurses were capable of promoting oral healthcare services in the cardiac care setting and would participate in oral

healthcare offered by cardiac nurses. The patients' educational level and their level of oral health knowledge were predictive factors of the participant's perceived capability of cardiac nurses to promote oral healthcare.

Chapter 9

Discussion

9.1 Introduction

The main focus of this study was to explore oral healthcare for people with CVD in order to develop a nurse-led cardiovascular oral health (CARDIOH) program. This study also aimed to explore the potential uptake of oral healthcare promotion services provided by a cardiac nurse and the possibility of developing such a program (CARDIOH) from the perspectives of patients and cardiac care providers. To achieve this, an exploratory, sequential mixed-methods approach was adopted, where cardiac care clinicians across Australia and patients with CVD took part in focus groups and individual interviews, and the findings from this phase informed the survey.

The purpose of this chapter is to summarise and integrate the overall findings in relation to the study aims and discuss the new knowledge that has been generated through the CARDIOH Study. This will be followed by a discussion of the application of Andersen's model in the CARDIOH Study and the study's strengths and limitations.

Summary of the key findings

- There is strong evidence supporting the relationship between periodontal disease and CVD.
- Most study participants (cardiac care clinicians and patients with CVD) were unaware of the relationship between oral health and CVD

- There was a high prevalence of self-reported oral health problems among patients with CVD.
- Cardiac care clinicians did not routinely discuss oral healthcare with their patients and attributed this to their knowledge gap and their limited training in this area.
- Very few patients received any information regarding oral healthcare from cardiac care providers.
- Patients were more likely to have seen a dentist in the previous 12 months if they received oral health information and had private health insurance.
- Cardiac care clinicians were receptive to the idea of promoting oral healthcare in their setting if identified barriers such as availability of resources and training were addressed. They also acknowledged, that cardiac nurses are the best suited to provide this service.
- Most patients with CVD perceived that cardiac nurses had the capability to promote oral healthcare and believed that these nurses could assist them with oral health problems.
- Patients with CVD expressed high levels of intention to participate in oral health promotion services provided by cardiac nurses.

9.2 Study Aim 1

‘To explore the evidence regarding oral healthcare and CVD, and the current strategies and implications for nurses’.

An updated review of the literature since the commencement of the CARDIOH Study and the initial scoping review, Thesis Paper 1 in Chapter 2, highlights that there has been further evidence supporting the relationship between periodontal disease and CVD (Beck et al., 2018; Hwang et al., 2018; Kampits et al., 2016; Watts, 2017; Zeng et al., 2016). This includes a summary of systematic reviews undertaken by experts in the field which concluded that there is high quality evidence to support an increased risk of ACVD among people with periodontal disease, and this risk is independent of other CVD risk factors (Dietrich et al., 2017).

In relation to the impact of periodontal treatment on cardiac outcomes, recent studies including a systematic review and meta-analysis of clinical trials (Roca-Millan et al., 2018), and a pre-post-test intervention study (Górski & Górka, 2018) confirm previous studies reporting a decrease in biochemical markers related to cardiovascular risk after treatment supporting a relationship between periodontal disease and mediators of atherosclerosis. Additionally, a recent review of the literature highlights the relevance of periodontal treatment in decreasing cardiovascular risk (Schenkein et al., 2020). However, there is a need for further, more conclusive empirical evidence regarding this issue.

Periodontal disease is a chronic condition that requires long-term treatment to achieve definitive improvement or cure. This treatment includes intensive oral health self-management as well as care provided by dental professionals. Hence, it is not surprising that undertaking large clinical trials looking at long-term cardiac outcomes after periodontal treatment would be challenging. But despite the potential difficulties, current gaps in this area warrant the need for a well-designed, adequately powered longitudinal pragmatic clinical trial (Singal, Higgins, & Waljee, 2014) in order to confirm the effectiveness of

periodontal treatment on cardiovascular outcomes. Nonetheless, treatment of periodontal disease is within the current recommendations for better oral health regardless of cardiovascular or other systemic benefits (Australian Health Ministers' Advisory Council, 2015).

Since the publication of the scoping review, there have been additional consensus and position statements by international professional organisations stressing the relevance of incorporating oral health in cardiac care. In a position statement by the Royal College of Surgeons in the UK, a recommendation was made to include oral health in government plans to raise an awareness among the general public about the link between oral health and systemic conditions such as CVD (Chowdhury et al., 2019). In 2019, a jointly organised workshop between the European Federation of Periodontology and the World Heart Federation resulted in a consensus statement recommending dental professionals, physicians and other healthcare professionals provide education, regular screening, and early management of periodontal disease for people with CVD as part of their regular practice. In their statement, they added that periodontal treatment is relevant and safe for people with CVD (Sanz et al., 2020).

To our knowledge, there are no specific oral health standards for adults with cardiac conditions but there are standards for children with conditions such as congenital heart disease. The first cardiology standards to include oral health were released in England in 2016. The Paediatric Congenital Heart Disease Standards and Specifications (PCHDSS) were developed to ensure that preventive advice was delivered regularly, oral disease diagnosed early, and children were managed or referred appropriately (Hughes, Balmer, Moffat, & Willcoxson, 2019). This is an example where including oral health as part of standard cardiac

practice is feasible. In Australia, there are no position statements or recommendations from the National Heart Foundation however they are currently endorsing a large study which is looking at the periodontal CVD link, indicating that there is interest in the issue (Heart Foundation of Australia, 2019b).

Within this context, it was posed in the scoping review, whether there was any evidence regarding the role of nurses promoting oral healthcare. At the time, there was no evidence of nurses taking up this role in the cardiac setting, despite studies showing nurses being successfully trained to promote oral healthcare in other settings (George et al., 2018; Johnson et al., 2015; Veale et al., 2016). Further, current evidence shows nurses providing oral health education, screening and referrals in areas such as early childhood, midwifery and by community nurses (Ahmed, Rao, Shenoy, & Suprabha, 2018; Garry & Boran, 2017; Wigen & Wang, 2017). However, there continues to be a gap in evidence for cardiac nurses promoting oral health as well as training and resources needed to support them in undertaking this role.

This updated review has further reinforced the need for this study to help develop a nurse-led cardiovascular oral health program for people with CVD.

9.3 Study Aim 2

‘To explore the knowledge, attitudes and practices of cardiac care clinicians regarding oral healthcare’.

This aim was explored in the qualitative phase of this study and presented as a publication in Chapter 5, Thesis Paper 2. The findings highlighted cardiac care clinicians, who were mostly nurses, frequently encountered patients with poor oral health in their clinical

practice but did not routinely discuss oral healthcare with their patients. In addition to time constraints, a lack of oral health knowledge, training, and formalised dental referral pathways were reported as key barriers to promoting oral healthcare.

In reviewing the current available literature, there remains a scarceness of studies that have explored the oral health knowledge, attitudes, and practices of cardiac care clinicians since the publication of Thesis Paper 2. Recent studies have primarily focused on the oral health knowledge and practices among adult and paediatric cardiologists, and the potential risk of patients with infective endocarditis, specifically in relation to the use of prophylactic antibiotics and providing oral health advice and dental referrals to their patients (Alim, Guner, & Dincer, 2020; Grattan, Power, Fruitman, Islam, & Mackie, 2015; Hughes et al., 2019; Naik, Patel, Wang, & Shah, 2016). These are long-standing practices internationally and in Australia, which cardiac care providers in the CARDIOH Study reiterated. Hence, it is no surprise that there is good knowledge about the relevance of oral healthcare for people at high risk of infective endocarditis among health care providers (Alim et al., 2020; Shimpi et al., 2016).

Most cardiac care clinicians in the CARDIOH Study were aware of the risk of infective endocarditis for certain patients, but their only intervention was to provide these patients with information regarding the need for a dental check prior to interventions as part of protocols in their clinic or hospital. This was further corroborated as patients in our study that required heart surgery, especially those with valvular conditions, were more likely to have received information about oral health from their clinicians compared to those who did not require surgery (Sanchez et al., 2019). Hence, having established protocols and guidelines is relevant as clinicians generally follow these in their practice.

Integrating oral health into cardiac care practice is feasible, although this is not a common practice in the Australian cardiac setting, likely contributed to by a lack of practice guidelines. Guidelines are usually developed based on high quality research; in relation to the oral-cardiac link, there is now strong evidence to show a link between periodontal disease and CVD (Nguyen, Wu, Leclerc, Pham, & Tran, 2018; Schenkein et al., 2020; Watts, 2017). However, evidence of the efficacy of periodontal treatment on CVD outcomes has not been established, which might be the deterrent for policy makers and professional organisations to develop such guidelines. Interestingly, in other healthcare areas, guidelines have been developed and implemented, despite unclear or inconclusive evidence such as the effectiveness of periodontal treatment in improving pregnancy outcomes or the effect of dental treatment before cardiac valve surgery (Adams, Gregorich, Rising, Hutchison, & Chung, 2017; Cotti et al., 2017; Lockhart et al., 2019).

As indicated earlier, guidelines are an important step to change established practice. However, adherence to guidelines may not always be consistent, as indicated by the poor compliance rates among adult and paediatric cardiologists to the oral health and infective endocarditis guidelines (Naik et al., 2016). Most concerning in Naik et al.'s study is the lack of compliance and failure to provide education, oral assessment or early essential dental referrals to these vulnerable children, leading to high rates of cancellations and delays in paediatric cardiac surgery (Naik et al., 2016; Oliver, Casas, Judd, & Russell, 2017). This finding suggests that other strategies beyond guidelines are needed to ensure that oral assessment and essential dental referrals occur.

In addition to the lack of oral health guidelines in the cardiac setting, cardiac care clinicians in the CARDIOH Study reported that there were limited education, resources, and

training in oral healthcare. This is not surprising, as there is a limited focus on oral health in Australian undergraduate nursing and medical degrees. The situation is also compounded by a lack of continuing professional development programs and resources on oral healthcare, specific to the cardiac setting. This was initially highlighted in the CARDIOH scoping review, and at the time of writing this remains unchanged. Another limiting factor is the lack of any validated oral health screening instruments that cardiac care clinicians could use, when taking into consideration the time constraints encountered with each patient.

The CARDIOH Study highlighted areas that need addressing, as well as challenges experienced by cardiac care clinicians in the quest to promote oral healthcare. However, these barriers of integrating oral healthcare in their clinical setting are not unique. Challenges such as lack of training, resources, time constraints and a lack of referral pathways are also common for other clinicians who are striving to integrate oral healthcare for patients with health conditions such as diabetes (Poudel et al., 2017), stroke (Ajwani et al., 2016), and aged care (Australian Institute of Health and Welfare, 2020). Encouragingly, there have been signs of progress in recent years to address some of these barriers and expand the role of non-dental professionals in oral healthcare at an educational, clinical, and public health level (Silk, 2018).

In the United States, a recent report highlighted the progress so far in relation to introducing oral health education in medical, midwifery, nursing, and other health professional educational programs (Silk, 2017). It also describes efforts to address oral health by several national and local organisations such as the National Interprofessional Initiative on Oral Health (NIIOH), the American Dental Education Association (ADEA) and Qualis Health, focusing on societal health outcomes rather than professional expectations

and/or boundaries. The focus is to incorporate oral health in education and practice as part of the project 'Advancing Dental Education in the 21st Century', which encourages non-dental clinicians such as nurses to include oral health in their professional training (Silk, 2017).

In the Australian context, there have been advances in developing oral health training programs for aged care nurses (Government of South Australia, 2008), early childhood care providers (NSW Ministry of Health, 2013; Veale et al., 2016) and midwives (George et al., 2018). This training has also trickled down to an undergraduate level in some universities (Duff et al., 2017; George et al., 2020). Further, simple oral health screening instruments have been developed and validated that are feasible for non-dental professionals to administer (Chalmers, John, Carter, King, & Wright, 2009; George et al., 2016; Mello, Zimmermann, & Gonçalves, 2012). These initiatives have significantly improved the knowledge and confidence of non-dental professionals to promote oral health and lead to practice change (George et al., 2016a; Heilbrunn-Lang et al., 2015).

Another barrier for cardiac care providers to promote oral health is the challenge of using a dental referral pathway. As highlighted earlier in this thesis, there are no priority pathways for people with CVD to access public dental care services, which can result in long waiting times. Although the cost of private dental care can be very expensive this should not be a reason for not discussing oral healthcare referral among non-dental clinicians (Heilbrunn-Lang et al., 2015; Sanchez, Everett, et al., 2018). Nevertheless, findings from the CARDIOH Study showed that a lack of information was a stronger predictor for not seeking dental care services. This suggests that raising awareness about oral health and using existing referral pathways is vital, which has been shown to be cost effective in other

settings like antenatal care and can improve the oral health outcomes of pregnant women (George et al., 2018; Tannous et al., 2020).

9.4 Study Aim 3

‘To explore the predisposing, enabling, and need factors as well as the behaviours of people with CVD regarding oral healthcare’.

This aim was addressed in Chapters 6 and 7, Thesis Papers 3–5. The findings highlighted the high prevalence of oral health problems among patients with CVD. This was first mentioned in the qualitative phase of the study (Thesis Papers 2 and 3) and confirmed in the survey indicating that 82% of respondents reported having at least one oral health problem. However, since the publication of these three studies between 2017 and 2019, no further updates have been published in Australia related to oral health problems among people with CVD. It is also noteworthy that the only Australian related population data of oral health problems among people with chronic conditions (including heart disease) was published in 2010 (Australian Institute of Health and Welfare, 2012).

This report sampled 6,284 adults with chronic conditions, and the experience of toothache was highest among people with heart disease (18%). Interestingly, this rate was similar in the CARDIOH findings, where 21% of people with CVD had toothache. The prevalence of dental problems appears to be higher among people with CVD compared to the general population, which is consistent with other international studies focusing on adults and children with congenital heart disease (Ali et al., 2016; Carrillo, Russell, Judd, & Casas, 2018; Hollatz et al., 2019). The most recent report of the oral health of adult Australians is the National Study of Adult Oral Health 2017–18 which included a total of

15,731 people over 15 years old, with 5,022 receiving an oral examination. However, this report only describes the oral health of the general population and those who identify as indigenous peoples. It does not identify the oral health of people with chronic conditions such as heart disease or CVD (Australian Research Centre for Population Oral Health ARCPOH, 2019).

Evidence indicates that people with CVD need to be more vigilant in seeking regular dental care (Mozos & Stoian, 2019; Seitz, 2019), yet the CARDIOH findings indicate that only 59% of people with CVD saw a dentist in the previous 12 months. This is similar to Australian data with 54% of people with heart disease having a dental visit in the preceding 12 months (Australian Institute of Health and Welfare, 2012). This low level of dental service utilisation is also reported in other populations at risk of poor oral health such as people with diabetes (Poudel et al., 2018), pregnant women (George, Johnson, et al., 2013), and people at risk of infective endocarditis (Ali et al., 2016; Folwaczny, Bauer, & Grünberg, 2019). For the Australian general adult population (15 years and over), latest available data (2017–2018) show that overall, 56% had visited a dentist in the previous 12 months (Australian Research Centre for Population Oral Health ARCPOH, 2019).

Even though there is no recent data of the oral health status of people with CVD, findings from the CARDIOH study indicate that there is a high prevalence of self-reported oral health problems among this population (81%). However, attending a dental service does not reflect this with only 58% reporting having seen a dentist in the preceding 12 months. It is relevant to highlight that some of those dental visits were from people in the study with valvular conditions needing to have a dental clearance prior to any surgery or other cardiac interventions as part of existing guidelines rather than seeing the dentist as part of their

regular oral healthcare behaviour. Nevertheless, the current dental visiting patterns of people with CVD are not ideal considering the risk of future CVD events from poor oral health (Folwaczny et al., 2019; Mozos & Stoian, 2019). These findings underscore the importance of understanding the barriers to seeking dental care for the CVD population in order to identify potential strategies to improve oral health.

A key barrier identified in the CARDIOH Study to the uptake of dental care services among those with CVD was their lack of awareness about the link between oral health and heart disease, as the study also found that those who received information about oral health were five times more likely to have seen a dentist in the last 12 months. The lack of oral health awareness among people with CVD is possibly related to health care system barriers. As previously discussed, oral healthcare has not been integrated into cardiac care practice, unless cardiac surgery is required. Added to this, in Australia, cardiac care providers are not trained in the provision of oral healthcare, and there is a lack of oral health practice guidelines and promotional resources contextualised for the cardiac setting. Further, those with CVD may be focused on concerning health issues relating to their heart condition, and oral healthcare may not be deemed as a priority. Hence, it is crucial to address this knowledge gap relating to the importance of oral healthcare and CVD.

Another important barrier for the poor oral healthcare-seeking behaviours of people with CVD was the affordability and accessibility of dental care services. Respondents who had private health insurance were three times more likely to have seen a dentist in the preceding 12 months. This is another example of a system-related barrier for those without private health insurance as they are less likely to have seen a dentist. Australia has numerous pathways to access dental care; however, more than half of Australians (58% in

2016–2017) directly fund their own dental care services, which is a significant financial burden for those who are uninsured. This is confirmed by recent reports showing that about one-third (32%) of people over 5 years old avoid or delay seeing a dentist due to cost, and 20% report costs prevent them from following recommended dental treatment (Australian Institute of Health and Welfare, 2020). In view of the significant financial outlay of AU\$200 for a basic preventive dental visit, it is not surprising that those in the lower income bracket prioritise other essential expenditure instead of an annual dental visit (Australian Institute of Health and Welfare, 2020).

For Australians with a low income, subsidies for public dental care services are available for those 18 years and over with a Medicare card, and: i) Health Care; ii) Pensioner Concession; or iii) Commonwealth Seniors Health card (Centre for Oral Health Strategy, 2017). However, in addition to waiting time, there is a limit to the subsidy available through this service across all states and territories (Department of Health, 2020). In NSW for example, recent public dental service data indicates that between December 2011 and December 2019, although the number of adults waiting for oral health assessment decreased (21,054 in 2011 to 15,079 in 2019), those waiting for treatment increased considerably (68,222 in 2011 to 93,307 in 2019) (NSW Government Health, 2020).

Accessibility and cost are, of course, issues for many people not just those with CVD however, more work is needed to prioritise dental referral pathways for people with CVD because people with periodontal disease and CVD are at increased risk of hospitalisation and mortality (Dietrich et al., 2017; Lang et al., 2015). Currently, at least two states in Australia prioritise certain population groups, for example, due to the negative impact of periodontal disease on maternal and foetal outcomes (Bobetsis, Graziani, Gürsoy & Madianos, 2020)

pregnant women have priority access to public dental care services (Dental Health Services Victoria, 2020; NSW Government Health, 2017). Similar public dental care services could be initiated for people with CVD, to at least identify periodontal disease. Considering that people with certain cardiac conditions such as valvular diseases require a dental clearance prior to any cardiac intervention, it would make sense to offer dental checks to all those with CVD. Despite the substantial financial cost to both federal and state governments, the long-term effectiveness could ameliorate the cost of this dental service scheme. More importantly, such a scheme would have a significant impact on supporting the recent national targets recommended by the Australian Dental Association and Australian Health Policy Collaboration of increasing dental visits (10%) and reducing periodontal disease (15%) for all adults by 2025 (Australian Health Policy Collaboration & Australian Dental Association, 2018).

9.5 Study Aims 4

‘The perceptions of cardiac care clinicians and patients with CVD of the capability of cardiac nurses to promote oral healthcare and patients’ intention to participate in oral healthcare services provided by cardiac nurses’

Integrating the qualitative and quantitative findings of the CARDIOH Study showed general agreement from cardiac care clinicians and patients that cardiac nurses can play a key role in promoting oral health in the cardiac setting. There was also agreement regarding the nurses’ scope in promoting oral healthcare, including cardiac nurses providing oral health education, undertaking an oral health screening, and providing referrals to oral health services.

These findings are similar to previous studies undertaken on nurses working in paediatrics and family nursing (Ahmed et al., 2018; Bernstein et al., 2017; Mattheus, Shannon, Gandhi, & Lim, 2018), oncology and haematology (Perry, Iida, Patton, & Wilder, 2015), and a community clinical setting (Garry & Boran, 2017), which consistently reported nurses' willingness and ease in extending their scope of practice to promote oral health and improve patients' general health. These findings are not surprising, as nurses have a professional responsibility for the promotion, maintenance, and prevention of disease (Nursing and Midwifery Board of Australia, 2016), which would include oral health. In addition, nurses are ideally suited to the role of oral health promotion, as they are often the first point of contact for patients, especially in the inpatient setting (Ozaras & Abaan, 2018). Attributes such as professional competency and close nurse-patient relationship are characteristics identified by patients, which make them 'feel safe' and 'trust' nurses (Ozaras & Abaan, 2018; Schaepe & Ewers, 2017). This perception is important, as findings of the CARDIOH Study showed that patients with CVD had poor oral health knowledge and nurses are well-placed to address this gap.

Significantly, those with high oral health knowledge levels were more likely to believe that cardiac nurses could promote oral healthcare supporting this expanded role of the cardiac nurse. These patients were likely to be more aware of their oral health needs and importance, and thus would be more willing and comfortable to participate in oral healthcare provided by nurses.

Interestingly, patients with CVD from the CARDIOH study who had lower educational levels were also more likely to believe the capability of cardiac nurses to promote oral healthcare. This factor does feel counter intuitive as higher education attainment is normally

linked with higher levels of knowledge. One possible reason could be that more educated patients may be more critical about the scope of practice of healthcare providers and may question the competency of cardiac nurses regarding oral healthcare. This view was highlighted in the qualitative findings (Thesis Paper 2) where some patients who were more educated were unsure if nurses possess sufficient training in this area. Another explanation is if someone has higher knowledge then they are more confident to advocate for themselves because they would feel they are more in control about what their needs are regarding oral health. It is important to acknowledge though that the tertiary level of education of the sample is considered generic or broad education. Additionally, of the participants who had qualifications beyond high school, a third of them only had TAFE qualifications. Therefore, participants are likely to only have broad oral health knowledge and a broad understanding of the role of nurses regarding oral healthcare.

Nevertheless, it is clear that nurses are capable of doing more in oral health education, screening, and referrals; however, for this to occur, key barriers related to training and resources need to be addressed.

There are clear examples in the Australian context that show that when these barriers are addressed, nurses can play a key role in oral health promotion. These examples have been demonstrated in the areas of early childhood (Early Childhood Oral Health [ECOH] program) (Veale et al., 2016), as well as aged care (Government of South Australia, 2008), and maternity (Midwifery Initiated Oral Health [MIOH] program) (George et al., 2018; Johnson et al., 2015). In the ECOH program, established in 2007 by the NSW government, a model of shared responsibility between parents and early child health professionals, such as child and family health nurses was developed to improve early childhood oral health (Maher

et al., 2012). The program was incorporated into routine child health visits (0-5 years) where trained child and family health nurses provided parents with oral health information, and then screened children for poor oral health and provided referrals (NSW Ministry of Health, 2014).

The ECOH program improved the oral health knowledge of clinicians and parents/guardians. Furthermore, clinicians and parents/guardians accepted this expanded role which translated into improving the oral health outcomes for children (Maher et al., 2012; NSW Department of Health, 2010; Veale et al., 2016). In the area of aged care, nurses were provided with education and training as part of a government supported national training program which included a validated screening instrument (Chalmers et al., 2005), referral pathways (South Australia Health, 2012) and the development of oral health policies and guidelines for older adults in residential facilities (Chalmers et al., 2009; Government of South Australia, 2008, 2009).

Another good example is the Midwifery Initiated Oral Health (MIOH) program, which was developed to build the capacity of midwives to provide oral health education, assessment, and referrals to pregnant women. As part of the MIOH program a nationally recognised continuing professional development (CPD) training program was rolled out along with a validated screening instrument (George et al., 2016; George, Duff, et al., 2012), which was translated into practice for midwives across the country (George et al., 2016). The program improved the knowledge and confidence of midwives to promote oral health (George et al., 2016; Heilbrunn-Lang et al., 2015) and resulted in undergraduate training to support midwifery students and ensure they had adequate oral health knowledge and confidence (Duff et al., 2017; George et al., 2020). For consumers, the MIOH program has

resulted in practice change, leading to a significant improvement in the uptake of dental care services and the oral health outcomes for pregnant women (George et al., 2018; State Government Victoria, 2018). Further, the MIOH program was found to be cost effective (Tannous et al., 2020) as well as acceptable and feasible to scale up nationally (Ajwani et al., 2019; Dahlen et al., 2019; George et al., 2019).

These successful examples in the Australian context suggest that a nurse-led cardiovascular oral health program is feasible if the key components of cardiac-specific guidelines, oral health training, resources and appropriate dental referral pathways are developed and integrated into practice. By addressing these components, clinicians, and patients regardless of their socioeconomic status, will be more receptive to adopting this model of care, which in turn, will improve the knowledge and confidence of cardiac nurses to promote oral health that can lead to improved oral health and general health outcomes for patients with CVD. Such a model would go a long way in supporting recent calls for more integrated approaches involving other disciplines to improve oral health globally (The Lancet, 2019).

9.6 Adapting Andersen's Model for CARDIOH

The Andersen's behavioural model of health utilisation (Andersen et al., 2007), was adapted for this study, as it was deemed the most appropriate conceptual framework to inform the CARDIOH Study (Figure 3.3).

Although Andersen's model has been used extensively to frame health research, this is the first time an adapted version of Andersen's model was used to understand the relationship between contextual characteristics, individual characteristics, and the oral health seeking behaviour of people with CVD. The adapted model also provided insight into

the perceptions of cardiac care clinicians and people with CVD regarding the acceptability and feasibility of a nurse-led cardiovascular oral health program.

Nevertheless, adapting Andersen's model (2007) for this study was challenging, as some of the components of the model are not specifically defined, thus these factors were not included, which were the social aspects of the contextual characteristics that could influence the oral health seeking behaviours of people with CVD. Further, due to the scope and timeframe of the PhD study, oral health outcome evaluation and satisfaction of consumers and key stakeholders (people with CVD and clinicians) could not be assessed.

However, the selected contextual characteristics that were included in this adapted model were strongly associated with the oral health behaviours of this population, as demonstrated by the findings about the predictors of people with CVD to uptake dental care services such as receiving oral health information in the cardiac care setting. The study also highlighted that predisposing, enabling and need factors within this framework were all interrelated. For example, contextual factors such as lack of guidelines, resources and referral pathways related to the health care system seem to be factors that resulted in patients not receiving information, which in terms was a significant independent predictor of having seen a dentist in the preceding 12 months. In addition, the lack of practice guidelines, along with limited oral health training, no cardiac-specific oral health resources, and the absence of appropriate dental referral pathways for those with CVD was found could deter cardiac care clinicians from promoting oral health. These factors contributed to the lack of focus on oral healthcare by cardiac care clinicians and influenced their practice. Need factors included the prevalence of oral health problems among people with CVD, which the study found to be high.

Exploring the individual characteristics of people with CVD highlighted a number of factors that influenced their oral healthcare-seeking behaviours. These included: 1) individual predisposing factors such as being born overseas and having social support; 2) enabling factors such as having adequate oral health knowledge; and 3) need factors such as their perceived need for oral healthcare or treatment.

As previously discussed, there were correlations between contextual and individual characteristics which influenced the oral healthcare-seeking behaviour of people with CVD. For example, limitations in the accessibility and affordability of the current dental care services in Australia contributed to the poor oral health practices of clinicians. This led to limited oral health information being provided to people with CVD, which was the strongest predictor for the uptake of dental care services among this population.

The final component of the adapted Andersen model was outcomes, which included the perceived capability of cardiac nurses to promote oral healthcare and the intention to participate in an oral healthcare promotion service led by cardiac nurses. The finding provided insight into cardiac care clinicians and people with CVD perceptions of the acceptability and feasibility of a nurse-led cardiovascular oral health program as a strategy to improve the utilisation of dental care services. In view of the fact that both nurses and patients were receptive to the program and considered cardiac nurses capable of delivering it, it paves the way for future studies to utilise the same model to assess the CARDIOH program and evaluate health outcomes and satisfaction of patients with CVD.

The application of Andersen's model in the CARDIOH Study has brought clarity to the predisposing, enabling and need factors that impact on the perceptions and health behaviours of people with CVD and cardiac care clinicians in relation to providing oral health

education, assessment, and referrals to people with CVD. The findings confirmed that the adapted Andersen's model was an appropriate framework for this study.

9.7 Strengths and Limitations

To our knowledge, this is the first study to have explored oral healthcare within the cardiac setting in Australia, and the findings have provided valuable insight into the factors that influence the oral healthcare-seeking behaviours of people with CVD. It has also provided unique data about the oral health status of CVD patients and the key barriers and predictors for seeking dental care through a new valid and reliable instrument. Another key strength is that it has shown for the first time that cardiac nurses are willing to play a role in promoting oral health, provided they get support and training in the area. Additionally, the study has provided detailed strategies to facilitate their scope of practice. The findings have also paved the way for the development of an innovative nurse-led cardiovascular oral health program that is acceptable and feasible to implement from both the perspective of patients and cardiac care clinicians.

This study has a number of limitations. First, only patients with CVD who accessed cardiac health services in a metropolitan area in NSW, Australia were recruited, thus the findings cannot be generalised to those who access health services in other metropolitan sites in other cities, and regional and remote Australia. Nevertheless, the settings in the study had a diverse population in terms of socioeconomic status and ethnicity and hence there is likely to be a reasonable level of generalisability.

Second, the quantitative data from this study is based on self-reported responses of patients with CVD, so this limits the ability to determine the actual prevalence of oral health

problems among this population. In this regard, it has been reported that patients with heart disease tend to under-report their health limitations (Berghammer et al., 2018), which could be the case for the participants in this study. In terms of oral health, it has been described that self-reported data from patients can help predict clinical outcomes associated with oral health indicators (such as caries and periodontal disease) and help inform health policies and treatment outcomes (Bassim et al., 2019; Peres et al., 2019).

A further major limitation is that only those who accessed cardiac services were included in this study, thus excluding those who did not access services for a variety of reasons including cultural safety. In addition, in the qualitative phase of the study, patients with CVD attending rehabilitation were interviewed immediately before or soon after cardiac rehabilitation sessions and it is widely reported that the uptake of cardiac rehabilitation is relatively low. Both these factors further bias the sample recruited and should be acknowledged. However, in the quantitative phase of the study, patients with CVD from other cardiac settings such as private and public clinics were recruited to have a more representative sample.

Another key limitation was the exclusion of patients who did not speak sufficient English to participate in the study, despite attempts to include these patients through using professional interpreters. As such, the findings are not generalisable to culturally and linguistically diverse populations with CVD.

Transcriptions of interviews with patients that used a translator or interpreter were only done on sections of the interviews that were in English due to budget limitations for the doctoral candidate.

The next and final chapter of this thesis will detail the conclusion and recommendations.

Chapter 10

Conclusion and Recommendations

10.1 Conclusion

This study has increased our understanding of this under-researched and under-reported aspect of Australian cardiac care. Prior to this study, there was no available information about the oral health status, knowledge, and oral healthcare-seeking behaviours of people with CVD, despite strong evidence linking periodontal disease with adverse CVD outcomes (Dietrich et al., 2017; Mozos & Stoian, 2019). Further, there were limited international studies and none in Australia that examined the perceptions, practices, and knowledge of cardiac care clinicians regarding oral healthcare, even though current recommendations advocate the need to promote oral health in cardiac settings.

The study findings have revealed for the first time in Australia that there is limited focus on oral health by cardiac care clinicians. Consequently, patients with CVD are not receiving pertinent oral health information, nor are they receiving regular oral health screening or referrals in cardiac settings. Promoting oral health awareness among people with CVD is crucial, as this has been identified as a key influencing factor in people with CVD seeking dental care, along with accessible and affordable dental care, which remains an ongoing challenge for Australians. Cardiac nurses are well-positioned to address some of these gaps and promote oral healthcare, as they are often a frequent point of contact in the cardiac setting. The study also found that patients were very receptive to this idea and had confidence in the capability of nurses to undertake this role.

Furthermore, they were willing to participate in oral healthcare offered by cardiac nurses. Although undertaking this role was equally acceptable for cardiac nurses, they qualified this view of an extended nursing role by emphasising the need for additional infrastructure support and professional development in oral health training, appropriate oral health resources, simple screening instrument and appropriate referral pathways. The findings of this study support the need for a new preventative model of oral healthcare and have paved the way for the development of a nurse-led cardiovascular oral health (CARDIOH) program, where cardiac nurses are trained in providing oral health information, screening, and referrals as necessary to appropriate dental care services. Key components are needed for the development of the CARDIOH program, which is elaborated in the following recommendation section.

10.2 Recommendations

The findings of this study have important recommendations for clinical practice, policy and research.

10.2.1 Clinical practice

To address the knowledge gap among people with CVD it is important for cardiac-specific, evidence-based oral health promotion resource(s) such as brochures or electronic resources to be developed for the cardiac setting. Having such a resource would also minimise the time needed for cardiac clinicians to promote oral health. During resource development, it is important to consider health literacy and the readability level of the contents due to the ethnic diversity and varying levels of English language proficiency among the Australian population. In addition, it is important that oral health promotional resources are translated into various languages to help foster a better understanding of this

topic among people with CVD who are from culturally and linguistically diverse (CALD) populations.

It is also essential to seek endorsement of these resources from professional organisations, for example the Heart Foundation of Australia, Australian Dental Association and State Government's health departments, as endorsement will enhance the credibility of these resources and support greater distribution and uptake among cardiac settings. A good example of this is the 'Diabetes & Oral Health' brochure, which was recently endorsed by NSW Health, Diabetes Australia and the Australian Dental Association and made available electronically on the government website for clinicians and services to order free of charge (Centre for Oral Health Strategy, 2019). A similar process could be followed for a "Cardiovascular and Oral Health" brochure.

One way of building on the findings and to help cardiac nurses identify CVD patients at risk of poor oral health would be to develop a validated, cardiac specific oral health-screening instrument. This intervention would include a well-designed instrument that is practical and quick to use due to the time constraints of clinicians. One potential avenue is to adapt an existing validated oral health screening instruments being used by non-dental professionals like the 2-item screening instrument developed for midwives to undertake oral health risk assessment of pregnant women (George et al., 2015; George et al., 2016).

Finally, a key recommendation to capacity-build cardiac nurses to promote oral health is to develop a cardiovascular oral health-training program. Findings from the CARDIOH Study underscore the importance of developing an educational program, in consultation with a multidisciplinary expert panel from dental and cardiac disciplines that focuses on: 1) Research, background, recommendations for cardiac practice; 2) Anatomy and physiology,

including common gum conditions for people with CVD, and cardiac medications that may cause oral health problems; and 3) Skills in oral health education, screening and referral. To increase the reach of this educational program, multiple delivery formats are proposed to be made available electronically and in workbook format and would also contain the oral health promotion resource and screening instrument discussed above. In addition, the findings addressed the need for a referral pathway to assist nurses in referring patients to private, public or health funded dental clinics. As such the training program would include a flow chart for accessing current referral pathways.

To ensure cardiac nurses achieve the required competency to promote oral health, a theoretical and practical competency test could be included as part of the education package. To encourage nurses to take up the training, it is important to endorse it as a professional development activity by the Australian College of Nursing, as a similar process was followed to develop an oral health CPD training activity for midwives, which has been hugely successful in Australia (Dental Health Services Victoria, 2018; George et al., 2016; Heilbrunn-Lang et al., 2015). To complement the CPD program it is also recommended that oral health be incorporated into the undergraduate nursing curriculum at Australian universities. The education would include information about the relevance of the systemic oral health connection which goes beyond just the cardiovascular-oral link. The framework for the CPD program could be adapted to develop the oral health nursing module.

10.2.3 Policy

The CARDIOH Study has identified the need for specific clinical practice guidelines on oral healthcare for people with CVD. These guidelines need to clearly articulate the scope of practice for all cardiac care clinicians, as well as the most appropriate time to deliver this

oral health information to cardiac patients. Such a strategy is vital to include oral healthcare as one of the priorities for this population.

One way of improving adherence to oral health screening would be to incorporate a validated oral health screening instrument for cardiac patients into the current Electronic Medical Record system. In Australia, nurses currently use electronic clinical information systems for nursing handover and to record various assessments such as Falls Risk Assessment, Pressure Injury Risk Assessment, among other relevant information about their patients (Johnson, Sanchez, & Zheng, 2016). Offering this facility would provide a valuable prompt to remind cardiac nurses to undertake oral health screening and referrals.

The findings of this study identified the need for appropriate oral healthcare referral pathways for CVD patients, particularly those disadvantaged. In Australia, access to public dental care services is an ongoing challenge for eligible populations, due to the long waiting lists and triage system (Australian Institute of Health and Welfare, 2018a; NSW Government Health, 2017). Having a dental check-up after a triage process for people with CVD would go a long way to improving the oral health of disadvantaged people with CVD. Another option would be to explore specific dental schemes like the former Australian Chronic Dental Benefit Scheme (CDBS) (Kraatz, Qin, Hoang, Godwin, & Crocombe, 2014; Lam, Kruger, & Tennant, 2012), to provide all people with CVD access to private dentists. However, unlike the CDBS which provided a significant amount for dental treatment, it might be more feasible and cost-effective to just provide check-ups for people with CVD through private dentists. This scheme could also be a viable option for eligible people with CVD who access the public dental care services to alleviate the burden on these services (NSW Ministry of Health, 2016).

10.2.3 Research

Further research is needed at different levels. First, to confirm the qualitative findings of the CARDIOH Study, it is important to undertake a cross-sectional survey of cardiac nurses about their knowledge, attitudes, and practices in this area. Further, to ascertain additional perspectives on the topic, it is significant to explore the knowledge, attitudes and practices of other cardiac care clinicians including general practitioners, cardiologists, and allied health professionals working with cardiac patients in Australia. Obtaining this information will help assess whether there is a consensus among cardiac care providers regarding oral healthcare promotion in a cardiac setting and to identify additional strategies that may need to be implemented.

Research that helps to identify any unmet needs of vulnerable groups such as the CALD population and those from rural and regional areas of Australia can provide new insights into the issue within the Australian context. Additionally, it is also relevant that research focuses on the oral health needs among Aboriginal and Torres Strait Islander peoples, as they have a higher prevalence of CVD and periodontal disease compared to other populations in Australia (Heart Foundation of Australia, 2019a; Kapellas et al., 2014).

Upon developing an oral health training program and screening instrument for cardiac nurses, further evaluation research is needed to determine the effectiveness of the training program. Further, the instrument would need to be validated to ensure it has adequate sensitivity and specificity to identify CVD patients at risk of poor oral health and requiring dental referrals. Following program evaluation, a well-designed multicentre randomised controlled trial would provide more evidence regarding the efficacy of the CARDIOH intervention in improving the oral health status, knowledge, the quality of life, the uptake of

dental care services and the cardiac outcomes of people with CVD. As part of the trial process, a process evaluation would assist in exploring the acceptability, feasibility and potential scalability of the CARDIOH program in the real world. An economic evaluation of the program, considering the additional time taken by cardiac nurses to complete the training and deliver the CARDIOH program during clinical practice, is important to assess the cost effectiveness of the program.

Further research is needed to explore current medication usage and knowledge of side effects among people with CVD, as some cardiac medications can have adverse side effects on the oral cavity.

Finally, more current data on the oral health status and practices of people with CVD at a population level is required. Addressing these aspects in any future national oral health surveys is important. The last time a similar approach was undertaken was in 2012, however, the information gathered about people with heart disease was very general (Australian Institute of Health and Welfare, 2012). Obtaining this information will provide more recent and detailed national mapping of the oral health of people with CVD which will greatly inform future research and preventative strategies in this area.

References

- Aarabi, G., Heydecke, G., & Seedorf, U. (2018). Roles of oral infections in the pathomechanism of atherosclerosis. *International Journal of Molecular Sciences*, *19*(7), 1978. Doi: 10.3390/ijms19071978 .
- Adams, S. H., Gregorich, S. E., Rising, S. S., Hutchison, M., & Chung, L. H. (2017). Integrating a nurse-midwife-led oral health intervention into centeringpregnancy prenatal care: Results of a pilot study. *Journal of Midwifery & Women's Health*, *62*(4), 463-469. Doi: 10.1111/jmwh.12613.
- Ahmed, F., Rao, A., Shenoy, R., & Suprabha, B. (2018). Knowledge, attitude, and behavior of nurses toward delivery of primary oral health care in Dakshina Kannada, India. *Journal of Indian Society of Pedodontics and Preventive Dentistry*, *36*(1), 21. Doi: 10.4103/JISPPD.JISPPD_80_17.
- Ajwani, S., Jayanti, S., Burkolter, N., Anderson, C., Bhole, S., Itaoui, R., & George, A. (2016). Integrated oral health care for stroke patients – a scoping review. *Journal of Clinical Nursing*, *26*(7-8), 891-901. Doi: 10.1111/jocn.13520.
- Ajwani, S., Mattila, K. J., Tilvis, R. S., & Ainamo, A. (2003). Periodontal disease and mortality in an aged population. *Special Care in Dentistry*, *23*(4), 125-130. Doi: 10.1111/j.1754-4505.2003.tb00297.x.
- Ajwani, S., Sousa, M. S., Villarosa, A. C., Bhole, S., Johnson, M., Dahlen, H. G., . . . Yaacoub, A. (2019). Process evaluation of the midwifery initiated oral health-dental service program: Perceptions of dental professionals. *Health Promotion Journal of Australia*, *30*(3), 333-343. Doi: 10.1002/hpja.224.
- Ali, H. M., Mustafa, M., Nasir, E. F., Lie, S. A., Hasabalrasol, S., Elshazali, O. H., . . . Skeie, M. S. (2016). Oral-health-related background factors and dental service utilisation among Sudanese children with and without a congenital heart defects. *BMC Oral Health*, *16*(1), 123. Doi: 10.1186/s12903-016-0318-5.

- Alim, B. A., Guneser, M. B., & Dincer, A. N. (2020). Cardiologists' and cardiovascular surgeons' attitudes toward managing endodontic infections and oral health in patients with cardiovascular diseases. *Postgraduate Medicine*, 132(2), 156-161. Doi: 10.1080/00325481.2020.1714205.
- Allen Furr, L., Binkley, C. J., McCurren, C., & Carrico, R. (2004). Factors affecting quality of oral care in intensive care units. *Journal of Advanced Nursing*, 48(5), 454-462. Doi: 10.1111/j.1365-2648.2004.03228.x.
- American Heart Association. (2015). What is cardiovascular disease? Retrieved 11.October, 2015, from http://www.heart.org/HEARTORG/Caregiver/Resources/WhatisCardiovascularDisease/What-is-Cardiovascular-Disease_UCM_301852_Article.jsp.
- Andersen, R. (1995). Revisiting the behavioral model and access to medical care: Does it matter? *Journal of Health and Social Behavior*, 2016(1), 1-10. Doi: 10.2307/2137284
- Andersen, R. M., Davidson, P. L., & Baumeister, S. E. (2007). *Improving access to care in America*. (Third ed.). San Francisco: Jossey-Bass.
- Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological framework. *International Journal of Social Research Methodology*, 8(1), 19-32. Doi: 10.1080/1364557032000119616.
- Australian Bureau of Statistics. (2016). Cultural diversity in Australia: 2016 Census. Retrieved 13 May, 2020, from <https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/2071.0~2016~Main%20Features~Cultural%20Diversity%20Article~60>.
- Australian Bureau of Statistics. (2018). National Health Survey: First Results, 2017-18. Heart, stroke and vascular disease. Retrieved 11 October, 2019, from <https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4364.0.55.001~2017-18~Main%20Features~Heart,%20stroke%20and%20vascular%20disease~55>.

- Australian Bureau of Statistics. (2020). 3415.0 Migrant data matrices. Retrieved 13 May, 2020, from <https://www.abs.gov.au/ausstats/abs@.nsf/mf/3415.0>.
- Australian Commission on Safety and Quality in Health Care. (2013). *Consumers, the health system and health literacy: Taking action to improve safety and quality [Consultation Paper]*. Sydney: ACSQHC.
- Australian Dental Association. (2016). Dental practice survey 2013-2014. Retrieved 7 December, 2016, from <http://www.ada.org.au/Professional-Information/Benchmarking/Dental-Practices/Dental-Practice-Survey-2013-2014>.
- Australian Education Network. (2016). Australian universities guide. Retrieved 16 November, 2016, from <http://www.australianuniversities.com.au>.
- Australian Government, & Private Health Insurance Ombudsman. (2018). Average dental charges for privately insured services in 2015 Retrieved 2 February, 2018, from <https://www.privatehealth.gov.au/healthinsurance/whatiscovered/averagedental.htm#dentalCharges>.
- Australian Government Department of Human Services. (2017). Income test for low income health care card Australia 2017 [updated 27 August 2017]. Retrieved 2 February, 2018, from <https://www.humanservices.gov.au/individuals/enablers/income-test-low-incomehealth-care-card>.
- Australian Health Ministers' Conference. (2014, 7 July 2014). *Australia's National Oral Health Plan 2015 - 2024 Healthy Mouths Healthy Lives [Consultation Draft]*. AIHW cat. no. DEN, (Version 2.8). Australian Health Ministers' Conference.
- Australian Health Ministers' Advisory Council. (2015). *Healthy mouths, healthy lives: Australia's National Oral Health Plan 2015–2024*. Adelaide SA: Retrieved 13 March, 2016, from http://www.coaghealthcouncil.gov.au/Portals/0/Australia%27s%20National%20Oral%20Health%20Plan%202015-2024_uploaded%20170216.pdf.

- Australian Health Policy Collaboration, & Australian Dental Association. (2018). *Australia's Oral Health Tracker: Technical Paper*. (2018-02). Melbourne: Victoria University
Retrieved 10 January, 2019, from
<https://www.vu.edu.au/sites/default/files/australias-oral-health-tracker-technical-paper.pdf>.
- Australian Institute of Health and Welfare. (2012). *Chronic conditions and oral health* (56). Australia: AIHW Retrieved 12 April, 2018, from
<https://www.aihw.gov.au/getmedia/bb741327-90bf-470b-9b12-24dcf23b853a/14802.pdf.aspx?inline=true>.
- Australian Institute of Health and Welfare. (2014). *Cardiovascular disease, diabetes and chronic kidney disease. Australian facts: Mortality*. (Cat. no.CDK 1). Canberra: AIHW.
- Australian Institute of Health and Welfare. (2015). What are cardiovascular diseases?
Retrieved 15 January, 2015, from <http://www.aihw.gov.au/cardiovascular-health/about/>.
- Australian Institute of Health and Welfare. (2016a). Oral health and dental care in Australia 2015: Cost of dental care. Retrieved 18 January, 2018, from
<https://www.aihw.gov.au/reports/dental-oral-health/oral-health-and-dental-care-in-australia-2015/contents/cost-of-dental-care>.
- Australian Institute of Health and Welfare. (2016b). Workforce: Health workforce. Retrieved February, 2016, from <http://www.aihw.gov.au/workforce/>.
- Australian Institute of Health and Welfare. (2018a). *A discussion of public dental waiting times information in Australia: 2013–14 to 2016–17*. (Cat. no. DEN 230). Canberra: AIHW.
- Australian Institute of Health and Welfare. (2018b). Health and welfare overview. Retrieved 4 Feb, 2018, from <https://www.aihw.gov.au/reports-statistics/health-welfare-overview>.

- Australian Institute of Health and Welfare. (2018c). Oral health and dental care in Australia. Retrieved April, 2019, from <https://www.aihw.gov.au/reports/den/231/oral-health-and-dental-care-in-australia/contents/summary>.
- Australian Institute of Health and Welfare. (2019). Principal diagnosis data cubes: Separation statistics by principal diagnosis (ICD-10-AM 10th edition) Australia, 2017-18. Retrieved 16 April, 2020, from <https://www.aihw.gov.au/reports/hospitals/principal-diagnosis-data-cubes/contents/data-cubes>.
- Australian Institute of Health and Welfare. (2020). Oral health and dental care in Australia. Retrieved 6 May, from <https://www.aihw.gov.au/reports/den/231/oral-health-and-dental-care-in-australia/contents/summary>.
- Australian Institute of Health and Welfare, Chrisopoulos, S., Harford, J., & Ellershaw, A. (2016). Oral health and dental care in Australia: Key facts and figures 2015. Canberra: AIHW.
- Australian Institute of Health and Welfare, Harford, J., & Islam, S. (2013). *Adult oral health and dental visiting in Australia: Results from the National Dental Telephone Interview Survey 2010*. (DEN 227). Canberra: Retrieved 19 January, 2016, from <https://www.aihw.gov.au/getmedia/39d5d2ac-8873-4cb8-9fb2-f68095e014fb/14803.pdf.aspx?inline=true>.
- Australian Research Centre for Population Oral Health ARCPOH. (2019). National Study of Adult Oral Health NSAOH 2017-2018. Adelaide: University of Adelaide.
- Babitsch, B., Gohl, D., & Von Lengerke, T. (2012). Re-revisiting Andersen's Behavioral Model of Health Services Use: a systematic review of studies from 1998–2011. *GMS Psycho-Social-Medicine*, 9.
- Baehni, P., & Tonetti, M. (2010). Conclusions and consensus statements on periodontal health, policy and education in Europe: A call for action—consensus view 1. *European Journal of Dental Education*, 14(s1), 2-3. Doi: 10.1111/j.1600-0579.2010.00619.x.

- Baelum, V., & López, R. (2013). Periodontal disease epidemiology—learned and unlearned? *Periodontology 2000*, 62(1), 37-58. Doi: 10.1111/j.1600-0757.2012.00449.x.
- Bahekar, A. A., Singh, S., Saha, S., Molnar, J., & Arora, R. (2007). The prevalence and incidence of coronary heart disease is significantly increased in periodontitis: a meta-analysis. *American Heart Journal*, 154(5), 830-837. Doi: 10.1016/j.ahj.2007.06.037.
- Bartlett, M. S. (1954). A note on the multiplying factors for various χ^2 approximations. *Journal of the Royal Statistical Society. Series B (Methodological)*, 16(2), 296-298. Doi: 10.1111/j.2517-6161.1954.tb00174.x.
- Bartova, J., Sommerova, P., Lyuya-Mi, Y., Mysak, J., Prochazkova, J., Duskova, J., . . . Podzimek, S. (2014). Periodontitis as a risk factor of atherosclerosis. *Journal of Immunology Research*, 2014. Doi: 10.1155/2014/636893.
- Bassim, C. W., MacEntee, M. I., Nazmul, S., Bedard, C., Liu, S., Ma, J., . . . Raina, P. (2019). Self-reported oral health at baseline of the Canadian Longitudinal Study on Aging. *Community Dentistry and Oral Epidemiology*. Doi: 10.1111/cdoe.12506.
- Beck, J., Garcia, R., Heiss, G., Vokonas, P. S., & Offenbacher, S. (1996). Periodontal disease and cardiovascular disease. *Journal of Periodontology*, 67(10s), 1123-1137.
- Beck, J. D., Moss, K. L., Morelli, T., & Offenbacher, S. (2018). Periodontal profile class is associated with prevalent diabetes, coronary heart disease, stroke, and systemic markers of C-reactive protein and Interleukin-6. *Journal of Periodontology*, 89(2), 157-165. Doi: 10.1002/JPER.17-0426.
- Berghammer, M., Johansson, B., Mattson, E., Moons, P., Dellborg, M., & APPROACH-IS. (2018). Exploration of disagreement between the patient's self reported limitations and limitations assessed by caregivers in adults with congenital heart disease. *European Heart Journal*, 39(suppl 1), ehy565. 2406.
- Bernstein, J., Gebel, C., Vargas, C., Geltman, P., Walter, A., Garcia, R., & Tinanoff, N. (2017). Listening to paediatric primary care nurses: a qualitative study of the potential for interprofessional oral health practice in six federally qualified health centres in

Massachusetts and Maryland. *BMJ Open*, 7(3), e014124. Doi: 10.1136/bmjopen-2016-014124.

Beukers, N. G., van der Heijden, G. J., van Wijk, A. J., & Loos, B. G. (2017). Periodontitis is an independent risk indicator for atherosclerotic cardiovascular diseases among 60 174 participants in a large dental school in the Netherlands. *Journal of Epidemiology and Community Health*, 71(1), 37-42. Doi: 10.1136/jech-2015-206745.

Blaizot, A., Vergnes, J. N., Nuwwareh, S., Amar, J., & Sixou, M. (2009). Periodontal diseases and cardiovascular events: Meta-analysis of observational studies. *International Dental Journal*, 59(4), 197-209. Doi: 10.1922/IDJ_2114Sixou13.

Bobetsis, Y. A., Graziani, F., Gürsoy, M., & Madianos, P. N. (2020). Periodontal disease and adverse pregnancy outcomes. *Periodontology 2000*, 83(1), 154-174. Doi: 10.1111/prd.12294.

Bokhari, S. A. H., Khan, A. A., Butt, A. K., Azhar, M., Hanif, M., Izhar, M., & Tatakis, D. N. (2012). Non-surgical periodontal therapy reduces coronary heart disease risk markers: a randomized controlled trial. *Journal of Clinical Periodontology*, 39(11), 1065-1074. Doi: 10.1111/j.1600-051X.2012.01942.x.

Bouchard, P., Boutouyrie, P., D'Aluoto, F., Deanfield, J., Deliargyris, E., Fernandez-Avilés, F., . . . Sanz, M. (2010). European workshop in periodontal health and cardiovascular disease consensus document. *European Heart Journal Supplements*, 12(B). Doi: 10.1093/eurheartj/suq001.

Bowyer, V., Sutcliffe, P., Ireland, R., Lindenmeyer, A., Gadsby, R., Graveney, M., . . . Dale, J. (2011). Oral health awareness in adult patients with diabetes: A questionnaire study. *British Dental Journal*, 211(6), E12-E12. Doi: 10.1038/sj.bdj.2011.769.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101. Doi: 10.1191/1478088706qp063oa.

- Buhlin, K., Gustafsson, A., Pockley, A. G., Frostegård, J., & Klinge, B. (2003). Risk factors for cardiovascular disease in patients with periodontitis. *European Heart Journal*, 24(23), 2099-2107. Doi: 10.1016/j.ehj.2003.09.016.
- Bush, T. (2012). Authenticity in research—reliability, validity and triangulation. In A. Briggs, M. Coleman & M. Morrison (Eds.), *Research methods in educational leadership and management* (3rd Edition ed.). Los Angeles: Sage.
- Calvasina, P., Muntaner, C., & Quiñonez, C. (2015). The deterioration of Canadian immigrants' oral health: Analysis of the longitudinal survey of immigrants to Canada. *Community Dentistry and Oral Epidemiology*, 43(5), 424-432. Doi: 10.1111/cdoe.12165.
- Campbell, P. C., & Sheriff, D. (2016). Awareness and method of oral health care among people living with human immunodeficiency virus infection and acquired immune deficiency syndrome attending Federal Medical Centre, Abeokuta, Nigeria. *Journal of Oral Health and Oral Epidemiology*, 5(1), 24-33.
- Carrillo, C., Russell, J., Judd, P., & Casas, M. (2018). Oral Health of Children with Congenital Heart Disease at a Pediatric Health Science Centre. *Journal of the Canadian Dental Association*, 84(i7), 1488-2159.
- Carroll, L. J., & Rothe, J. P. (2010). Levels of reconstruction as complementarity in mixed methods research: A social theory-based conceptual framework for integrating qualitative and quantitative research. *International Journal of Environmental Research and Public Health*, 7(9), 3478-3488. Doi: 10.3390/ijerph7093478.
- Caúla, A. L., Lira-Junior, R., Tinoco, E. M. B., & Fischer, R. G. (2014). The effect of periodontal therapy on cardiovascular risk markers: A 6-month randomized clinical trial. *Journal of Clinical Periodontology*, 41(9), 875-882. Doi: 10.1111/jcpe.12290.
- Centre for Oral Health Strategy. (2017). *Eligibility of persons for public oral health care in NSW: Policy Directive*. (PD2017_027). NSW Australia: Retrieved 5 November, 2018, from https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/PD2017_027.pdf.

- Centre for Oral Health Strategy. (2019). Diabetes and oral health. In NSW Government (Ed.), (Vol. 190271). Australia: NSW Health.
- Chalmers, J., King, P., Spencer, A., Wright, F., & Carter, K. (2005). The oral health assessment tool—Validity and reliability. *Australian Dental Journal*, *50*(3), 191-199. Doi: 10.1111/j.1834-7819.2005.tb00360.x.
- Chalmers, J., & Pearson, A. (2005). A systematic review of oral health assessment by nurses and carers for residents with dementia in residential care facilities. *Special Care in Dentistry*, *25*(5), 227-233. Doi: 10.1111/j.1754-4505.2005.tb01654.x.
- Chalmers, J. M., John, S. A., Carter, K. D., King, P. L., & Wright, C. (2009). *Caring for oral health in Australian residential care*. (DEN 193). Canberra: AIHW.
- Chapple, I. L., Van der Weijden, F., Doerfer, C., Herrera, D., Shapira, L., Polak, D., . . . Donos, N. (2015). Primary prevention of periodontitis: managing gingivitis. *Journal of Clinical Periodontology*, *42*, S71-S76. Doi: 10.1111/jcpe.12366 |.
- Chew, D. P., Scott, I. A., Cullen, L., French, J. K., Briffa, T. G., Tideman, P. A., . . . Aylward, P. E. (2016). National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand: Australian clinical guidelines for the management of acute coronary syndromes 2016. *Heart, Lung and Circulation*, *25*(9), 895-951. Doi: 10.1016/j.hlc.2016.06.789.
- CHOICE Australia. (2013). Down in the mouth over dentist fees? Retrieved 2 December, 2016, from <https://www.choice.com.au/health-and-body/dentists-and-dental-care/dental-treatment/articles/dental-fees>.
- Chowdhury, S., Srivastava, B., Pujari, S., Gupta, N., Singh, R., Yadav, D., . . . Chowdhury, U. K. (2019). Assessment of dental status and oral health status in children with congenital heart diseases. *Journal of Cardiovascular Surgery and Heart Diseases*, *1*, 42-58.
- Chrisopoulos, S., Beckwith, K., & Harford, J. (2011). *Oral health and dental care in Australia: Key facts and figures 2012*. . (Cat. no. DEN 224). Canberra: AIHW.

- Clayton, R., Chaudhry, S., Ali, I., Cooper, S., Hodgson, T., & Wojnarowska, F. (2010). Mucosal (oral and vulval) lichen planus in women: Are angiotensin-converting enzyme inhibitors protective, and beta-blockers and non-steroidal anti-inflammatory drugs associated with the condition? *Clinical and Experimental Dermatology*, 35(4), 384-387. Doi: 10.1111/j.1365-2230.2009.03581.x.
- Clemmens, D. A., & Kerr, A. R. (2008). Improving oral health in women: Nurses' call to action. *MCN: The American Journal of Maternal/Child Nursing*, 33(1), 10-14. Doi: 10.1097/01.NMC.0000305651.94118.6b.
- Cope, D. G. (2014). Methods and meanings: Credibility and trustworthiness of qualitative research. *Oncology Nursing Forum*, 41(1), 89-91. Doi: 10.1188/14.ONF.89-91.
- Cotti, E., Arrica, M., Di Lenarda, A., Serri, S. B., Bassareo, P., Padeletti, L., & Mercurio, G. (2017). The perioperative dental screening and management of patients undergoing cardiothoracic, vascular surgery and other cardiovascular invasive procedures: A systematic review. *European Journal of Preventive Cardiology*, 24(4), 409-425. Doi: 10.1177/2047487316682348.
- Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*. Lincoln, USA: Sage Publications.
- Creswell, J. W., & Plano-Clark, V. L. (2011). *Designing and conducting mixed methods research* (2nd ed.). Lincoln, USA: SAGE Publications.
- D'Aiuto, F., Orlandi, M., & Gunsolley, J. C. (2013). Evidence that periodontal treatment improves biomarkers and CVD outcomes. *Journal of Clinical Periodontology*, 40(s14), S85-S105. Doi: 10.1111/jcpe.12061.
- Da Silva, D., Souza, I., & Cunha, M. (2002). Knowledge, attitudes and status of oral health in children at risk for infective endocarditis. *International Journal of Paediatric Dentistry*, 12(2), 124-131. Doi: 10.1046/j.1365-263X.2002.00335.x.
- Dahlen, H. G., Johnson, M., Hoolsema, J., Norrie, T. P., Ajwani, S., Blinkhorn, A., . . . Yaacoub, A. (2019). Process evaluation of the midwifery initiated oral health-dental service

program: Perceptions of midwives in Greater Western Sydney, Australia. *Women and Birth*, 32(2), e159-e165. Doi: 10.1016/j.wombi.2018.06.021.

Davis, A. (1974). The emergence of American dental medicine: the relation of the maxillary antrum to focal infection. *Texas Reports on Biology and Medicine*, 32(1), 141.

Davis, K., Drey, N., & Gould, D. (2009). What are scoping studies? A review of the nursing literature. *International Journal of Nursing Studies*, 46(10), 1386-1400. Doi: 10.1016/j.ijnurstu.2009.02.010.

Demmer, R. T., Trinquart, L., Zuk, A., Fu, B. C., Blomkvist, J., Michalowicz, B. S., . . .

Desvarieux, M. (2013). The influence of anti-infective periodontal treatment on C-reactive protein: A systematic review and meta-analysis of randomized controlled trials. *PLoS One*, 8(10), e77441. Doi: 10.1371/journal.pone.0077441.

Dental Health Services Victoria. (2018). Healthy Families, Healthy Smiles: Advancing oral health in midwifery practice [Newsletter]. In Dental Health Services Victoria (Ed.). Victoria, Australia: Dental Health Services Victoria.

Dental Health Services Victoria. (2020). Advice for pregnant women Retrieved 16 April, 2020, from <https://www.dhsv.org.au/dental-health/general-dental-advice/pregnant-women>.

Department of Health. (2020). Programs and Campaigns: Dental. Retrieved March, 2020, from <https://www1.health.gov.au/internet/main/publishing.nsf/Content/dental-1>.

DeStefano, F., Anda, R. F., Kahn, H. S., Williamson, D. F., & Russell, C. M. (1993). Dental disease and risk of coronary heart disease and mortality. *British Medical Journal*, 306(6879), 688-691.

Dhadse, P., Gattani, D., & Mishra, R. (2010). The link between periodontal disease and cardiovascular disease: How far we have come in last two decades? *Journal of Indian Society of Periodontology*, 14(3), 148. Doi: 10.4103/0972-124X.75908.

- Dickinson, H., Watkins, C., & Leathley, M. (2001). The development of the THROAT: The holistic and reliable oral assessment tool. *Clinical Effectiveness in Nursing*, 5(3), 104-110. Doi: 10.1054/cein.2001.0221.
- Dietrich, T., Webb, I., Stenhouse, L., Pattni, A., Ready, D., Wanyonyi, K. L., . . . Gallagher, J. E. (2017). Evidence summary: The relationship between oral and cardiovascular disease. *British Dental Journal*, 222, 381-385. Doi: 10.1038/sj.bdj.2017.224.
- Dolce, M. C. (2014). Integrating oral health into professional nursing practice: An interprofessional faculty tool kit. *Journal of Professional Nursing*, 30(1), 63-71. Doi: 10.1016/j.profnurs.2013.06.002.
- Dolce, M. C., Haber, J., & Shelley, D. (2012). Oral health nursing education and practice program. *Nursing Research and Practice*, 2012(ID149673), 1-5. Doi: 10.1155/2012/149673.
- Dorn, J. M., Genco, R. J., Grossi, S. G., Falkner, K. L., Hovey, K. M., Iacoviello, L., & Trevisan, M. (2010). Periodontal disease and recurrent cardiovascular events in survivors of myocardial infarction (MI): the Western New York Acute MI Study. *Journal of Periodontology*, 81(4), 502-511. Doi: 10.1902/jop.2009.090499.
- Dudko, Y., Kruger, E., & Tennant, M. (2017). A national analysis of dental waiting lists and point-in-time geographic access to subsidised dental care: Can geographic access be improved by offering public dental care through private dental clinics? *Rural and Remote Health*, 17(3814). Doi: 10.22605/RRH3814.
- Duff, M., Dahlen, H. G., Burns, E., Priddis, H., Schmied, V., & George, A. (2017). Designing an oral health module for the Bachelor of Midwifery program at an Australian University. *Nurse Education in Practice*, 23, 76-81. Doi: 10.1016/j.nepr.2017.02.005.
- Eckel, R. H., Jakicic, J. M., Ard, J. D., de Jesus, J. M., Miller, N. H., Hubbard, V. S., . . . Millen, B. E. (2014). 2013 AHA/ACC guideline on lifestyle management to reduce cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Journal of the American College of Cardiology*, 63(25 Part B), 2960-2984.

- Eke, P. I., Dye, B. A., Wei, L., Slade, G. D., Thornton-Evans, G. O., Borgnakke, W. S., . . . Genco, R. J. (2015). Update on prevalence of periodontitis in adults in the United States: NHANES 2009-2012. *Journal of Periodontology*, *86*(5), 611-622. Doi: 10.1902/jop.2015.140520.
- El Kholy, K., Genco, R. J., & Van Dyke, T. E. (2015). Oral infections and cardiovascular disease. *Trends in Endocrinology & Metabolism*, *26*(6), 315-321. Doi: 10.1016/j.tem.2015.03.001.
- Fardal, Ø., & Lygre, H. (2015). Management of periodontal disease in patients using calcium channel blockers—gingival overgrowth, prescribed medications, treatment responses and added treatment costs. *Journal of Clinical Periodontology*, *42*(7), 640-646. Doi: 10.1111/jcpe.12426.
- Fardi, A., & Papadimitriou, D. (2007). Periodontal and atherosclerosis-induced diseases. *International Angiology*, *26*(3), 197.
- Flores, M. F., Montenegro, M. M., Furtado, M. V., Polanczyk, C. A., Rösing, C. K., & Haas, A. N. (2014). Periodontal status affects C-reactive protein and lipids in patients with stable heart disease from a tertiary care cardiovascular clinic. *Journal of Periodontology*, *85*(4), 545-553. Doi: 10.1902/jop.2013.130255.
- Folwaczny, M., Bauer, F., & Grünberg, C. (2019). Significance of oral health in adult patients with congenital heart disease. *Cardiovascular Diagnosis and Therapy*, *9*(Suppl 2), S377. Doi: 10.21037/cdt.2018.09.17.
- Freitas, C. O. T. d., Gomes-Filho, I. S., Naves, R. C., Nogueira Filho, G. d. R., Cruz, S. S. d., Santos, C. A. d. S. T., . . . Barbosa, M. D. d. S. (2012). Influence of periodontal therapy on C-reactive protein level: A systematic review and meta-analysis. *Journal of Applied Oral Science*, *20*(1), 1-8.
- Frenkel, H., Harvey, I., & Needs, K. (2002). Oral health care education and its effect on caregivers' knowledge and attitudes: A randomised controlled trial. *Community Dentistry and Oral Epidemiology*, *30*(2), 91-100. Doi: 10.1034/j.1600-0528.2002.300202.x.

- Freshwater, D., & Cahill, J. (2012). Why write? *Journal of Mixed Methods Research*, 6(3), 151-153. Doi: 10.1177/1558689812452416.
- Friedewald, V. E., Kornman, K. S., Beck, J. D., Genco, R., Goldfine, A., Libby, P., . . . Roberts, W. C. (2009). The American Journal of Cardiology and Journal of Periodontology editors' consensus: Periodontitis and atherosclerotic cardiovascular disease. *Journal of Periodontology*, 80(7), 1021-1032. Doi: 10.1902/jop.2009.097001.
- Fusch, P. I., & Ness, L. R. (2015). Are we there yet? Data saturation in qualitative research. *The Qualitative Report*, 20(9), 1408.
- Gandhi, N., & Silway, G. (2015). How important is dental clearance for elective open heart operations? *The Annals of Thoracic Surgery*, 99(1), 377. Doi: 10.1016/j.athoracsur.2014.04.145.
- Garry, B., & Boran, S. (2017). Promotion of oral health by community nurses. *British Journal of Community Nursing*, 22(10), 496-502. Doi: 10.12968/bjcn.2017.22.10.496.
- Genco, R. J., & Borgnakke, W. S. (2013). Risk factors for periodontal disease. *Periodontology 2000*, 62(1), 59-94. Doi: 10.1111/j.1600-0757.2012.00457.x.
- Genco, R. J., & Williams, R. C. (2010). *Periodontal disease and overall health: A clinician's guide*. Yardley, Pennsylvania, USA: Professional Audience Communications.
- George, A., Ajwani, S., Johnson, M., Dahlen, H., Blinkhorn, A., Bhole, S., . . . Dawes, W. (2015). Developing and testing of a midwifery oral health screening tool for pregnant women *Health Care for Women International*. Doi: 10.1080/07399332.2014.959170.
- George, A., Bhole, S., Johnson, M., Blinkhorn, A., Dahlen, H., Ellis, S., . . . Ajwani, S. (2013). *Improving maternal oral health in Australia through midwifery-dental collaboration*. Paper presented at the 10th World Congress on Preventive Dentistry 2013, Budapest, Hungary. www.dentalresearch.org.
- George, A., Dahlen, H. G., Blinkhorn, A., Ajwani, S., Bhole, S., Ellis, S., . . . Johnson, M. (2018). Evaluation of a midwifery initiated oral health-dental service program to improve oral health and birth outcomes for pregnant women: A Multi Centre Randomised

Controlled Trial. *International Journal of Nursing Studies*, 82, 49-57. Doi: 10.1016/j.ijnurstu.2018.03.006.

George, A., Dahlen, H. G., Blinkhorn, A., Ajwani, S., Bhole, S., Ellis, S., . . . Johnson, M. (2016). Measuring oral health during pregnancy: sensitivity and specificity of a maternal oral screening (MOS) tool. *BMC Pregnancy and Childbirth*, 16(1), 347. Doi: 10.1186/s12884-016-1140-4.

George, A., Duff, M., Ajwani, S., Johnson, M., Dahlen, H., Blinkhorn, A., . . . Bhole, S. (2012). Development of an online education program for midwives in Australia to improve perinatal oral health. *The Journal of Perinatal Education*, 21(2), 112-122. Doi: 10.1891/1058-1243.21.2.112.

George, A., Duff, M., Johnson, M., Dahlen, H., Blinkhorn, A., Ellis, S., . . . Bhole, S. (2014). Piloting of an oral health education programme and knowledge test for midwives. *Contemporary Nurse*, 46(2), 180-186. Doi: 10.5172/conu.2014.46.2.180.

George, A., Johnson, M., Blinkhorn, A., Ajwani, S., Bhole, S., Yeo, A., & Ellis, S. (2013). The oral health status, practices and knowledge of pregnant women in south-western Sydney. *Australian Dental Journal*, 58(1), 26-33. Doi: 10.1111/adj.12024.

George, A., Johnson, M., Blinkhorn, A., Ajwani, S., Ellis, S., & Bhole, S. (2014). Views of pregnant women in South Western Sydney towards dental care and an oral-health program initiated by midwives. *Health Promotion Journal of Australia*, 24(3), 178-184. Doi: 10.1071/HE13040.

George, A., Johnson, M., Blinkhorn, A., Ellis, S., Bhole, S., & Ajwani, S. (2010). Promoting oral health during pregnancy: Current evidence and implications for Australian midwives. *Journal of Clinical Nursing*, 19(23-24), 3324-3333. Doi: 10.1111/j.1365-2702.2010.03426.x.

George, A., Johnson, M., Duff, M., Ajwani, S., Bhole, S., Blinkhorn, A., & Ellis, S. (2012). Midwives and oral health care during pregnancy: Perceptions of pregnant women in South-Western Sydney, Australia. *Journal of Clinical Nursing*, 21(7-8), 1087-1096. Doi: 10.1111/j.1365-2702.2011.03870.x.

- George, A., Johnson, M., Duff, M., Blinkhorn, A., Ajwani, S., Bhole, S., & Ellis, S. (2011). Maintaining oral health during pregnancy: Perceptions of midwives in Southwest Sydney. *Collegian, 18*(2), 71-79. Doi: 10.1016/j.colegn.2010.10.003.
- George, A., Kong, A. C., Villarosa, A., Duff, M., Sheehan, A., Burns, E., . . . Dahlen, H. G. (2020). Implementing and evaluating the effectiveness of an oral health module for the bachelor of midwifery program at an Australian university. *Nurse Education Today, 104*457. Doi: 10.1016/j.nedt.2020.104457.
- George, A., Lang, G., Johnson, M., Ridge, A., de Silva, A. M., Ajwani, S., . . . Heilbrunn-Lang, A. Y. (2016a). The evaluation of an oral health education program for midwives in Australia. *Women and Birth, 29*(2016), 208-213. Doi: 10.1016/j.wombi.2015.10.004.
- George, A., Rojo, J., Alomari, A., Marks, A., Villarosa, A., & Kong, A. (2019). Oral health matters: Enhancing the undergraduate nursing curriculum. *Australian Nursing & Midwifery Journal, 26*(Jan-Mar 2020), 46.
- George, A., Villarosa, A. R., Patterson Norrie, T., Hoolsema, J., Dahlen, H. G., Ajwani, S., . . . Yaacoub, A. (2019). Process evaluation of the midwifery initiated oral health-dental service program: perceptions of pregnant women. *Australian Dental Journal, 64*(1), 55-65. Doi: 10.1111/adj.12660.
- Ghapanchi, J., Shahidi, S. P., Kamali, F., Zamani, L., & Ebrahimi, H. (2016). Knowledge and attitude of general dentists and last-year students regarding the management of medically compromised patients in Shiraz, Iran. *British Journal of Medicine and Medical Research, 11*(2), 1. Doi: 10.9734/BJMMR/2016/19576.
- Gold, S. I. (1985). Periodontics. The past. Part II. *Journal of Clinical Periodontology, 12*(3), 171-189. Doi: 10.1111/j.1600-051x.1985.tb00915.x.
- Gomes-Filho, I. S., Freitas Coelho, J. M., da Cruz, S. S., Passos, J. S., Teixeira de Freitas, C. O., Aragão Farias, N. S., . . . Barreto, M. L. (2011). Chronic periodontitis and C-reactive protein levels. *Journal of Periodontology, 82*(7), 969-978. Doi: 10.1902/jop.2010.100511.

- Górski, B., & Górska, R. (2018). The impact of periodontal treatment on inflammatory markers and cellular parameters associated with atherosclerosis in patients after myocardial infarction. *Central-European Journal of Immunology*, 43(4), 442. Doi: 10.5114/ceji.2018.81356.
- Government of South Australia. (2008). *Better oral health in residential care. Staff portfolio. Education and training program* South Australia: South Australian (SA) Dental Service Retrieved 14 February, 2016, from https://www.sahealth.sa.gov.au/wps/wcm/connect/09fa99004358886a979df72835153af6/BOHRC_Staff_Portfolio_Full_Version%5B1%5D.pdf?MOD=AJPERES&CACHEID=09fa99004358886a979df72835153af6.
- Government of South Australia. (2009). *Better oral health in residential care: Professional portfolio*. South Australia: South Australian (SA) Dental Service Retrieved 6 January, 2016, from https://www.sahealth.sa.gov.au/wps/wcm/connect/77fd7a004b3323958834ade79043faf0/BOHRC_Professional_Portfolio_Full_Version%5B1%5D.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-77fd7a004b3323958834ade79043faf0-mNBOcQ4.
- Government of South Australia. (2011). *Cardiac rehabilitation: A model of care for South Australia - An overview*. (ISBN: 978-1-74243-317-2). South Australia, Australia: Government of South Australia.
- Grattan, M. J., Power, A., Fruitman, D. S., Islam, S., & Mackie, A. S. (2015). The impact of infective endocarditis prophylaxis recommendations on the practices of pediatric and adult congenital cardiologists. *Canadian Journal of Cardiology*, 31(12), 1497. e1423-1497. e1428. Doi: 10.1016/j.cjca.2015.04.032.
- Green, E. C., & Murphy, E. (2014). *The Wiley Blackwell encyclopedia of health, illness, behavior, and society*. USA: John Wiley & Sons.
- Greene, J. C., Caracelli, V. J., & Graham, W. F. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis*, 11(3), 255-274. Doi: 10.3102/01623737011003255.

- Griffiths, J., & Lewis, D. (2002). Guidelines for the oral care of patients who are dependent, dysphagic or critically ill. *Journal Disability Oral Health*, 3(1), 30-33.
- Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (Vol. 2, pp. 105). Thousand Oaks, CA: Sage Publications, Inc.
- Guggenheimer, J., Mayher, D., & Eghtesad, B. (2005). A survey of dental care protocols among US organ transplant centers. *Clinical Transplantation*, 19(1), 15-18. Doi: 10.1111/j.1399-0012.2005.00251.x.
- Habbab, K., Moles, D., & Porter, S. (2010). Potential oral manifestations of cardiovascular drugs. *Oral Diseases*, 16(8), 769-773. Doi: 10.1111/j.1601-0825.2010.01686.x.
- Heart and Stroke Foundation Canada. (2016). Statistics Canada. Retrieved 18 November, 2016, from <http://www.heartandstroke.com/site/c.iKlQLcMWJtE/b.3483991/k.34A8/Statistics.htm>.
- Heart Foundation of Australia. (2019a). Cardiovascular disease fact sheet. Retrieved 14 October, 2019, from <https://www.heartfoundation.org.au/about-us/what-we-do/heart-disease-in-australia/cardiovascular-disease-fact-sheet>.
- Heart Foundation of Australia. (2019b). A novel link between periodontal disease and cardiovascular disease. Retrieved 2 June 2019, from <https://www.heartfoundation.org.au/research-project/a-novel-link-between-periodontal-disease-and-cardiovascular-disease>.
- Heart Research Institute. (2019). Atherosclerosis. Retrieved 2 June, 2019, from <https://www.hri.org.au/health/learn/cardiovascular-disease/atherosclerosis>.
- Hedt, B. L., & Pagano, M. (2011). Health indicators: Eliminating bias from convenience sampling estimators. *Statistics in Medicine*, 30(5), 560-568. Doi: 10.1002/sim.3920.
- Heilbrunn-Lang, A. Y., de Silva, A. M., Lang, G., George, A., Ridge, A., Johnson, M., . . . Gilmour, C. (2015). Midwives' perspectives of their ability to promote the oral health

of pregnant women in Victoria, Australia. *BMC Pregnancy and Childbirth*, 15(1), 110. Doi: 10.1186/s12884-015-0536-x.

Hollatz, S., Wacker-Gussmann, A., Wilberg, S., Folwaczny, M., Neidenbach, R., Kaemmerer, H., . . . Therapy. (2019). Awareness of oral health in adults with congenital heart disease. *Cardiovascular Diagnosis Therapy*. (Suppl 2):S281-S291. Doi: 10.21037/cdt.2019.01.01.

House of Representatives. (2013). Bridging the dental gap: Report on the inquiry into adult dental services. Australia: The Parliament of the Commonwealth of Australia. ISBN 978-1-74366-069-0 (Printed version)/ ISBN 978-1-74366-070-6 (HTML version).

Hughes, S., Balmer, R., Moffat, M., & Willcoxson, F. (2019). The dental management of children with congenital heart disease following the publication of Paediatric Congenital Heart Disease Standards and Specifications. *British Dental Journal*, 226(6), 447.

Humagain, M., Nayak, D., & Uppoor, A. (2005). Periodontal infections and cardiovascular disease: Is it a mere association? *Kathmandu University Medical Journal (KUMJ)*, 4(3), 379-382.

Humphrey, L. L., Fu, R., Buckley, D. I., Freeman, M., & Helfand, M. (2008). Periodontal disease and coronary heart disease incidence: A systematic review and meta-analysis. *Journal of General Internal Medicine*, 23(12), 2079-2086. Doi: 10.1007/s11606-008-0787-6.

Hunter, W. (1900). Oral sepsis as a cause of disease. *British Medical Journal*, 2(2065), 215-216. Doi: 10.1136/bmj.2.2065.215.

Hussein, A. (2009). The use of triangulation in social sciences research: Can qualitative and quantitative methods be combined? *Journal of Comparative Social Work*, 4(1).

Hwang, S. Y., Shim, J. L., Kang, D., & Choi, J. (2018). Poor oral health predicts higher 10-year cardiovascular risk: A propensity score matching analysis. *Journal of Cardiovascular Nursing*, 33(5), 429-436. Doi: 10.1097/JCN.0000000000000497.

- Iacobucci, D., Posavac, S. S., Kardes, F. R., Schneider, M. J., & Popovich, D. L. (2015). Toward a more nuanced understanding of the statistical properties of a median split. *Journal of Consumer Psychology, 25*(4), 652-665. Doi: 10.1016/j.jcps.2014.12.002.
- IBM Corp. (2016). IBM SPSS statistics for windows (Version 24.0). Armonk, NY: IBM Corp.
- Ioannidou, E., Malekzadeh, T., & Dongari-Bagtzoglou, A. (2006). Effect of periodontal treatment on serum C-reactive protein levels: A systematic review and meta-analysis. *Journal of Periodontology, 77*(10), 1635-1642. Doi: 10.1902/jop.2006.050443.
- Jamieson, L., Elani, H., Mejia, G., Ju, X., Kawachi, I., Harper, S., . . . Kaufman, J. (2016). Inequalities in indigenous oral health: findings from Australia, New Zealand, and Canada. *Journal of Dental Research, 95*(12), 1375-1380. Doi: 10.1177/0022034516658233.
- Jangid, K., Doraiswamy, J. N., Varghese, S., & Malaiappan, S. (2015). Periodontitis as a risk factor for cardiovascular diseases-hype or a fact? *Journal of Cardiovascular Disease Research Vol, 6*(1), 25. Doi: 10.5530/jcdr.2015.1.4.
- Janket, S.-J., Baird, A. E., Chuang, S.-K., & Jones, J. A. (2003). Meta-analysis of periodontal disease and risk of coronary heart disease and stroke. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology, 95*(5), 559-569. Doi: 10.1067/moe.2003.107.
- Jeganathan, S., Purnomo, J., Houtzager, L., Batterham, M., & Begley, K. (2010). Development and validation of a three-item questionnaire for dietitians to screen for poor oral health in people living with human immunodeficiency virus and facilitate dental referral. *Nutrition & Dietetics, 67*(3), 177-181. Doi: 10.1111/j.1747-0080.2010.01452.x.
- Jin, L., Lamster, I., Greenspan, J., Pitts, N., Scully, C., & Warnakulasuriya, S. (2016). Global burden of oral diseases: Emerging concepts, management and interplay with systemic health. *Oral Diseases, 22*(7), 609-619. Doi: 10.1111/odi.12428.

- Johnson, M., George, A., Dahlen, H., Ajwani, S., Bhole, S., Blinkhorn, A., . . . Yeo, A. (2015). The midwifery initiated oral health-dental service protocol: An intervention to improve oral health outcomes for pregnant women. *BMC Oral Health, 15*(1), 2. Doi: 10.1186/1472-6831-15-2.
- Johnson, M., Sanchez, P., & Zheng, C. (2016). The impact of an integrated nursing handover system on nurses' satisfaction and work practices. *Journal of Clinical Nursing, 25*(1-2), 257-268. Doi: 10.1111/jocn.13080.
- Johnson, N. A., Inder, K. J., Nagle, A. L., & Wiggers, J. H. (2010). Attendance at outpatient cardiac rehabilitation: Is it enhanced by specialist nurse referral? *Australian Journal of Advanced Nursing, 27*(4), 31-37. Doi: ProQuestID609127514.
- Jolliffe, I. (2011). Principal component analysis. In M. Lovric (Ed.), *International encyclopedia of statistical science* (pp. 1094-1096). Berlin, Heidelberg: Springer.
- Joshy, G., Arora, M., Korda, R., Chalmers, J., & Banks, E. (2016). Is poor oral health a risk marker for incident cardiovascular disease hospitalisation and all-cause mortality? Findings from 172 630 participants from the prospective 45 and Up Study. *BMJ Open, 6*(8). Doi: 10.1136/bmjopen-2016-012386.
- Jowett, N., & Cabot, L. (2000). Patients with cardiac disease: Considerations for the dental practitioner. *British Dental Journal, 189*(6), 297-302. Doi: 10.1038/sj.bdj.4800750.
- Kampits, C., Montenegro, M. M., Ribeiro, I. W., Furtado, M. V., Polanczyk, C. A., RÖSING, C. K., & HAAS, A. (2016). Periodontal disease and inflammatory blood cytokines in patients with stable coronary artery disease. *Journal of Applied Oral Science, 24*(4), 352-358. Doi: 10.1590/1678-775720160082.
- Kandelman, D., Arpin, S., Baez, R. J., Baehni, P. C., & Petersen, P. E. (2012). Oral health care systems in developing and developed countries. *Periodontology 2000, 60*(1), 98-109. Doi: 10.1111/j.1600-0757.2011.00427.x.
- Kapellas, K., Jamieson, L. M., Do, L. G., Bartold, P. M., Wang, H., Maple-Brown, L. J., . . . Celermajer, D. S. (2014). Associations between periodontal disease and

cardiovascular surrogate measures among Indigenous Australians. *International Journal of Cardiology*, 173(2), 190-196. Doi: 10.1016/j.ijcard.2014.02.015.

Kassebaum, N., Smith, A., Bernabé, E., Fleming, T., Reynolds, A., Vos, T., . . . Collaborators, G. O. H. (2017). Global, regional, and national prevalence, incidence, and disability-adjusted life years for oral conditions for 195 countries, 1990–2015: A systematic analysis for the global burden of diseases, injuries, and risk factors. *Journal of Dental Research*, 96(4), 380-387. Doi: 10.1177/0022034517693566.

Kaur, S., Kaur, B., & Ahluwalia, S. S. (2015). "Oral health knowledge, attitude and practices amongst health professionals in Ludhiana, India." *Dentistry* 5(7): 1. Doi: 10.4172/2161-1122.1000315.

Kayser-Jones, J., Bird, W. F., Paul, S. M., Long, L., & Schell, E. S. (1995). An instrument to assess the oral health status of nursing home residents. *The Gerontologist*, 35(6), 814-824. Doi: 10.1093/geront/35.6.814.

Keboa, M. T., Hiles, N., & Macdonald, M. E. (2016). The oral health of refugees and asylum seekers: A scoping review. *Globalization and health*, 12(1), 59. Doi: 10.1186/s12992-016-0200-x.

Kebschull, M., Demmer, R., & Papapanou, P. (2010). "Gum bug, leave my heart alone!" — Epidemiologic and mechanistic evidence linking periodontal infections and atherosclerosis. *Journal of Dental Research*, 89(9), 879-902. Doi: 10.1177/0022034510375281.

Kennedy, S., Kidd, M. P., McDonald, J. T., & Biddle, N. (2015). The healthy immigrant effect: Patterns and evidence from four countries. *Journal of International Migration and Integration*, 16(2), 317-332. Doi: 10.1007/s12134-014-0340-x.

Khader, Y. S., Albashaireh, Z. S., & Alomari, M. A. (2004). Periodontal diseases and the risk of coronary heart and cerebrovascular diseases: A meta-analysis. *Journal of Periodontology*, 75(8), 1046-1053. Doi: 10.1902/jop.2004.75.8.1046.

- Kinane, D., & Bouchard, P. (2008). Periodontal diseases and health: Consensus report of the sixth European workshop on periodontology. *Journal of Clinical Periodontology*, 35(s8), 333-337. Doi: 10.1111/j.1600-051X.2008.01278.x.
- King, P. L. (1992). *A dental health education program for caregivers of elderly people in nursing homes*. (Master of Dental Surgery), University of Sydney, Sydney.
- Kolltveit, K. M., & Eriksen, H. M. (2001). Is the observed association between periodontitis and atherosclerosis causal? *European Journal of Oral Sciences*, 109(1), 2-7.
- Kraatz, J., Qin, D., Hoang, H., Godwin, D., & Crocombe, L. A. (2014). Regional use of the Australian Chronic Disease Dental Scheme. *Australian Journal of Rural Health*, 22(6), 310-315. Doi: 10.1111/ajr.12121.
- Kumar, P., Mastan, K., Chowdhary, R., & Shanmugam, K. (2012). Oral manifestations in hypertensive patients: A clinical study. *Journal of Oral and Maxillofacial Pathology: JOMFP*, 16(2), 215. Doi: 10.4103/0973-029X.99069.
- Kundoor Vinay Kumar Reddy, R., Kinnera, R. R., Maloth, K. N., & Sunitha, K. (2015). Evaluation of Association between CRP Levels in Chronic Periodontitis patients and Chronic Periodontitis with Cardiovascular Diseases. *Journal of Cardiovascular Disease Research*, 6(4), 176-178. Doi: 10.5530/jcdr.2015.4.2.
- Kuramoto, C., Watanabe, Y., Tonogi, M., Hirata, S., Sugihara, N., Ishii, T., & Yamane, G. y. (2011). Factor analysis on oral health care for acute hospitalized patients in Japan. *Geriatrics & Gerontology International*, 11(4), 460-466. Doi: 10.1111/j.1447-0594.2011.00709.x.
- Kuwabara, M., Motoki, Y., Ichiura, K., Fujii, M., Inomata, C., Sato, H., . . . Nakamura, Y. (2016). Association between toothbrushing and risk factors for cardiovascular disease: A large-scale, cross-sectional Japanese study. *BMJ Open*, 6(1), e009870. Doi: 10.1136/bmjopen-2015-009870.

- Lafon, A., Pereira, B., Dufour, T., Rigouby, V., Giroud, M., Bejot, Y., & Tubert-Jeannin, S. (2014). Periodontal disease and stroke: a meta-analysis of cohort studies. *European Journal of Neurology*, 21(9), 1155. Doi: 10.1111/ene.12415.
- Lam, O. L., Zhang, W., Samaranayake, L. P., Li, L. S., & McGrath, C. (2011). A systematic review of the effectiveness of oral health promotion activities among patients with cardiovascular disease. *International Journal of Cardiology*, 151(3), 261-267. Doi: 10.1016/j.ijcard.2010.11.014.
- Lam, R., Kruger, E., & Tennant, M. (2012). Experiences in the implementation of a national policy: a retrospective analysis of the Australian Chronic Dental Disease Scheme. *The Australasian Medical Journal*, 5(10), 551. Doi: 10.4066/AMJ.2012.1479.
- Lang, N. P., Suvan, J. E., & Tonetti, M. S. (2015). Risk factor assessment tools for the prevention of periodontitis progression a systematic review. *Journal of Clinical Periodontology*, 42(S16). Doi: 10.1111/jcpe.12350.
- Lavrakas, P. J. (2008). *Encyclopedia of survey research methods*. USA: Sage Publications.
- Leng, W.-D., Zeng, X.-T., Kwong, J., & Hua, X.-P. (2015). Periodontal disease and risk of coronary heart disease: An updated meta-analysis of prospective cohort studies. *International Journal of Cardiology*, 201, 469. Doi: 10.1016/j.ijcard.2015.07.087.
- Li, C., Lv, Z., Shi, Z., Zhu, Y., Wu, Y., & Li, L. (2014). Periodontal therapy for the management of cardiovascular disease in patients with chronic periodontitis. *Cochrane Database of Systemic Reviews*(8). Doi: 10.1002/14651858.CD009197.pub2.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry* (Vol. 75). London: Sage.
- Liu, L., Zhang, Y., Wu, W., & Cheng, R. (2015). Characteristics of dental care-seeking behavior and related sociodemographic factors in a middle-aged and elderly population in northeast China. *BMC Oral Health*, 15(1), 66. Doi: 10.1186/s12903-015-0053-3.
- Lockhart, P. B., Bolger, A. F., Papapanou, P. N., Osinbowale, O., Trevisan, M., Levison, M. E., . . . Gewitz, M. H. (2012). Periodontal disease and atherosclerotic vascular disease: Does the evidence support an independent association? A scientific

statement from the American Heart Association. *Circulation*, 125(20), 2520-2544.

Doi: 10.1161/CIR.0b013e31825719f3.

Lockhart, P. B., DeLong, H. R., Lipman, R. D., Abt, E., Baddour, L. M., Colvin, M., . . . Estrich, C. G. (2019). Effect of dental treatment before cardiac valve surgery: Systematic review and meta-analysis. *The Journal of the American Dental Association*, 150(9), 739-747. e739. Doi: 10.1016/j.adaj.2019.04.024.

Løken, S. Y., Wang, N. J. & Wigen, T. I. (2016). "Health nurses' experiences and attitudes regarding collaboration with dental personnel." *BMC Oral Health* 16(1): 66.

Loos, B. G., Teeuw, W. J., & Nicu, E. A. (2016). Plausible mechanisms explaining the association of periodontitis with cardiovascular diseases. In A. M. L. Pedersen (Ed.), *Oral Infections and General Health* (pp. 19-33). The Netherlands: Springer International.

Mackian, S., Bedri, N., & Lovel, H. (2004). Up the garden path and over the edge: Where might health-seeking behaviour take us? *Health Policy and Planning*, 19(3), 137-146. Doi: 10.1093/heapol/czh017.

Madianos, P. N., Bobetsis, G. A., & Kinane, D. F. (2002). Is periodontitis associated with an increased risk of coronary heart disease and preterm and/or low birth weight births? *Journal of Clinical Periodontology*, 29(s3), 22-36.

Maher, L., Phelan, C., Lawrence, G., Dawson, A., Torvaldsen, S., & Wright, C. (2012). The early childhood oral health program: Promoting prevention and timely intervention of early childhood caries in NSW through shared care. *Health Promotion Journal of Australia*, 23(3), 171-176. Doi: 10.1071/HE12171.

Mallinckrodt, B., Miles, J. R., & Recabarren, D. A. (2015). Using focus groups and rasch item response theory to improve instrument development. *The Counseling Psychologist*, 44(2), 146-194. Doi: 10.1177/0011000015596437.

- Mattheus, D., Shannon, M., Gandhi, K., & Lim, E. (2018). Oral health knowledge and practices of pediatric and family nurse practitioners. *Journal of Pediatric Health Care*, 32(4), 356-362. Doi: 10.1016/j.pedhc.2017.12.005.
- Mattila, K., Valtonen, V., Nieminen, M., & Huttunen, J. K. (1995). Dental infection and the risk of new coronary events: prospective study of patients with documented coronary artery disease. *Clinical Infectious Diseases*, 20(3), 588-592.
- Mello, A. L. S. F. d., Zimermann, K., & Gonçalves, L. H. T. (2012). Nurse's assessment of oral health of elderly people: OHAT validity and reliability [Portuguese]. *Revista Gaúcha de Enfermagem*, 33(2), 36-44.
- Meurman, J. H., Sanz, M., & Janket, S.-J. (2004). Oral health, atherosclerosis, and cardiovascular disease. *Critical Reviews in Oral Biology and Medicine*, 15(6), 403-413. Doi: 10.1177/154411130401500606.
- Minkle Gulati, Vishal Anand, Jain, N., Anand, B., Bahuguna, R., Govila, V., & Rastogi, P. (2013). Essentials of periodontal medicine in preventive medicine. *International Journal of Preventive Medicine*, 4(9), 988-994.
- Montebugnoli, L., Servidio, D., Miaton, R., Prati, C., Tricoci, P., Melloni, C., & Melandri, G. (2005). Periodontal health improves systemic inflammatory and haemostatic status in subjects with coronary heart disease. *Journal of Clinical Periodontology*, 32(2), 188-192. Doi: 10.1111/j.1600-051X.2005.00641.x.
- Morse, J. M. (2015). Critical analysis of strategies for determining rigor in qualitative inquiry. *Qualitative Health Research*, 25(9), 1212-1222. Doi: 10.1177/1049732315588501.
- Mosley, M., Offenbacher, S., Phillips, C., Granger, C., & Wilder, R. S. (2014). North Carolina cardiologists' knowledge, opinions and practice behaviors regarding the relationship between periodontal disease and cardiovascular disease. *American Dental Hygienists Association*, 88(5), 275-284.

- Moura, F. A., Alexandre, R. G., Manoel, B. C., Luciancencov, P. C., Patel, K., Suvan, J., & D'Aiuto, F. (2010). Periodontal therapy and biomarkers related to cardiovascular risk. *Minerva Stomatologica*, *59*(5), 271-283. Doi: PMID 20502435.
- Mozaffarian, D., Benjamin, E. J., Go, A. S., Arnett, D. K., Blaha, M. J., Cushman, M., . . . Fullerton, H. J. (2016). Executive Summary: Heart Disease and Stroke Statistics—2016 Update A Report From the American Heart Association. *Circulation*, *133*(4), 447-454. Doi: 10.1161/CIR.0000000000000366.
- Mozos, I., & Stoian, D. (2019). Oral Health and Cardiovascular Disorders *Crosstalk in Biological Processes*: IntechOpen.
- Mustapha, I. Z., Debrey, S., Oladubu, M., & Ugarte, R. (2007). Markers of systemic bacterial exposure in periodontal disease and cardiovascular disease risk: a systematic review and meta-analysis. *Journal of Periodontology*, *78*(12), 2289-2302. Doi: 10.1902/jop.2007.070140.
- Nagata, T., Ninomiya, M., Mihara, C., Kido, J., Nishikawa, S., & Kataoka, M. (Eds.). (2016). *Etiology of drug-induced gingival overgrowth. Chapter 7* (Vol. 37). Bali, Indonesia: Asian Pacific Society of Periodontology.
- Naik, R. J., Patel, N. R., Wang, M., & Shah, N. C. (2016). Infective endocarditis prophylaxis: current practice trend among paediatric cardiologists: are we following the 2007 guidelines? *Cardiology in the Young*, *26*(6), 1176-1182. Doi: 10.1017/S1047951115002176.
- National Health and Medical Research Council. (2007). *National statement on ethical conduct in human research*. Australia: NHMRC.
- National Health Service England. (2014, 7 April 2014). Improving dental care and oral health – A call to action – National stakeholder event summary report. Version 1. from <https://www.england.nhs.uk/2014/02/improve-dental-cta/>.
- National Heart Foundation of Australia. (2014a). Directory of NSW/ACT Cardiovascular Health Services (pp. 1-84). NSW: Heart Foundation.

- National Heart Foundation of Australia. (2014b). Improving cardiac rehabilitation in Australia. Retrieved 9 November, 2015, from <http://www.heartfoundation.org.au/information-for-professionals/Clinical-Information/Cardiac-rehabilitation/Pages/default.aspx>.
- National Heart Foundation of Australia. (2014c). Information for professionals: Data and statistics. Retrieved 23 October, 2014, from <http://heartfoundation.org.au/about-us/what-we-do/heart-disease-in-australia>.
- National Heart Foundation of Australia. (2018). Clinical information for health professionals Retrieved 30 January, 2018, from <https://www.heartfoundation.org.au/for-professionals/clinical-information>.
- National Heart Foundation of Australia. (2019). Cardiovascular disease fact sheet. Retrieved 11 August, 2019, from <https://www.heartfoundation.org.au/about-us/what-we-do/heart-disease-in-australia/cardiovascular-disease-fact-sheet>.
- National Heart Lung and Blood Institute. (2019). Atherosclerosis. Retrieved 16 August, 2019, from <https://www.nhlbi.nih.gov/health-topics/atherosclerosis>.
- Nguyen, T. T., Wu, K. Y., Leclerc, M., Pham, H. M., & Tran, S. D. (2018). Cardiovascular diseases and periodontal disease. *Current Oral Health Reports*, 5(1), 13-18. Doi: 10.1007/s40496-018-0165-03.
- Nichols, M., Peterson, K., Herbert, J., Alston, L., & Allender, S. (2016). *Australian heart disease statistics 2015*: National Heart Foundation of Australia Melbourne.
- Niwa, H., Sato, Y., & Matsuura, H. (2000). Safety of dental treatment in patients with previously diagnosed acute myocardial infarction or unstable angina pectoris. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*, 89(1), 35-41.
- Nonzee, V., Manopatanakul, S., & Khovidhunkit, S.-o. P. (2012). Xerostomia, hyposalivation and oral microbiota in patients using antihypertensive medications. *Journal of the Medical Association of Thailand*, 95(1), 96.

- NSW Department of Health. (2010). *NSW Early Childhood Oral Health Program Evaluation*. New South Wales Australia,: Retrieved 19 November, 2015, from <http://www.health.nsw.gov.au/oralhealth/Publications/ecoh-eval.pdf>.
- NSW Government Health. (2017). *Policy Directive: Priority oral health program (POHP) and waiting list management*. (PD2017_023). Australia: Retrieved 22 July, 2018, from https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/PD2017_023.pdf.
- NSW Government Health. (2020). *NSW public dental waiting lists: by financial quarter*. Retrieved 2 June, 2020, from <https://www.health.nsw.gov.au/oralhealth/Pages/waiting.aspx>.
- NSW Ministry of Health. (2013). *Oral health 2020: A strategic framework for dental health in NSW*. New South Wales Australia: Retrieved 11 May, 2015, from http://www.health.nsw.gov.au/oralhealth/Pages/oral_health_2020.aspx.
- NSW Ministry of Health. (2013). *Policy Directive. Early Childhood Oral Health (ECOH) program: The role of public oral health services*. (PD2013_037). New South Wales Australia: Retrieved 1 March, 2019, from https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/PD2013_037.pdf.
- NSW Ministry of Health. (2014). *Guideline. Early childhood oral health guidelines for child health professionals, 3rd Edition*. (GL2014_020). New South Wales Australia: Retrieved 11 May, 2015, from https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/GL2014_020.pdf.
- NSW Ministry of Health. (2016). *Policy Directive. Oral Health Fee for Service Scheme*. (PD2016_018). New South Wales Australia: COHS Retrieved 10 November, 2017, from https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/PD2016_018.pdf.
- Nursing and Midwifery Board of Australia. (2015). *Fact sheet: Continuing professional development*. Retrieved 12 July, 2015, from <http://www.nursingmidwiferyboard.gov.au/Codes-Guidelines-Statements/FAQ/CPD-FAQ-for-nurses-and-midwives.aspx>.

- Nursing and Midwifery Board of Australia. (2016). *Registered Nurses Standards for Practice*. (NMP00011). Australia: NMBA Retrieved 12 July, 2015, from file:///C:/Users/Owner/Downloads/Nursing-and-Midwifery-Board---Standard---Registered-nurse-standards-for-practice---1-June-2016%20(1).PDF.
- Nyongesa, N. (2013). *Implementing an evidence-based oral health assessment tool (OHAT) in a nursing home [PhD Dissertation]*. (DNP Dissertation/Thesis), North Dakota State University, United States: North Dakota. Retrieved 12 July, 2015, from <http://search.proquest.com/docview/1353401428> (3559498).
- Öcek, Z. A., Eden, E., Soyer, M. T., & Cliçeklioglu, M. (2003). Evaluation of a dental health education program for midwives. *Journal of Public Health Dentistry*, 63(4), 255-257. Doi: 10.1111/j.1752-7325.2003.tb03509.x.
- Office of Disease prevention and Health promotion. (2016). Healthy People 2020.
- Oliver, K. J., Casas, M. J., Judd, P. L., & Russell, J. L. (2017). Oral health assessment practices and perceptions of North American paediatric cardiologists. *Paediatrics & Child Health*, 22(6), 312-316. Doi: 10.1093/pch/pxx093.
- Olsen, I. (2015). From the acta prize lecture 2014: The periodontal-systemic connection seen from a microbiological standpoint: Summary of the Acta Odontologica Scandinavia Price Lecture 2014 presented at the meeting of the IADR/Pan European Region in Dubrovnik, September 10–13. 2014. *Acta Odontologica Scandinavica*, 73(8), 563-568. Doi: 10.3109/00016357.2015.1007480.
- Onwuegbuzie, A. J., Bustamante, R. M., & Nelson, J. A. (2010). Mixed research as a tool for developing quantitative instruments. *Journal of Mixed Methods Research*, 4(1), 56-78. Doi: 10.1177/1558689809355805.
- O'Reilly, P., & Claffey, N. (2000). A history of oral sepsis as a cause of disease. *Periodontology* 2000, 23(1), 13-18. Doi: 10.1034/j.1600-0757.2000.2230102.x.
- Orlandi, M., Suvan, J., Petrie, A., Donos, N., Masi, S., Hingorani, A., . . . D'Aiuto, F. (2014). Association between periodontal disease and its treatment, flow-mediated dilatation

- and carotid intima-media thickness: A systematic review and meta-analysis. *Atherosclerosis*, 236(1), 39-46. Doi: 10.1016/j.atherosclerosis.2014.06.002.
- Ozaras, G., & Abaan, S. (2018). Investigation of the trust status of the nurse–patient relationship. *Nursing Ethics*, 25(5), 628-639. Doi: 10.1177/0969733016664971.
- Pandey, S., & Chawla, D. (2016). Using qualitative research for establishing content validity of e-lifestyle and website quality constructs. *Qualitative Market Research: An International Journal*, 19(3), 339-356. Doi: 10.1108/QMR-05-2015-0033.
- Papapanou, P. N. (2015). Systemic effects of periodontitis: Lessons learned from research on atherosclerotic vascular disease and adverse pregnancy outcomes. *International Dental Journal*, 65(6), 283-291. Doi: 10.1111/idj.12185.
- Paraskevas, S., Huizinga, J. D., & Loos, B. G. (2008). A systematic review and meta-analyses on C-reactive protein in relation to periodontitis. *Journal of Clinical Periodontology*, 35(4), 277-290. Doi: 10.1111/j.1600-051X.2007.01173.x.
- Patten, M. L. (2016). *Questionnaire research: A practical guide* (4th ed.). New York: Routledge.
- Peduzzi, P., Concato, J., Kemper, E., Holford, T. R., & Feinstein, A. R. (1996). A simulation study of the number of events per variable in logistic regression analysis. *Journal of Clinical Epidemiology*, 49(12), 1373-1379. Doi: 10.1016/S0895-4356(96)00236-3.
- Peres, M. A., Macpherson, L. M., Weyant, R. J., Daly, B., Venturelli, R., Mathur, M. R., . . . Kearns, C. (2019). Oral diseases: a global public health challenge. *The Lancet*, 394(10194), 249-260.
- Perry, A. D., Iida, H., Patton, L. L., & Wilder, R. S. (2015). Knowledge, perceived ability and practice behaviors regarding oral health among pediatric hematology and oncology nurses. *American Dental Hygienists' Association*, 89(4), 219-228.
- Persson, G. R., & Persson, R. E. (2008). Cardiovascular disease and periodontitis: An update on the associations and risk. *Journal of Clinical Periodontology*, 35(s8), 362-379. Doi: 10.1111/j.1600-051X.2008.01281.x.

- Petersen, P. E. (2009). Global policy for improvement of oral health in the 21st century—implications to oral health research of World Health Assembly 2007, World Health Organization. *Community Dentistry and Oral Epidemiology*, 37(1), 1-8. Doi: 10.1111/j.1600-0528.2008.00448.x.
- Petersen, P. E., & Ogawa, H. (2012). The global burden of periodontal disease: Towards integration with chronic disease prevention and control. *Periodontology 2000*, 60(1), 15-39. Doi: 10.1111/j.1600-0757.2011.00425.x.
- PHN South Western Sydney. (2020). Multicultural & refugee health Retrieved 13 May, 2020, from <https://www.swsphn.com.au/multiculturalhealth>.
- Poudel, P., Griffiths, R., Wong, V. W., Arora, A., Flack, J. R., Khoo, C. L., & George, A. (2018). Oral health knowledge, attitudes and care practices of people with diabetes: a systematic review. *BMC Public Health*, 18(1), 577. Doi: 10.1186/s12889-018-5485-7.
- Poudel, P., Griffiths, R., Wong, V. W., Arora, A., & George, A. (2017). Knowledge and practices of diabetes care providers in oral health care and their potential role in oral health promotion: A scoping review. *Diabetes Research and Clinical Practice*, 130, 266-277. Doi: 10.1016/j.diabres.2017.06.004.
- QRS International Pty Ltd. (2015). NVivo qualitative data analysis software. Version 11.
- Quinonez, R., & Boggess, K. (2016). Prenatal oral health program. Retrieved 28 February, 2016, from <http://www.prenataloralhealth.org/>.
- Rai, K., & Hegde, A. (2009). Oral health status of children with congenital heart disease and the awareness, attitude and knowledge of their parents. *Journal of Clinical Pediatric Dentistry*, 33(4), 315-318. Doi: 10.17796/jcpd.33.4.2j108w0225241867.
- Rasouli-Ghahroudi, A. A., Khorsand, A., Yaghobee, S., Rokn, A., Jalali, M., Masudi, S., . . . Kabir, A. (2016). Oral health status, knowledge, attitude and practice of patients with heart disease. *ARYA Atherosclerosis*, 12(1), 1-9. Doi: ProQuestID 1772449339 / PMID 274834175.

- Reichert, S., Schlitt, A., Beschow, V., Lutze, A., Lischewski, S., Seifert, T., . . . Hofmann, B. (2015). Use of floss/interdental brushes is associated with lower risk for new cardiovascular events among patients with coronary heart disease. *Journal of Periodontal Research*, *50*(2), 180-188. Doi: 10.1111/jre.12191.
- Reyes, L., Herrera, D., Kozarov, E., Roldán, S., & Progulske-Fox, A. (2013). Periodontal bacterial invasion and infection: contribution to atherosclerotic pathology. *Journal of Clinical Periodontology*, *40*(s14). Doi: 10.1111/jcpe.12079.
- Roca-Millan, E., González-Navarro, B., del Mar Sabater-Recolons, M., Marí-Roig, A., Jané-Salas, E., & López-López, J. (2018). Periodontal treatment on patients with cardiovascular disease: Systematic review and meta-analysis. *Medicina Oral, Patología Oral y Cirugía Bucal*, *23*(6), e681. Doi: 10.4317/medoral.22725.
- Roth, G. A., Johnson, C., Abajobir, A., Abd-Allah, F., Abera, S. F., Abyu, G., . . . Alam, K. (2017). Global, regional, and national burden of cardiovascular diseases for 10 causes, 1990 to 2015. *Journal of the American College of Cardiology*, *70*(1), 1-25. Doi: 10.1016/j.jacc.2017.04.052.
- Rydén, L., Buhlin, K., Ekstrand, E., de Faire, U., Gustafsson, A., Holmer, J., . . . Nygren, Å. (2016). Periodontitis increases the risk of a first myocardial infarction: A report from the PAROKRANK study. *Circulation*, *133*(6), 576-583. Doi: 10.1161/CIRCULATIONAHA.115.020324.
- Saldaña, J. (2015). *The coding manual for qualitative researchers* (Third ed.). London: Sage.
- Sanchez, P., Everett, B., Salamonson, Y., Ajwani, S., Bhole, S., Bishop, J., . . . Redfern, J. (2017). Oral health and cardiovascular care: Perceptions of people with cardiovascular disease. *PLoS One*, *12*(7), e0181189. Doi: 10.1371/journal.pone.0181189.
- Sanchez, P., Everett, B., Salamonson, Y., Ajwani, S., Bhole, S., Bishop, J., . . . George, A. (2018). Perceptions of cardiac care providers towards oral health promotion in Australia. *Collegian*, *25*(5), 471-478. Doi: 10.1016/j.colegn.2017.11.006.

- Sanchez, P., Everett, B., Salamonson, Y., Ajwani, S., & George, A. (2017). Oral healthcare and cardiovascular disease: A scoping review of current strategies and implications for nurses. *Journal of Cardiovascular Nursing*, 32(3), E10-E20. Doi: 10.1097/JCN.0000000000000388.
- Sanchez, P., Everett, B., Salamonson, Y., Bishop, J., Lintern, K., Nolan, S., . . . Skarligos, F. (2017). Factors affecting access to oral healthcare for patients with cardiovascular disease in Australia. *Circulation*, 136(A16286).
- Sanchez, P., Everett, B., Salamonson, Y., Redfern, J., Ajwani, S., Bhole, S., . . . Rajaratnam, R. (2019). The oral health status, behaviours and knowledge of patients with cardiovascular disease in Sydney Australia: A cross-sectional survey. *BMC Oral Health*, 19(1), 12. Doi: 10.1186/s12903-018-0697-x.
- Sanchez, P., Salamonson, Y., Everett, B., & George, A. (2018). Barriers and predictors associated with accessing oral healthcare among patients with cardiovascular disease in Australia. *Journal of Cardiovascular Nursing*, 34(3), 208-214. Doi: 10.1097/JCN.0000000000000559.
- Sanz, M., Marco del Castillo, A., Jepsen, S., Gonzalez-Juanatey, J. R., D’Aiuto, F., Bouchard, P., . . . Graziani, F. (2020). Periodontitis and cardiovascular diseases: Consensus report. *Journal of Clinical Periodontology*, 47(3), 268-288. Doi: 10.1111/jcpe.13189.
- Scannapieco, F. A., Bush, R. B., & Paju, S. (2003). Associations between periodontal disease and risk for atherosclerosis, cardiovascular disease, and stroke. A systematic review. *Annals of Periodontology*, 8(1), 38-53. Doi: 10.1902/annals.2003.8.1.38.
- Schaepe, C., & Ewers, M. (2017). ‘I need complete trust in nurses’—home mechanical ventilated patients’ perceptions of safety. *Scandinavian Journal of Caring Sciences*, 31(4), 948-956. Doi: 10.1111/scs.12418.
- Schenkein, H. A., Papapanou, P. N., Genco, R., & Sanz, M. (2020). Mechanisms underlying the association between periodontitis and atherosclerotic disease. *Periodontology 2000*, 83(1), 90-106. Doi: 10.1111/prd.12304.

- Schmitt, A., Carra, M. C., Boutouyrie, P., & Bouchard, P. (2015). Periodontitis and arterial stiffness: a systematic review and meta-analysis. *Journal of Clinical Periodontology*, 42(11), 977-987. Doi: : 10.1111/jcpe.12467.
- Schwarz, E. (2006). Access to oral health care—An Australian perspective*. *Community Dentistry and Oral Epidemiology*, 34(3), 225-231. Doi: 10.1111/j.1600-0528.2006.00301.x.
- Scrine, C., Durey, A., & Slack-Smith, L. (2019). Providing oral care for adults with mental health disorders: Dental professionals' perceptions and experiences in Perth, Western Australia. *Community Dentistry and Oral Epidemiology*, 47(1), 78-84. Doi: 10.1111/cdoe.12427.
- Seitz, M. W. (2019). Current knowledge on correlations between highly prevalent dental conditions and chronic diseases: An umbrella review. *Preventing Chronic Disease*, 16. Doi: 10.5888/pcd16.180641.
- Sharif, M. O., Janjua-Sharif, F., Ali, H., & Ahmed, F. (2013). Systematic reviews explained: AMSTAR-how to tell the good from the bad and the ugly. *Oral Health Dental Management*, 12(1), 9-16.
- Shimpi, N., Schroeder, D., Kilsdonk, J., Chyou, P.-h., Glurich, I., Penniman, E., & Acharya, A. (2016). Medical providers' oral health knowledgeability, attitudes, and practice behaviors: an opportunity for Interprofessional collaboration. *Journal of Evidence Based Dental Practice*, 16(1), 19-29. Doi: 10.1016/j.jebdp.2016.01.002.
- Silk, H. (2017). The future of oral health care provided by physicians and allied professionals. *Journal of Dental Education*, 81(8), eS171. Doi: 10.21815/JDE.017.024.
- Silk, H. (2018). The expanding dental workforce: the impact of nondental providers. 62(2), 195-206. Doi: 10.1016/j.cden.2017.11.002.
- Singal, A. G., Higgins, P. D., & Waljee, A. K. (2014). A primer on effectiveness and efficacy trials. *Clinical and Translational Gastroenterology*, 5(1), e45. Doi: 10.1038/ctg.2013.13.

- SLHD Sydney Cardiothoracic Surgeons. (2016). Heart valve surgery booklet [Information Booklet]. In Royal Prince Alfred Hospital (Ed.). Sydney.
- Song, M., O'Donnell, J. A., Bekhuis, T., & Spallek, H. (2013). Are dentists interested in the oral-systemic disease connection? A qualitative study of an online community of 450 practitioners. *BMC Oral Health*, *13*(1), 1. Doi: 10.1186/1472-6831/13/65.
- South Australia Health. (2012). Dental Treatment Pathway for Older People in the Acute Care Setting. Retrieved 14 April, 2020, from <https://www.sahealth.sa.gov.au/wps/wcm/connect/public+content/sa+health+internet/resources/dental+treatment+pathway+for+older+people+in+the+acute+care+setting>.
- Southerland, J. H., Moss, K., Taylor, G. W., Beck, J. D., Pankow, J., Gangula, P. R., & Offenbacher, S. (2012). Periodontitis and diabetes associations with measures of atherosclerosis and CHD. *Atherosclerosis*, *222*(1), 196-201. Doi: 10.1016/j.atherosclerosis.2012.01.026.
- State Government Victoria. (2018). Advancing oral health in midwifery practice: MIOH (D. H. S. Victoria, Trans.). In D. H. S. Victoria (Ed.), (pp. 1-7). Victoria Australia: Dental Health Services Victoria.
- Stefanac, S. J. (2016). Having heart surgery? Why good dental health matters. Retrieved 11 September, 2017, from <https://healthblog.uofmhealth.org/heart-health/having-heart-surgery-why-good-dental-health-matters>.
- Stevens, J., Iida, H., & Ingersoll, G. (2007). Implementing an oral health program in a group prenatal practice. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, *36*(6), 581-591. Doi: 10.1111/J.1552-6909.2007.00189.x.
- Stuart, J., Hoang, H., Crocombe, L., & Barnett, T. (2017). Relationships between dental personnel and non-dental primary health care providers in rural and remote Queensland, Australia: dental perspectives. *BMC Oral Health*, *17*(1), 99. Doi: 10.1186/s12903-017-0389-y.

- Suma, G., Mohan Das, U., Ambika, G., & Jairanganath. (2011). Oral health status of normal children and those affiliated with cardiac diseases. *Journal of Clinical Pediatric Dentistry*, 35(3), 315-318. Doi: 10.17796/jcpd.35.3.b316g17n57445473.
- SWSLHD. (2013). *Strategic & Healthcare Services Plan Strategic Priorities in Health Care Delivery to 2021*. Liverpool: SWSLHD.
- SWSLHD. (2014). *Health Profile of Local Communities 2014*. Sydney: SWSLHD.
- SWSLHD. (2018). *Clinical Stream Development Priorities: Cardiovascular Clinical Stream 2018-2020*. SWSLHD: SWSLHD Retrieved 20 June, 2020, from <https://www.swslhd.health.nsw.gov.au/pdfs/CSP/Cardiovascular%202018%20-%202020%20FINAL.pdf>.
- Sydney Local Health District. (2015). *A picture of health sydney local health district health profile 2015*. Sydney Australia: NSW Government. Retrieved 17 May, 2016, from https://www.slhd.nsw.gov.au/planning/pdf/SLHD_Health_Profile.pdf.
- Sydney Local Health District. (2018). *A demographic and social profile of Sydney Local Health District*. Sydney Australia: NSW Government. Retrieved 2 March, 2020, from https://www.slhd.nsw.gov.au/populationhealth/pdf/slhd_demography_2016.pdf.
- Sydney Local Health District. (2018). *Royal Prince Alfred Hospital*. Retrieved 13 May, 2020, from <https://www.slhd.nsw.gov.au/rpa/>.
- Sydney Local Health District. (2020). *About Balmain Hospital*. Retrieved 13 May, 2020, from https://www.slhd.nsw.gov.au/balmain/OurServices_Outpatients.html.
- Tabachnik, B., & Fidell, L. (2013). *Using multivariate statistics (Sixth ed.)*. Boston: Pearson.
- Tannous, K., George, A., Ahmed, M., Blinkhorn, A., Dahlen, H., Skinner, J., . . . Johnson, M. (2020 [Under Review]). Economic evaluation of the Midwifery-initiated Oral Health Dental Service program. *Value in Health Journal*.
- Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, 2, 53-55. Doi: 10.5116/ijme.4dfb.8dfd.

- Taylor, B., & Tofler, G. (2002). Evidence for an association between periodontal disease and cardiovascular disease. *Annals of the Royal Australasian College of Dental Surgeons*, *16*, 82-83.
- Teeuw, W. J., Slot, D. E., Susanto, H., Gerdes, V. E., Abbas, F., D'Aiuto, F., . . . Loos, B. G. (2014). Treatment of periodontitis improves the atherosclerotic profile: A systematic review and meta-analysis. *Journal of Clinical Periodontology*, *41*(1), 70-79. Doi: 10.1111/jcpe.12171.
- Teles, R., & Wang, C. Y. (2011). Mechanisms involved in the association between periodontal diseases and cardiovascular disease. *Oral Diseases*, *17*(5), 450-461. Doi: 10.1111/j.1601-0825.2010.01784.x.
- The Joanna Briggs Institute. (2015). Oral assessment tools: Older adults. [Evidence Summaries] JBI1558. Retrieved 28 February, 2016, from http://ovidsp.tx.ovid.com/sp-3.22.1b/ovidweb.cgi?&S=CIAKFPDADDDLLPONCHKFBOPDEGAA00&Link+Set=S.sh.21%7c1%7csl_190.
- The Lancet. (2019). Oral health at a tipping point. *Lancet (London, England)*, *394*(10194), 188. doi: 10.1016/S0140-6736(19)31639-3.
- The Task Force for the Management of Valvular Heart Disease of the European Society of Cardiology (ESC), & European Association for Cardio-Thoracic Surgery (EACTS). (2019). New 2017 ESC/EACTS Guidelines for the management of valvular heart disease *European Heart Journal*, *38*, 2739-2791. Doi: 10.1093/eurheartj/ehx391.
- Tonetti, M. S. (2009). Periodontitis and risk for atherosclerosis: An update on intervention trials. *Journal of Clinical Periodontology*, *36*(s10), 15-19. Doi: 10.1111/j.1600-051X.2009.01417.x.
- Tonetti, M. S., & Dyke, T. E. (2013). Periodontitis and atherosclerotic cardiovascular disease: Consensus report of the joint EFP/AAP workshop on periodontitis and systemic diseases. *Journal of Clinical Periodontology*, *40*(s14), S24-S29. Doi: 10.1111/jcpe.12089.

- Torpet, L. A., Kragelund, C., Reibel, J., & Nauntofte, B. (2004). Oral adverse drug reactions to cardiovascular drugs. *Critical Reviews in Oral Biology & Medicine*, *15*(1), 28-46.
- Townsend, N., Bhatnagar, P., Wilkins, E., Wickramasinghe, K., & Rayner, M. (2015). *Cardiovascular disease statistics 2015*. London: British Heart Foundation.
- Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nursing & Health Sciences*, *15*(3), 398-405. Doi: 10.1111/nhs.12048.
- Veale, M., Ajwani, S., Johnson, M., Nash, L., Patterson, T., & George, A. (2016). The early childhood oral health program: A qualitative study of the perceptions of child and family health nurses in South Western Sydney, Australia. *BMC Oral Health*, *16*(56). Doi: 10.1186/s12903-016-0213-0.
- Vedin, O., Hagström, E., Gallup, D., Neely, M. L., Stewart, R., Koenig, W., . . . White, H. D. (2015). Periodontal disease in patients with chronic coronary heart disease: Prevalence and association with cardiovascular risk factors. *European Journal of Preventive Cardiology*, *22*(6), 771-778. Doi: 10.1177/2047487314530660.
- Vellayappan, R. and S. S. Varghese (2017). A survey on knowledge, attitude and practice among the doctors towards systemic health possibly influenced by periodontitis. *International Journal of Applied Dental Sciences*, *3*(2): 190-192.
- Vieira, C., & Caramelli, B. (2009). The history of dentistry and medicine relationship: Could the mouth finally return to the body? *Oral Diseases*, *15*(8), 538-546. Doi: 10.1111/j.1601-0825.2009.01589.x.
- Vinel, A., Vachon, C., Barthet, P., & Laurencin-Dalicioux, S. (2017). Periodontal diseases and systemic disorders: What do our doctors know? A general practitioner's survey conducted in Southern France. *Journal of Evidence Based Dental Practice*, *17*(4), 361-369. Doi: 10.1016/j.jebdp.2017.05.007.
- Virdee, P. (2006). Improve uptake of care. *British Dental Journal*, *201*(3), 132-133. Doi: 10.1038/sj.bdj.4813891.

- Virtanen, E., Nurmi, T., Söder, P.-Ö., Airila-Månsson, S., Söder, B., & Meurman, J. H. (2017). Apical periodontitis associates with cardiovascular diseases: A cross-sectional study from Sweden. *BMC Oral Health*, *17*(1), 107. Doi: 10.1186/s12903-017-0401-6.
- Wårdh, I., Berggren, U., Hallberg, L. R.-M., Andersson, L., & Sörensen, S. (2002). Dental auscultation for nursing personnel as a model of oral health care education: Development, baseline, and 6-month follow-up assessments. *Acta Odontologica*, *60*(1), 13-19. Doi: 10.1080/000163502753471943.
- Watts, D. (2017). Scrutinising the link between periodontal disease and systemic conditions: Does recent evidence continue to support the European Federation of Periodontology's 2012 manifesto? *Journal of the International Academy of Periodontology*, *19*(2), 36-41.
- Wigen, T. I., & Wang, N. J. (2017). Referral of young children to dental personnel by primary care nurses. *International Journal of Dental Hygiene*, *15*(3), 249-255. Doi: 10.1111/idh.12238.
- Wilson, W., Taubert, K. A., Gewitz, M., Lockhart, P. B., Baddour, L. M., Levison, M., . . . Baltimore, R. S. (2007). Prevention of infective endocarditis guidelines from the American Heart Association. A guideline from the American Heart Association Rheumatic Fever, Endocarditis, and Kawasaki Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group. *Circulation*, *116*(15), 1736-1754. Doi: 10.1161/CIRCULATIONAHA.106.183095.
- World Health Organisation. (2015). Cardiovascular diseases (CVDs). *Fact Sheet Number 317*. Retrieved 19 June, 2015, from <http://www.who.int/mediacentre/factsheets/fs317/en/>.
- World Health Organization. (2016). *International statistical classification of diseases and related health problems 10th revision (Vol. 1)*. Geneva: World Health Organization.

World Health Organization. (2019). Fact sheet: The top 10 causes of death. Retrieved 12 July, 2019, from <https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death>.

Xu, F., & Lu, B. (2011). Prospective association of periodontal disease with cardiovascular and all-cause mortality: NHANES III follow-up study. *Atherosclerosis*, *218*(2), 536-542. Doi: 10.1016/j.atherosclerosis.2011.07.091.

Yu, Y. H., Chasman, D. I., Buring, J. E., Rose, L., & Ridker, P. M. (2015). Cardiovascular risks associated with incident and prevalent periodontal disease. *Journal of Clinical Periodontology*, *42*(1), 21-28. Doi: 10.1111/jcpe.12335.

Zafar, S., Yasin, S., Siddiqi, A., & Naz, F. (2008). Oral health status of paediatric cardiac patients: A case-control study. *International Dentistry South Africa*, *10*(6), 26-38.

Zeng, X.-T., Leng, W.-D., Lam, Y.-Y., Yan, B. P., Wei, X.-M., Weng, H., & Kwong, J. S. (2016). Periodontal disease and carotid atherosclerosis: A meta-analysis of 17,330 participants. *International Journal of Cardiology*, *203*, 1044-1051. Doi: 10.1016/j.ijcard.2015.11.092.

Appendices

Appendix 1	Guide Focus Groups and Telephone Interviews with Cardiac Care Clinicians
Appendix 2	Guide for interviews with people with CVD
Appendix 3	CARDIOH Questionnaire (Cross-sectional Survey)
Appendix 4	SWSLHD, SLHD, WSU Human Research Ethics Committee, Approval Letters
Appendix 5	Participant Consent Form (People with CVD Interviews)
Appendix 6	Participant Consent Form (People with CVD Survey)
Appendix 7	Participant Consent Form (Cardiac Care Clinicians)
Appendix 8	Participant Information Sheet (People with CVD Interviews)
Appendix 9	Participant Information Sheet (People with CVD Survey)
Appendix 10	Participant Information Sheet (Cardiac Care Clinicians)
Appendix 11	Participant Demographic Form (Patient Interviews)
Appendix 12	Participant Demographic Form (Focus Groups and Telephone Interviews)
Appendix 13	Invitation to Participate Flyer (Interviews)
Appendix 14	Invitation to Participate Flyer (Focus Groups)
Appendix 15	Invitation to Participate Flyer (Survey)
Appendix 16	Statement of Authors' Contributions

Appendix 1 Guide Focus Groups and Telephone Interviews with Cardiac Care Clinicians

Questions

1. What do you know about the topic of oral health and CVD? Do you think oral health is important for cardiac people? Why or why not?
 2. Do you currently talk about oral health with cardiac people? When do you ask this? What do you say exactly? Is it part of your assessment? Do you initiate the topic or do the people? Please elaborate.
 3. Do you encounter people with poor oral health? If yes, how many out of 10 people would have poor oral health?
 4. What type of oral health complaints do you usually encounter from cardiac people?
 5. Do you currently refer cardiac people to a dentist? How do you make this referral? If so, do you follow up at the next appointment? Please elaborate.
 6. Do you think it is appropriate to provide oral health education, assessment and referral in the cardiac setting?
 7. When do you think would be the best time to provide this information in the cardiac setting?
 8. What are your views on cardiac nurses promoting oral health education, assessment and referrals to people?
 9. Do you foresee any problems in undertaking this additional task? Please elaborate.
 10. What do you think could be some of the barriers for people receiving oral health education, assessment and referrals?
 11. In relation to educating people, what do you think would be the best way to provide oral health education to cardiac people? (Verbally and other brochures etc.) Do you currently have any health promotional resources about oral health that you can use?
 12. Do you feel that you have the knowledge and confidence to provide oral health education, assessment and referrals to people in the cardiac setting? What would be required? Please elaborate.
 13. If an oral health education/training program were to be developed for cardiac nurses, what information do you think should be included in the program?
 14. If a program is developed, how do you think would be the best way to deliver this program to nurses? How would you encourage nurses to complete the program?
 15. Do you think other cardiac care clinicians can play a role in promoting oral health among people in the cardiac setting?
 16. Are there any other comments or suggestions you would like to make on this topic?
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Appendix 2 Guide for interviews with people with CVD

Questions

1. Can you tell me what do you know about the topic of oral health (the health of your teeth and gums) and cardiac (heart) disease?
 2. Is maintaining oral health in CVD important to you?
 3. Can you tell me if you have ever received any information about oral health since diagnosed with a heart problem?
 4. Can you tell me what information you have received?
 5. If no information was received, would you like to get information?
 6. Can you tell me how you would like to receive information and in what form?
 7. Would you like the information in your own language or in English? (CALD people)
 8. Now we just want to talk about your dental health needs. Have you got any current concerns about the health of your mouth, teeth and gums?
 9. When was the last time you saw a dentist?
 10. What oral health practices do you follow? What do you do to look after your oral health?
 11. Tell me about your experience going to the dentist or dental service. When did you go? What happened? Did you need treatment? Please explain.
 12. Do you face any challenges in looking after your oral health or seeing a dentist (dental professional)? What are those challenges?
 13. What are your views about including oral health information when attending cardiac rehabilitation?
 14. What are your views about having an oral assessment when attending cardiac rehabilitation?
 15. How do you feel about responding to questions about your oral health? How do you feel about having a visual inspection?
 16. Would you be comfortable receiving information and having an oral health assessment by the cardiac rehabilitation nurse? What do you think?
 17. When do you think is the best time to receive this information?
 18. Can you tell me what sort of support you need to be able to look after the health of your teeth, mouth and gums?
 19. Would you follow the nurses' advice about your oral health, for example, a referral to see a dentist? Why or why not?
 20. Do you think nurses have enough knowledge to provide information about oral health?
 21. Can you tell me about your social support (who supports you, living arrangements, family/ friends/ health or other services) to attend appointments and other commitments? What type of transport do you use?
 22. Are there any other comments or suggestions you would like to make about this program or any other issues?
-

Appendix 3 CARDIOH Questionnaire (Survey)

Participant Questionnaire

Developing a Cardiovascular Oral Health (CARDIOH) program

Please answer all questions. Most questions require you to put a tick (✓) or cross (X) in the box/boxes to indicate your answer. Choose the box/boxes that best match your answer.

Section A: Your dental health. Tick all that apply

1. Do you currently have any of the following problems or concerns with your teeth, gums or mouth?

1.1 Bleeding gums	No <input type="checkbox"/>	Yes <input type="checkbox"/>
1.2 Toothache (pain in your teeth)	No <input type="checkbox"/>	Yes <input type="checkbox"/>
1.3 Cavities (holes in your teeth)	No <input type="checkbox"/>	Yes <input type="checkbox"/>
1.4 Loose teeth	No <input type="checkbox"/>	Yes <input type="checkbox"/>
1.5 Sensitivity (E.g. pain with hot or cold)	No <input type="checkbox"/>	Yes <input type="checkbox"/>
1.6 Teeth that don't look right (crooked or discoloured teeth)	No <input type="checkbox"/>	Yes <input type="checkbox"/>
1.7 Dry mouth	No <input type="checkbox"/>	Yes <input type="checkbox"/>
1.8 Other problems (please specify):		

2. Do your dental problems affect what you eat?

- ₁ Never
₂ Sometimes
₃ Often

If yes, please specify how it has affected you: _____

Section B: Your visits to the dentist

3. Have you seen a dentist in the last 12 months?

- ₀ No ₁ Yes → Go to Question 4

If no, when was your last dental visit?

- ₁ More than a year to 2 years
₂ More than 2 years to 5 years
₃ More than 5 years
₄ Don't know

Page 1 of 8

CARDIOH Questionnaire Version 2.0 12 October 2016

4. Where do you most often see the dentist?

₁ Private dental practice

₂ Government dental clinic (including dental hospital)

₃ Clinical operated by health insurance fund

₄ Armed Services / Defence Force clinic

₅ Other site (*Please specify*): _____

₆ Don't know

5. The following are reasons why cardiovascular patients may not see a dentist frequently.

Please indicate how true each statement is for you by circling the number corresponding to your response

		Strongly disagree					Strongly agree
		↓					↓
5.1	I am nervous or afraid to seek advice from a dental health professional	1	2	3	4	5	6 7
5.2	I am worried about seeing a dental health professional because it could affect my heart condition	1	2	3	4	5	6 7
5.3	I was advised not to seek dental treatment by my health care provider (doctor, nurse etc.)	1	2	3	4	5	6 7
5.4	I do not feel well enough to go and see a dental health professional	1	2	3	4	5	6 7
5.5	I am too busy to go to see a dental health professional	1	2	3	4	5	6 7
5.6	I have difficulty attending the dentist/ dental clinic because transport is an issue for me	1	2	3	4	5	6 7
5.7	I do not see a dental health professional because I have other priorities	1	2	3	4	5	6 7
5.8	I do not see a dental health professional because it costs too much	1	2	3	4	5	6 7
5.9	I do not see a dental health professional because the wait is too long to access the public dental service	1	2	3	4	5	6 7
5.10	I do not see a dental health professional because it is too painful or uncomfortable	1	2	3	4	5	6 7
5.11	I do not see a dental health professional because it is difficult to make an appointment in the public dental service	1	2	3	4	5	6 7
5.13	Other issues (<i>Please specify</i>):						

Please place a tick or cross in the numbered box that best reflects your opinion

6. Overall, how would you generally rate your ease of accessing dental care

Extremely Difficult Extremely easy

— — — — — — — — — —

Other comments: _____

Section C: Oral hygiene habits

7. How often do you brush your teeth and/or dentures?

- ₁ A few times a week
- ₂ Less than once a day
- ₃ Once a day
- ₄ Twice a day
- ₅ More than twice a day
- ₆ Never

8. Which of the following do you use? (*tick all that apply*)

- ₁ Fluoride toothpaste
- ₂ Mouthwash
- ₃ Dental floss or any other oral health aids
- ₄ Sugar free chewing gum
- ₅ Fluoride tablets or drops
- ₆ None

Other products, please indicate what do you use: _____

Section D: Perceptions about oral health (the health of the mouth, gums and teeth)

9. How would you describe the health of your teeth and mouth

- ₅ Excellent
- ₄ Very good
- ₃ Good
- ₂ Fair
- ₁ Poor

10. How important is the health of your teeth and mouth to you compared to your overall health?

Not important at all Extremely important

— — — — — — — — — —

0 1 2 3 4 5 6 7 8 9 10

Section E: Confidence about looking after your oral health. Tick the answer that most apply to you

11. The following questions relate to your level of confidence managing your oral health:

	Strongly disagree	Disagree	Unsure	Agree	Strongly Agree
11.1 I am confident that I am able to look after my teeth	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
11.2 I am confident that I know when I have a dental problem	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
11.3 I am confident that I know when to seek dental treatment	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅

Section F: Your beliefs about oral health (health of the mouth, gums and teeth)

12. Please select an answer for the following statement listed below:

12.1 Flossing should be done daily to clean in between teeth	True <input type="checkbox"/> ₀	False <input type="checkbox"/> ₁	Don't know <input type="checkbox"/> ₂
12.2 People with heart problems should avoid dental treatment	True <input type="checkbox"/> ₀	False <input type="checkbox"/> ₁	Don't know <input type="checkbox"/> ₂
12.3 People with heart problems should only see a dentist when there is an emergency	True <input type="checkbox"/> ₀	False <input type="checkbox"/> ₁	Don't know <input type="checkbox"/> ₂
12.4 Poor oral health may affect an existing heart condition	True <input type="checkbox"/> ₀	False <input type="checkbox"/> ₁	Don't know <input type="checkbox"/> ₂
12.5 People with existing heart problems should visit a dentist regularly for a check up	True <input type="checkbox"/> ₀	False <input type="checkbox"/> ₁	Don't know <input type="checkbox"/> ₂
12.6 Some medications for high blood pressure can cause people to experience dry mouth	True <input type="checkbox"/> ₀	False <input type="checkbox"/> ₁	Don't know <input type="checkbox"/> ₂
12.7 Dry mouth does not increase the risk of dental decay	True <input type="checkbox"/> ₀	False <input type="checkbox"/> ₁	Don't know <input type="checkbox"/> ₂
12.8 Some medications for high blood pressure can affect the sense of taste	True <input type="checkbox"/> ₀	False <input type="checkbox"/> ₁	Don't know <input type="checkbox"/> ₂
12.9 Some heart medications can cause swelling or overgrowth (thickening) of the gums	True <input type="checkbox"/> ₀	False <input type="checkbox"/> ₁	Don't know <input type="checkbox"/> ₂
12.10 The overgrowth of gums can lead to poor oral health	True <input type="checkbox"/> ₀	False <input type="checkbox"/> ₁	Don't know <input type="checkbox"/> ₂
12.11 Bad breath is a sign of gum disease	True <input type="checkbox"/> ₀	False <input type="checkbox"/> ₁	Don't know <input type="checkbox"/> ₂
12.12 Loose teeth is one sign of severe gum disease	True <input type="checkbox"/> ₀	False <input type="checkbox"/> ₁	Don't know <input type="checkbox"/> ₂

Section G: Information about oral health care in the cardiac setting

13. Have you received any information about oral health since you have been diagnosed with a heart problem?

₀ No → Go to Question 14 ₁ Yes

(a) If yes, what information did you receive about oral health?

- ₁ You were advised to visit a dentist
₂ Instructions about how to look after your mouth and teeth (e.g. brushing, flossing, mouth rinse, etc.)
₃ Oral health promotion material such as leaflets, pamphlets, samples or other
₄ Other advice (please specify): _____

(b) Who provided you the information ?

Please specify (e.g. doctor, nurse, educators, etc.): _____

(c) When did you receive information about oral health?

Please specify (e.g. before admission to hospital, ward, on discharge, etc.) _____

Section H: Oral health services provided by cardiac nurses

14. The following questions relate to cardiac nurses:

14.1	Do you think cardiac nurses could assist you in identifying oral health problems?	No <input type="checkbox"/> ₀	Yes <input type="checkbox"/> ₁	Don't know <input type="checkbox"/> ₂
14.2	Would you consider oral health advice given by cardiac nurses?	No <input type="checkbox"/> ₀	Yes <input type="checkbox"/> ₁	Don't know <input type="checkbox"/> ₂
14.3	Do you think cardiac nurses have sufficient knowledge about oral health to advise you?	No <input type="checkbox"/> ₀	Yes <input type="checkbox"/> ₁	Don't know <input type="checkbox"/> ₂
14.4	Would you make an appointment to see a dentist if you were provided a dental referral by a cardiac nurse?	No <input type="checkbox"/> ₀	Yes <input type="checkbox"/> ₁	Don't know <input type="checkbox"/> ₂

15. The following are services that could be provided to improve access to dental care for patients with a heart condition							
How likely are you to participate in these services if they are provided?							
						Very unlikely	Very likely
15.1	Cardiac nurses asking questions to find out about your oral health	1	2	3	4	5	6 7
15.2	Cardiac nurses offering you dental advice	1	2	3	4	5	6 7
15.3	Cardiac nurses providing you with oral health information resources such as leaflets, pamphlets or others	1	2	3	4	5	6 7
15.4	Cardiac nurses visually checking your mouth and teeth	1	2	3	4	5	6 7
15.5	Cardiac nurses referring you to a dentist	1	2	3	4	5	6 7
15.6	Having priority access to public dental service	1	2	3	4	5	6 7
15.7	Receiving free vouchers to attend private dental services	1	2	3	4	5	6 7

16. When do you think is the best time to have an oral health check by the cardiac nurse?

₁ Before admission to hospital

₂ Sometime during your stay in hospital

₃ Before discharge from hospital

₄ At cardiac rehabilitation

₅ At another time (please specify): _____

17. When do you think is the best time to receive oral health educational material from cardiac nurses?

₁ Before admission to hospital

₂ Sometime during your time in hospital

₃ Before discharge from hospital

₄ At cardiac rehabilitation

₅ At another time (please specify): _____

Section I: Your social and family support

18. The following questions relate to your network and social support to access dental care services

18.1	Do you have someone (family or friend) to give you support when you have a dental problem?	<input type="checkbox"/> ₀ No	<input type="checkbox"/> ₁ Yes
18.2	Do you have someone (family or friend) to talk about your dental problems if you have any?	<input type="checkbox"/> ₀ No	<input type="checkbox"/> ₁ Yes
18.3	Do you have someone (family or friend) who can take you to dental appointments if necessary?	<input type="checkbox"/> ₀ No	<input type="checkbox"/> ₁ Yes
18.4	Do you have financial support to see a dentist or have dental treatment if necessary?	<input type="checkbox"/> ₀ No	<input type="checkbox"/> ₁ Yes
18.5	Do you have easy access to transport if you need to go to a dental appointment?	<input type="checkbox"/> ₀ No	<input type="checkbox"/> ₁ Yes

Section H: Finally, some questions about you

19.	Age at your last birthday	years	
20.	Country of birth		
21.	Language spoken at home		
22.	Name of cardiac condition(s) that you have been diagnosed with		
23.	Name any other medical conditions you have been diagnosed with		
24.	Number of years since your diagnosis with a cardiac condition	years	
25.	Employment status	<input type="checkbox"/> ₀ Not working	<input type="checkbox"/> ₁ Part-time <input type="checkbox"/> ₂ Full-time
26.	Are you currently married or living with a partner?	<input type="checkbox"/> ₀ No	<input type="checkbox"/> ₁ Yes
27.	What is your postcode		
28.	What is your highest educational qualification?		
	<input type="checkbox"/> ₁ No formal schooling		
	<input type="checkbox"/> ₂ Primary school		
	<input type="checkbox"/> ₃ Secondary school		
	<input type="checkbox"/> ₄ TAFE		
	<input type="checkbox"/> ₅ College or University		

29. What is your average annual household income (combined)?

- ₁ Less than \$40,000
- ₂ \$40,000 to \$60,000
- ₂ \$60,000 to \$80,000
- ₃ \$80,000 to \$100,000
- ₃ \$100,000 to \$120,000
- ₄ More than \$120,000
- ₅ Prefer not to answer

30. Do you have private health insurance ₀ No ₁ Yes ₂ Don't know

31. Do you currently have the following:

- i) Pensioner concession card ₀ No ₁ Yes ₂ Don't know
- ii) Health care card ₀ No ₁ Yes ₂ Don't know
- iii) Department of Veterans Affairs card ₀ No ₁ Yes ₂ Don't know

Thank you for participating in this survey

For any enquiries contact Paula Sanchez (02) 8738 9352 or Dr Ajesh George (02) 8738 9356.
Email: 11154671@student.westernsydney.uws.edu.au

Appendix 4 SWSLHD, SLHD, WSU Human Research Ethics Committee, Approval Letters



Health
South Western Sydney
Local Health District

Research and Ethics Office
Leadership · Quality · Governance

Locked Bag 7103, LIVERPOOL BC, NSW, 1871

Phone: 02 8738 8304

Facsimile: 02 8738 8310

<http://www.sswahs.nsw.gov.au/swsld/ethics/default.html>

18 November 2015

Mrs Paula Sanchez
CANR
Liverpool Hospital

*** AMENDMENT TO LETTER DATED 11/11/2015 ***

Dear Mrs Sanchez,

*****THIS LETTER CONSTITUTES ETHICAL APPROVAL ONLY. THIS RESEARCH PROJECT MUST NOT COMMENCE AT A SITE UNTIL SEPARATE AUTHORISATION FROM THE CHIEF EXECUTIVE OR DELEGATE OF THAT SITE HAS BEEN OBTAINED. ******

Dear Mrs Sanchez,

Project Title: DEVELOPING A CARDIOVASCULAR ORAL HEALTH (CARDIOH) PROGRAM: A MIXED METHODS STUDY
HREC Reference: HREC/15/LPOOL/410
Local Project Number: 15/226

Thank you for your response dated 6 November 2015 to our request for further information dated 29 October 2015. This Human Research Ethics Committee is constituted and operates in accordance with the National Health and Medical Research Council's *National Statement on Ethical Conduct in Research Involving Humans* and the *CPMP/ICH Note for Guidance on Good Clinical Practice*.

I am pleased to advise that the Committee has granted ethical approval of the above project.

The following documentation has been reviewed and approved:

Documentation Title	Version	Date
Cover Letter	N/A	31.08.2015
National Ethics Application Form	AU/1/0AE0219	21.08.2015
Protocol	1.0	17.09.2015
MASTER Participant Information Sheet – Clinicians	1.0	17.08.2015
MASTER Participant Information Sheet – Patients	1.0	17.08.2015
MASTER Consent Form	1.0	17.08.2015
MASTER Participant Demographics Focus Group	1.0	17.08.2015
MASTER Participant Demographics Interview	1.0	17.08.2015
Flyer Focus Group	1.0	17.08.2015
Flyer for Interview	1.0	17.08.2015
Ethics Further Information Letter	N/A	21.09.2015
Ethics Further Information Letter	N/A	29.10.2015
Public Dental Services Brochure	Not provided	Undated

Please ensure for all future documents submitted for review include a document version number, document date and page numbering.

Page 1 of 3

Monitoring Requirements:
(National Statement Chapters 2.1 and 5.5)

- The Committee has classified this project as:

Low Risk

- Monitoring required for this study will be:
 - Submission of Annual Progress Reports with the first report due **11 November 2016 and annually thereafter for the duration of the approval period**

Approval has been granted for the following site(s):

- Liverpool Hospital
- Fairfield Hospital
- Royal Prince Alfred Hospital
- Balmain Hospital

Please note the following conditions of approval:

1. The Principal Investigator will immediately report anything which might warrant review of ethical approval of the project in the specified format, including:
 - any serious or unexpected adverse events; and
 - unforeseen events that might affect continued ethical acceptability of the project.
2. The Principal Investigator will report proposed changes to the research protocol, conduct of the research, or length of HREC approval to the HREC in the specified format, for review. For multi-centre studies, the Chief Investigator should submit to the Lead HREC and then send the amendment approval letter to the investigators at each sites so that they can notify their Research Governance Officer.
3. The Principal Investigator will inform the HREC, giving reasons, if the project is discontinued before the expected date of completion.
4. The Principal Investigator will provide an annual report to the HREC and at completion of the study in the specified format.
5. The Principal Investigator must reassure participants about confidentiality of the data.
6. Proposed changes to the personnel involved in the study are submitted to the HREC accompanied by a CV where applicable.
7. The Principal Investigator is responsible for ensuring the research project is conducted in line with relevant NSW Health, South Western Sydney Local Health District and Hospital policies available from:
<http://www.sswahs.nsw.gov.au/swslhd/ethics/policies.html>

HREC approval is valid for (5) years. If the study is ongoing at the conclusion of the five year approval period, a full resubmission may be required. Ethics approval will continue during the re-approval process.

The South Western Sydney Local Health District Human Research Ethics Committee has been accredited by the NSW Ministry of Health to provide single ethical and scientific review of research proposals conducted within the NSW public health system and Victorian and Queensland Public Health Organisations participating in the Mutual Acceptance Scheme.

You are reminded that this letter constitutes ethical approval only. This research project must not commence at a site until separate authorisation from the Chief

Executive or delegate of that site has been obtained. It is your responsibility to forward a copy of this letter together with any approved documents as enumerated above, to all site investigators for submission to the site's Research Governance Officer.

Should you have any queries about your project please contact **Annamarie D'Souza** on the telephone number listed above. The HREC Terms of Reference, Standard Operating Procedures, membership and standard forms are available from the SWSLHD website: <http://www.sswahs.nsw.gov.au/swslhd/ethics/default.html>

Please quote the Local HREC reference **15/226** in all correspondence. The HREC wishes you every success in your research

Yours faithfully


Professor Jeremy Wilson
Chairperson, SWSLHD Human Research Ethics Committee

This HREC is constituted and operates in accordance with the National Health and Medical Research Council's (NHMRC) *National Statement on Ethical Conduct in Human Research (2007)*. The processes used by this HREC to review multi-centre research proposals have been certified by the National Health and Medical Research Council.



13 November 2015

Mrs Paula Sanchez
CANR
Liverpool Hospital

Dear Mrs Sanchez,

Project Title: DEVELOPING A CARDIOVASCULAR ORAL HEALTH (CARDIOH) PROGRAM: A MIXED METHODS STUDY
HREC Reference: HREC/15/LPOOL/410
SSA Reference: SSA/15/LPOOL/451 - Liverpool
SSA Reference: SSA/15/LPOOL/452 - Fairfield
Local Project Number: 15/226a, 15/226b

*****SITE SPECIFIC AUTHORISATION*****

Thank you for your correspondence received 6 November 2015 in response to our request for further information dated 28 October 2015.

I am pleased to inform you that the Chief Executive has granted authorisation for this study to take place at the following sites:

- Liverpool Hospital
- Fairfield Hospital

The following are authorised for use at the **Liverpool and Fairfield Hospital** sites:

Document	Version	Date	Site Specific	
			Version	Date
Participant Information Sheet – Clinicians	1.0	17.08.2015	1.0	07.10.2015
Participant Information Sheet – Patients	1.0	17.08.2015	1.0	07.10.2015
Consent Form	1.0	17.08.2015	1.0	07.10.2015
Participant Demographics Focus Group	1.0	17.08.2015	1.0	07.10.2015
Participant Demographics Interview	1.0	17.08.2015	1.0	07.10.2015

Note: CV's for P. Sanchez and associated investigators are not required to be submitted for future 2015 projects as there is now one on file.

The following conditions apply to this research project. These are additional to those conditions imposed by the Human Research Ethics Committee that granted ethical approval:

- **Replace HREC/15/LPOOL/410 with the Local Project Number 15/226 at the end of the SWSLHD complaints paragraph**
**Changes made to documentation do not need to be forwarded to the office. Please amend before issuing to participants.*
1. Proposed amendments to the research protocol or conduct of the research which may affect the ethical acceptability of the project, and which are submitted to the lead HREC for review, are copied to this office.
 2. Proposed amendments to the research protocol or conduct of the research which may affect the ongoing site acceptability of the project, are to be submitted to this office.

3. Please note that you are responsible for making the necessary arrangements (e.g. identity pass and vaccine compliance as per NSW Health Policy Directive PD2011_005) for any researcher who is not employed by the South Western Sydney Local Health District and is conducting the research on-site.
4. The Principal Investigator is responsible for ensuring the research project is conducted in line with relevant NSW Health, South Western Sydney Local Health District and Hospital policies available from: <http://www.sswahs.nsw.gov.au/swslhd/ethics/policies.htm>

Yours sincerely,



Annamarie D'Souza
Manager, Research and Ethics Office
South Western Sydney Local Health District (SWSLHD)



South Western Sydney Local Health District acknowledges the traditional owners of this land.

28 October 2016

Mrs Paula Sanchez
Translation & Evaluation (COHORTE) Research Group
Western Sydney University/Collaboration for Oral Health Outcomes

Dear Mrs Sanchez,

*****THIS LETTER CONSTITUTES ETHICAL APPROVAL ONLY. THIS RESEARCH PROJECT MUST NOT COMMENCE AT A SITE UNTIL SEPARATE AUTHORISATION FROM THE CHIEF EXECUTIVE OR DELEGATE OF THAT SITE HAS BEEN OBTAINED.*****

Project Title: Developing a cardiovascular oral health (CARDIOH) program: A mixed methods study. Phase 2
HREC Reference: LNR/16/LPOOL/499
Local Project Number: HE16/266
SSA Reference Number: LNRSSA/16/LPOOL/522 (Fairfield)
LNRSSA/16/LPOOL/521 (Liverpool)

Thank you for your response dated 12 October 2016 to our request for further information dated 5 October 2016. This Human Research Ethics Committee is constituted and operates in accordance with the National Health and Medical Research Council's *National Statement on Ethical Conduct in Research Involving Humans* and the *CPMP/ICH Note for Guidance on Good Clinical Practice*.

I am pleased to advise that the Committee has granted ethical approval of the above project.

The following documentation has been reviewed and approved:

Document	Version	Date
Low and Negligible Risk (LNR) Application Form	2.0	28.07.2016
Protocol	1.0	26.07.2016
MASTER Participant Information Sheet	2.0	12.10.2016
MASTER Consent Form	1.0	26.07.2016
Questionnaire	2.0	12.10.2016
Flyer	1.0	26.07.2016

Please ensure for all future documents submitted for review include a document version number, document date and page numbering.

Monitoring Requirements:
(*National Statement Chapters 2.1 and 5.5*)

- The Committee has classified this project as:

Low Risk

- Monitoring required for this study will be:
 - Submission of Annual Progress Reports with the first report due 28 October 2017 and annually thereafter for the duration of the approval period

Page 1 of 3

Approval is valid for the following site only:

- Liverpool Hospital
- Fairfield Hospital
- Royal Prince Alfred Hospital
- Balmain Hospital

Please note the following conditions of approval:

1. The Principal Investigator will immediately report anything which might warrant review of ethical approval of the project in the specified format, including:
 - any serious or unexpected adverse events; and
 - unforeseen events that might affect continued ethical acceptability of the project.
2. The Principal Investigator will report proposed changes to the research protocol, conduct of the research, or length of HREC approval to the HREC in the specified format, for review. For multi-centre studies, the Chief Investigator should submit to the Lead HREC and then send the amendment approval letter to the investigators at each sites so that they can notify their Research Governance Officer.
3. The Principal Investigator will inform the HREC, giving reasons, if the project is discontinued before the expected date of completion.
4. The Principal Investigator will provide an annual report to the HREC and at completion of the study in the specified format.
5. The Principal Investigator must reassure participants about confidentiality of the data.
6. Proposed changes to the personnel involved in the study are submitted to the HREC accompanied by a CV where applicable.
7. The Principal Investigator is responsible for ensuring the research project is conducted in line with relevant NSW Health, South Western Sydney Local Health District and Hospital policies available from: <http://www.sswahs.nsw.gov.au/swslhd/ethics/policies.html>

HREC approval is valid for (5) years. If the study is ongoing at the conclusion of the five year approval period, a full resubmission may be required. Ethics approval will continue during the re-approval process.

The South Western Sydney Local Health District Human Research Ethics Committee has been accredited by the NSW Ministry of Health to provide single ethical and scientific review of research proposals conducted within the NSW public health system and Victorian and Queensland Public Health Organisations participating in the Mutual Acceptance Scheme.

You are reminded that this letter constitutes ethical approval only. This research project must not commence at a site until separate authorisation from the Chief Executive or delegate of that site has been obtained. It is your responsibility to forward a copy of this letter together with any approved documents as enumerated above, to all site investigators for submission to the site's Research Governance Officer.

Should you have any queries about your project please contact Annamarie D'Souza on the telephone number listed above. The HREC Terms of Reference, Standard Operating Procedures, membership and standard forms are available from the SWSLHD website: <http://www.sswahs.nsw.gov.au/swslhd/ethics/default.html>

Please quote the Local HREC reference HE16/266 in all correspondence. The HREC wishes you every success in your research.

Yours faithfully



Annamarie D'Souza
on behalf of
Professor Jeremy Wilson
Chairperson, SWSLHD Human Research Ethics Committee

This HREC is constituted and operates in accordance with the National Health and Medical Research Council's (NHMRC) *National Statement on Ethical Conduct in Human Research (2007)*. The processes used by this HREC to review multi-centre research proposals have been certified by the National Health and Medical Research Council.



South Western Sydney Local Health District acknowledges the traditional owners of this land.

22 November 2016

Mrs Paula Sanchez
Translation & Evaluation (COHORTE) Research Group
Western Sydney University/Collaboration for Oral Health Outcomes

Dear Mrs Sanchez,

Project Title: Developing a cardiovascular oral health (CARDIOH) program: A mixed methods study. Phase 2
HREC Reference: LNR/16/LPOOL/499
Local Project Number: HE16/266
SSA Reference Number: LNRSSA/16/LPOOL/522 (Fairfield)
LNRSSA/16/LPOOL/521(Liverpool)

*****SITE SPECIFIC AUTHORISATION*****

Thank you for your correspondence received 27 October 2016 in response to our request for further information dated 5 October 2016.

I am pleased to inform you that the Chief Executive has granted authorisation for this study to take place at the following site(s):

- Liverpool Hospital
- Fairfield Hospital

The following are authorised for use at the Liverpool and Fairfield Hospital site:

Document	Master		Site Specific	
	Version	Date	Version	Date
Participant Information Sheet Questionnaire - Fairfield	2.0	12.10.2016	2.0	01.11.2016
Participant Information Sheet Questionnaire – Liverpool	2.0	12.10.2016	2.0	01.11.2016
Consent Form – Fairfield	1.0	26.07.2016	1.0	01.11.2016
Consent Form – Liverpool	1.0	26.07.2016	1.0	01.11.2016
Flyer – Fairfield	1.0	26.07.2016	1.0	01.11.2016
Flyer – Liverpool	1.0	26.07.2016	1.0	01.11.2016

The following conditions apply to this research project. These are additional to those conditions imposed by the Human Research Ethics Committee that granted ethical approval:

1. Proposed amendments to the research protocol or conduct of the research which may affect the ethical acceptability of the project, and which are submitted to the lead HREC for review, are copied to this office.
2. Proposed amendments to the research protocol or conduct of the research which may affect the ongoing site acceptability of the project, are to be submitted to this office.
3. Please note that you are responsible for making the necessary arrangements (e.g. identity pass and vaccine compliance as per NSW Health Policy Directive PD2011_005) for any researcher who is not employed by the South Western Sydney Local Health District and is conducting the research on-site.
4. The Principal Investigator is responsible for ensuring the research project is conducted in line with relevant NSW Health, South Western Sydney Local Health District and Hospital policies available from: <http://www.sswahs.nsw.gov.au/swslhd/ethics/policies.html>

Page 1 of 2

5. Proposed changes to the personnel involved in the study at South Western Sydney Local Health District sites are submitted to the South Western Sydney Local Health District Research and Ethics Office accompanied by the required supporting documents. A list of the documentation required to add an Investigator to a study is located on the South Western Sydney Local Health District Research and Ethics Office website:
<http://www.swslhd.nsw.gov.au/ethics/forms.html>

Yours sincerely,



Annamarie D'Souza
Manager, Research and Ethics Office
South Western Sydney Local Health District (SWSLHD)

ADDRESS FOR ALL CORRESPONDENCE
RESEARCH ETHICS AND GOVERNANCE OFFICE
ROYAL PRINCE ALFRED HOSPITAL
CAMPERDOWN NSW 2050



TELEPHONE: (02) 9515 7899
FACSIMILE: (02) 9515 7176
EMAIL: maree.larkin@sswahs.nsw.gov.au
REFERENCE: X15-0452

22 December 2015

Mrs Paula Sanchez
Centre for Applied Nursing Research
Lockeæd Bag 7103, SWSLHD
LIVERPOOL NSW 1871

Dear Mrs Sanchez,

Re: Protocol No X15-0452 - "Developing a cardiovascular oral health (CARDIOH) program: A mixed methods study"

HREC/15/LPOOL/410

SSA/15/RPAH/600 & SSA/15/RPAH/601

Thank you for submitting a Site Specific Assessment Form for this study. I am pleased to inform you that authorisation has been granted for **Phase 2** to be undertaken at the **Royal Prince Alfred Hospital** and **Balmain Hospital**.

The approved information and consent documents for use at this site are:

Royal Prince Alfred Hospital

- Participant Information for Cardiac Rehabilitation Patients (RPAH Version 1.0, 19/11/2015) based on Master Version 1.0, 17/8/2015
- Participant Information for Cardiac Rehabilitation Clinicians (RPAH Version 1.0, 19/11/2015) based on Master Version 1.0, 17/8/2015
- Consent Form (RPAH Version 1.0, 19/11/2015) based on Master Version 1.0, 17/8/2015
- Participant Demographics – Focus Group (RPAH Version 1.0, 19/11/2015) based on Master Version 1.0, 17/8/2015
- Participant Demographics – Interview (RPAH Version 1.0, 19/11/2015) based on Master Version 1.0, 17/8/2015

Balmain Hospital

- Participant Information for Cardiac Rehabilitation Patients (Balmain Version 1.0, 19/11/2015) based on Master Version 1.0, 17/8/2015
- Participant Information for Cardiac Rehabilitation Clinicians (Balmain H Version 1.0, 19/11/2015) based on Master Version 1.0, 17/8/2015
- Consent Form (Balmain Version 1.0, 19/11/2015) based on Master Version 1.0, 17/8/2015
- Participant Demographics – Focus Group (Balmain Version 1.0, 19/11/2015) based on Master Version 1.0, 17/8/2015
- Participant Demographics – Interview (Balmain Version 1.0, 19/11/2015) based on Master Version 1.0, 17/8/2015

The following conditions apply to this research study. These are additional to those conditions imposed by the human research ethics committee (HREC) that granted ethical approval:

1. A copy of the annual report and any other reports to the approving HREC, accompanied by a copy of the HREC's acknowledgement letter, should be provided to me for review.

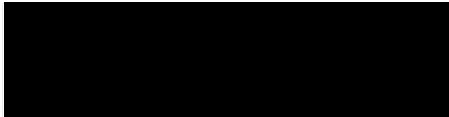
Sydney Local Health District
ABN 17 520 269 052
www.slhd.nsw.gov.au

ID 640008 Dec 11

2. When required, the appropriate documentation must be submitted to me for authorisation before any new external researcher is authorised to be on-site for the project.
3. Proposed amendments to the research protocol or conduct of the research, which may affect the ethical acceptability of the study and which are submitted to the lead HREC for review, must be copied to me.
4. Proposed amendments to the research protocol or conduct of the research, which may affect the ongoing site acceptability of the study, must be submitted to me.

I wish you every success in your research.

Yours sincerely,



Maree Larkin
Research Governance Officer
SLHD (RPAH Zone)

RGO - Maree\CORRES\X15-0452 RPAH/Balmain

ADDRESS FOR ALL CORRESPONDENCE
RESEARCH ETHICS AND GOVERNANCE OFFICE
ROYAL PRINCE ALFRED HOSPITAL
CAMPERDOWN NSW 2050
TELEPHONE: (02) 9515 7899
EMAIL: maree.larkin@sswahs.nsw.gov.au
REFERENCE: X16-0480



21 December 2016

Mrs Paula Sanchez
SWSLHD, COHORTE Research Group
Locked Bag 7103
LIVERPOOL BC NSW 1671

Dear Mrs Sanchez,

Re: Protocol No X16-0480- "Developing a cardiovascular oral health (CARDIOH) program: A mixed methods study. Phase 2"

LNR/16/LPOOL/499

LNRSSA/16/RPAH/688

Thank you for submitting a Site Specific Assessment Forms (AU/7/BCC7211 and AU/7/DCC728) for this low and negligible risk study. I am pleased to inform you that the delegate of the Chief Executive has granted authorisation for it to be undertaken at the *Royal Prince Alfred Hospital and Balmain Hospital*.

The following documents are authorised for use at the sites:

- ***Flyer for Questionnaire (RPAH Version 1.0, 23/11/2016) based on Master Version 1.0, 26/7/2016***
- ***Participant Information Sheet and Consent Form (RPAH Version 2.0, 23/11/2016) based on Master Version 2.0, 12/10/2016***
- ***Flyer for Questionnaire (Balmain Version 1.0, 23/11/2016) based on Master Version 1.0, 26/7/2016***
- ***Participant Information Sheet and Consent Form (Balmain Version 2.0, 23/11/2016) based on Master Version 2.0, 12/10/2016***

The following conditions apply to this research study. These are additional to those conditions imposed by the human research ethics committee (HREC) that granted ethical approval:

1. A copy of the annual report and any other reports to the approving HREC, accompanied by a copy of the HREC's acknowledgement letter, *must be provided to me for review*.
2. When required, the appropriate documentation must be submitted to me for authorisation before any new external researcher is authorised to be on-site for the project.
3. Proposed amendments to the research protocol or conduct of the research, which may affect the ethical acceptability of the study and which are submitted to the lead HREC for review, must be copied to me.
4. Proposed amendments to the research protocol or conduct of the research, which may affect the ongoing site acceptability of the study, must be submitted to me.

I wish you every success in your research.

Yours sincerely,

Maree Larkin
Research Governance Officer
SLHD (RPAH Zone)

RGO - Maree\CORRES\X16-0480

Sydney Local Health District
ABN 17 520 269 052
www.slhd.nsw.gov.au

ID 640008 Dec 11

Locked Bag 1797
Penrith NSW 2751 Australia
Office of Research Services

ORS Reference: H11433



HUMAN RESEARCH ETHICS COMMITTEE

25 November 2015

Ms Paula Sanchez
School of Nursing and Midwifery

Dear Paula,

I wish to formally advise you that the Human Research Ethics Committee has noted the external HREC approval of your research titled: "Developing a cardiovascular oral health (CARDIOH) program: A mixed method study" under the UWS number H11433.

Conditions of Approval

1. Please advise UWS HREC of amendments approved by the Administering HREC.
2. Please advise UWS HREC of any serious or unexpected adverse events reported to the Administering HREC
3. As the Administering HREC has approved the protocol until 11 November 2020 the UWS record will close after that date unless we are advised that the Administering HREC has approved an extension.
4. Please provide a copy of the Final report to UWS HREC.

Please quote the registration number and title as indicated above in the subject line on all future correspondence related to this project. All correspondence should be sent to the email address humanethics@uws.edu.au as this email address is closely monitored.

Regards

Human Ethics Officer on behalf of UWS HREC
humanethics@uws.edu.au
Tel: 4736 2493, Ext: 2493

Appendix 5 Participant Consent Form (People with CVD Interviews).

[LOGO]

[Site Name]

CONSENT FORM

DEVELOPING A CARDIOVASCULAR ORAL HEALTH (CARDIOH) PROGRAM: A MIXED METHODS STUDY

1. I,
of
agree to participate in the study described in the participant information statement set out in the Participant Information Sheet attached to this form.
2. I acknowledge that I have read the participant information statement, which explains why I have been selected, the aims of the study and the nature and the possible risks of the investigation, and the statement has been explained to me to my satisfaction.
3. Before signing this consent form, I have been given the opportunity of asking any questions relating to any possible physical and mental harm I might suffer as a result of my participation and I have received satisfactory answers.
4. I understand that I can withdraw from the study at any time without prejudice to my relationship with the [Site Name].
5. I agree that research data gathered from the results of the study may be published, provided that I cannot be identified.
6. I understand that if I have any questions relating to my participation in this research, I may contact Mrs Paula Sanchez on telephone (+612) 8738 9352, who will be happy to answer them.
7. I acknowledge receipt of a copy of this Consent Form and the Participant Information Statement.

Signature of PARTICIPANT	Please PRINT name	Date
--------------------------	-------------------	------

Signature of WITNESS	Please PRINT name	Date
----------------------	-------------------	------

Signature of INVESTIGATOR	Please PRINT name	Date
---------------------------	-------------------	------

Appendix 6 Participant Consent Form (People with CVD Questionnaire)

[Insert Logo]

[Insert site]

CONSENT FORM (Questionnaire)

DEVELOPING A CARDIOVASCULAR ORAL HEALTH (CARDIOH) PROGRAM: A MIXED METHODS STUDY

Phase 2

1. I,
of
agree to participate in the study described in the participant information statement set out in the Participant Information Sheet attached to this form.
2. I acknowledge that I have read the participant information statement, which explains why I have been selected, the aims of the study and the nature and the possible risks of the investigation, and the statement has been explained to me to my satisfaction.
3. Before signing this consent form, I have been given the opportunity of asking any questions relating to any possible physical and mental harm I might suffer as a result of my participation and I have received satisfactory answers.
4. I understand that I can withdraw from the study at any time without prejudice to my relationship to [Insert site].
5. I agree that research data gathered from the results of the study may be published, provided that I cannot be identified.
6. I understand that if I have any questions relating to my participation in this research, I may contact Mrs Paula Sanchez on telephone (+612) 8738 9352, who will be happy to answer them.
7. I acknowledge receipt of a copy of this Consent Form and the Participant Information Statement.

Signature of PARTICIPANT Please PRINT name Date

Signature of WITNESS Please PRINT name Date

Signature of INVESTIGATOR Please PRINT name Date

Appendix 7 Participant Consent Form (Cardiac Care Clinicians)

[Insert Logo]

[Site name]

CONSENT FORM (Cardiac Care Clinicians)

DEVELOPING A CARDIOVASCULAR ORAL HEALTH (CARDIOH) PROGRAM: A MIXED METHODS STUDY

1. I,
of
agree to participate in the study described in the participant information statement set out in the Participant Information Sheet attached to this form.
2. I acknowledge that I have read the participant information statement, which explains why I have been selected, the aims of the study and the nature and the possible risks of the investigation, and the statement has been explained to me to my satisfaction.
3. Before signing this consent form, I have been given the opportunity of asking any questions relating to any possible physical and mental harm I might suffer as a result of my participation and I have received satisfactory answers.
4. I understand that I can withdraw from the study at any time without prejudice to my relationship with the Liverpool Cardiac Ambulatory Service.
5. I agree that research data gathered from the results of the study may be published, provided that I cannot be identified.
6. I understand that if I have any questions relating to my participation in this research, I may contact Mrs Paula Sanchez on telephone (+612) 8738 9352, who will be happy to answer them.
7. I acknowledge receipt of a copy of this Consent Form and the Participant Information Statement.

Signature of PARTICIPANT

Please PRINT name

Date

Signature of WITNESS

Please PRINT name

Date

Signature of INVESTIGATOR

Please PRINT name

Date

Appendix 8 Participant Information Sheet (People with CVD Interviews)

[LOGO]

PARTICIPANT INFORMATION SHEET FOR CARDIAC REHABILITATION PATIENTS

[Site Name]

Title: Developing a Cardiovascular Oral Health (CARDIOH) Program: A mixed methods study.

Short Title: The CARDIOH project

Coordinating Principal Investigator: Paula Sanchez

Associate Investigators: Dr Ajesh George; Associate Professor Bronwyn Everett, Associate Professor Yenna Salamonson; Associate Professor Rohan Rajaratnam; Associate Professor Julie Redfern, Dr Shilpi Ajwani, Dr Ravi Srinivas, Dr Sameer Bhole; Fiona Skarligos; Lisa Spencer, Joshua Bishop, Samantha Nolan Karen Lintern, Maria Sheehan

Location: Liverpool Cardiac Ambulatory Service

PART 1: What does my participation involve?

1. Introduction

You are invited to take part in this research study: *Developing the cardiovascular oral health (CARDIOH) program: A mixed methods study*. The overall aim of this study is to develop a cardiovascular oral health program for a cardiac rehabilitation setting in Australia. The objective of this phase of the study (phase 2) is to explore patients and cardiac rehabilitation clinicians perceptions regarding the practicability, acceptability and feasibility of the CARDIOH program.

This Participant Information Sheet tells you about the research study. It explains the research involved and the questions asked. Knowing what is involved will help you decide if you want to take part in the research.

Please read this information carefully. Ask questions about anything you don't understand or want to know more about. Before deciding whether or not to take part, you might want to talk about it with a relative, friend or colleague.

Participation in this research is voluntary. If you don't wish to take part, you don't have to. If you decide to take part and later change your mind, you are free to withdraw from the study at any stage, prior to data collection.

Your decision whether to take part or not to take part, or to take part and then withdraw, will not affect your relationship with the [Site Name].

If you do decide to take part in this study, you will be asked to sign the Consent Form (separate form included with this Participant Information Sheet). By signing the Consent Form, you are telling us that you:

- Understand what you have read;
- Consent to take part in the research study;
- Consent to the use of your personal information as described.

You will be given a copy of this Participant Information Sheet and the Consent Form to keep.

2. What is the purpose of this research?

There is increasing evidence linking poor oral health with cardiovascular (CVD) disease and the risk appears to be high in patients with established CVD as well. However, many cardiovascular patients are not seeking dental care even when they have a problem with one of the barriers being lack of oral health awareness. It is now recommended internationally that all cardiac care providers should provide oral health education, assessment and referral to their patients. As the primary contact nurses could play an essential role in promoting oral health in the cardiac rehabilitation setting. Unfortunately this does not currently occur in Australia. Thus the broad aim of this study is to develop a cardiovascular oral health (CARDIOH) program for a cardiac rehabilitation setting in Australia. This program will incorporate oral health guidelines into cardiac rehabilitation practice and will involve educating cardiac rehabilitation nurses to provide oral health education, assessment and referral for their patients. The purpose of this project is to explore patients and cardiac rehabilitation clinicians' perceptions regarding the practicability, acceptability and feasibility of the CARDIOH program.

3. What does participation in this research involve?

Cardiac rehabilitation patients will be eligible to participate in this study. If you agree to participate you will be requested to be interviewed to discuss your perceptions about oral health and cardiovascular disease and cardiac rehabilitation nurses providing oral health education, assessment and referrals. The interview will take between 30-45 mins and will be audio recorded. It will be conducted at a time and place convenient to you. Prior to the commencement of the study you will be asked to sign a consent form and provide your demographic information. You may also provide your name and address if you would like to receive a report of the project findings

4. Do I have to take Part in this research?

Participation in this study is entirely voluntary; you are not obliged to be involved. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage without giving any reason and without any consequences.

5. What are the alternatives to participation?

This research study involves participation in a focus group. As such, non-participation is the only alternative.

6. What are the possible risks and disadvantages of taking part?

There is no anticipated risk in taking part in this study. If you feel uncomfortable or distressed as a result of your participation, the focus group will be stopped immediately and you will be comforted. If required, you will be referred to the local community health centre for free counselling or any other appropriate support. Any counselling or support will be provided by a qualified staff member who is not a part of the research team.

We cannot guarantee or promise that you will receive any benefits from this research. There may be no clear benefit to you from your participation however; the information gained through your participation will assist in improving awareness about the importance of maintaining oral health of patients with cardiovascular disease and ultimately increase knowledge and skills of nurses to

undertake oral health education, assessment and referral during cardiac rehabilitation. It would also improve oral health awareness and knowledge of other cardiac clinicians.

PART 2: How is the research project being conducted?

7. What will happen to information about me?

If you provide consent by signing the consent form the results will be used to develop a report, with the potential to be published in a peer-reviewed journal and presented at conference. Copies of the results will be available to participants upon request. All participants are assured of confidentiality in relation to data collected for the research and in any reports published following the completion of the research project. Employers will NOT have access to any of the reports. All transcripts from the interviews will be coded and any identifying information will be removed by the chief investigator prior to the data being analysed. All of the research data and associated materials will be kept by the chief investigator in a locked cupboard in a locked research office. In any research reports the data will be presented using pseudonyms and no individual names will appear. All data will be retained for seven years as per NH&MRC Guidelines and then destroyed.

8. Review of the research study

All research in Australia involving humans is reviewed by an independent group of people called a Human Research Ethics Committee (HREC). The ethical aspects of this research study have been approved by the HREC of South Western Sydney Local Health District. This research study will be carried out according to the *National Statement on Ethical Conduct in Human Research (2007)*. This statement has been developed to protect the interests of people who agree to participate in human research studies.

9. Further information and who to contact

If you have any concerns about your participation in this research, you should contact Ms Paula Sanchez (02 8738 9352) or Dr Ajesh George (02 8738 9356) as soon as possible.

This research study has been approved by the South Western Sydney Local Health District Human Research Ethics Committee. Any person with concerns or complaints about the conduct of this research study should contact the Ethics and Research Governance Office, Locked Bag 7279, Liverpool BC, NSW, 1871 on telephone: 02 8738 8304; fax: 02 8738 8310; email: research.support@sswahs.nsw.gov.au; or website: <http://www.sswahs.nsw.gov.au/swslhd/ethics/default.html> and quote HREC/15/LPOOL/410.

**Thank you for taking the time to consider this research study.
If you wish to take part in it, please sign the attached Consent Form.
This Participant Information Sheet is for you to keep.**

Appendix 9 Participant Information Sheet (People with CVD Questionnaire)

[LOGO]

PARTICIPANT INFORMATION SHEET QUESTIONNAIRE

[Site Name]

Title: Developing a Cardiovascular Oral Health (CARDIOH)
Program: A mixed methods study. Phase 2

Short Title: The CARDIOH project

Protocol Number:

Coordinating Principal Investigator: Paula Sanchez

Associate Investigators: Dr Ajesh George; Associate Professor Bronwyn Everett, Associate Professor Yenna Salamonson; Associate Professor Rohan Rajaratnam; Associate Professor Julie Redfern, Dr Shilpi Ajwani, Dr Ravi Srinivas, Dr Sameer Bhole; Fiona Skarligos; Lisa Spencer, Joshua Bishop, Samantha Nolan Karen Lintern, Maria Sheehan

Location: [Site Name]

PART 1: What does my participation involve?

1. Introduction

You are invited to take part in this research study: *Developing a cardiovascular oral health (CARDIOH) program: A mixed methods study*. The overall aim of this study is to develop a cardiovascular oral health program for nurses in the cardiac setting in Sydney so they can provide oral health education, assessment and referrals to their patients. The objective of this phase of the study (phase 2) is to explore the oral health status, knowledge and behaviour of patients with cardiovascular disease as well as the feasibility of the CARDIOH program.

This Participant Information Sheet tells you about the research study. It explains the research involved and the questions asked. Knowing what is involved will help you decide if you want to take part in the research.

Please read this information carefully. Ask questions about anything you don't understand or want to know more about. Before deciding whether or not to take part, you might want to talk about it with a relative, friend or colleague.

Participation in this research is voluntary. If you don't wish to take part, you don't have to. If you decide to take part and later change your mind, you are free to withdraw from the study at any stage, prior to data collection.

Your decision whether to take part or not to take part, or to take part and then withdraw, will not affect your relationship with [Insert Site].

If you do decide to take part in this study, you will be asked to sign the Consent Form (separate form included with this Participant Information Sheet). By signing the Consent Form, you are telling us that you:

- Understand what you have read;
- Consent to take part in the research study;
- Consent to the use of your personal information as described.

You will be given a copy of this Participant Information Sheet and the Consent Form to keep.

2. What is the purpose of this research?

There is increasing evidence linking poor oral health with cardiovascular disease and the risk appears to be high in patients with established cardiovascular disease as well. However, many cardiovascular patients are not seeking dental care even when they have a problem with one of the barriers being lack of oral health awareness. It is now recommended internationally that all cardiac care providers should provide oral health education, assessment and referral to their patients. As the primary contact nurses could play an essential role in promoting oral health in the cardiac setting. Unfortunately this does not currently occur in Australia. Thus the broad aim of this study is to develop a cardiovascular oral health (CARDIOH) program for the cardiac setting in Sydney. This program will incorporate oral health guidelines into cardiac practice and will involve educating cardiac nurses to provide oral health education, assessment and referral for their patients. In phase 1 of this study people with cardiovascular disease and cardiac care clinicians were interviewed to explore their oral health knowledge, practices and behaviours as well as their perceptions about incorporating oral health by nurses in the cardiac setting. The purpose of this phase of the project is to further explore the oral health status, knowledge and behaviours of patients with cardiovascular disease as well as the acceptability and feasibility of the CARDIOH program.

3. What does participation in this research involve?

Patients attending the cardiology department will be eligible to participate in this study. If you agree to participate you will be requested to complete a questionnaire in relation to oral health and cardiovascular disease, your oral health status and behaviour, your perception regarding oral health in the cardiac setting and the role of cardiac nurses. In addition some demographic information about you will also be requested. You will not be required to give information that identifies you in the questionnaire. Prior to the commencement of the study you will be asked to sign a consent form. You may also provide your name and address if you would like to receive a report of the project findings.

4. Do I have to take Part in this research?

Participation in this study is entirely voluntary; you are not obliged to be involved. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage without giving any reason and without any consequences.

5. What are the alternatives to participation?

This research study involves completing a questionnaire. As such, non-participation is the only alternative.

6. What are the possible risks and disadvantages of taking part?

There is no anticipated risk in taking part in this study. If you feel uncomfortable or distressed as a result of completing the questionnaire you can stop immediately and you will be comforted. If required, you will be referred to the local community health centre for free counselling or any other

appropriate support. Any counselling or support will be provided by a qualified staff member who is not a part of the research team.

We cannot guarantee or promise that you will receive any benefits from this research. There may be no clear benefit to you from your participation however; the information gained through your participation will assist in improving awareness about the importance of maintaining the oral health of patients with cardiovascular disease and ultimately increase knowledge and skills of nurses to undertake oral health education, assessment and referral in the cardiac setting. It would also improve oral health awareness and knowledge of other people with cardiovascular disease as well as cardiac clinicians.

PART 2: How is the research project being conducted?

7. What will happen to information about me?

If you provide consent by signing the consent form the results will be used to develop a report, with the potential to be published in a peer-reviewed journal and presented at conference. Copies of the results will be available to participants upon request. All participants are assured of confidentiality in relation to data collected for the research and in any reports published following the completion of the research project. All questionnaires will be coded and any potential identifying information will be removed by the chief investigator prior to the data being analysed. All of the research data and associated materials will be kept by the chief investigator in a locked cupboard in a locked research office. In any research reports the data will not be identifiable and no individual names will appear. All data will be retained for seven years as per NHMRC Guidelines and then destroyed.

8. Review of the research study

All research in Australia involving humans is reviewed by an independent group of people called a Human Research Ethics Committee (HREC). The ethical aspects of this research study have been approved by the HREC of South Western Sydney Local Health District. This research study will be carried out according to the *National Statement on Ethical Conduct in Human Research (2007)*. This statement has been developed to protect the interests of people who agree to participate in human research studies.

9. Further information and who to contact

The person you may need to contact will depend on the nature of your query. If you want any further information concerning this project or if you have any problems which may be related to your involvement in the project, you can contact the researcher Ms Paula Sanchez on 02 8738 9352/ 0402709028 or Dr Ajesh George on 02 8738 9356.

10. Complaints contact person

This research study has been approved by the South Western Sydney Local Health District Human Research Ethics Committee. Any person with concerns or complaints about the conduct of this research study should contact the Research and Ethics Office, Locked Bag 7103, Liverpool BC, NSW, 1871 or 02 8738 8304/ fax: 02 8738 8310/ email: research.support@sswahs.nsw.gov.au. Website: <http://www.sswahs.nsw.gov.au/swslhd/ethics/default.html> and quote [Local project number].

**Thank you for taking the time to consider this study.
If you wish to take part in it, please sign the attached consent form.
This information sheet is for you to keep.**

Appendix 10 Participant Information Sheet (Cardiac Care Clinicians)

[LOGO]

PARTICIPANT INFORMATION SHEET FOR CARDIAC CLINICIANS

[Site Name]

Title: Developing a Cardiovascular Oral Health (CARDIOH) Program: A mixed methods study.

Short Title: The CARDIOH project

Coordinating Principal Investigator: Paula Sanchez

Associate Investigators: Dr Ajesh George; Associate Professor Bronwyn Everett, Associate Professor Yenna Salamonson; Associate Professor Rohan Rajaratnam; Associate Professor Julie Redfern, Dr Shilpi Ajwani, Dr Ravi Srinivas, Dr Sameer Bhole; Fiona Skarligos; Lisa Spencer, Joshua Bishop, Samantha Nolan Karen Lintern, Maria Sheehan

Location: Liverpool Cardiac Ambulatory Service

PART 1: What does my participation involve?

1. Introduction

You are invited to take part in this research study: *Developing the cardiovascular oral health (CARDIOH) program: A mixed methods study*. The overall aim of this study is to develop a cardiovascular oral health program for a cardiac rehabilitation setting in Australia. The objective of this phase of the study (phase 2) is to explore patients and cardiac rehabilitation clinicians perceptions regarding the practicability, acceptability and feasibility of the CARDIOH program.

This Participant Information Sheet tells you about the research study. It explains the research involved and the questions asked. Knowing what is involved will help you decide if you want to take part in the research.

Please read this information carefully. Ask questions about anything you don't understand or want to know more about. Before deciding whether or not to take part, you might want to talk about it with a relative, friend or colleague.

Participation in this research is voluntary. If you don't wish to take part, you don't have to. If you decide to take part and later change your mind, you are free to withdraw from the study at any stage, prior to data collection.

Your decision whether to take part or not to take part, or to take part and then withdraw, will not affect your relationship with [Site Name].

If you do decide to take part in this study, you will be asked to sign the Consent Form (separate form included with this Participant Information Sheet). By signing the Consent Form, you are telling us that you:

- Understand what you have read;
- Consent to take part in the research study;
- Consent to the use of your personal information as described.

You will be given a copy of this Participant Information Sheet and the Consent Form to keep.

2. What is the purpose of this research?

There is increasing evidence linking poor oral health with cardiovascular (CVD) disease and the risk appears to be high in patients with established CVD as well. However, many cardiovascular patients are not seeking dental care even when they have a problem with one of the barriers being lack of oral health awareness. It is now recommended internationally that all cardiac care providers should provide oral health education, assessment and referral to their patients. As the primary contact nurses could play an essential role in promoting oral health in the cardiac rehabilitation setting. Unfortunately this does not currently occur in Australia. Thus the broad aim of this study is to develop a cardiovascular oral health (CARDIOH) program for a cardiac rehabilitation setting in Australia. This program will incorporate oral health guidelines into cardiac rehabilitation practice and will involve educating cardiac rehabilitation nurses to provide oral health education, assessment and referral for their patients. The purpose of this project is to explore patients and cardiac rehabilitation clinicians' perceptions regarding the practicability, acceptability and feasibility of the CARDIOH program.

3. What does participation in this research involve?

Cardiac rehabilitation clinicians will be eligible to participate in this study. If you agree to participate you will be asked to partake in a focus group to discuss your perceptions about cardiac nurses providing oral health education, assessment and referrals to patients in the cardiac setting. The focus group will take approximately 1 hour and will be audio recorded. It will be conducted at a time and place convenient to you. Prior to the commencement of the study you will be asked to sign a consent form and provide your demographic information. You may also provide your name and address if you would like to receive a report of the project findings

4. Do I have to take Part in this research?

Participation in this study is entirely voluntary; you are not obliged to be involved. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage without giving any reason and without any consequences.

5. What are the alternatives to participation?

This research study involves participation in a focus group. As such, non-participation is the only alternative.

6. What are the possible risks and disadvantages of taking part?

There is no anticipated risk in taking part in this study. If you feel uncomfortable or distressed as a result of your participation, the focus group will be stopped immediately and you will be comforted. If required, you will be referred to the local community health centre for free counselling or any other appropriate support. Any counselling or support will be provided by a qualified staff member who is not a part of the research team.

We cannot guarantee or promise that you will receive any benefits from this research. There may be no clear benefit to you from your participation however; the information gained through your participation will assist in improving awareness about the importance of maintaining oral health of patients with cardiovascular disease and ultimately increase knowledge and skills of nurses to

undertake oral health education, assessment and referral during cardiac rehabilitation. It would also improve oral health awareness and knowledge of other cardiac clinicians.

PART 2: How is the research project being conducted?

7. What will happen to information about me?

If you provide consent by signing the consent form the results will be used to develop a report, with the potential to be published in a peer-reviewed journal and presented at conference. Copies of the results will be available to participants upon request. All participants are assured of confidentiality in relation to data collected for the research and in any reports published following the completion of the research project. Employers will NOT have access to any of the reports. All transcripts from the focus group will be coded and any identifying information will be removed by the chief investigator prior to the data being analysed. All of the research data and associated materials will be kept by the chief investigator in a locked cupboard in a locked research office. In any research reports the data will be presented using pseudonyms and no individual names will appear. All data will be retained for seven years as per NH&MRC Guidelines and then destroyed.

8. Review of the research study

All research in Australia involving humans is reviewed by an independent group of people called a Human Research Ethics Committee (HREC). The ethical aspects of this research study have been approved by the HREC of South Western Sydney Local Health District. This research study will be carried out according to the *National Statement on Ethical Conduct in Human Research (2007)*. This statement has been developed to protect the interests of people who agree to participate in human research studies.

9. Further information and who to contact

If you have any concerns about your participation in this research, you should contact Ms Paula Sanchez (02 8738 9352) or Dr Ajesh George (02 8738 9356) as soon as possible.

This research study has been approved by the South Western Sydney Local Health District Human Research Ethics Committee. Any person with concerns or complaints about the conduct of this research study should contact the Ethics and Research Governance Office, Locked Bag 7279, Liverpool BC, NSW, 1871 on telephone: 02 8738 8304; fax: 02 8738 8310; email: research.support@sswahs.nsw.gov.au; or website: <http://www.sswahs.nsw.gov.au/swslhd/ethics/default.html> and quote HREC/15/LPOOL/410.

**Thank you for taking the time to consider this research study.
If you wish to take part in it, please sign the attached Consent Form.
This Participant Information Sheet is for you to keep.**

Appendix 11 Participant Demographic Form (Patient Interviews)

[LOGO]

[Site Name]

PARTICIPANT DEMOGRAPHICS (Interview)

DEVELOPING A CARDIOVASCULAR ORAL HEALTH (CARDIOH) PROGRAM: A MIXED METHODS STUDY

After you have read the Participant Information Sheet and signed the Consent Form, please complete the following information:

Age at your last birthday (in years)

Country of birth.....

Language spoken at home.....

What is your diagnosis?

Gender Female Male

Employment status Not working Part-time Full-time

What is your highest educational qualification? No formal schooling
 Primary school
 Secondary school
 TAFE
 Colleague or university

What is your average annual household income? Less than \$40,000
 \$40,000 to \$80,000
 \$80,000 to \$120,000
 More than \$120,000
 Prefer not to answer

Have you got private health insurance? No Yes Don't know

Do you currently have the following?

Pensioner concession card No Yes Don't know

Health care card No Yes Don't know

Department of Veterans Affairs card No Yes Don't know

Thank you for completing this information

Master Participant Demographics Interview, Version 1.0, 17 August 2015
[Site Name] [Version] [Date]

Page 1 of 1

Appendix 12 Participant Demographic Form (Focus Groups and Telephone Interviews)

[LOGO]

[Site Name]

PARTICIPANT DEMOGRAPHICS (Focus Group/Phone Interview)

DEVELOPING A CARDIOVASCULAR ORAL HEALTH (CARDIOH) PROGRAM: A MIXED METHODS STUDY

After you have read the Participant Information Sheet and signed the Consent Form, please complete the following information:

1. Age at your last birthday (in years)
2. Gender Female
 Male
3. Current position.....
4. Number of years of experience in your current position.....
5. Highest qualification Certificate
 Associate Diploma
 Diploma
 Bachelor
 Graduate Certificate
 Graduate Diploma
 Masters
 PhD
 Other.....

Thank you for completing this form

Appendix 13 Invitation to Participate Flyer (Interviews)

[LOGO]

Be a part of our study!

We are looking for cardiac rehabilitation or cardiac patients to participate in our study



Researchers from the University of Western Sydney, University of Sydney, Sydney and South Western Sydney Local Health District and the George Institute are conducting a research study to develop a cardiovascular oral health program for cardiac patients in Sydney. This program will involve educating cardiac rehabilitation nurses to provide oral health education, assessment and referral to patients

This study involves participating in an interview to explore your perceptions about oral health and cardiovascular disease and cardiac rehabilitation nurses providing oral health education, assessment and referrals. The information you provide will assist us in developing a more comprehensive program that is tailored to the needs of the local population. The interview will be 30-45 mins long and will be conducted at a convenient time and place. Participation is voluntary and the information you provide will be strictly confidential. This study has been approved by the South Western Sydney Local Health District Human Research Ethics Committee

If you would like to be involved, please contact
Paula Sanchez, (Principal Investigator and PhD student),
Tel: 02 8738 9352 or email paula.sanchez@sswahs.nsw.gov.au

Appendix 14 Invitation to Participate Flyer (Focus Groups)

[LOGO]

Be a part of our study!

We are looking for cardiac rehabilitation/cardiac clinicians to participate in our study



Researchers from the University of Western Sydney, University of Sydney, Sydney and South Western Sydney Local Health District and the George Institute are conducting a research study to develop a cardiovascular oral health program for cardiac patients in Sydney. This program will involve educating cardiac rehabilitation nurses to provide oral health education, assessment and referral to patients

This study involves participating in a focus group with other cardiac rehabilitation clinicians to explore your perceptions regarding the practicability, acceptability and feasibility of the CARDIOH program. The information you provide will assist us in developing a more comprehensive program that is tailored to the needs of the local population. The focus group will be 1 hours long and will be conducted at a convenient time and place. Participation is voluntary and the information you provide will be strictly confidential. This study has been approved by the South Western Sydney Local Health District Human Research Ethics Committee

If you would like to be involved, please contact
Paula Sanchez, (Principal Investigator and PhD student),
Tel: 02 8738 9352 or email paula.sanchez@sswahs.nsw.gov.au

Appendix 15 Invitation to Participate Flyer (Survey/Questionnaire)

[Inset Logo]

Be a part of our study!

We are looking for patients with cardiovascular disease
to participate in our study



Researchers from the Western Sydney University, University of Sydney, Sydney and South Western Sydney Local Health District and the George Institute are conducting a research study to develop a cardiovascular oral health program for cardiac patients in Sydney. This program will involve educating cardiac nurses to provide oral health education, assessment and referral to patients.

This study involves completing a questionnaire to explore your perceptions about oral health and cardiovascular disease, the role of cardiac nurses in oral health, and receiving oral health education, assessment and referrals by nurses in the cardiac setting. The information you provide will assist us in developing a more comprehensive program that is tailored to the needs of the local population. Completing the questionnaire will be 15-20 minutes. Participation is voluntary and the information you provide will be strictly confidential. This study has been approved by the South Western Sydney Local Health District Human Research Ethics Committee

If you would like to complete the questionnaire please approach the stall
located in the waiting area or contact

Paula Sanchez, (Principal Investigator and PhD student),

Tel: 02 8738 9352 / 0402709028 or email

paula.sanchez@sswahs.nsw.gov.au

Appendix 16 Statement of Authors' Contributions

This thesis is presented as a series of five publications. All jointly published manuscripts contained within this thesis were undertaken with the permission of the co-authors.

The authors have contributed in different aspects on the publications included within the thesis. Contribution to the publications by the main author and co-authors is presented in the proceeding pages.

Thesis Paper 1

Sanchez P, Everett B, Salamonson Y, Ajwani S, George A. (2017). Oral healthcare and cardiovascular disease: A scoping review of current strategies and implications for nurses [Online January 31, 2017]. *Journal of Cardiovascular Nursing*. 32(3): E10-E20.

Contribution: Study conception, design, data collection, analysis, manuscript preparation, critical revision of the manuscript, important intellectual content.

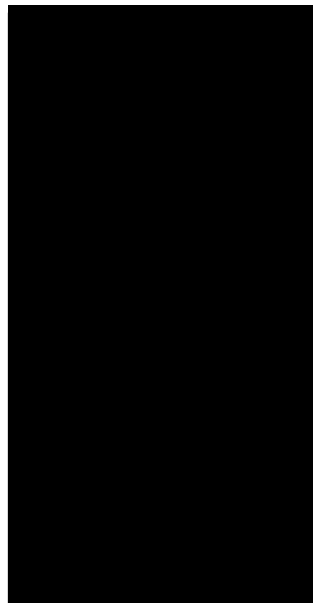
Paula Sanchez

Bronwyn Everett

Yenna Salamonson

Shilpi Ajwani

Ajesh George



.....

.....

.....

.....

.....

Thesis Paper 2

Sanchez P, Everett B, Salamonson Y, Ajwani S, Bhole S, Bishop J, Lintern K, Nolan S, Rajaratnam R, Redfern J, Sheehan M, Skarligos F, Spencer L, Srinivas R, George A. (2017) Perceptions of cardiac care providers towards oral health promotion in Australia. *Collegian*, 25(5), 471-478.

Contribution: Study conception, design, data collection, analysis, manuscript preparation, critical revision of the manuscript, important intellectual content.

Paula Sanchez

Bronwyn Everett

Yenna Salamonson

Shilpi Ajwani

Sameer Bhole

Joshua Bishop

Karen Lintern

Samantha Nolan

Rohan Rajaratnam

Julie Redfern

Maria Sheehan

Fiona Skarligos

Lissa Spencer

Ravi Srinivas

Ajesh George

Thesis Paper 3

Sanchez P, Everett B, Salamonson Y, Ajwani S, Bhole S, Bishop J, Lintern K, Nolan S, Rajaratnam R, Redfern J, Sheehan M, Skarligos F, Spencer L, Srinivas R, George A. (2017). Oral health and cardiovascular care: Perceptions of people with cardiovascular disease. *PLoS One*, 12(7): e0181189.

Contribution: Study conception, design, data collection, analysis, manuscript preparation, critical revision of the manuscript, important intellectual content.

Paula Sanchez		.....
Bronwyn Everett		.....
Yenna Salamonson		.....
Shilpi Ajwani		.....
Sameer Bhole		.....
Joshua Bishop		.....
Karen Lintern		.....
Samantha Nolan		.....
Rohan Rajaratnam		.....
Julie Redfern		.....
Maria Sheehan		.....
Fiona Skarligos		.....
Lissa Spencer		.....
Ravi Srinivas		.....
Ajesh George		.....

Thesis Paper 4

Sanchez, P., Everett, B., Salamonson, Y., Redfern, J., Ajwani, S., Bhole, S., Bishop, J., Lintern, K., Nolan, S., Rajaratnam, R., Sheehan, M., Skarligos, F., Spencer, L., Srinivas, R., George, A. (2019). The oral health status, behaviours and knowledge of people with cardiovascular disease in Sydney Australia: A cross-sectional survey. *BMC Oral Health*, 19(1), 12.

Contribution: Study conception, design, data collection, analysis, manuscript preparation, critical revision of the manuscript, important intellectual content.

Paula Sanchez		.....
Bronwyn Everett		.....
Yenna Salamonson		.....
Julie Redfern		.....
Shilpi Ajwani		.....
Sameer Bhole		.....
Joshua Bishop		.....
Karen Lintern		.....
Samantha Nolan		.....
Rohan Rajaratnam		.....
Maria Sheehan		.....
Fiona Skarligos		.....
Lissa Spencer		.....
Ravi Srinivas		.....
Ajesh George		.....

Thesis Paper 5

Sanchez P, Salamonson Y, Everett B, George A. (2018). Barriers and predictors associated with accessing oral healthcare among people with cardiovascular disease in Australia.

Journal of Cardiovascular Nursing, 34(3), 208-214.

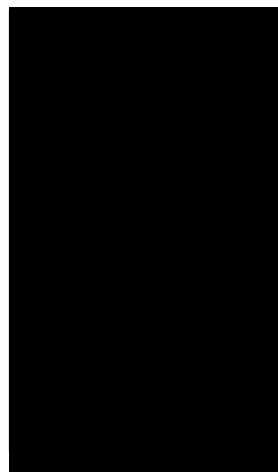
Contribution: Study conception, design, data collection, analysis, manuscript preparation, critical revision of the manuscript, important intellectual content.

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