IMPLANT DENTISTRY IN AUSTRALIA:

THE PRESENT AND FUTURE

Ying Nan Guo

BDS, BScDent Hons

School of Dentistry, Faculty of Health Sciences

The University of Adelaide

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ABSTRACT

In recent years, implant dentistry has become a routine part of many general dental practices in Australia. However, there is little information regarding its prevalence as well as the extent and nature of its practice. This investigation aims to address the paucity of information in this area. Additionally, data concerning general dental practitioners (GDPs) will be compared with that for dental specialists to reveal the degree of conformity between the two groups in their practice of implant dentistry. The results of this research may also be of assistance in the development of educational programs in this field.

Electronic surveys on the practice of implant dentistry were designed using SurveyMonkey™ and delivered along with a participation invitation to the following professional bodies: all seven State/Territory branches of the Australian Dental Association (ADA), the Australian and New Zealand Academy of Periodontists (ANZAP), the Australian and New Zealand Academy of Oral and Maxillofacial Surgeons (ANZAOMS), and prosthodontist members of the Australian Prosthodontic Society (APS). After examining the surveys for approval, all above professional organisations agreed to participate by inviting their respective members to complete the surveys online via SurveyMonkey™. The same program was used to analyse the responses while preserving the anonymity of the respondents.

The initial response rates were 7.61% (n = 801) for GDPs, 41.76% (n = 38) for prosthodontists, 34.16% (n = 55) for periodontists, and 34.07% (n = 46) for oral and maxillofacial (OMF) surgeons. Among the respondents, 66.37 % (n = 521) of GDPs, 86.11%

(n = 31) of prosthodontists, 82.98 % (n = 39) of periodontists, and 97.67% (n = 42) of OMF surgeons indicated that they currently practise implant dentistry. Furthermore, of the implant-practising GDPs and prosthodontists, 205 (42.52%) and 13 (41.94%), respectively, reported to be practising both surgical and restorative aspects; while the vast majority of the remainder are involved solely in restorative treatment. In terms of intentions for further education, 79.67% (588) of all GDP respondents indicated a willingness to undertake some form of continuing professional education to improve their knowledge and skills in implant dentistry. Finally, a number of noticeable differences were also found between GDPs and the specialist groups with respect to their opinions and styles of practice.

Being cognizant of the limitations of this study, such as the somewhat arbitrary nature of the participants' input and variable response rates, it appears that implant dentistry is presently practised in its restorative and surgical facets by a significant proportion of GDPs across Australia. Differences were found in opinions and practice styles between GDPs and dental specialists, reflecting differing levels of knowledge and experience. Despite this, the desire displayed by most of the GDP respondents to undertake continuing professional education in this discipline of dentistry suggests that there is a self-identified need for relevant educational programs. This is especially important in light of current guidelines defining the practising scope of implant dentistry based on practitioners' educational experiences.

Declaration

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree.

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Ying Nan Guo

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Fifthly, and in its own way most importantly, I extend my sincere gratitude to the staff and members of the following professional bodies who kindly participated in this research by

taking their valuable time to distribute and respond to our surveys: all seven State/Territory branches of the Australia Dental Association (i.e. ADANSW, ADANT, ADAQ, ADASA, ADATB, ADAVB, ADAWA), the Australian and New Zealand Academy of Oral and Maxillofacial Surgeons (ANZAOMS), the Australian and New Zealand Academy of Periodontists (ANZAP), and the prosthodontist members of the Australian Prosthodontic Society (APS). This project would not have been possible without the crucial data helpfully provided by all the participants.

Finally, and equally notably, I gratefully acknowledge the financial support generously provided by the University of Adelaide over the course of my research and studies in the Doctor of Clinical Dentistry program.

LIST OF ABBREVIATIONS

ABL – Alveolar bone loss

ACWIDUE – Australian Consensus Workshop on Implant Dentistry University Education

ADA Federal – Australian Dental Association Federal Office

ADANSW – Australian Dental Association New South Wales Branch

(also includes practitioners in Australian Capital Territory)

ADANT – Australian Dental Association Northern Territory Branch

ADAQ – Australian Dental Association Queensland Branch

ADASA – Australian Dental Association South Australia Branch

ADATB – Australian Dental Association Tasmania Branch

ADAVB – Australian Dental Association Victoria Branch

ADAWA – Australian Dental Association Western Australia Branch

ADEE – Association for Dental Education in Europe

AIHW – Australian Institute of Health and Welfare

ANZAOMS – Australian and New Zealand Association of Oral and Maxillofacial Surgeons

ANZAP – Australian and New Zealand Academy of Periodontists

APS – Australian Prosthodontic Society

BOP – Bleeding on probing

CAL – Clinical attachment level

CIST – Cumulative Interceptive Supportive Therapy

CPD – Continuing professional development

FDP – Fixed dental prosthesis

FPD – Fixed partial denture

GDP – General dental practitioner

IP – Implant-practising

NIP – Non-implant-practising

OMF – Oral and maxillofacial

PPD – Pocket probing depth

RPD – Removable partial denture

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RESEARCH BRANCH
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BEVERLEY DOBBS
EXECUTIVE OFFICER
LOW RISK HUMAN RESEARCH ETHICS REVIEW GROUPS
THE UNIVERSITY OF ADELAIDE
SA 5005 AUSTRALIA

TELEPHONE +61 8 8313 4725
FACSIMILE +61 8 8313 7325
email: beverley.dobbs@adelaide.edu.au
CRICOS Provider Number 00123M

Applicant: Professor R Logan

School: Dentistry

Project Title: Implant Dentistry in Australia: The present and Future

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Low Risk Human Research Ethics Review Group (Faculty of Health Sciences)

ETHICS APPROVAL No: H-2014-001 **App. No.: 0000017779**

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Thank you for the response dated 18.1.14 to the matters raised. This study is to be conducted by Dr Ying Nan Guo, Doctor of Clinical Dentistry candidate.

per BEVERLEY DOBBS
EXECUTIVE OFFICER
Low Risk Human Research Ethics Review Groups

Chapter One:

Introduction

1.1 Literature Review

1.1.1 The Rise and Significance of Implant Dentistry

Dental implant therapy has advanced considerably over the past two decades (Mattheos *et al.* 2010[a]). The remarkable longevity and predictability of dental implant treatment have led to a significant rise in the number of such treatments performed worldwide, with Australia being a fast expanding market (Kalorama Information 2009, cited in Mattheos *et al.*, 2010[a]). Worthy of note is the fact that dental implant treatment is increasingly being carried out by general dental practitioners (GDPs), and this trend will likely continue such that implant dentistry will become a significant part of contemporary general dental practice in the foreseeable future (Mattheos *et al.*, 2010[a]).

A report on various systematic reviews by Pjetursson and Lang (2008) revealed the survival rate of implant-supported fixed dental restorations to be comparable to or exceeding that of conventional fixed restorations over five to ten years. Based on the results of this study, the authors recommended purely implant-supported fixed dental prostheses (FDPs) and single crowns, as well as conventional end-abutment tooth-supported FDPs, as treatment options of first choice for the replacement of lost dentition. Meanwhile, dental implants have also improved treatment outcomes in removable prosthodontic therapy. A ten-year follow-up study conducted by Raghoebar *et al.* (2003) showed that implant-retained mandibular overdentures proved to be superior to conventional full lower dentures with respect to patients' satisfaction with the prosthesis

and their masticatory capacity. This finding is reinforced by an economic cost-effectiveness analysis by Zitzmann *et al.* (2005), which suggested that a two-implant-retained mandibular overdenture would be the most cost-effective treatment option for patients with an edentulous lower arch, since it offered an appreciable improvement in perceived masticatory function compared to a conventional complete lower denture at a commensurate financial cost.

The growing importance of implant dentistry and its implications for dental education have been formally recognised in Australia. Consequently, the Australian Consensus Workshop on Implant Dentistry University Education (ACWIDUE), which took place in February 2010 and involved prominent educators of dental implantology from all Australian dental schools, produced official guidelines regarding the education of dental students and practitioners in this discipline (Mattheos & Ivanovski 2010, Mattheos *et al.* 2010[a], Mattheos *et al.*2010[b], Ivanovski *et al.* 2010).

1.1.2 The Prevalence of Implant Dentistry Practice

Some of the most notable advantages of dental implants include conservation of abutment tooth structure, enhancement of the prognosis of long-span fixed partial dentures (FPDs), reduction of difficulties associated with free-end saddles, and the possibility of fixed dental prostheses for edentulous patients. These favourable features, in conjunction with their commendable clinical performance outlined in the previous section, have enabled implant dentistry to become a reliable and well accepted part of contemporary dental practice. It should be noted, however, that the practice of implant dentistry varies depending on the region of the world. For instance, a survey of all registered dentists in New Zealand in 2004 (Reid *et al.* 2005) showed that approximately half (49.5%) of the respondents were involved in implant dentistry, while a national survey of dentists and dental specialists in Nigeria spanning 2004 and 2005 revealed that only 1.3% of the respondents had provided implant-supported restorations (Akeredolu *et al.* 2007).

A report by Eklund (2010) indicated that, of all prosthodontic procedures such as FPDs and removable partial dentures (RPDs), dental implant treatment is the only one to have risen from 1992 to 2007. This trend is echoed in a survey on prosthodontic treatments performed by GDPs in Virginia, USA (Janus *et al.* 2007), which reported that, of the 195 participating dentists, 54% indicated an increase in the number of implant-supported FPDs they have been providing, while 21% felt either no change or a reduction. Regarding the quantity of implant-supported RPDs, the corresponding percentages were 32% and 29%, respectively. A survey of 100 dentists selected from across the USA (Jüngling *et al.* 2008) indicated that 70% of them had had experience in providing dental implant therapy. Moreover, half of

these individuals reported to undertake implant procedures at least twice a week, qualifying them as 'frequent implant users'. It is worth noting that not all the participating practitioners in this survey were GDPs. Specialists who presumably utilise implants regularly (including periodontists, oral surgeons and prosthodontists) participated as well. Hence it is probable that the group with dental implant experience contained a significant proportion of specialists. Interestingly, another survey in the USA (TWD 2007) suggested that more than half (i.e. 53%) of general dentists in that country performed surgical implant placement as well as its restoration, thereby indicating considerably avid practice of implant dentistry by GDPs in America.

Surveys concerning the practice of implant dentistry by GDPs in Hong Kong were conducted in 2004 and 2008 (Ng *et al.* 2011). During the four-year period between the two surveys, it was found that the percentage of respondents providing dental implant therapy had increased markedly from 39% to 61%. Furthermore, the majority (i.e. 77%) of those involved in implant therapy undertook both its surgical and restorative stages. Meanwhile, approximately half (i.e. 49%) of those practising implant dentistry reportedly placed or restored at least five implants every three months.

A survey of 106 GDPs attending a continuing professional educational course in the United Kingdom was conducted in 2004 (Gibson & Barclay 2006). In contrast to results from the USA and Hong Kong, it was found that only 2.8% of the respondents had had clinical experience in the provision of dental implant treatment. This suggested a relatively slower permeation of implant dentistry through general dental practice in the UK.

Data regarding the practice of implant dentistry by GDPs in Australia have been scarce.

According to Spratley and Coyne (1995), a survey of GDPs in Queensland conducted in 1992 contained a question in relation to the provision of dental implant treatment. It was found that the total number of episodes of contact with dental implants experienced by the 318 respondents in 1992 was six. The authors noted, however, that the question on implant practice was rather vague in that it failed to specify whether it was the number of cases or number of implants; nor did it distinguish between surgical implant placement and implant restoration. More recently, 32 participating GDPs in an extended educational program in dental implantology were surveyed to investigate their implant dentistry practice patterns (Brandt *et al.* 2000). Twenty-six (i.e. 81.25%) of the respondents reported actively providing dental implant therapy at the time. Among these 26 individuals, the vast majority (i.e. 24) referred their implant patients to appropriate specialists at least occasionally while the remaining two performed their own implant treatments entirely.

1.1.3 Education in Implant Dentistry

The success and growth of implant dentistry have resulted in the development of postgraduate educational programs at various levels by dental schools, professional organisations, scientific societies and commercial companies (Donos *et al.* 2009). Marked qualitative and quantitative differences exist within the plethora of dental implantology educational programs available for GDPs in Australia and other regions of the world such as Europe and North America, progressing from single-seminar non-award continuing professional development (CPD) courses to full-time specialty training. The spectrum of postgraduate educational programs in implant dentistry in Australia has been outlined by Ivanovski *et al*. (2010):

1) Non-degree CPD courses – these may be conducted by scientific or professional organisations and associations, university CPD programs, independent bodies involved in implant dentistry, and the implant industry in product-training settings. This type of education is usually in the form of stand-alone seminars or lectures that address theoretical or clinical aspects of implant dentistry, and often includes pre-clinical or simulation practical exercises. Although such educational programs largely provide a reasonable theoretical understanding of procedures related to implant dentistry and can assist participants in maintaining and updating their existing knowledge and skills, they alone are unable to provide the level of competency required for safe and effective clinical practice.

2) Formal postgraduate degree education in a university program – this is recognised as the optimal pathway of education for the safe and effective management of routine implant-related cases by GDPs. The universities of Melbourne and Sydney currently offer Graduate Diploma programs for GDPs wishing to do so. The duration of these part-time structured programs lies between 1.5 to two years, during which period candidates undergo both didactic and clinical experiences. Other universities are also contemplating the introduction of similar programs.

3) Specialty training – this is a form of full-time postgraduate education that enables the participating GDP to qualify as a registered specialist upon graduation. A number of tertiary educational institutions, such as The Universities of Adelaide, Melbourne and Sydney, offer this training under the title of Doctor of Clinical Dentistry (DClinDent), which spans a period of three years consisting of full-time clinical and research experiences. Successful completion of a DClinDent program in oral and maxillofacial surgery, periodontics or prosthodontics justifies a practitioner's intention to undertake relatively complex cases of implant dentistry.

Logically, the level of the educational program undertaken by the participating dentist should be commensurate with the degree of difficulty of the cases he/she is able to safely and effectively manage. The continuum of complexity levels for dental implantology procedures is depicted by the SAC classification presented in Table 1.1 (Dawson & Chen

2009 [cited in Ivanovski *et al.* 2010]).

The Association for Dental Education in Europe (ADEE) and the Australian Consensus Workshop on Implant Dentistry University Education (ACWIDUE) have both published similar guidelines matching treatment complexity degrees to corresponding levels of required education (Donos *et al.* 2009; Ivanovski *et al.* 2010). The Australian model of the guidelines is presented in Table 1.2 (modified from Donos *et al.* 2009 and Ivanovski *et al.* 2010):

Table 1.1. The SAC Classification of the Complexity of Dental Implantology Procedures (Adapted from Dawson & Chen 2009)		
	Surgical	**Prosthodontic**
Straightforward	● Adequate bone volume ● Placement of 2 implants in the mandible ● Treatment of large tooth gaps and single-tooth replacement where aesthetics is not a factor	● Treatment of the mandible with bar prostheses or stud-retained prostheses; ● Gap treatment and single tooth replacement where aesthetics is not a factor
Advanced	● Placement of ≥4 implants in the mandible; ● Single tooth replacement in the aesthetic zone, with or without simultaneous bone augmentation (GBR)	● Fixed prostheses in the edentulous mandible supported by ≥4 implants; Partially removable prostheses in the edentulous mandible; ● Single tooth replacement in the aesthetic zone; ● Bar prostheses in the edentulous maxilla
Complex	● Comprehensive gap treatment in aesthetically complex regions with simultaneous augmentation (GBR); ● Implantation procedure for fixed reconstructions in the edentulous maxilla; Immediate implantation; ● All two-stage augmentation techniques; ● Sinus lift with osteotome and lateral window technique	● Comprehensive gap treatment and single tooth replacement in aesthetically complex regions; ● Fixed prostheses in the edentulous maxilla; ● Immediate placement and restoration of implants

Table 1.2. Australian Guidelines for the Practice of Implant Dentistry Based on Practitioner's Education Level (Adapted from Donos *et al.* 2009 and Ivanovski *et al.* 2010)		
Education Level	**Education Duration**	**Complexity Level of Treatment as Defined by the SAC Classification**
CPD/Non-degree	*Ad hoc* days/part-time	N/A (Introduction to implant dentistry only)
Graduate Certificate	1 semester full-time or part-time equivalent	'Straightforward'
Graduate Diploma	2 semesters (1 year) full-time or part-time equivalent	Up to 'Advanced'
Master's Degree	≥2 semesters full-time or part-time equivalent	Up to 'Advanced'
Doctoral Degree in appropriate specialty	≥3 years full-time or part-time equivalent	Up to 'Complex'

It is known that the vast majority of GDPs will endeavour to acquire knowledge and skills that were insufficiently covered in their general dental education via the CPD/non-degree pathway, while many fewer tend to undertake full-time formal postgraduate programs (Ivanovski *et al.* 2010). As the primary providers of continuing professional education in Australia, universities undoubtedly have a major role to assume in designing and conducting a range of educational programs in implant dentistry to cater for the needs of a rapidly increasing population of interested GDPs. It would therefore be useful to uncover the current intentions of GDPs regarding the acquisition of further education in this field, so that education providers are able to meet this demand more appropriately.

1.1.4 Peri-implantitis and Its Management

The long-term success of dental implants is intimately related to the status of their immediately surrounding tissues (Esposito *et al.* 2012). The health of peri-implant tissues can be commonly afflicted by an inflammatory condition known as peri-implantitis, which may result from microbial dysbiosis following successful osseointegration of a dental implant (Heitz-Mayfield 2008) and lead to its eventual failure if untreated (Esposito *et al.* 1999).

The precise definition of peri-implantitis has varied over time and with different authorities, though a degree of consensus was established in the 6th European Workshop on Periodontology, which established the following definition: 'peri-implantitis described inflammatory reactions associated with loss of supporting bone around an implant in function', manifesting clinically as the presence of periodontal pocket depths (PPDs) of 5mm or greater in conjunction with bleeding or purulence on probing, as well as radiographic evidence of alveolar bone loss (Zitzmann & Berglundh 2008).

Numerous studies have investigated the prevalence of peri-implantitis and produced various figures ranging widely from less than 10% to approximately 50% (Atieh *et al.* 2013; Murray *et al.* 2013; Zitzmann & Berglundh 2008). Furthermore, Esposito and colleagues (2012), in their Cochrane review on the therapeutic measures for peri-implantitis, commented that the true prevalence of this condition may well be underestimated in some investigations.

In light of the considerable frequency and potentially serious consequences of peri-implantitis, numerous combinations of various therapeutic approaches have been attempted to treat this condition. Despite continued efforts of innumerable clinicians and researchers over the years, no treatment modality has been found to be conclusively efficacious to date, though varying extents of success have been achieved (Esposito 2012). One principle that most authorities would agree on, however, is the employment of one or more of the following four main therapeutic strategies depending on disease severity (Murray *et al.* 2013):

1) Mechanical debridement;
2) Pharmaceutical treatment (i.e. subgingival chlorhexidine irrigation, local or systemic antibiotics);
3) Surgical procedures (e.g. open flap surgery to facilitate deeper debridement); and
4) Laser therapy (e.g. Er:YAG, CO_2).

The primary objective of the above strategies is to eliminate microbial pathogens from the ailing implant and its immediately surrounding tissues. Additionally, many clinicians combine surgical procedures with alveolar bone augmentation techniques in an attempt to replace the osseous tissue destroyed by peri-implantitis. An example of utilising different combinations of these methods based on disease severity is the Cumulative Interceptive Supportive Therapy (CIST) protocol recommended by Mombelli and Lang (1998), which was also reiterated in the review by Murray and associates published in 2013. The CIST protocol is summarised in Table 1.3.

Table 1.3. Cumulative Interceptive Supportive Therapy (CIST) Protocol for Management of Peri-implantitis (Mombelli & Lang 1998)	
Clinical Findings	**Recommended Treatment**
Plaque + Bleeding on probing (BOP)	*Regimen A:* Mechanical debridement with rubber cup and instruments softer than the titanium that constitutes the body of a dental implant; Oral hygiene instructions.
Suppuration +/- alveolar bone loss (ABL) with 4-5mm pocket probing depths (PPDs)	*Regimen B:* Regimen A + local antiseptic (0.2% chlorhexidine irrigation of peri-implant pockets twice daily.
PPD >5mm with radiographic evidence of early alveolar bone loss (ABL)	*Regimen C:* Regimen B + systemic antibiotics specific against anaerobes.
Advanced ABL	*Regimen D:* Regimen C + surgical intervention for guided tissue regeneration and/or to correct tissue morphology.
Complete loss of osseointegration (mobile implant)	*Regimen E:* Removal of implant.

As illustrated in Table 1.3, the CIST protocol involves a set of progressively aggressive therapeutic measures commensurate with disease severity. CIST's Regimen C and beyond are concerned with the management of peri-implantitis, while Regimens A and B are designed to treat peri-implant mucositis, which refers to the inflammation of peri-implant mucosal tissues without involving the local alveolar bone (Zitzmann & Berglundh 2008). Peri-implant mucositis lies at the mild end of the spectrum of peri-implant diseases, and is generally reversible and less challenging to manage than peri-implantitis. However, if left untreated, it may potentially progress to destroy the local alveolar bone, leading to the commencement of peri-implantitis (Esposito 2012).

Regarding the treatment approaches for peri-implantitis, two recent systematic reviews (Esposito *et al.* 2012; Faggion *et al.* 2013) concluded that, in light of the limited degree of sound evidence available in the literature, it would appear that:

1) The use of local antibiotics in addition to mechanical subgingival debridement can achieve slight but clinically appreciable improvements in PPD and clinical attachment level (CAL) in patients afflicted by severe forms of peri-implantitis, compared with mechanical debridement alone; and
2) Surgical procedures result in greater PPD reduction and CAL gain compared with non-surgical measures.

Both of these reviews emphasised the tenuous nature of their conclusions owing to the limited amount of data available and considerable variations in methodology of the studies assessed.

1.2 Aims

Despite the rise of implant dentistry as a significant part of modern general dental practice, data relating to the prevalence and range of its application by Australian GDPs have been scarce. Furthermore, there is little indication regarding the intentions of GDPs to undertake further education in implant dentistry. Since education in dental implantology has recently received official focus nationwide, it would be useful for dental education providers to be supplied with some information concerning these issues. This will in turn facilitate the development of relevant educational programs for practising dentists.

Interestingly, there is evidence in the literature indicating that the attitudes of GDPs are not entirely aligned with evidence-based knowledge in the practice of implant dentistry (Lang-Hua *et al.* 2013). It would therefore be worthwhile to compare the opinions and implant practice patterns of GDPs with those of various implant-practising dental specialists including prosthodontists, periodontists, and OMF surgeons, in order to reveal any differences. It is likely that the specialists, by virtue of their relatively greater experience in the theory and practice of implant dentistry, are practising more concordantly with the current evidence in the literature.

Specifically, this study aims to uncover data with respect to:

1. The prevalence and various characteristics of the practice of implant dentistry, such as the range and extent of treatment performed, frequency of treatment performed, and certain technical respects including brands of

implants used and impression acquisition methods (a greater emphasis is placed on restorative than surgical aspects of implant dentistry to reflect the prosthodontic component of the coursework associated with this Doctor of Clinical Dentistry degree);

2. Therapeutic modalities employed to treat peri-implantitis (this specific complication is accorded particular attention to reflect the oral pathology component of the coursework associated with this Doctor of Clinical Dentistry degree);
3. Attitudes of practitioners towards further education in implant dentistry; and
4. Wherever practicable, the degree of conformity between the opinions and practising patterns of GDPs and those of dental specialists.

It is hoped that the results of this project, by assisting the development of dental implantology educational programs, will contribute to further improvements in implant-related treatments provided by GDPs in Australia.

Chapter Two:

Materials and Methods

The ethics approval for this investigation was granted by The University of Adelaide in January, 2014, prior to its commencement.

Apart from GDPs, three groups of specialist practitioners were deemed appropriate participants in this investigation: prosthodontists, periodontists, and oral and maxillofacial (OMF) surgeons. These specialists were selected since the use of dental implants was thought to be relatively common in their practice.

Consequently, four anonymous questionnaires, each one slightly modified to be specifically tailored to its target respondent group, were developed. The questionnaires for GDPs and prosthodontists consist of questions regarding both restorative and surgical aspects of implant dentistry, while those for periodontists and OMF surgeons only contain questions regarding the latter. It was agreed that the practice of periodontists and OMF surgeons would more likely be restricted to surgical aspects of implant dentistry, and hence little purpose would be served by presenting these practitioners with questions related to restorative aspects. The majority of questions were made compulsory in order to avoid any loss of responses caused by respondents' accidental negligence to answer. This meant that a respondent would not be able to progress on to the next page in the survey without having completed all mandatory questions on the current page. The questions in the questionnaires for GDPs and prosthodontists are essentially identical while the same arrangement applies to those for periodontists and OMF surgeons.

The surveys were designed to gather basic demographic information as well as data on the respondents' preferred patterns and techniques of practice. The practitioners' preferences

regarding the management of the challenging disease of peri-implantitis, as well as their opinions regarding a number of relevant topical and contentious issues are also explored. Moreover, the participants' attitudes towards further education in implant dentistry were solicited as well. Direct questions regarding participants' age and sex were deliberately excluded from the surveys since such questions may be perceived by some to be compromising to their anonymity, especially considering the fact that the number of practising dental specialists in Australia and New Zealand is relatively small.

For ease of administration and analysis, all surveys were created online using SurveyMonkey™ and administered electronically. Each survey was associated with a unique web link, which was provided to the participants so that they could access the appropriate version for their professional group. Once a respondent had completed a survey, their responses were automatically saved to the database within SurveyMonkey™ for analysis. Additionally, each survey was configured with an appropriate skip logic routine to ensure that each respondent was presented with questions relevant to their individual situation. For instance, if a respondent had indicated negative to practising implant dentistry, they would not have been presented with specific questions on the various technical aspects of implant-related procedures. All four surveys used are replicated in Appendix A.

In order to ensure an adequately representative sample of participants for this survey, a number of professional organisations were individually approached to request assistance with recruiting their members for voluntary participation. These organisations initially included the Australian Dental Association Federal Office (ADA Federal), the Academy of Australian and New Zealand Prosthodontists (AANZP), the Australian and New Zealand

Academy of Periodontists (ANZAP), and the Australian and New Zealand Association of Oral and Maxillofacial Surgeons (ANZAOMS). Each organisation was provided with an official letter of request outlining the purpose and nature of this investigation, as well as a copy of the relevant survey for approval. As a token of appreciation to the participating organisations for their crucial assistance, a promise was made to share the relevant results of this investigation with them.

After deliberation and approval, while the ADA Federal, ANZAP and ANZAOMS agreed to distribute the surveys' web links to their members via E-mail on behalf of the author, the President of the AANZP requested the author to approach the Academy's Secretary for a list of the members' E-mail addresses, which would be permitted to be used solely for the purpose of survey link distribution. However, despite repeated communication attempts, no response was received from the Secretary. This resulted in the employment of an alternate approach, which involved obtaining the publicly accessible E-mail addresses of numerous prosthodontists registered on the web site of the Australian Prosthodontic Society (APS). The principal research supervisor, who is also a prosthodontist, then personally E-mailed these prosthodontists with a request for voluntary participation in this investigation.

Meanwhile, despite the ADA Federal's effort to distribute the GDPs' survey's web link to its members, the eventual number of respondents reached only 21. Such a response rate was insufficient by far and, once again, necessitated an alternate approach. One possible reason for this low response rate is that the web link to the survey was sent to all the members as a minor part of the Association's monthly electronic newsletter. The resultant lack of conspicuousness plus the highly occupied schedule of most dentists would have made it difficult for the link to capture the readers' attention. In order to procure a viable

response rate, the author proceeded to contact the ADA's branch office in each State and Territory within Australia with the same recruitment request for volunteer participants. The branch offices approached include ADA New South Wales (ADANSW, which also includes members from Australian Capital Territory), ADA Northern Territory (ADANT), ADA Queensland (ADAQ), ADA South Australia (ADASA), ADA Tasmania (ADATB), ADA Victoria (ADAVB), and ADA Western Australia (ADAWA). Once again, each branch office was provided with a copy of the relevant survey for individual evaluation and approval. As an incentive for all ADA members to participate, a randomised prize draw involving one prepaid VISA Universal Gift Card valued at $500 plus five more of such Cards valued at $100 each was offered. The funding for this prize scheme was supplied by the University of Adelaide.

Eventually, every ADA Branch agreed to participate by distributing the survey's web link to its members. Interestingly, ADAVB proposed a number of additional conditions which it requested the author to abide by prior to consenting to participate. The additional conditions mainly focused on the protection of the confidentiality of any resulting data directly pertaining to ADAVB itself. They were deemed reasonable by the principal research supervisor and adherence was agreed.

A response collection time of two weeks minimum was allowed for each organisation, but this was readily extended depending on the response rate. With respect to the ANZAP and ANZAOMS, the author requested a participation reminder to be E-mailed to all members approximately two weeks after initial survey link distribution. This was conducted in an attempt to improve the somewhat low early response rate. The same measure was believed to be unnecessary for the other participating organisations since their response rates proved

to be generally adequate, and every effort was made to minimise inconvenience to the participants.

In summary, participant recruitment and data collection for this survey were carried out between April and September in 2014, during which period responses were obtained from a number of professional organisations as outlined in Table 2.1.

Statistical analysis could only be applied to a very small number of data distributions generated in this study. Sampling was not consistent between participant groups owing to the differing nature of their practices, and this was further compounded by the voluntary and somewhat arbitrary method of response collection. Consequently, the statistical power was difficult to anticipate and hence this study was designed to be primarily descriptive rather than being able to demonstrate statistically significant differences. However, when comparisons were feasible and appropriate, the chi-square test was used compare observed frequencies of certain responses with their expected frequencies in order to illustrate any significant differences.

Table 2.1. Titles and Abbreviations Thereof of Participating Professional Organisations	
Organisation Title	**Abbreviation**
Australian Dental Association New South Wales Branch (also includes practitioners in Australian Capital Territory)	ADANSW
Australian Dental Association Northern Territory Branch	ADANT
Australian Dental Association Queensland Branch	ADAQ
Australian Dental Association South Australia Branch	ADASA
Australian Dental Association Tasmania Branch	ADATB
Australian Dental Association Victoria Branch	ADAVB
Australian Dental Association Western Australia Branch	ADAWA
Australian and New Zealand Association of Oral and Maxillofacial Surgeons	ANZAOMS
Australian and New Zealand Academy of Periodontists	ANZAP
Australian Prosthodontic Society	APS

Chapter Three:

Results

3.1 Response Rates

Table 3.1 summarises the number of respondents and response rates obtained from each of the participating professional organisations. It should be noted that the ANZAOMS, ANZAP and APS include practitioners from both Australia and New Zealand. For the purpose of this study, responses from participants who practise solely in New Zealand have been excluded.

Table 3.1. Gross Number of Respondents and Response Rates of Participating Organisations				
Professional Organisation	**Number of Currently Practising Members**		**Number of Respondents**	**Response Rate**
ADANSW	3440	10,524 GDPs	801	7.61%
ADANT	70*			
ADAQ	2100			
ADASA	724			
ADATB	150			
ADAVB	2699			
ADAWA	1341			
ANZAOMS	135 OMF Surgeons (Australia)		46	34.07%
ANZAP	161 Periodontists (Australia)		55	34.16%
APS	91 Prosthodontists¥		38	41.76%

** Precise number of currently practising members unknown; may also include retired members.*

¥ May include small numbers of retired members as well as New Zealand practitioners.

As mentioned in 'Materials and Methods', the majority of survey questions were made compulsory in order to prevent any loss of responses resulting from participants' inadvertent failure to answer. Despite this, all respondents were still free to exit the survey at any time by closing its window on their computers. In such a situation, only part of their existing responses would have been recorded and saved by SurveyMonkey™. Considering the reasonably large number of questions some of the participants would have been presented with, particularly if they were implant-practising GDPs or prosthodontists, some of them may well have decided not to persevere with the survey owing to its protracted nature, and thus withdrawn prior to completion. This explains the falling response rates as one progresses further with the survey questions.

It is also worth noting that the collective members of the ADA branches do not constitute the entire population of registered GDPs within the nation, since the acquisition of ADA membership is not compulsory. However, based on Australian Institute of Health and Welfare (AIHW)'s dental workforce data from 2012, one can be fairly certain that the ADA represents the majority of Australia's practising dentists. AIHW's data indicates that the total number of registered GDPs was 12,577 in 2012, which had increased by 4.5% from the previous year. Using this trend as a guide, a reasonable estimation of the total number of registered GDPs in Australia would be approximately 13,734 in 2014. This means that the 10,524 GDPs currently composing the ADA would represent 76.73%, or slightly over three-quarters, of the actual GDP population.

3.2 Respondents' Profiles

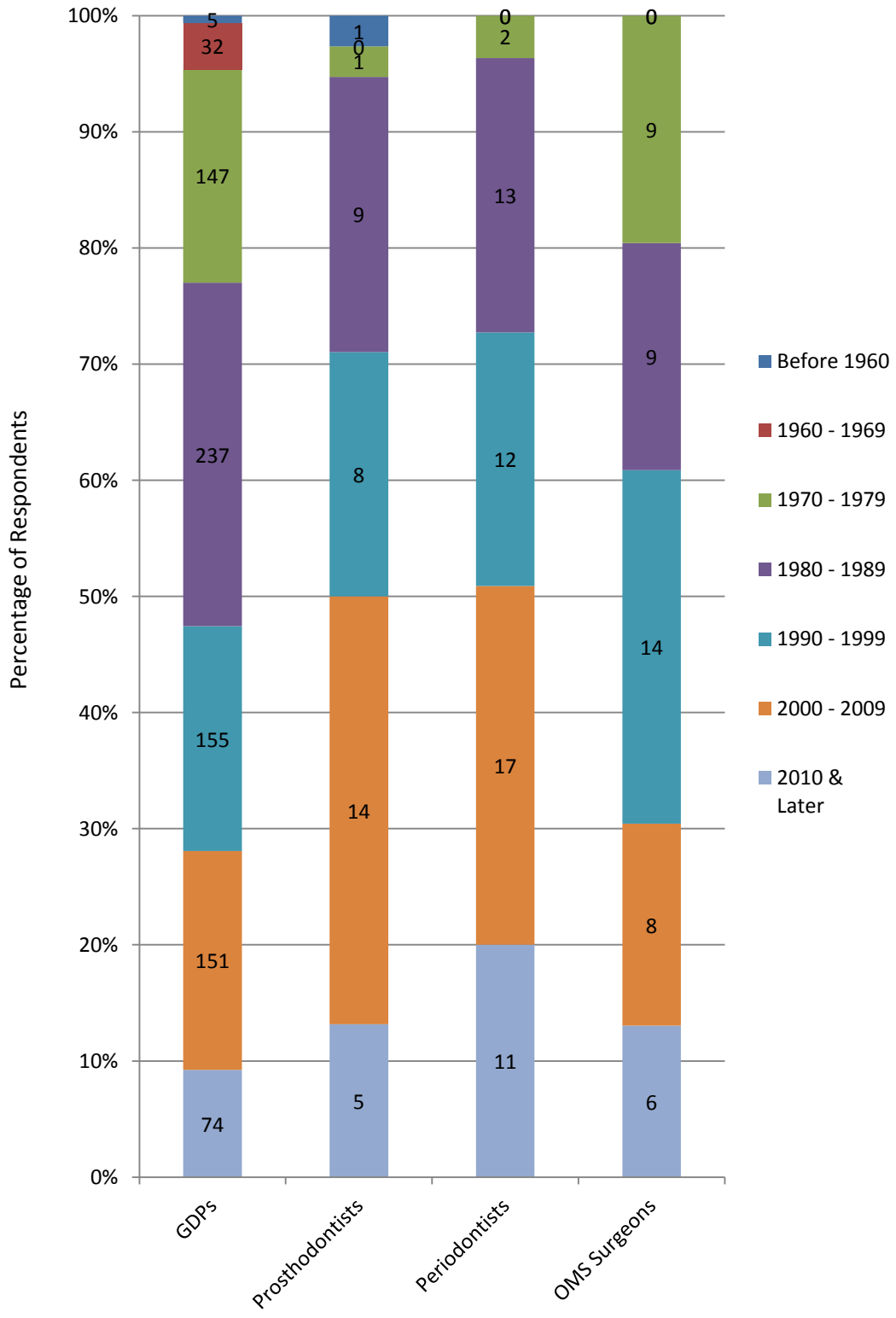
<u>Survey Question</u>: Please indicate the year of your completion of dental/prosthodontic/periodontic/oral and maxillofacial surgical training.

Table 3.2 and Figure 3.1 provide a summary of the times of the respondents' completion of their respective training, as categorised by progressive decades. GDPs were asked to indicate the year of completion of their general dental training while that of specialty training applied to the specialist groups. The actual numbers of respondents in each category are labelled on their corresponding columns in the graph in Figure 3.1 and subsequently on all such presentations.

Table 3.2. Times of Completion of Dental/Specialty Training for All Respondents

	GDPs	Prosthodontists	Periodontists	OMF Surgeons
Before 1960	5 (0.62%)	1 (2.63%)	0	0
1960 – 69	32 (4.00%)	0	0	0
1970 – 79	147 (18.35%)	1 (2.63%)	2 (3.64%)	9 (19.57%)
1980 – 89	237 (29.59%)	9 (23.68%)	13 (23.64%)	9 (19.57%)
1990 – 99	155 (19.35%)	8 (21.05%)	12 (21.82%)	14 (30.43%)
2000 – 09	151 (18.85%)	14 (36.84%)	17 (30.91%)	8 (17.39%)
2010 & After	74 (9.24%)	5 (13.16%)	11 (20%)	6 (13.04%)
Total	**801**	**38**	**55**	**46**

Figure 3.1. Times of Completion of Dental/Specialty Training for All Respondents



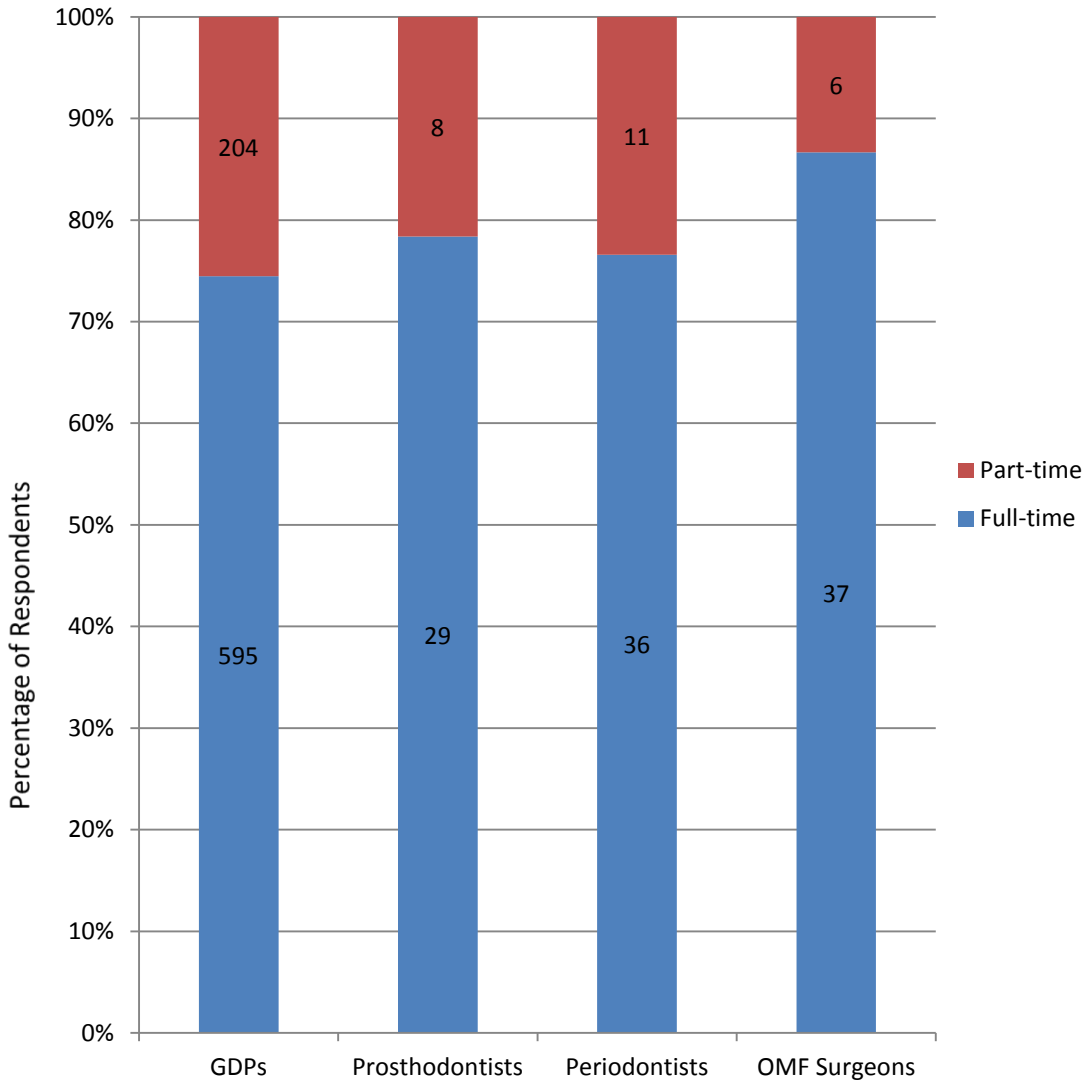
Most GDPs and all OMF surgeons completed their professional training between 1970 and 2009, while the great majority of prosthodontists and periodontists trained between 1980 and 2009. Interestingly, the distribution patterns of each professional group across the three decades from 1980 to 2009 appear reasonably consistent.

<u>Survey Question</u>: Are you practising on a full- or part-time basis?

The working hour profiles (i.e. full- or part-time) of the respondents are displayed in Table 3.3 and Figure 3.2.

Table 3.3. Working Hour Profiles of All Respondents				
	GDPs	**Prosthodontists**	**Periodontists**	**OMF Surgeons**
Full-time	595 (74.47%)	29 (78.38%)	36 (76.60%)	37 (86.05%)
Part-time	204 (25.53%)	8 (21.62%)	11 (23.40%)	6 (13.95%)
Total	**799**	**37**	**47**	**43**

Figure 3.2. Working Hour Profiles of All Respondents



Data from the AIHW revealed that the percentage of GDPs working part-time was 30.8% in 2012. This proportion is fairly closely reflected by the input of GDP respondents here.

<u>Survey Question</u>: If practising part-time, how many hours, on average, are you working per week?

Table 3.4 lists the average number of weekly working hours for respondents working part-time. The consistency across all groups is conspicuous.

Table 3.4. Average Number of Weekly Working Hours for Respondents Working Part-time

Professional Group	Average Number of Part-time Weekly Working Hours
GDPs	26.02
Prosthodontists	25.21
Periodontists	27.52
OMF Surgeons	26.63

Additionally, assuming that full-time GDP respondents work forty hours per week, then the average number of weekly working hours for all GDP respondents is calculated to be 36.43. This is, once again, fairly concordant with the corresponding value of 37.3 hours in the AIHW's data from 2012.

<u>Survey Question</u>: In which State(s) and/or Territory(ies) are you practising?

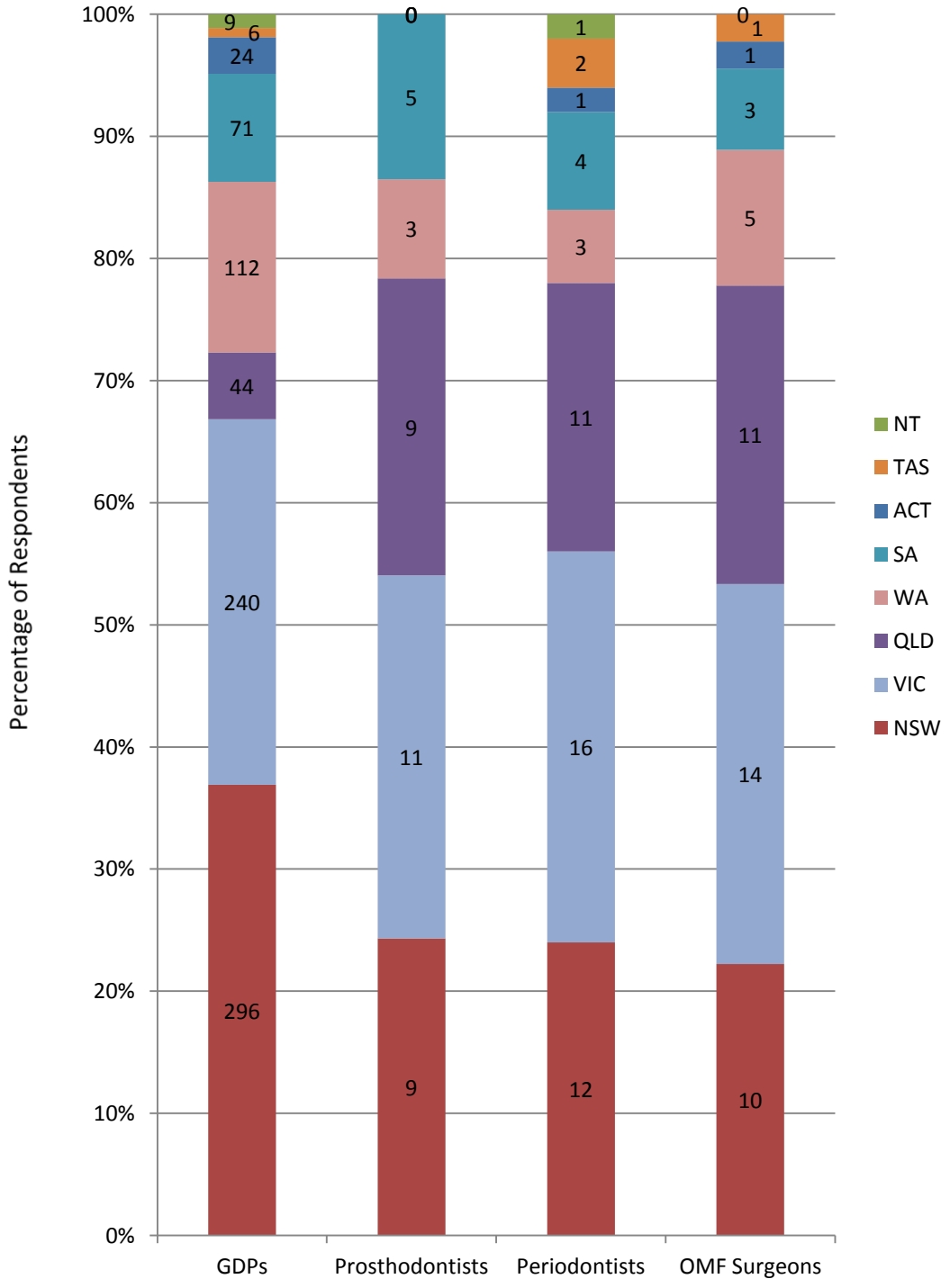
Table 3.5 and Figure 3.3 depict the geographical distribution of the respondents' practices as categorised by State/Territory. Multiple response choices were allowed for this question to cater for respondents who practise in more than one State or Territory.

Table 3.5. Geographical Distribution of Respondents Practices by State/Territory

	GDPs	Prosthodontists	Periodontists	OMF Surgeons
ACT	24 (2.99%)	0	1 (2%)	1 (2.22%)
NSW	296 (36.91%)	9 (24.32%)	12 (24%)	10 (22.22%)
NT	9 (1.12%)	0	1 (2%)	0
QLD	44 (5.49%)	9 (23.68%)	11 (22%)	11 (24.44%)
SA	71 (8.85%)	5 (13.16%)	4 (8%)	3 (6.67%)
TAS	6 (0.75%)	0	2 (4%)	1 (2.22%)
VIC	240 (29.93%)	11 (28.95%)	16 (32%)	14 (31.11%)
WA	112 (13.97%)	3 (7.89%)	3 (6%)	5 (11.11%)
Total	**802***	**37**	**50***	**45***

** The total number of responses exceeds that of subjects due to multiple response choices made by some of them.*

Figure 3.3. Geographical Distribution of Respondents' Practices by State/Territory

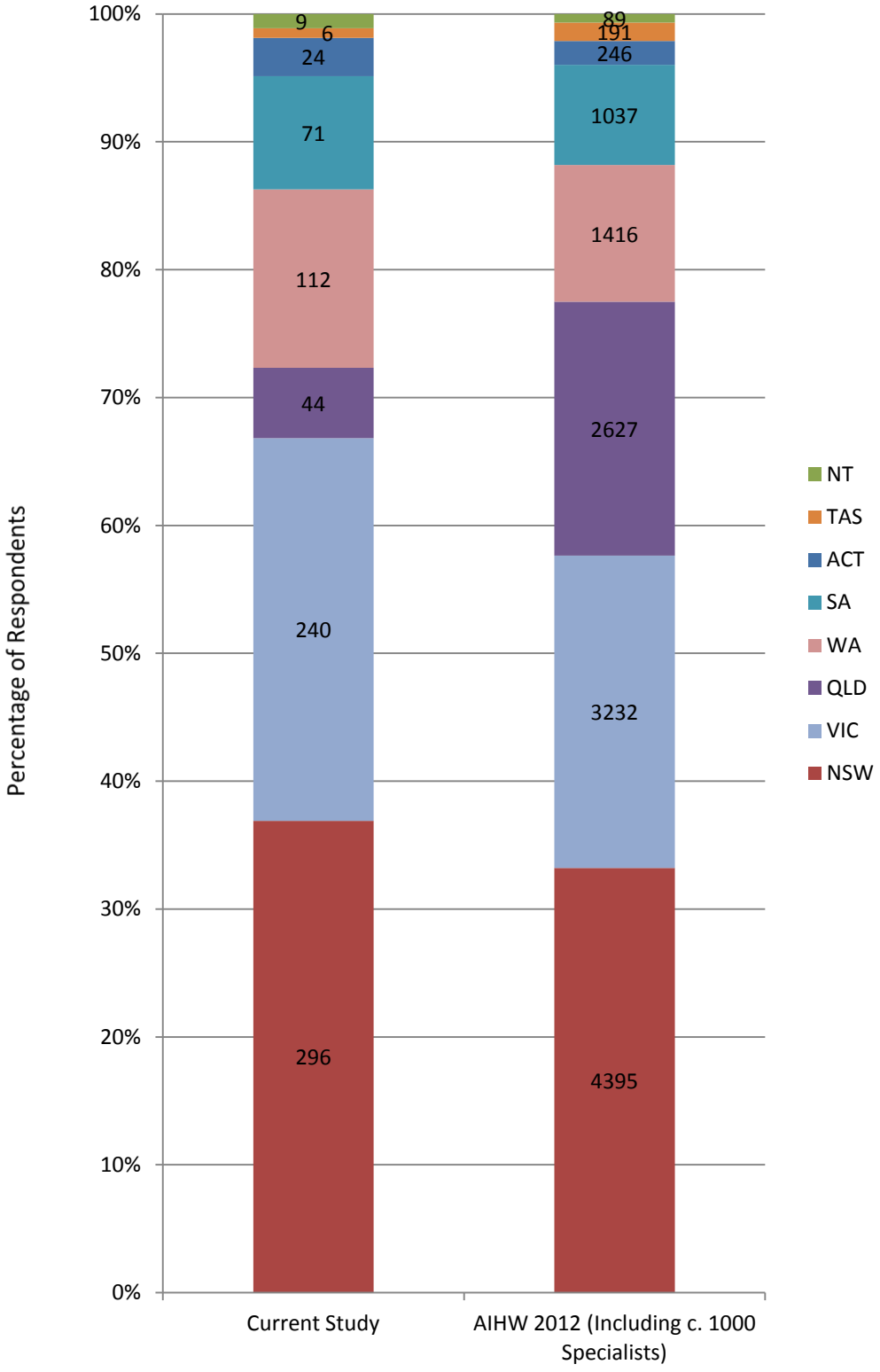


It is evident that practitioners from New South Wales and Victoria contribute a significant percentage of the respondent population, accounting for over half of it. It is likely that Queensland is considerably under-represented in the GDP group, especially in light of the noticeable disparity in its proportions between the GDP and specialist groups. This is confirmed by relevant data from AIHW in 2012, which indicate that 19.80% of Australian dentists (including dental specialists) were practising in Queensland at the time. This is in stark contrast to the 5.49% found in Table 3.5 and Figure 3.3 above.

The geographical distribution of GDPs by State/Territory as indicated by this investigation is directly compared to that in AIHW's dental workforce data from 2012, as shown in Table 3.6 and Figure 3.4:

Table 3.6. Geographical Distribution of GDPs by State/Territory: Comparison with AIHW Data 2012		
	Current Study	**AIHW 2012**
ACT	24 (2.99%)	246 (1.86%)
NSW	296 (36.91%)	4,395 (33.21%)
NT	9 (1.12%)	89 (0.67%)
QLD	44 (5.49%)	2,627 (19.85%)
SA	71 (8.85%)	1,037 (7.84%)
TAS	6 (0.75%)	191 (1.44%)
VIC	240 (29.93%)	3,232 (24.42%)
WA	112 (13.97%)	1,416 (10.70%)
Total	**802**	**13,233***
* *Inclusive of c.1000 dental specialists.*		

Figure 3.4. Geographical Distribution of GDPs by State/Territory: Comparison with AIHW Data 2012



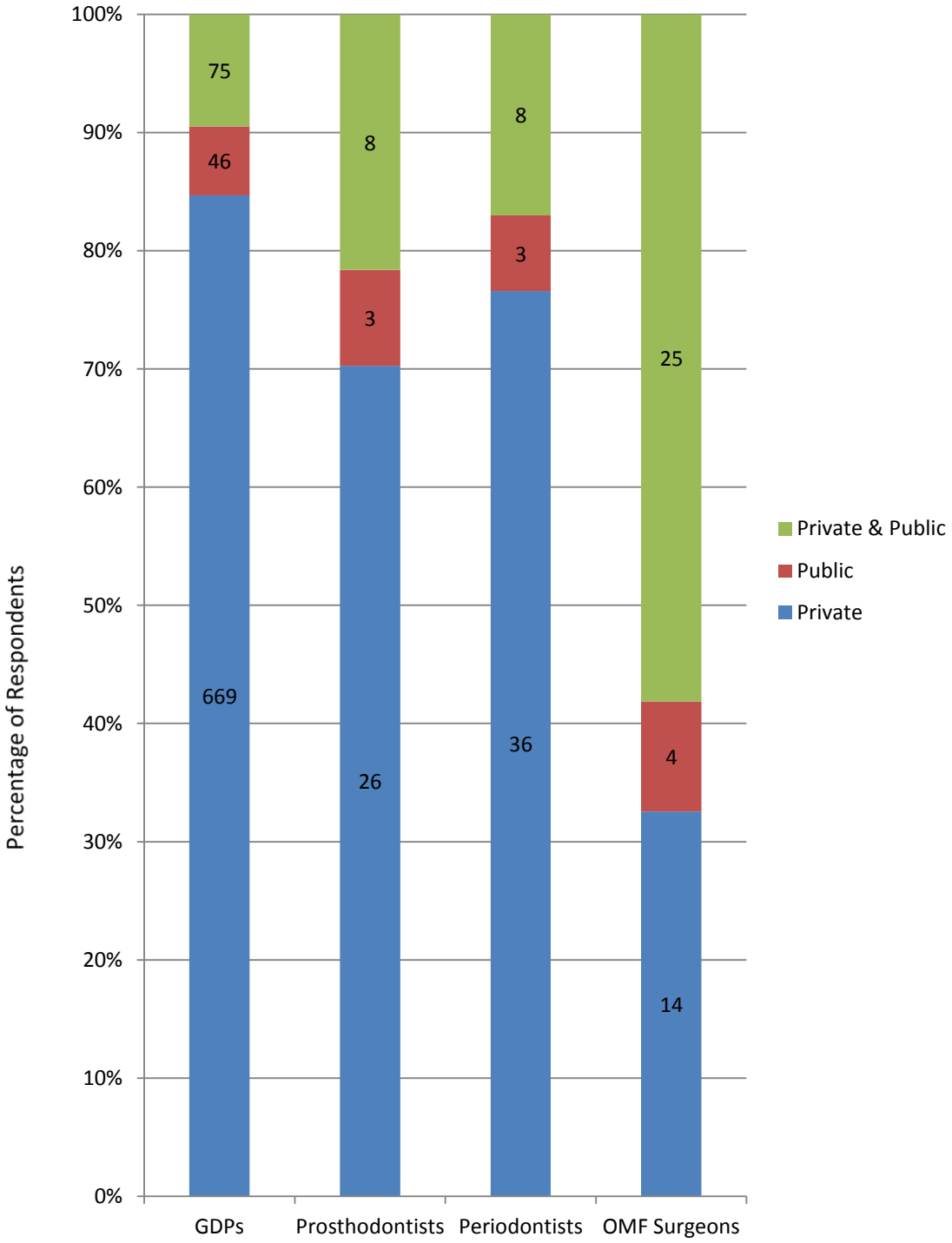
With the exception of the prominent under-representation of Queensland, the geographical profile of this study's GDP participants appears to be a reasonably accurate reflection of the actual general dental workforce in terms of distribution by State/Territory.

<u>Survey Question</u>: Are you working in the private and/or public sector(s)?

Table 3.7 and Figure 3.5 outline the sectors in which the respondents' practised.

Table 3.7. Respondents' Practising Sectors				
	GDPs	**Prosthodontists**	**Periodontists**	**OMF Surgeons**
Private	669 (84.68%)	26 (70.27%)	36 (76.60%)	14 (32.56%)
Public	46 (5.82%)	3 (8.11%)	3 (6.38%)	4 (9.30%)
Private & Public	75 (9.49%)	8 (21.62%)	8 (17.02%)	25 (58.14%)
Total	**790**	**37**	**47**	**43**

Figure 3.5. Respondents' Practising Sectors



It is readily observed that the majority of GDP, prosthodontist and periodontist respondents practise in the private sector. The uniquely large proportion of OMF surgeons employed in both public and private sectors is not surprising owing to the medical specialty's part in the nature of their occupation.

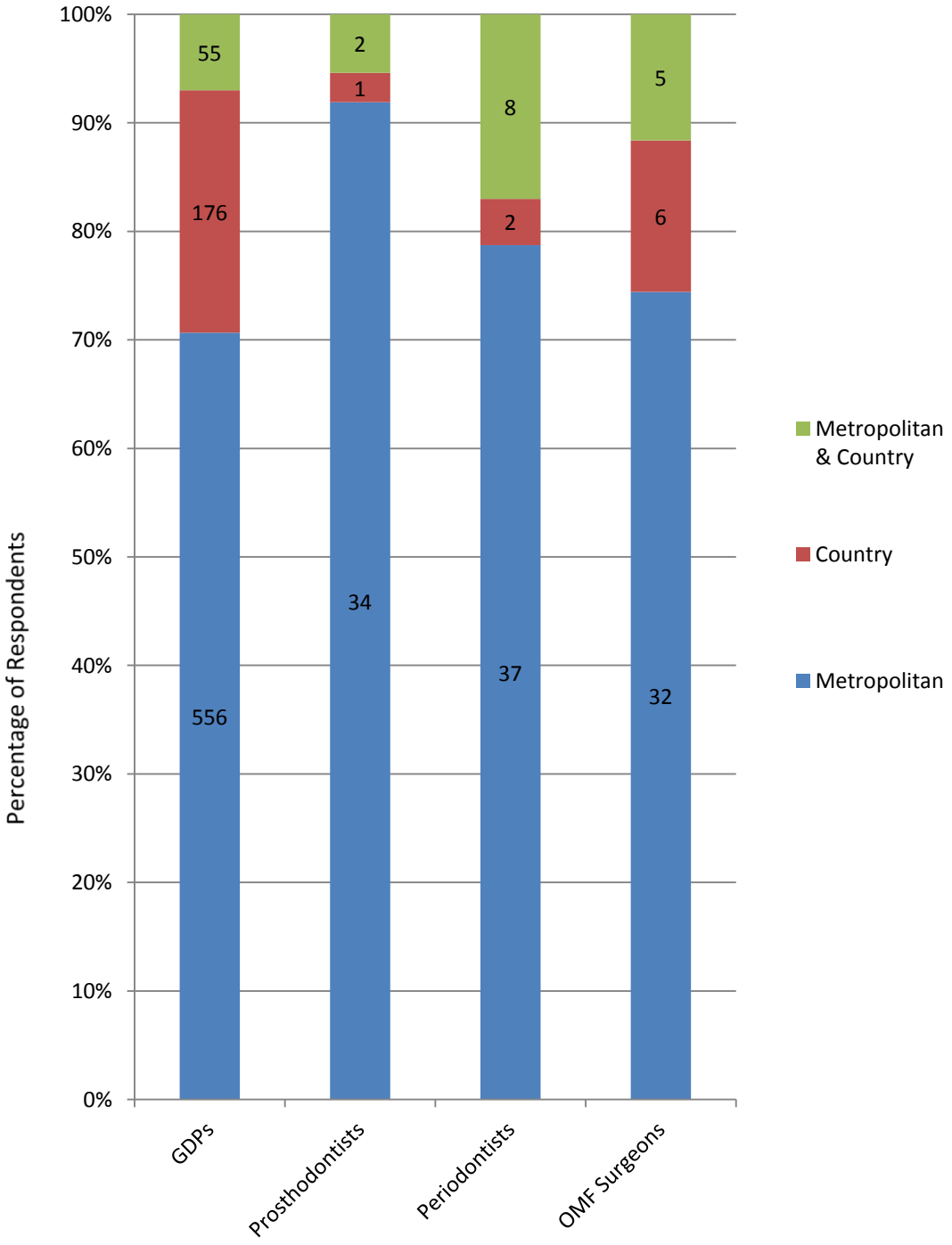
Comparison of the GDP portion of the data with its counterpart in the AIHW's 2012 dental workforce information is somewhat difficult. According to the latter, 11,796 dental professionals (82.12%) worked in the private sector while the remaining 17.88% in the public. However, these two categories were not mutually exclusive, meaning that they each included practitioners working in both sectors simultaneously. Moreover, these figures encompass dental specialists of an unspecified number as well.

<u>Survey Question</u>: What is/are the location(s) of the practice(s) you are working at?

Table 3.8 and Figure 3.6 present the locations of the respondents' practices.

Table 3.8. Locations of Respondents' Practices				
	GDPs	**Prosthodontists**	**Periodontists**	**OMF Surgeons**
Metropolitan	556 (70.65%)	34 (91.89%)	37 (78.72%)	32 (74.42%)
Country	176 (22.36%)	1 (2.70%)	2 (4.26%)	6 (13.95%)
Metropolitan & Country	55 (6.99%)	2 (5.41%)	8 (17.02%)	5 (11.63%)
Total	**787**	**37**	**47**	**43**

Figure 3.6. Locations of Respondents' Practices



It is clear that over 70% of all respondents are practising in metropolitan regions, with prosthodontists displaying the highest percentage of metropolitan practitioners of nearly 92%. With respect to GDPs, the figure of 70.65% generated by this study's participants is somewhat less than the 79.92% revealed by AIHW's data from 2012, but the same general pattern of geographical distribution of GDPs is conveyed by both sets of data.

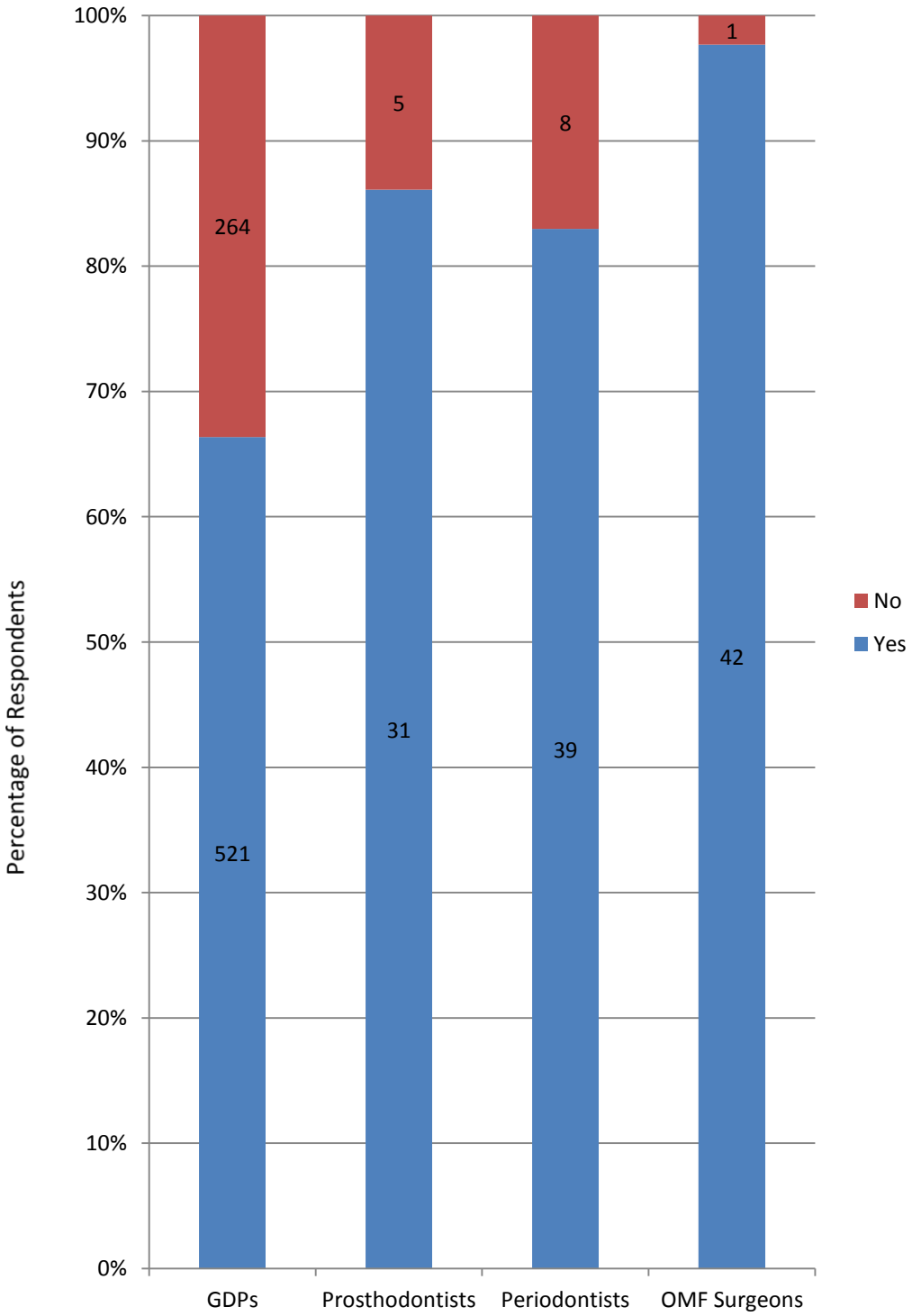
<u>Survey Question</u>: Are you practising surgical and/or restorative aspect(s) of implant dentistry?

The implant dentistry practising status of the respondents is displayed in Table 3.9 and Figure 3.7.

Table 3.9. Respondents' Implant Dentistry Practising Status

	GDPs	Prosthodontists	Periodontists	OMF Surgeons
Not Practising	264 (33.63%)	5 (13.89%)	8 (17.02%)	1 (2.33%)
Practising	521 (66.37%)	31 (86.11%)	39 (82.98%)	42 (97.67%)
Total	**785**	**36**	**47**	**43**

Figure 3.7. Respondents' Implant Dentistry Practising Status



It can be observed that approximately two thirds of GDP respondents indicated that they are actively involved in the practice of implant dentistry, which supports the notion that this discipline has indeed become a significant part of general dental practice in Australia. Meanwhile, the corresponding percentages of specialists are appreciably higher, ranging from 82.98% of periodontists to 97.67% of OMF surgeons. This difference is expected since all three specialist groups selected for this investigation are believed to be routinely involved in the provision of dental implant-related treatments in general.

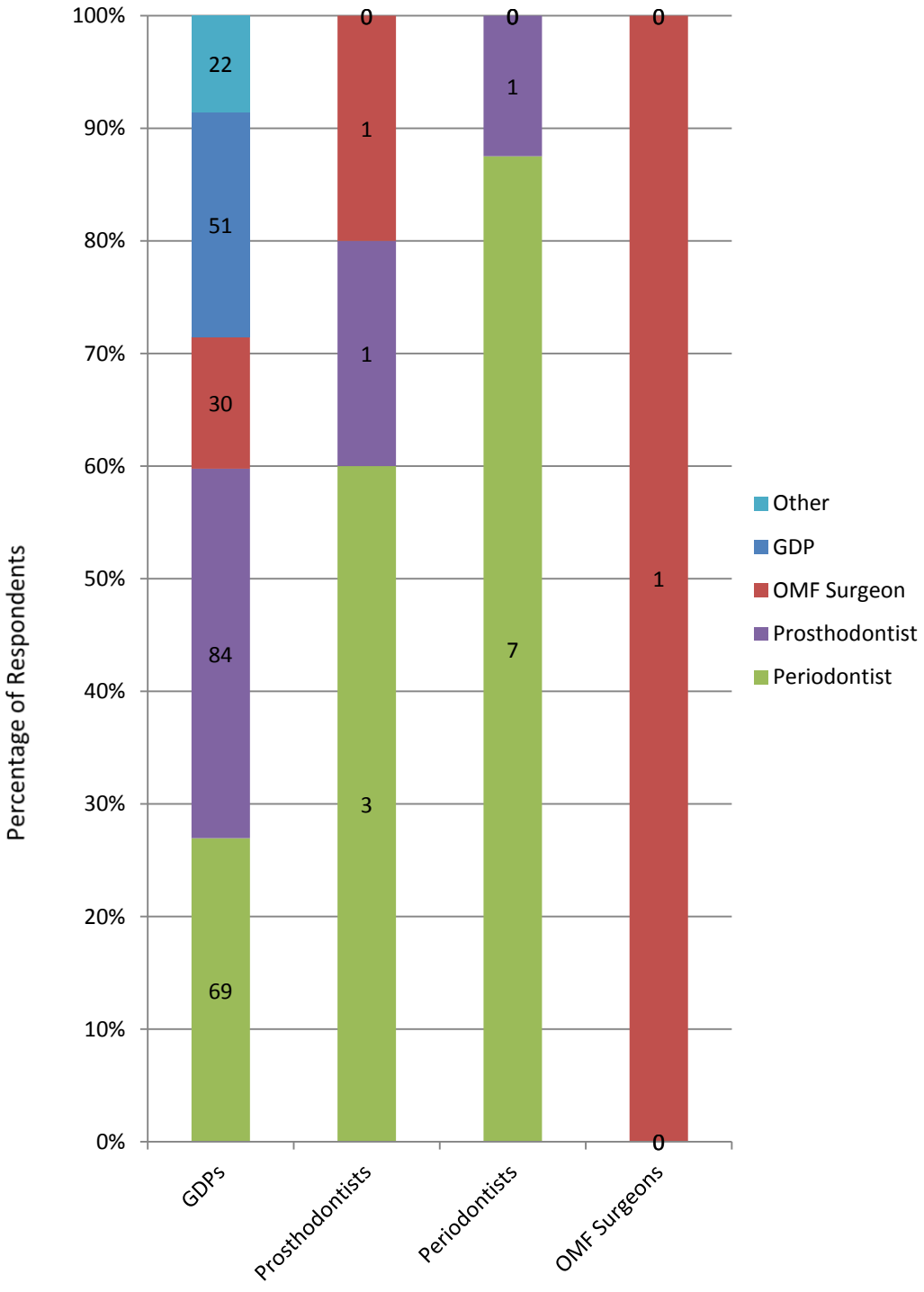
3.3 Non-implant-practising Respondents

<u>Survey Question</u>: If you are not practising implant dentistry, which type of practitioner do you most frequently refer your implant dentistry cases to?

Table 3.10 and Figure 3.8 illustrate the referral patterns of non-implant-practising (NIP) respondents for any dental implant cases they encounter in their practices.

Table 3.10. Referral Patterns of NIP Respondents for Dental Implant-related Cases					
		REFERRING PRACTITIONERS			
		GDPs	**Prosthodontists**	**Periodontists**	**OMF Surgeons**
RECEIVING PRACTITIONERS	**GDP Experienced in Implant Dentistry**	51 (19.92%)	0	0	0
	OMF Surgeon	30 (11.72%)	1 (20%)	0	1 (100%)
	Periodontist	69 (26.95%)	3 (60%)	7 (87.5%)	0
	Prosthodontist	84 (32.81%)	1 (20%)	1 (12.5%)	0
	Other	22 (8.59%)	0	0	0
	Total	**256**	**5**	**8**	**1**

Figure 3.8. Referral Patterns of NIP Respondents for Dental Implant-related Cases



At a glance, it seems that NIP GDPs prefer prosthodontists, periodontists and implant-capable GDPs as their main destinations of referral for implant-related cases. The fact that prosthodontists and implant-capable GDPs constitute over half of all recipients of referrals from NIP GDPs may be partially due to the current trend of prosthetically driven treatment planning, as advocated by Garber (1995). As for NIP specialists, their very low numbers preclude the derivation of significant information, though it would appear that periodontists are the most frequent recipients of implant-associated cases from them.

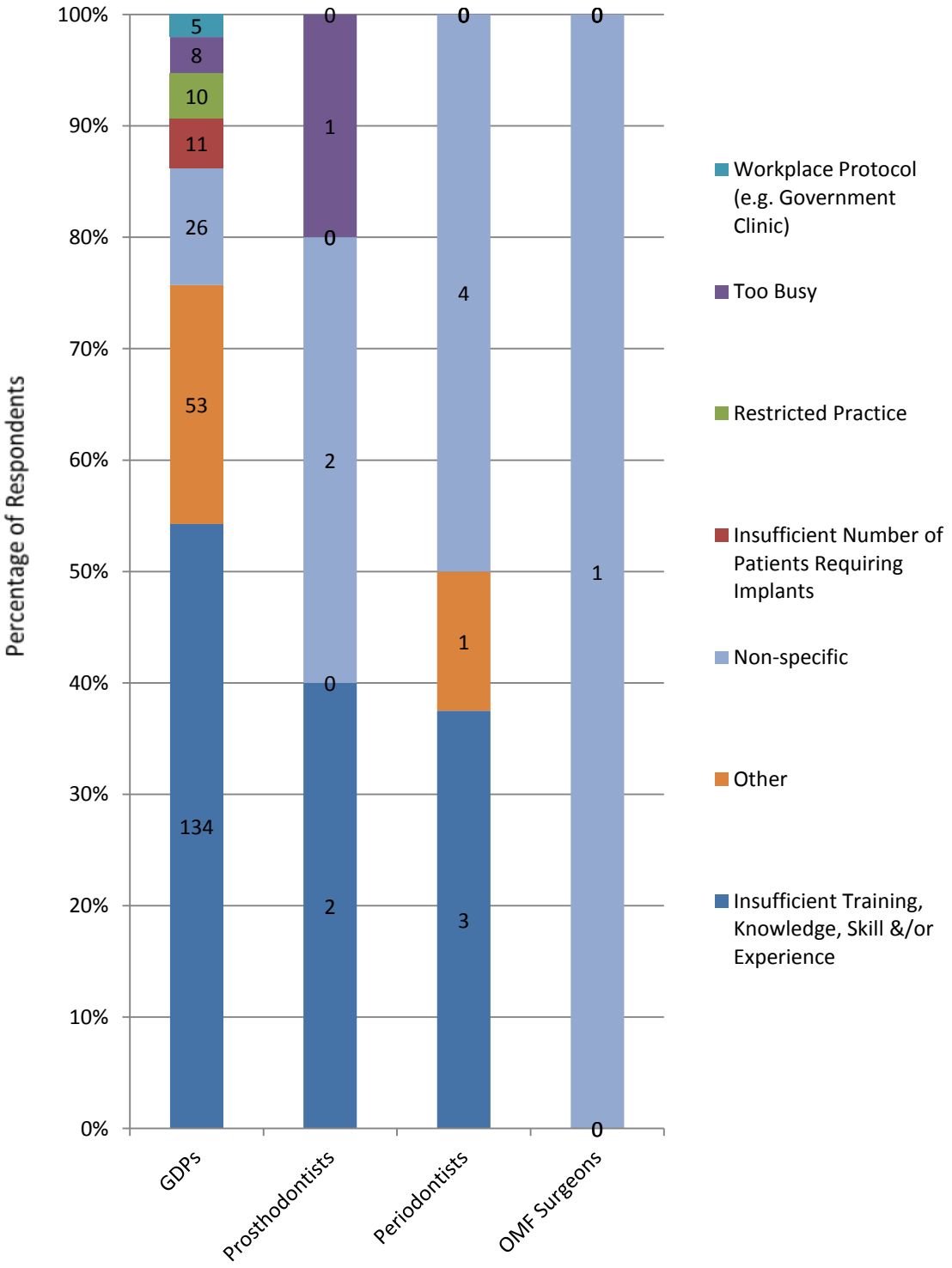
The category "Other" contains a considerable number of individual responses that overlap with some of the more specific categories, such as "both periodontist and prosthodontist", "senior dentist" and "specialist dental implantologist".

<u>Survey Question</u>: Please indicate your reason(s) for referring implant dentistry-related cases.

All NIP respondents were asked to briefly indicate, in their own words, the reason(s) for not electing to undertake dental implant-related procedures. Following perusal of the responses provided, the reasons were organised into seven categories as presented in Table 3.11 and Figure 3.9.

Table 3.11. NIP Respondents' Reasons for Referring Dental Implant-related Cases				
	GDPs	**Prosthodontists**	**Periodontists**	**OMF Surgeons**
Insufficient Training, Knowledge, Skill &/or Experience	134 (54.25%)	2 (40%)	3 (37.5%)	0
Insufficient Number of Patients Requiring Implants	11 (4.45%)	0	0	0
Restricted Practice	10 (4.05%)	0	0	0
Too Busy	8 (3.24%)	1 (20%)	0	0
Workplace Protocol	5 (2.02%)	0	0	0
Other	53 (21.46%)	0	1 (12.5%)	0
Non-specific	26 (10.53%)	2 (40%)	4 (50%)	1 (100%)
Total	**247**	**5**	**8**	**1**

Figure. 3.9. NIP Respondents' Reasons for Referring Dental Implant-related Cases



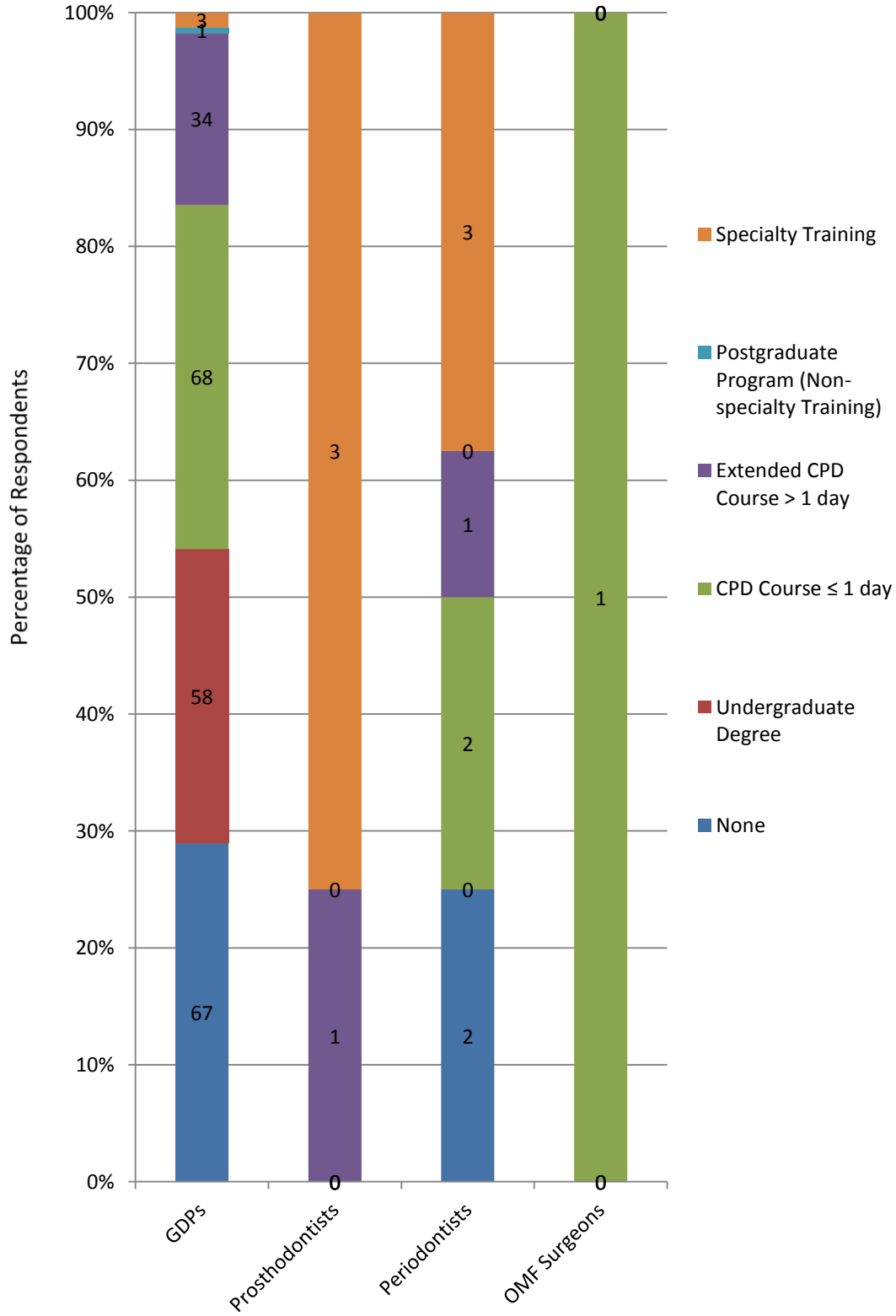
For GDP members, by far the most common reason provided revolves around the lack of adequate training or experience supplemented by the popular view that highly trained or specialist expertise should be required to successfully perform implant-related treatments. The second most frequently reported category, “Other”, is composed of numerous different reasons such as availability and/or cost of associated equipment and materials, patient’s preference, and potential risk of legal complications. Since there are a large number of such reasons and they are each associated with only minor numbers of respondents, it would be impractical to list them in full. The “Non-specific” category, which constitutes an appreciable proportion of responses, comprises non-indicative responses such as “I choose not to do implants” or “I do not do implants”. This category holds limited value since they fail to provide clear reasons as requested by the survey question concerned. Lastly, the category “Workplace Protocol” is almost entirely composed of responses from GDPs who practise in the public sector where treatments involving dental implants are often unavailable to patients.

<u>Survey Question</u>: What is the highest level of education in implant dentistry you have attained or are undertaking?

Table 3.12 and Figure 3.10 reveal the highest levels of education in implant dentistry attained or being undertaken by NIP participants:

Table 3.12. Highest Levels of Education in Implant Dentistry Attained/Currently Undertaken by NIP Respondents				
	GDPs	**Prosthodontists**	**Periodontists**	**OMF Surgeons**
None	67 (29.00%)	0	2 (25%)	0
Undergraduate Degree	58 (25.11%)	0	0	0
CPD Course ≤ 1 day	68 (29.44%)	0	2 (25%)	1 (100%)
Extended CPD Course > 1 day	34 (14.72%)	1 (25%)	1 (12.5%)	
Postgraduate Program (Non-specialty Training)	1 (0.43%)	0	0	0
Specialty Training	3 (1.30%)	3 (75%)	3 (37.5%)	0
Total	**231**	**4**	**8**	**1**

Figure 3.10. Highest Levels of Education in Implant Dentistry Attained/Currently Undertaken by NIP Respondents



Virtually all (i.e. 98.27%) of NIP GDPs have not experienced implant-related education programs beyond the level of non-degree CPD courses, which the ACWIDUE guidelines determine to be insufficient for the provision of clinical implant-related services. This is only reasonable considering these respondents are not practising implant dentistry. Interestingly, despite electing not to be involved with implants, three of the remaining four NIP GDPs appear to be highly educated in dental implantology, having experienced it at the level of specialty training. The same is also true for exactly the same number of prosthodontists and periodontists.

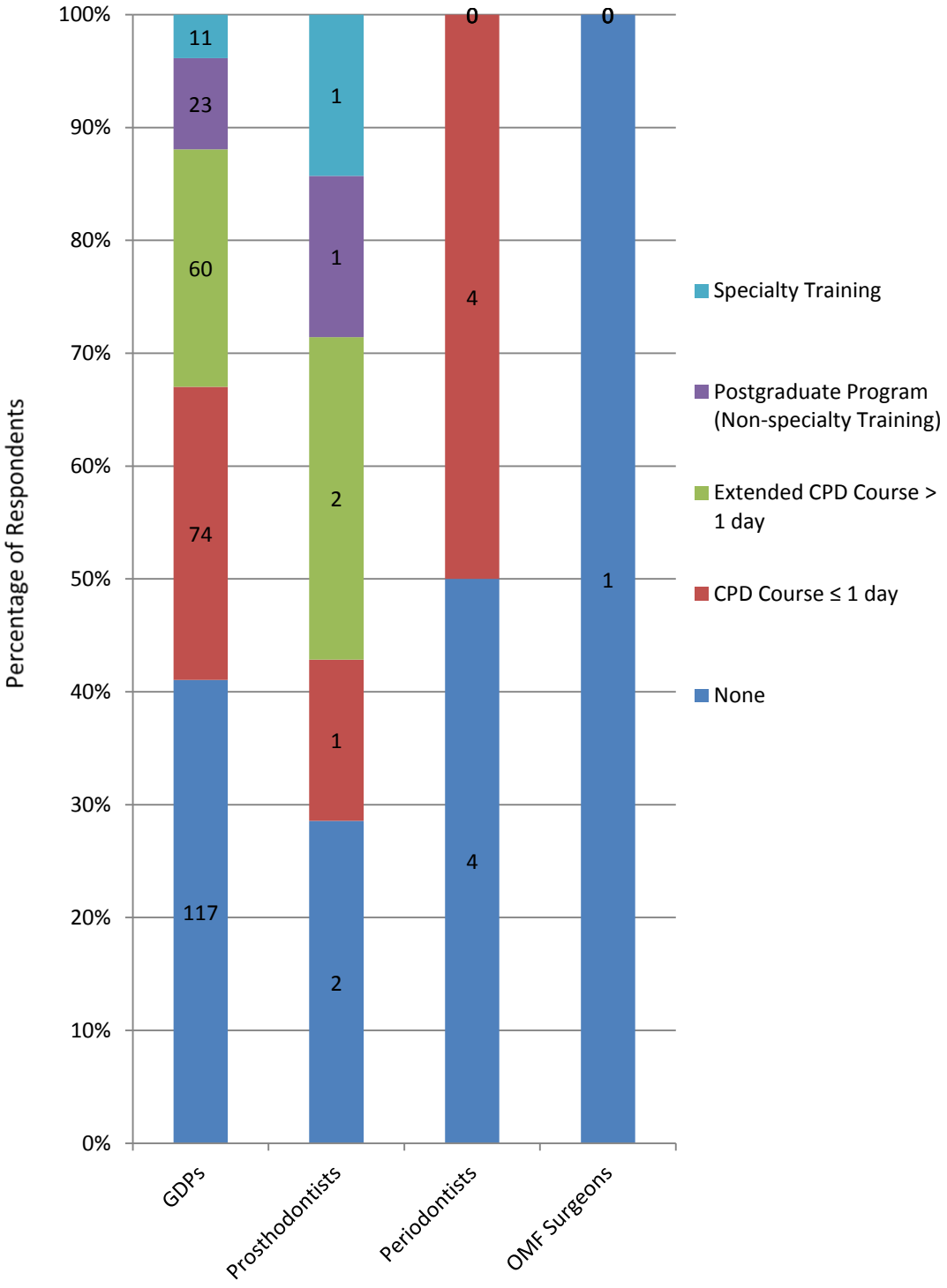
<u>Survey Question</u>: What kind(s) of further education in implant dentistry are you intending to undertake in the foreseeable future?

The NIP respondents' future educational intentions with respect to implantology educational program types are displayed in Table 3.13 and Figure 3.11. Multiple response choices were allowed for the question relating to this aspect since there may well be practitioners willing to undertake more than one kind of further education in order to improve their ability to practise implant dentistry.

Table 3.13. Attitudes of NIP Respondents towards Implant Dentistry Education: Types of Educational Programs				
	GDPs	**Prosthodontists**	**Periodontists**	**OMF Surgeons**
None	117 (41.05%)	2 (28.57%)	4 (50%)	1(100%)
CPD* Course ≤ 1 day	74 (25.96%)	1 (14.29%)	4 (50%)	0
Extended CPD Course > 1 day	60 (21.05%)	2 (28.57%)	0	0
Postgraduate Program (Non-specialty Training)	23 (8.07%)	1 (14.29%)	0	0
Specialty Training	11 (3.86%)	1 (14.29%)	0	0
Total	**285***	**7***	**8**	**1**

** The total number of responses exceeds the number of subject since some of the respondents have selected more than one response.*

Figure 3.11. Attitudes of NIP Respondents towards Implant Dentistry Education: Types of Educational Programs



In general, NIP respondents' desire for further education in implant dentistry is palpable: nearly 60% of GDPs', over 70% of prosthodontists' and 50% of periodontists' responses indicate positive intention to undertake some form of continuing educational program in this discipline. In general, the most popular types of program appear to be CPD and extended CPD courses, with a considerably smaller proportion of respondents planning to progress to formal postgraduate training.

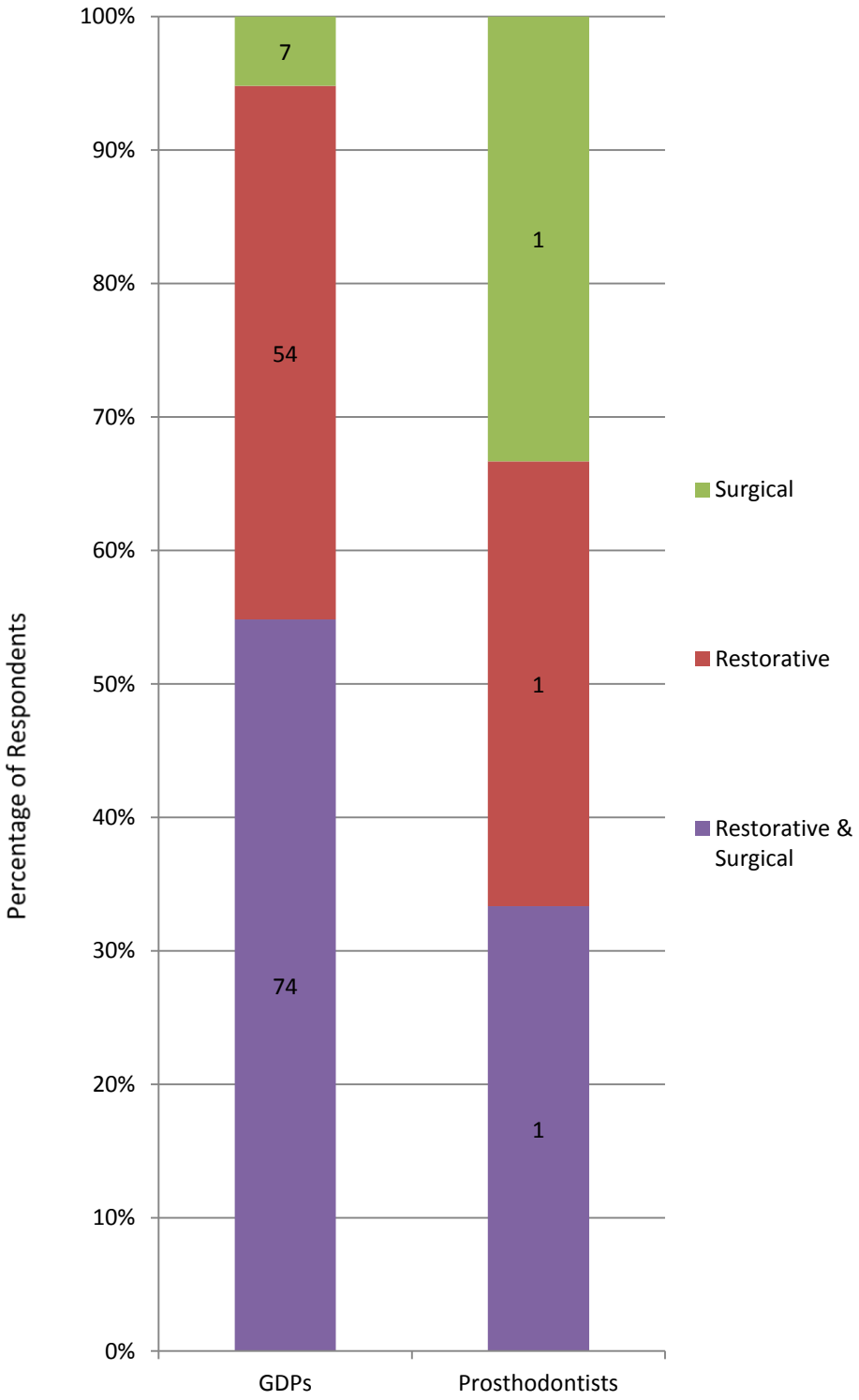
<u>Survey Question</u>: If you were to undertake further education in implant dentistry, which aspect(s) of it would you like to improve in?

NIP respondents' future educational intentions with respect to specific aspects (i.e. restorative and/or surgical) of implant dentistry are shown in Table 3.14 and Figure 3.12. The survey question addressing this issue applied only to GDPs and prosthodontists since most periodontists and OMF surgeons would be unlikely to be practising restorative aspects of implant dentistry to a significant extent.

Table 3.14. Attitudes of NIP Respondents towards Implant Dentistry Education: Specific Aspects

	GDPs	Prosthodontists
Restorative	54 (40%)	1 (33.33%)
Surgical	7 (5.19%)	1 (33.33%)
Restorative & Surgical	74 (54.81%)	1 (33.33%)
Total	**135**	**3**

Figure 3.12. Attitudes of NIP Respondents towards Implant Dentistry Education: Specific Aspects



As far as NIP GDPs are concerned, the vast majority (i.e. nearly 95%) of those wishing to undertake further education in implant dentistry would prefer to focus on either restorative aspects alone or both restorative and surgical aspects. Merely a few of them are considering only the surgical facet.

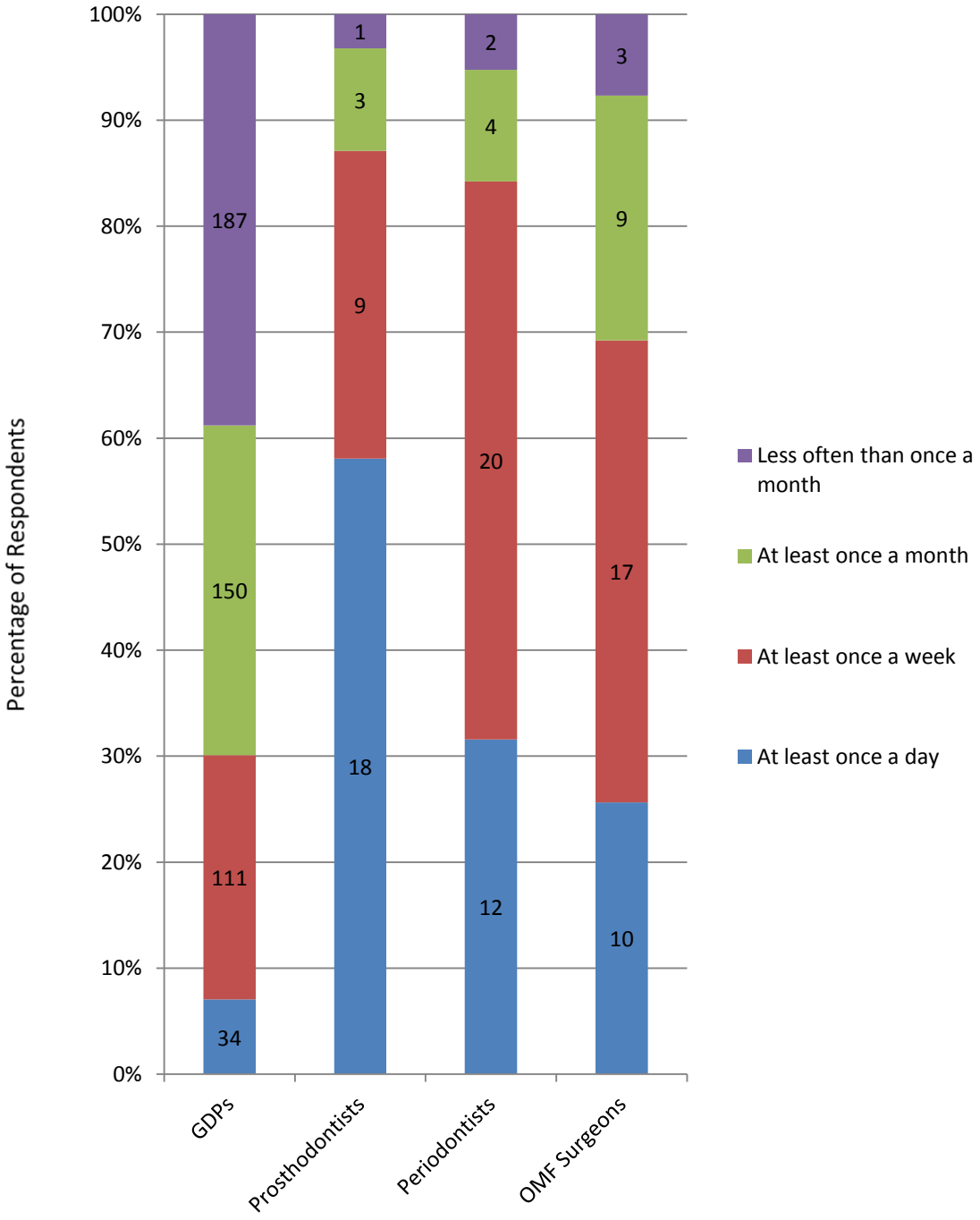
3.4 Implant-practising Respondents

<u>Survey Question</u>: How often do you perform dental implant-related procedures?

For implant-practising (IP) respondents, the frequencies of dental implant-related procedures they perform are summarised in Table 3.15 and Figure 3.13.

Table 3.15. Frequency of Dental Implant-related Procedures Performed by IP Respondents				
	GDPs	**Prosthodontists**	**Periodontists**	**OMF Surgeons**
At Least Once per Day	34 (7.05%)	18 (58.06%)	12 (31.58%)	10 (25.64%)
At Least Once per Week	111 (23.03%)	9 (29.03%)	20 (52.63%)	17 (43.59%)
At Least Once per Month	150 (31.12%)	3 (9.68%)	4 (10.53%)	9 (23.08%)
Less Than Once per Month	187 (38.80%)	1 (3.23%)	2 (5.26%)	3 (7.69%)
Total	**482**	**31**	**38**	**39**

Figure 3.13. Frequency of Dental Implant-related Procedures Performed by IP Respondents



On the whole, it can be seen that IP specialists perform implant-related procedures more frequently than IP GDPs: 87.09% of prosthodontists, 84.21% of periodontists and 69.23% of OMF surgeons provide implant-related treatments at least once a week or more, while the same applies to only 30.08% of GDPs. This is most likely a natural result of the restricted and highly focused nature of the specialists' scopes of practice. Furthermore, nearly 40% of GDPs are practising implant dentistry less frequently than once per month, while the corresponding percentage of specialists appears rather insignificant by comparison.

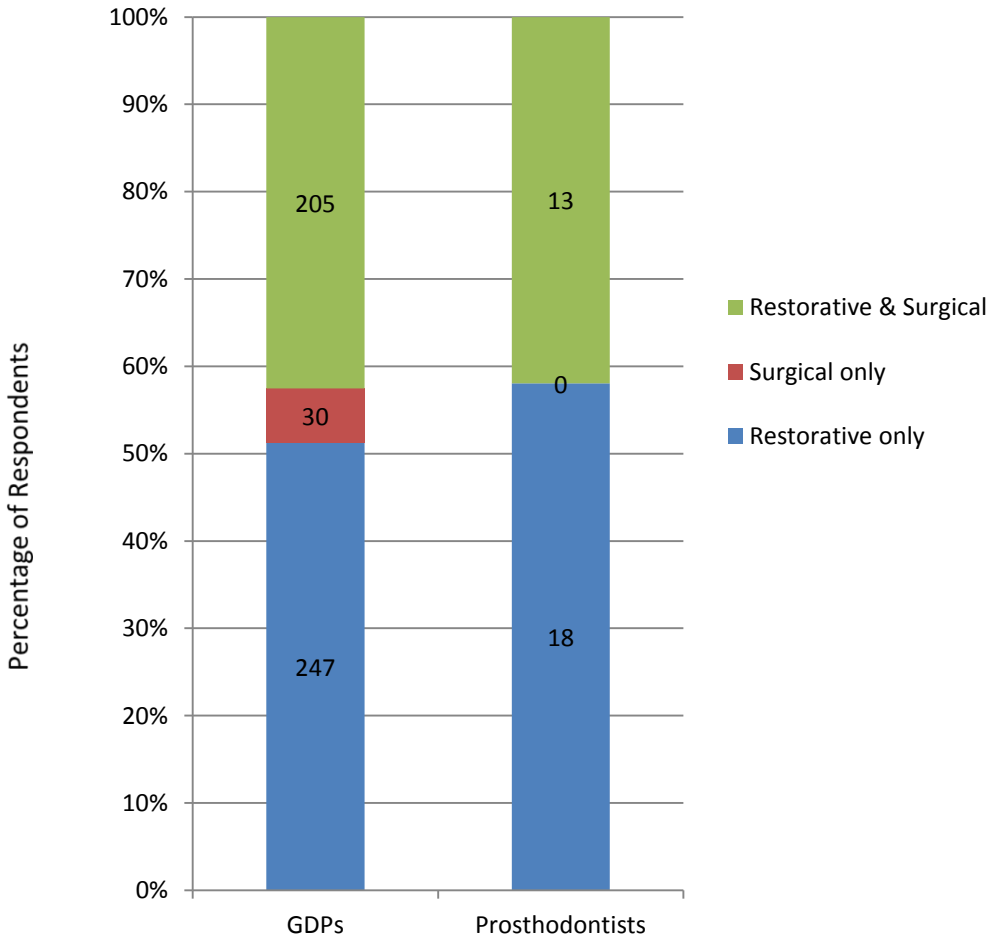
<u>Survey Question</u>: What aspect(s) of implant dentistry are you practising?

Specific aspects (i.e. surgical and/or restorative facets) of implant dentistry practised by IP respondents are presented in Table 3.16 and Figure 3.14. Only GDPs and prosthodontists were asked to indicate a response regarding this issue since periodontists and OMF surgeons would more likely be restricted to surgical aspects of this field.

Table 3.16. Aspects of Implant Dentistry Practised by IP GDPs and Prosthodontists

	GDPs	Prosthodontists
Restorative Only	247 (51.24%)	18 (58.06%)
Surgical Only	30 (6.22%)	0
Restorative & Surgical	205 (42.52%)	13 (41.94%)
Total	**482**	**31**

Figure 3.14. Aspects of Implant Dentistry Practised by IP GDPs and Prosthodontists



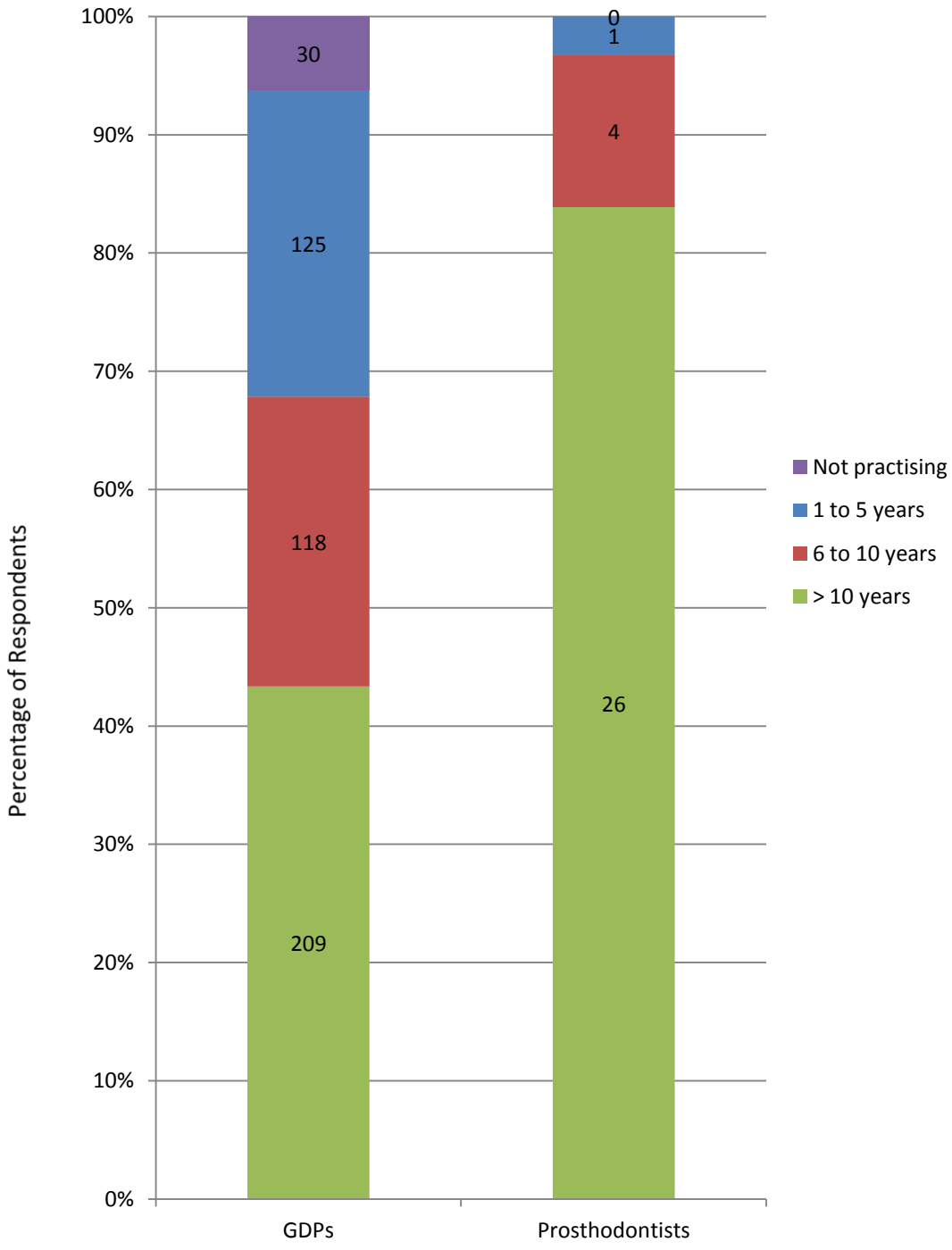
Similar patterns are demonstrated by GDPs and prosthodontists here in that nearly equal proportions of each group are found in the categories of 'Restorative & Surgical' and 'Restorative Only', which together constitute the bulk of both practitioner groups. Only 6.22% of GDPs are involved solely in the surgical facet of implant dentistry.

<u>Survey Question</u>: How many years have you been practising restorative aspects of implant dentistry for?

Table 3.17 and Figure 3.15 outline the amount of experience IP GDPs and prosthodontists possess with respect to restorative aspects of implant dentistry.

Table 3.17. Experience in Restorative Aspects of Implant Dentistry Possessed by IP GDPs and Prosthodontists		
	GDPs	**Prosthodontists**
1 to 5 Years	125 (25.93%)	1 (3.23%)
6 to 10 Years	118 (24.48%)	4 (12.90%)
> 10 Years	209 (43.36%)	26 (83.87%)
Not Practising	30 (6.22%)	0
Total	**482**	**31**

Figure 3.15. Experience in Restorative Aspects of Implant Dentistry Possessed by IP GDPs and Prosthodontists



The majority of GDPs and prosthodontists appear to be reasonably experienced in restorative aspects of implant dentistry, as suggested by the fact that over two thirds of the former and 95% of the latter possess at least six to ten years of experience in this respect. Additionally, more than 40% of GDPs and 80% of prosthodontists have reported experiences of longer than ten years. The relatively longer experience of prosthodontists likely stems from the accumulation of their specialist and prior general practices. However, it should be noted that duration of experience alone does not necessarily reflect the total amount of experience accurately, since the frequency of exposure is another major determining factor.

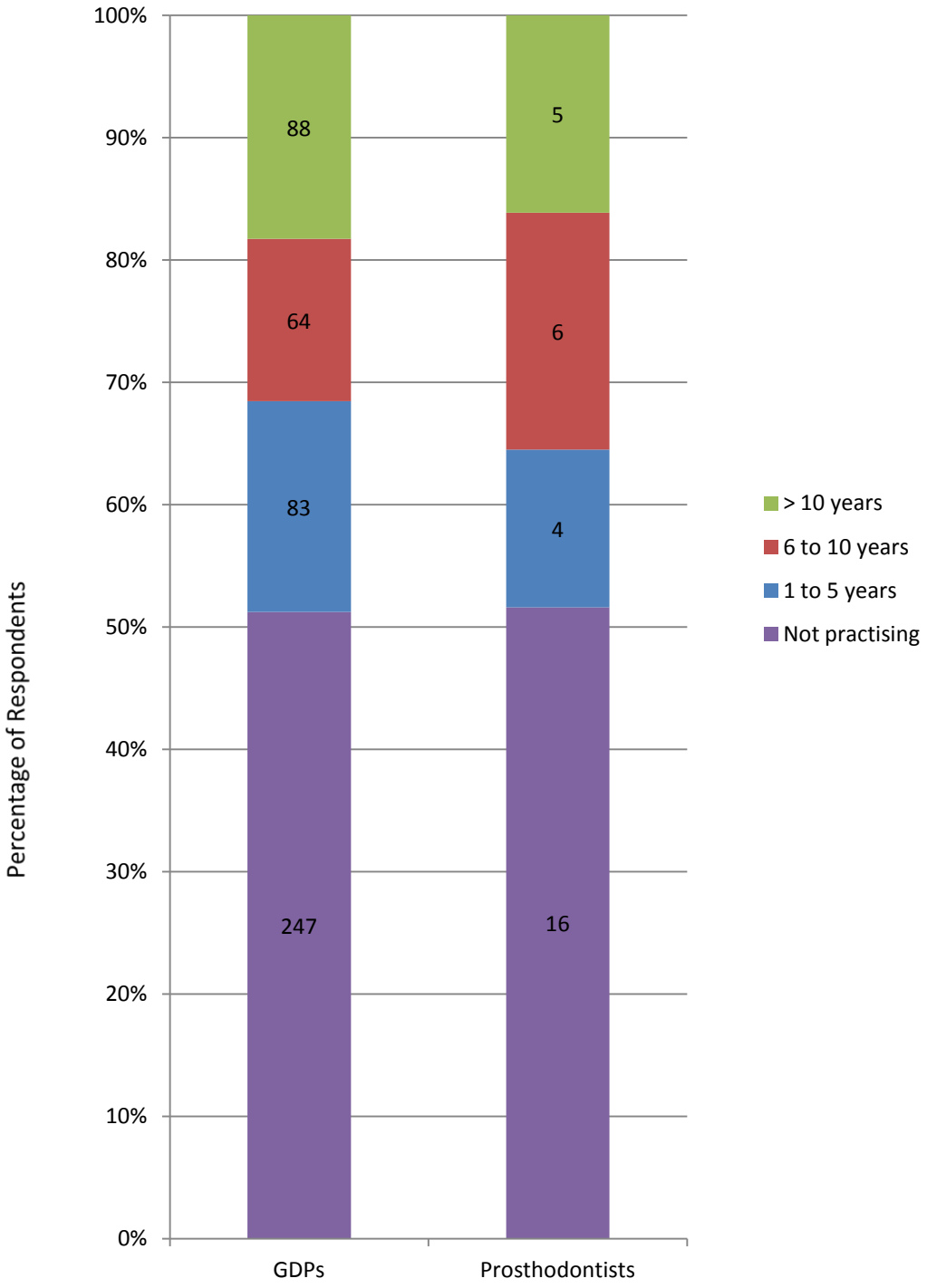
<u>Survey Question</u>: How many years have you been practising surgical aspects of implant dentistry for?

Table 3.18 and Figure 3.16 reveal the amount of experience IP GDPs and prosthodontists possess with respect to surgical aspects of implant dentistry.

Table 3.18. Experience in Surgical Aspects of Implant Dentistry Possessed by IP GDPs and Prosthodontists

	GDPs	Prosthodontists
1 to 5 Years	83 (17.22%)	4 (12.90%)
6 to 10 Years	64 (13.28%)	6 (19.35%)
> 10 Years	88 (18.26%)	5 (16.13%)
Not Practising	247 (51.24%)	16 (51.61%)
Total	**482**	**31**

Figure 3.16. Experience in Surgical Aspects of Implant Dentistry Possessed by IP GDPs and Prosthodontists



Given the largely restorative nature of GDPs' and prosthodontists' clinical work, it is not surprising that their collective experience in the surgical facet of implant dentistry is considerably less than in the restorative. The percentages of GDPs and prosthodontists not involved in implant dentistry surgically are remarkably similar at slightly over 51% for each group. The remaining proportions in each experience category are also fairly comparable between the two groups, thus generating very similar surgical experience profiles overall. This possibly implies an insufficiency of implant-associated surgical training in prosthodontic specialty education.

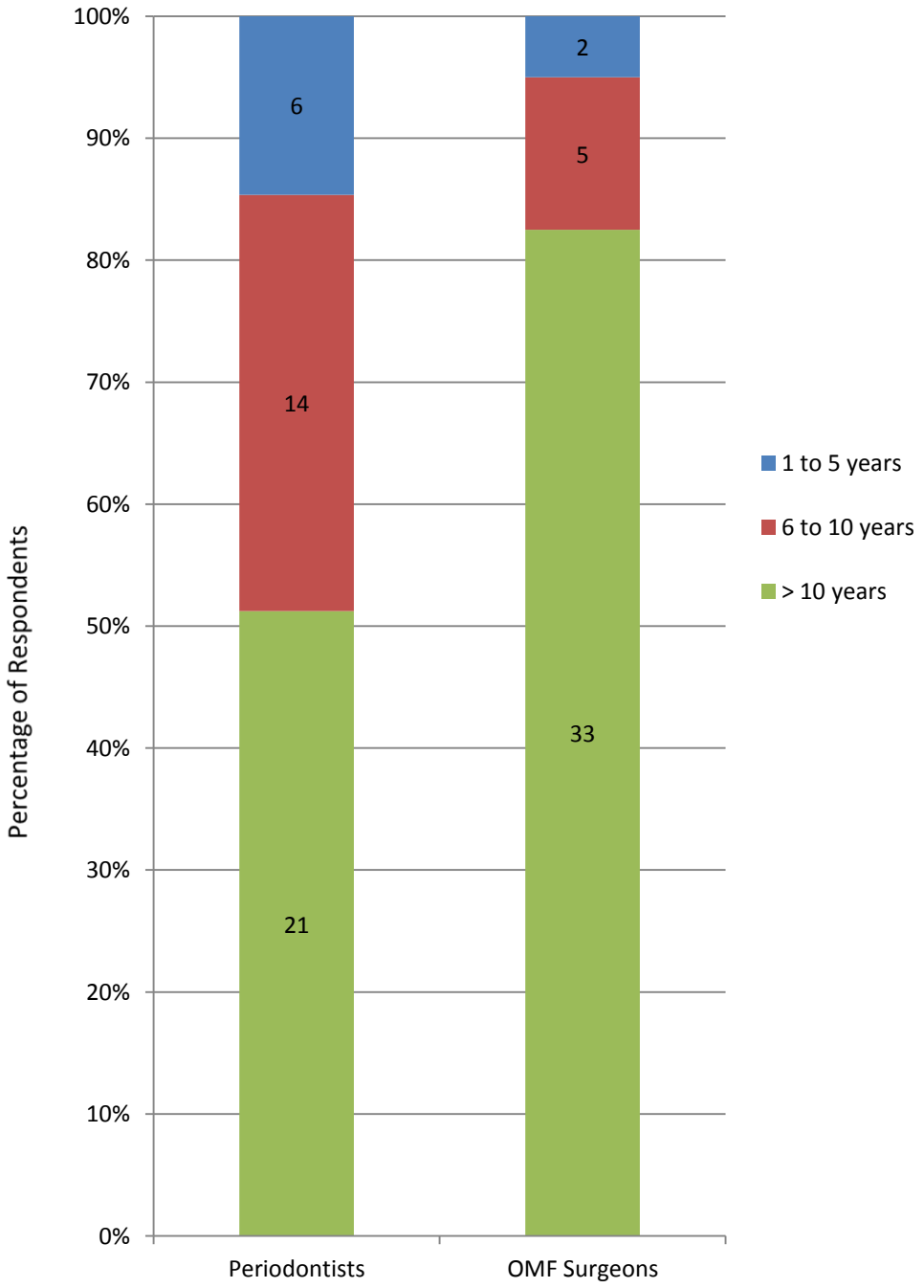
<u>Survey Question</u>: (For IP periodontists and OMF surgeons) How many years have you been working with dental implants for?

IP Periodontists and OMF surgeons' levels of experience in implant dentistry are indicated in Table 3.19 and Figure 3.17. Considering the nature of these specialists' work, their experience is most likely mainly surgical in nature.

Table 3.19. Experience in Implant Dentistry Possessed by IP Periodontists and OMF Surgeons

	Periodontists	OMF Surgeons
1 to 5 Years	6 (14.63%)	2 (5.00%)
6 to 10 Years	14 (34.15%)	5 (12.50%)
> 10 Years	21 (51.22%)	33 (82.50%)
Total	**41**	**40**

Figure 3.17. Experience in Implant Dentistry Possessed by IP Periodontists and OMF Surgeons



Judging purely by duration of experience, it appears that both periodontists and OMF surgeons boast fairly solid profiles, with 85% of the former and 95% of the latter having worked with dental implants for a minimum of six to ten years or longer. The fact that a noticeably greater proportion of OMF surgeons have been involved with dental implants for over ten years possibly reflects the fact that implants entered the scope of OMF surgery earlier than that of periodontics.

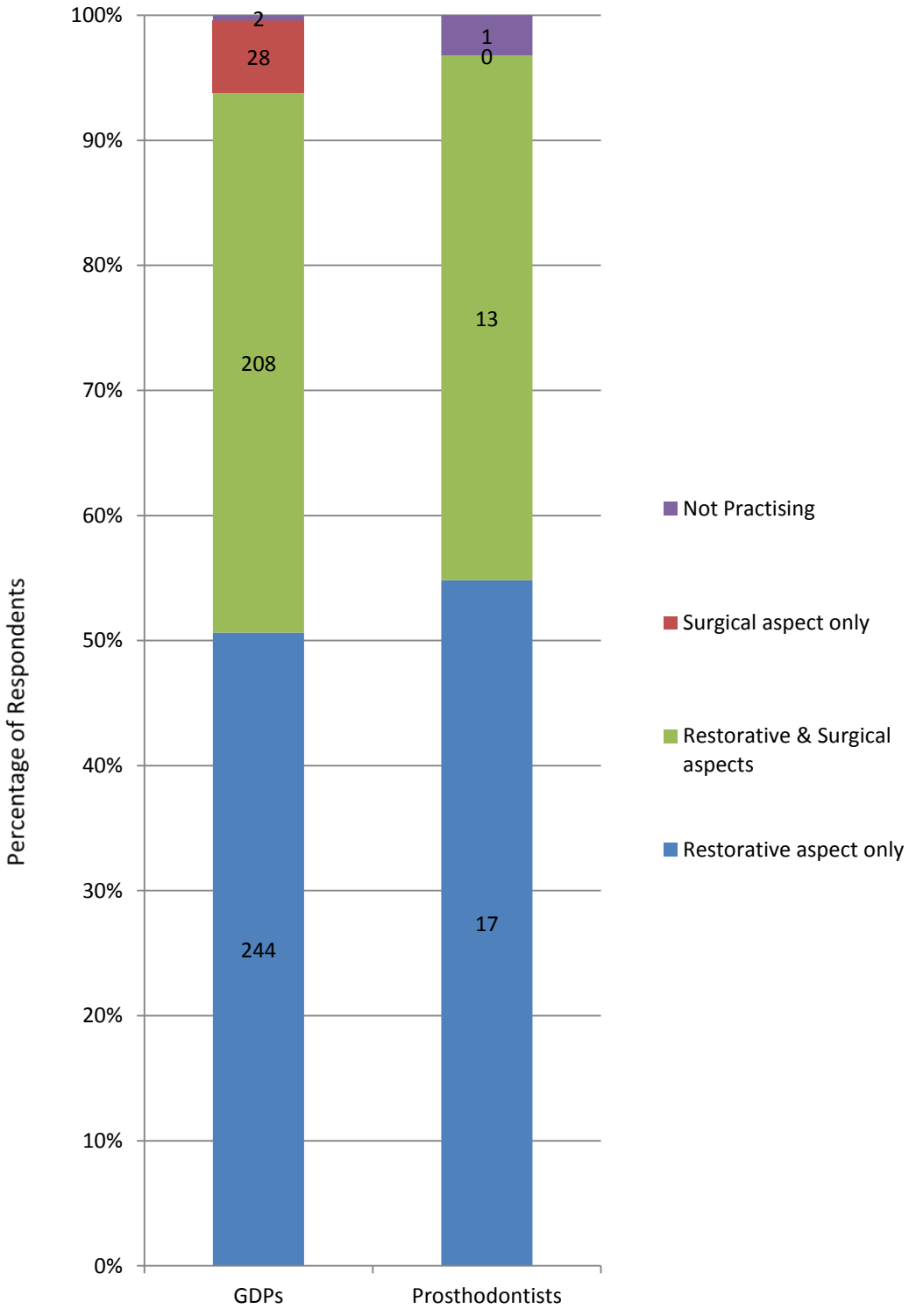
<u>Survey Question</u>: For a single tooth replacement, please indicate the extent of your practice.

The extent of practice by IP GDPs and prosthodontists for single-tooth implant-supported crowns is depicted in Table 3.20 and Figure 3.18.

Table 3.20. Extent of Practice by IP GDPs and Prosthodontists for Single-implant-supported Crowns

	GDPs	Prosthodontists
Restorative Aspects Only	244 (50.62%)	17 (54.84%)
Surgical Aspects Only	28 (5.81%)	0
Restorative & Surgical Aspects	208 (43.15%)	13 (41.94%)
Not Practising	2 (0.41%)	1 (3.23%)
Total	**482**	**31**

Figure 3.18. Extent of Practice by IP GDPs and Prosthodontists for Single-implant-supported Crowns



With the minor exception of a small percentage of GDPs practising solely surgical aspects of implant dentistry, the practice patterns of GDPs and prosthodontists for single-implant-supported crowns closely parallel each other. Approximately equal percentages of each group belong to the ‘Restorative Aspects Only’ and ‘Restorative & Surgical Aspects’ categories, which together form the great majority of the two respondent groups.

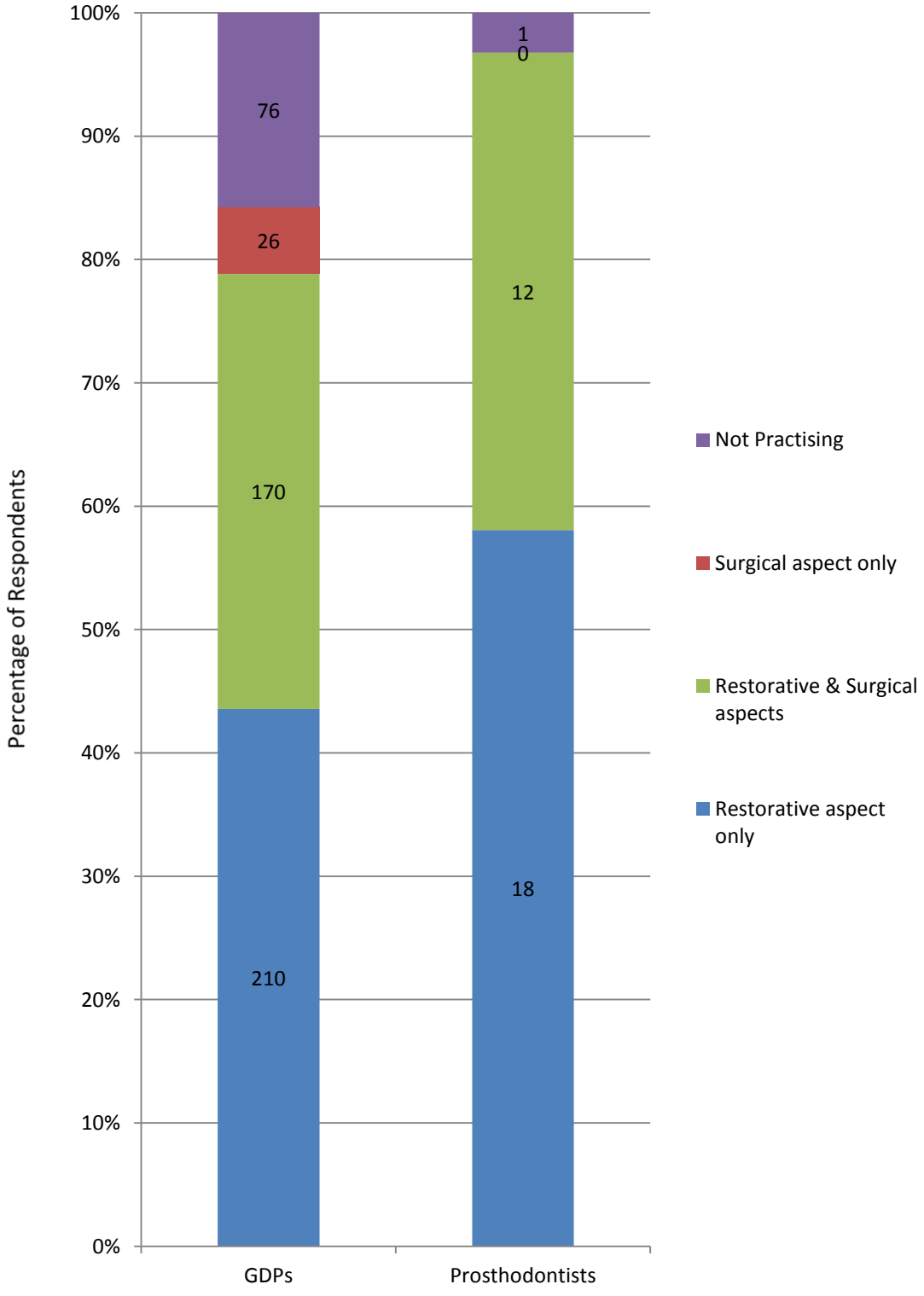
<u>Survey Question</u>: For a multiple-implant bridge (non-full-arch), please indicate the extent of your practice.

The extent of practice by IP GDPs and prosthodontists for multiple-implant-supported bridges (non-full-arch) is shown in Table 3.21 and Figure 3.19.

Table 3.21. Extent of Practice by IP GDPs and Prosthodontists for Multiple-implant-supported Bridges (Non-full-arch)

	GDPs	Prosthodontists
Restorative Aspects Only	210 (43.57%)	18 (58.06%)
Surgical Aspects Only	26 (5.39%)	0
Restorative & Surgical Aspects	170 (35.27%)	12 (38.71%)
Not Practising	76 (15.77%)	1 (3.23%)
Total	**482**	**31**

Figure 3.19. Extent of Practice by IP GDPs and Prosthodontists for Multiple-implant-supported Bridges (Non-full-arch)



Compared with the practice patterns for single-implant-supported crowns, the proportion of GDPs in the 'Not Practising' category has increased noticeably from 0.41% to 15.77%. This may be a reflection of the fact that implant-supported bridges represent a more sophisticated treatment modality than single crowns in certain respects. In contrast, the percentage of prosthodontists in each response category remains largely unchanged.

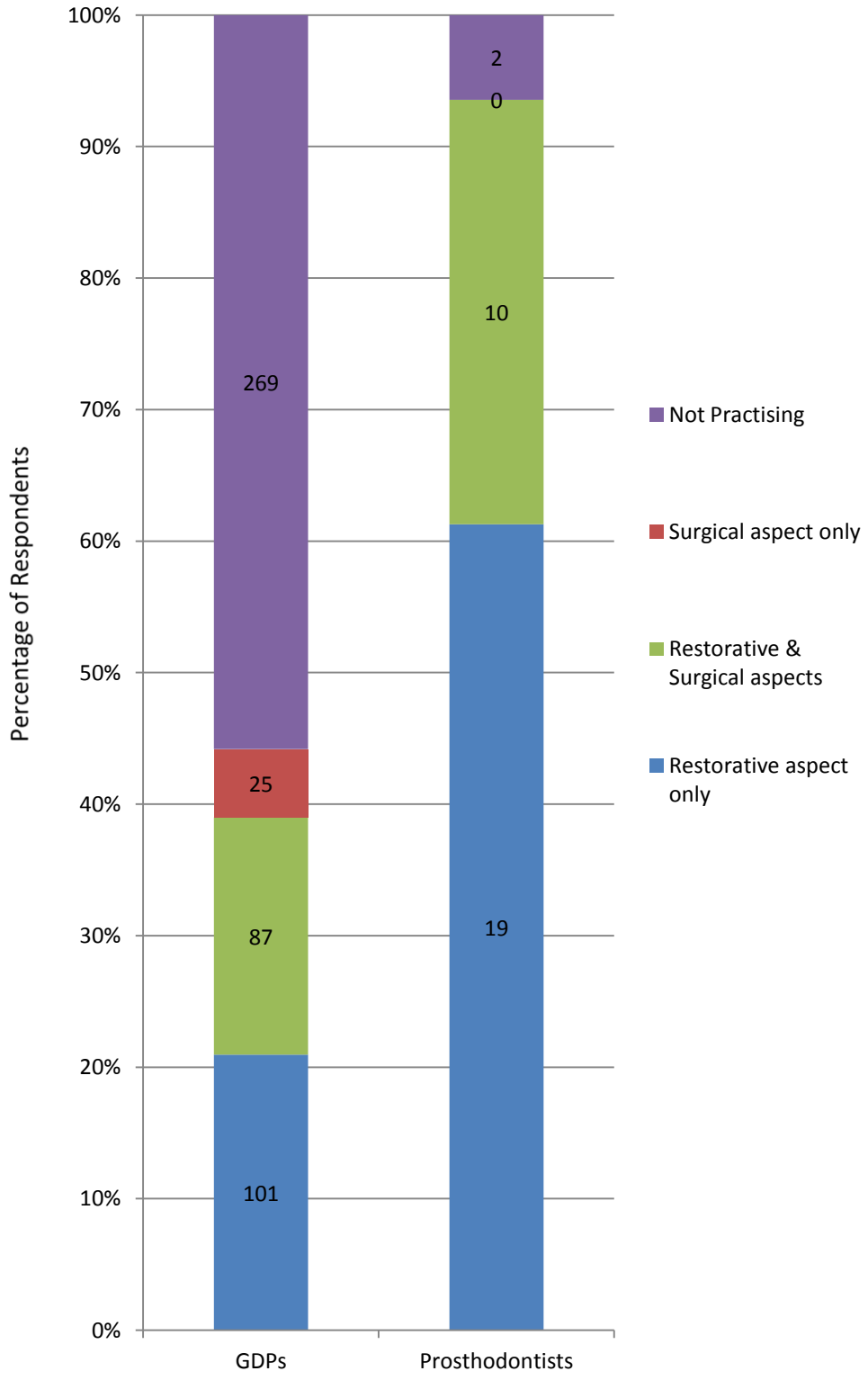
<u>Survey Question</u>: For a full-arch fixed prosthesis, please indicate the extent of your practice.

The extent of practice by IP GDPs and prosthodontists for full-arch implant-supported fixed prostheses is presented in Table 3.22 and Figure 3.20.

Table 3.22. Extent of Practice by IP GDPs and Prosthodontists for Full-arch Implant-supported Fixed Prostheses

	GDPs	Prosthodontists
Restorative Aspects Only	101 (20.95%)	19 (61.29%)
Surgical Aspects Only	25 (5.19%)	0
Restorative & Surgical Aspects	87 (18.05%)	10 (32.26%)
Not Practising	269 (55.81%)	2 (6.45%)
Total	**482**	**31**

Figure 3.20. Extent of Practice by IP GDPs and Prosthodontists for Full-arch Implant-supported Fixed Prostheses



As the degree of complexity of the procedure rises, the extent of practice of GDPs in particular falls correspondingly. With respect to full-arch implant-supported fixed prostheses, over 55% of GDP respondents have joined the 'Not Practising' category. Interestingly, an appreciable fraction of GDPs (i.e. 18.05%) have indicated that they are involved in this type of treatment both surgically and restoratively, despite its inherent challenges and the high level of additional training entailed. At 6.45%, the percentage of prosthodontists who do not practise treatment modality is considerably lower in comparison, which is testimony to the benefit of their specialty training.

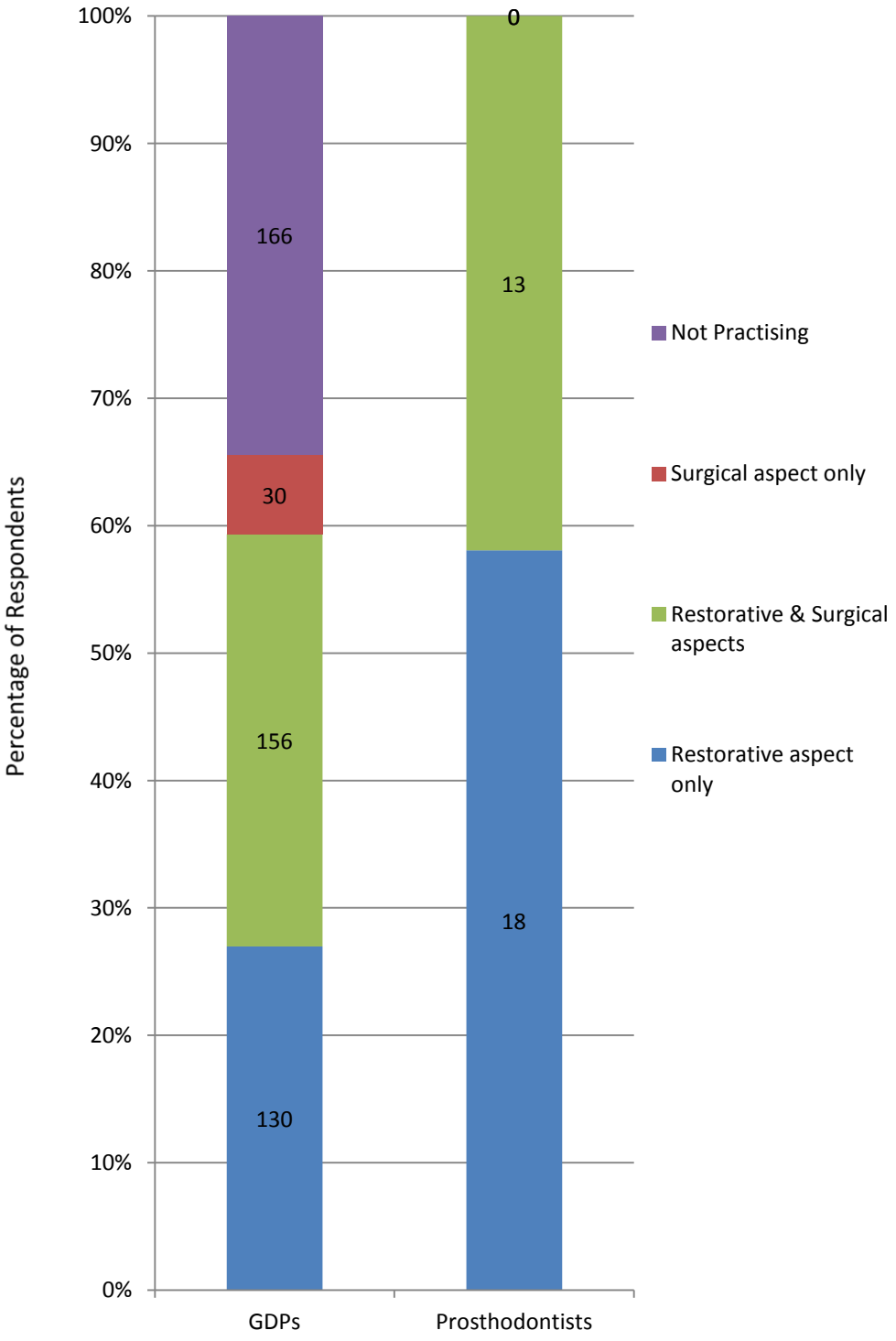
<u>Survey Question</u>: For an implant-retained overdenture, please indicate the extent of your practice.

The extent of practice by IP GDPs and prosthodontists for implant-retained overdentures is depicted in Table 3.23 and Figure 3.21.

Table 3.23. Extent of Practice by IP GDPs and Prosthodontists for Implant-retained Overdentures

	GDPs	Prosthodontists
Restorative Aspects Only	130 (26.97%)	18 (58.06%)
Surgical Aspects Only	30 (6.22%)	0
Restorative & Surgical Aspects	156 (32.37%)	13 (41.94%)
Not Practising	166 (34.44%)	0
Total	**482**	**31**

Figure 3.21. Extent of Practice by IP GDPs and Prosthodontists for Implant-retained Overdentures



GDPs and prosthodontists' extent of practice for implant-retained overdentures can be likened to the corresponding profiles generated for non-full-arch multiple-implant-supported bridges. The primary difference lies in the doubling of the proportion of 'Not Practising' GDPs from 15.77% to 34.44%, along with an accompanying reduction of GDPs in the 'Restorative Aspects Only' and 'Restorative & Surgical Aspects' categories. A possible reason for this pattern might be the placement of greater emphasis on fixed prostheses than removable in dental implant-related educational programs attended by GDPs.

<u>Survey Question</u>: If you are referring to (an)other practitioner(s) for any aspect of dental implant treatment, please indicate the type(s) of practitioner(s) that you refer to for restorative aspects of treatment.

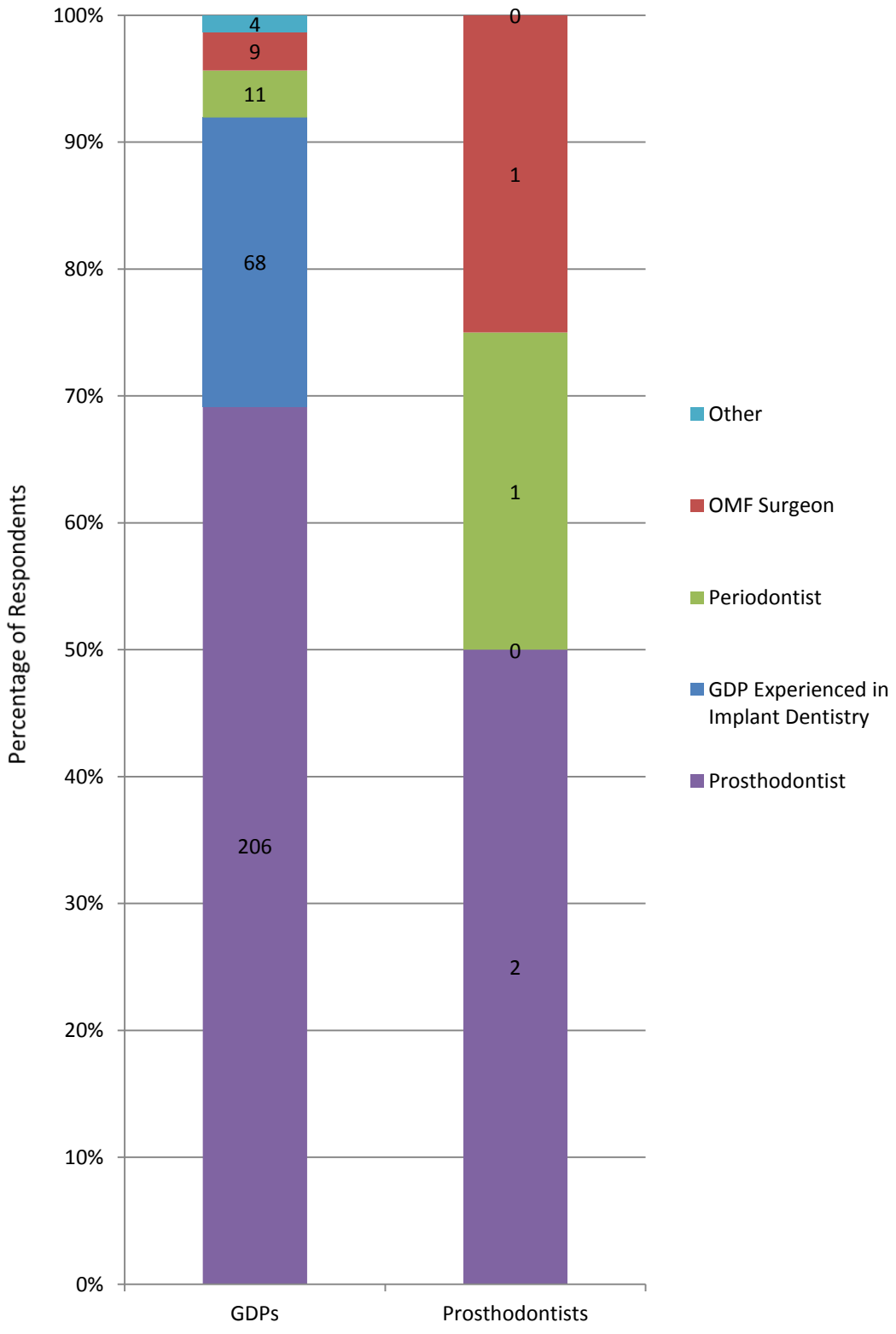
It is understood that IP clinicians also have the need to refer implant-involving cases to other practitioners at times, particularly if a case falls outside their chosen scope of practice. Hence IP respondents were also asked to provide some information regarding their general referral patterns for implant-related procedures.

Table 3.24 and Figure 3.22 present the general referral patterns of IP GDPs and prosthodontists concerning implant-related restorative procedures. Multiple response options were allowed since a practitioner may well utilise the expertise of more than one colleague.

Table 3.24. Referral Patterns of IP GDPs and Prosthodontists for Implant-related Restorative Procedures		
	GDPs	**Prosthodontists**
GDP Experienced in Implant Dentistry	68 (22.82%)	0
OMF Surgeon	9 (3.02%)	1 (25%)
Periodontist	11 (3.69%)	1 (25%)
Prosthodontist	206 (69.13%)	2 (50%)
Other	4 (1.34%)	0
Total	**298***	**4***

** The total number of responses exceeds that of subjects due to multiple response choices made by some of them.*

Figure 3.22. Referral Patterns of IP GDPs and Prosthodontists for Implant-related Restorative Procedures



As one would expect, very few IP prosthodontists ever refer implant-related restorative procedures to the care of other practitioners. In contrast, referrals from IP GDPs are much more abundant, with over two thirds of them heading to prosthodontists and a further 22.82% to implant-capable GDPs. This referral pattern, in which over 90% of referrals belong to primarily restorative practitioners, is only natural due to the nature of the procedure.

<u>Survey Question</u>: If you are referring to (an)other practitioner(s) for any aspect of dental implant treatment, please indicate the type(s) of practitioner(s) that you refer to for surgical aspects of treatment.

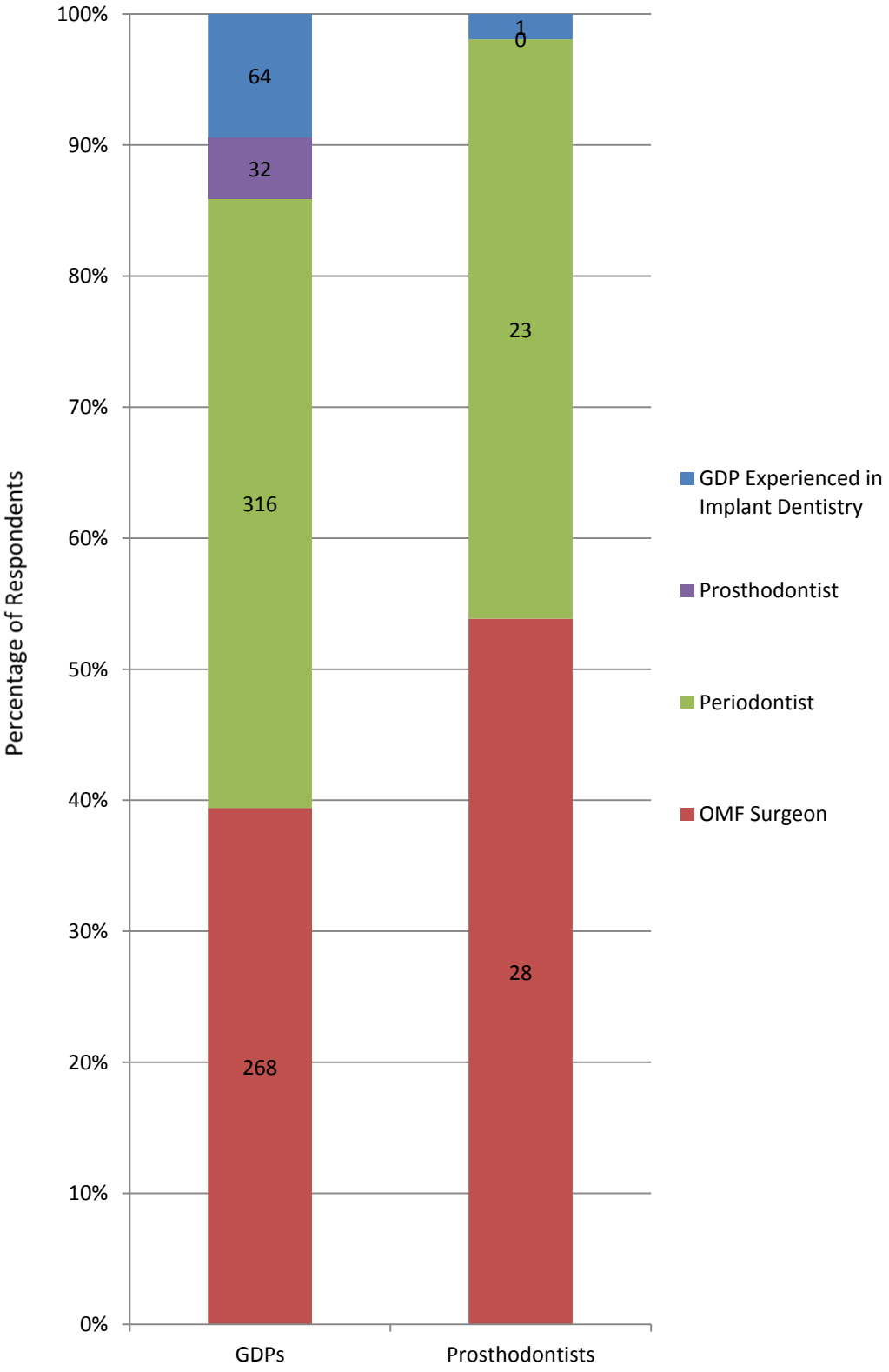
Table 3.25 and Figure 3.23 illustrate the general referral patterns of IP GDPs and prosthodontists concerning implant-related surgical procedures. Once again, multiple response options were allowed.

Table 3.25. Referral Patterns of IP GDPs and Prosthodontists for Implant-related Surgical Procedures

	GDPs	Prosthodontists
GDP Experienced in Implant Dentistry	64 (9.41%)	1 (1.92%)
OMF Surgeon	268 (39.41%)	28 (53.85%)
Periodontist	316 (46.47%)	23 (44.23%)
Prosthodontist	32 (4.71%)	0
Other	0	0
Total	**680***	**52***

** The total number of responses exceeds that of subjects due to multiple response choices made by some of them.*

Figure 3.23. Referral Patterns of IP GDPs and Prosthodontists for Implant-related Surgical Procedures



In contrast to the referral pattern for restorative procedures, both IP GDPs and IP prosthodontists appear to be referring frequently to periodontists and OMF surgeons for implant-related surgical procedures. GDPs seem to exhibit a slightly higher preference for periodontists while prosthodontists display a mildly greater tendency to select OMF surgeons. Perhaps the nature of prosthodontists' cases are generally more complex than those of GDPs', such as requiring a greater number of implants placed in more challenging anatomical locations, so that there is a greater need for OMF surgeons' expertise in maxillofacial surgery.

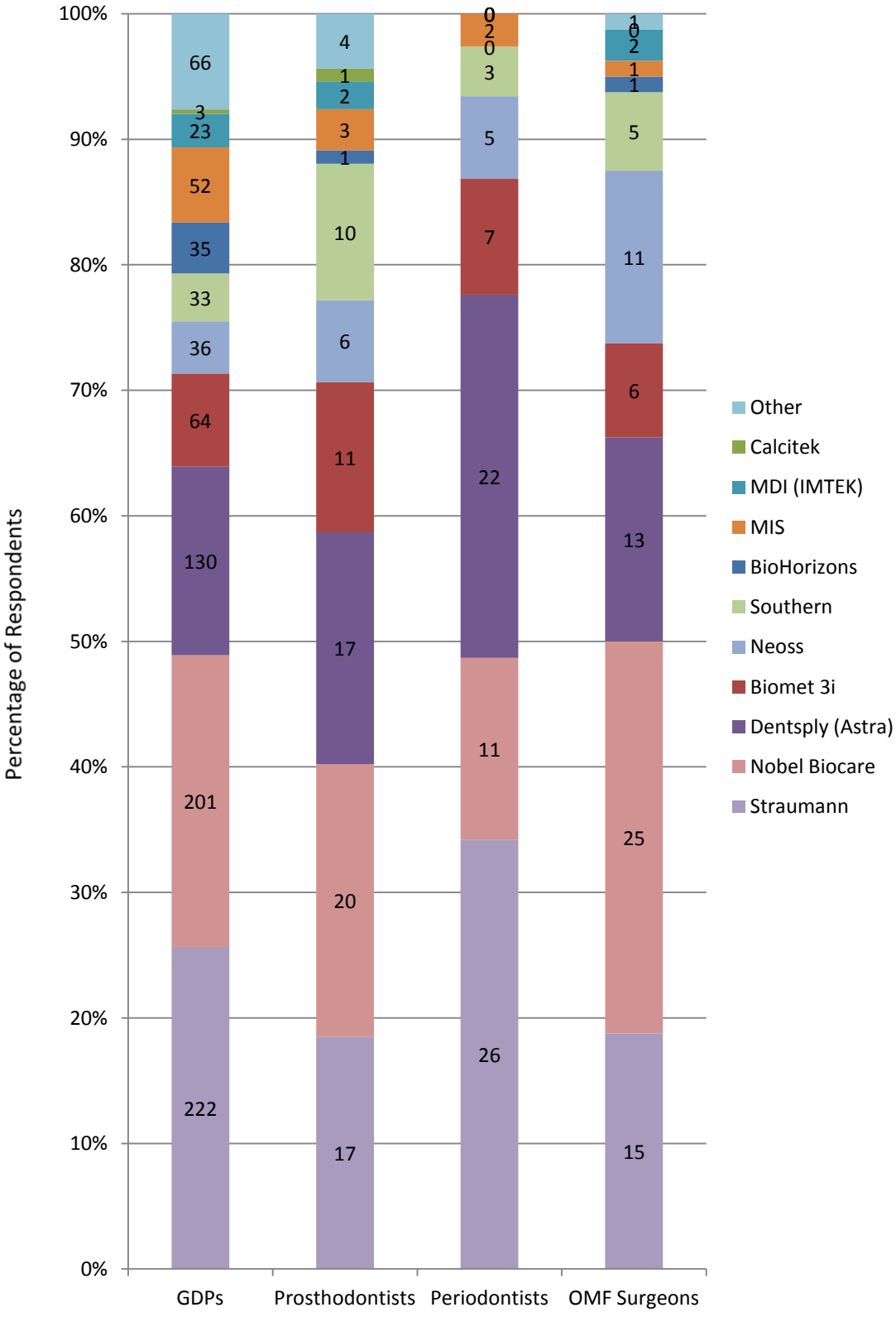
<u>Survey Question</u>: Which brand(s) of dental implant are you using most frequently? Please select all that apply.

The brands of dental implants used by all IP respondents are revealed in Table 3.26 and Figure 3.24. Multiple response options were allowed to cater for practitioners who utilise more than one brand of implant.

Table 3.26. Brands of Dental Implants Used by IP Respondents				
	GDPs	**Prosthodontists**	**Periodontists**	**OMF Surgeons**
BioHorizons™	35 (4.05%)	1 (1.09%)	0	1 (1.25%)
Biomet 3i™	64 (7.40%)	11 (11.96%)	7 (9.21%)	6 (7.50%)
Calcitek™	3 (0.35%)	1 (1.09%)	0	0
Dentsply (Astra)™	130 (15.03%)	17 (18.48%)	22 (28.95%)	13 (16.25%)
MDI (IMTEK)™	23 (2.66%)	2 (2.17%)	0	2 (2.5%)
MIS™	52 (6.01%)	3 (3.26)	2 (2.63%)	1 (1.25%)
Neoss™	36 (4.16%)	6 (6.52%)	5 (6.58%)	11 (13.75%)
Nobel Biocare™	201 (23.24%)	20 (21.74%)	11 (14.47%)	25 (31.25%)
Southern™	33 (3.82%)	10 (10.87%)	3 (3.95%)	5 (6.25%)
Straumann™	222 (25.66%)	17 (18.48%)	26 (34.21%)	15 (18.75%)
Other	66 (7.63%)	4 (4.35%)	0	1 (1.25%)
Total	**865***	**92***	**76***	**80***

** The total number of responses exceeds that of subjects due to multiple response choices made by some of them.*

Figure 3.24. Brands of Dental Implants Used by IP Respondents



There is little doubt that, in terms of pure quantities, the two dominant brands of implants used by all IP respondents are Nobel Biocare™ and Straumann™. Interestingly, while GDPs and prosthodontists appear to demonstrate similar degrees of preferences for both, the utilisation pattern is reversed between periodontists and OMF surgeons with the former preferring Straumann™ and latter Nobel Biocare™.

Dentsply (Astra)™ is another major player in the field, being used as equally frequently as Straumann™ by prosthodontists and twice as often as Nobel Biocare™ by periodontists. However, its use by GDPs, the most numerous group, is easily eclipsed by these two brands.

Biomet 3i™, Neoss™ and Southern™ should also be mentioned as the next three most popular brands across all four respondent groups.

<u>Survey Question</u>: Which method do you use most often to acquire impressions of implant fixtures and/or abutments in the case of a single tooth replacement?

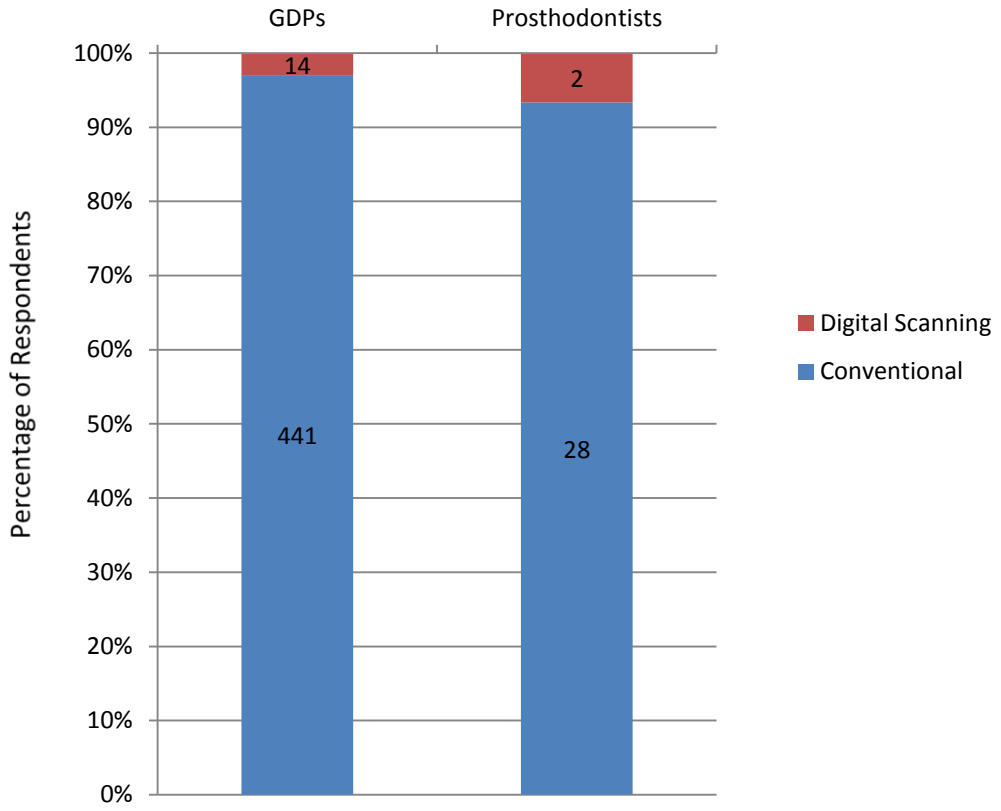
The primary methods of impression acquisition for fixtures and/or abutments by IP GDPs and prosthodontists were also investigated for various types of prostheses. The respondents were presented with a choice of either "Conventionally (i.e. using impression trays and elastomeric materials)" or "Digital Scanning".

Table 3.27 and Figure 3.25 display the most frequently employed means of impression acquisition by GDPs and prosthodontists for single-implant-supported crowns.

Table 3.27. Most Frequent Impression Acquisition Methods Used by IP GDPs and Prosthodontists for Single-implant-supported Crowns

	GDPs	Prosthodontists
Conventional	441 (96.92%)	28 (93.33%)
Digital Scanning	14 (3.08%)	2 (6.67%)
Total	**455**	**30**

Figure 3.25. Most Frequent Impression Acquisition Methods Used by IP GDPs and Prosthodontists for Single-implant-supported Crowns



It seems that the routine use of digital scanning for impression acquisition has yet to permeate the practice of implant dentistry to a significant extent, since only 3.08% of GDPs and 6.67% of prosthodontists have reported using it as their predominant method. However, these figures do not necessarily imply that digital scanning is not employed more often in reality, since the survey question only requested the most frequently used method for impression acquisition. It is quite likely that some of the respondents employ both conventional means and digital scanning, switching from one to the other based on the individual conditions associated with each clinical case. At this point, what can be certainly observed is that digital scanning has yet to become the mainstream approach for impression acquisition in implant dentistry.

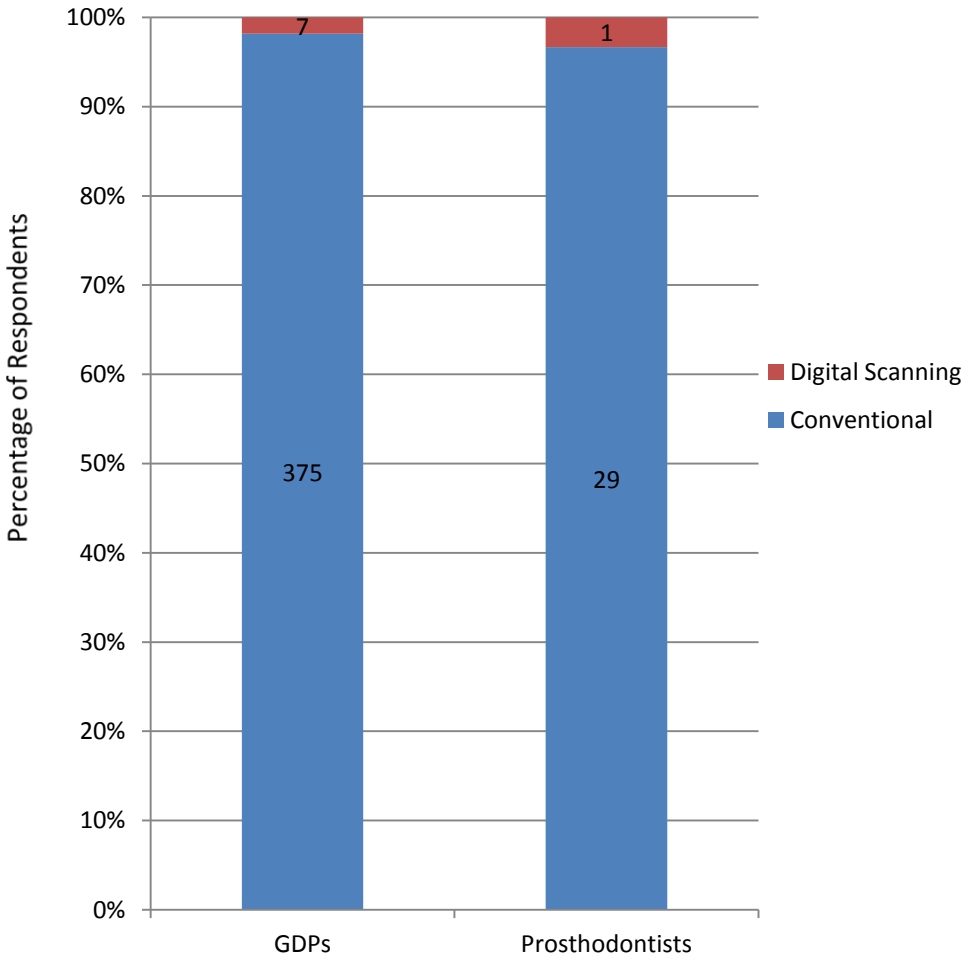
<u>Survey Question</u>: Which method do you use most often to acquire impressions of implant fixtures and/or abutments in the case of a multiple-implant bridge (non-full-arch)?

Table 3.28 and Figure 3.26 outline the most frequently used means of impression acquisition by IP GDPs and prosthodontists for multiple-implant-supported non-full-arch bridges.

Table 3.28. Most Frequent Impression Acquisition Methods Used by IP GDPs and Prosthodontists for Multiple-implant-supported Non-full-arch Bridges

	GDPs	Prosthodontists
Conventional	375 (98.17%)	29 (96.67%)
Digital Scanning	7 (1.83%)	1 (3.33%)
Total	**382**	**30**

Figure 3.26. Most Frequent Impression Acquisition Methods Used by IP GDPs and Prosthodontists for Multiple-implant-supported Non-full-arch Bridges



The percentages of GDPs and prosthodontists who use digital scanning as their primary means of impression acquisition for non-full-arch multiple-implant bridges are half of their counterpart values for single-implant-supported crowns. Digital scanning is used less often for bridge impressions possibly because of additional challenges associated with the need to capture a larger impression area containing a greater number of associated tissue structures

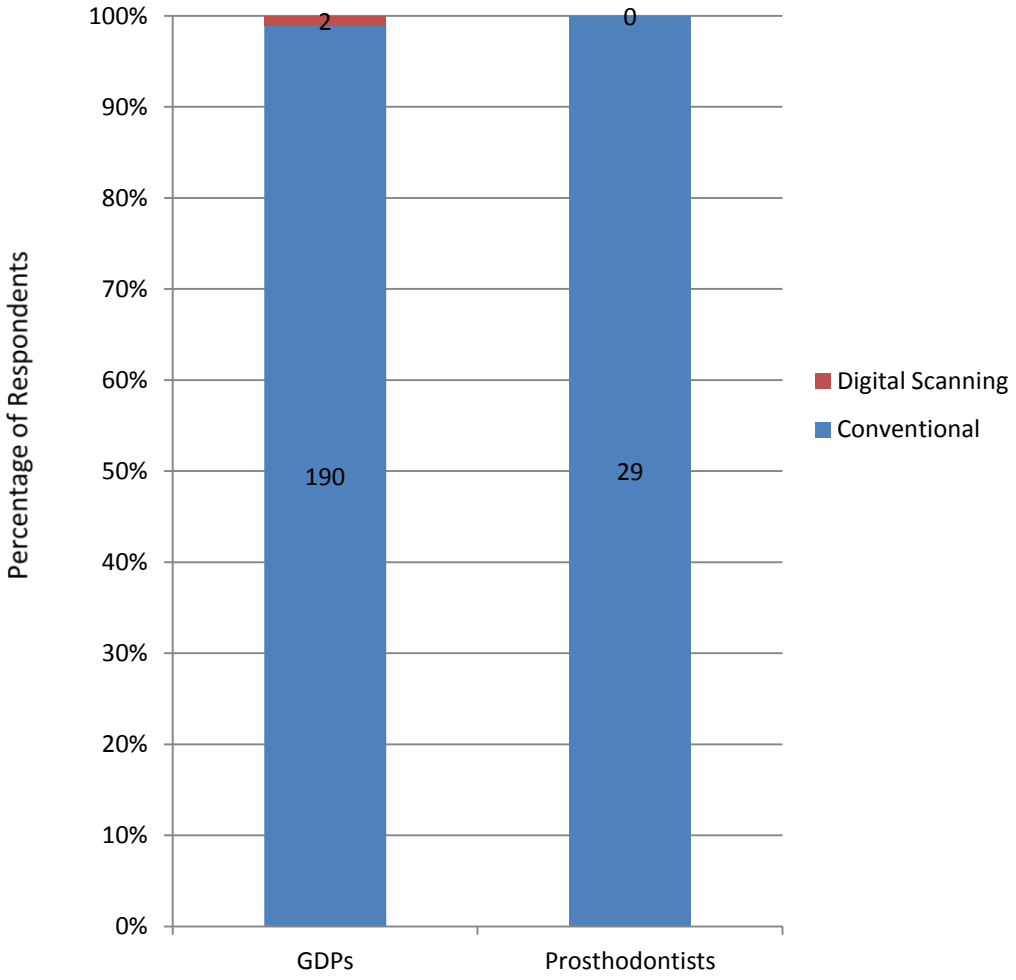
<u>Survey Question</u>: Which method do you use most often to acquire impressions of implant fixtures and/or abutments in the case of a full-arch fixed prosthesis?

Table 3.29 and Figure 3.27 reveal the most frequently used means of impression acquisition by IP GDPs and prosthodontists in cases involving full-arch implant-supported fixed prostheses.

Table 3.29. Most Frequent Impression Acquisition Methods Used by IP GDPs and Prosthodontists for Full-arch Implant-supported Fixed Prostheses

	GDPs	Prosthodontists
Conventional	190 (98.96%)	29 (100%)
Digital Scanning	2 (1.04%)	0
Total	**192**	**29**

Figure 3.27. Most Frequent Impression Acquisition Methods Used by IP GDPs and Prosthodontists for Full-arch Implant-supported Fixed Prosthses



It is somewhat puzzling that two of the GDP respondents have reported using digital scanning as their main method of impression acquisition for full-arch fixed implant-supported prostheses. It is understood that scanning an entire dental arch intraorally to a degree sufficiently accurate for precise construction and fitting of a full-arch prosthesis would theoretically require the scanner to be placed in different regions of the oral cavity at various angles, which would be highly difficult as well as time-consuming to accomplish. It may be possible for these two respondents to be referring to the digital scanning of their full-arch impressions instead.

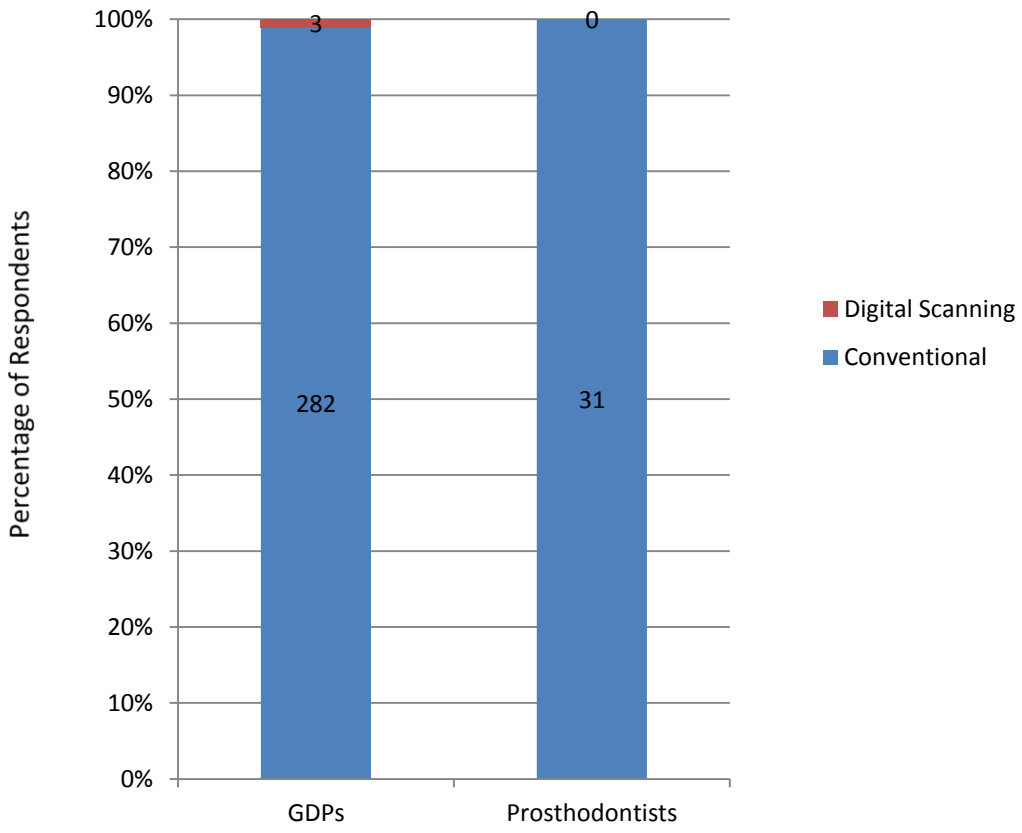
<u>Survey Question</u>: Which method do you use most often to acquire impressions of implant fixtures and/or abutments in the case of an implant-retained overdenture?

Table 3.30 and Figure 3.28 present the most often used means of impression acquisition by IP GDPs and prosthodontists in cases of implant-retained overdentures.

Table 3.30. Most Frequent Impression Acquisition Methods Used by IP GDPs and Prosthodontists for Implant-retained Overdentures

	GDPs	Prosthodontists
Conventional	282 (98.95%)	31 (100%)
Digital Scanning	3 (1.05%)	0
Total	**285**	**31**

Figure 3.28. Most Frequent Impression Acquisition Methods Used by IP GDPs and Prosthodontists for Implant-retained Overdentures



Once again, the fact that there are any practitioners at all reportedly using digital scanning routinely to acquire full-arch-type impressions is baffling. Nonetheless, the primary message conveyed by Tables 3.27 to 3.30 and Figures 3.25 to 3.28 is that the conventional approach of impression acquisition involving trays and elastomeric materials remains the predominant technique in implant dentistry by an overwhelming margin.

<u>Survey Question</u>: If you acquire your impressions conventionally, please indicate the type of impression tray and impression technique you would use most often in the case of a single tooth replacement.

Respondents who acquired impressions conventionally were also offered the option of elaborating on their styles in terms of the types of impression tray (i.e. 'Open' or 'Closed') used and actual techniques (i.e. 'Pick-up' or 'Transfer') practised. In this context, an 'open tray' refers to an impression tray on whose body an opening has been made to allow exposure and manipulation of the impression coping apparatus; while a 'closed tray' has no such opening. A 'pick-up' impression refers to an impression that has the impression coping attached to it on setting and removal from the mouth resulting in the coping being effectively 'picked up' by the set impression material. In contrast, a 'transfer' impression does not bring the impression coping with it on withdrawal from the mouth, leaving the coping to be separately 'transferred' onto the impression at a later stage. Traditionally, open trays are usually used in conjunction with the 'pick-up' technique, while closed trays are associated with 'transfer' (Lee *et al.* 2008).

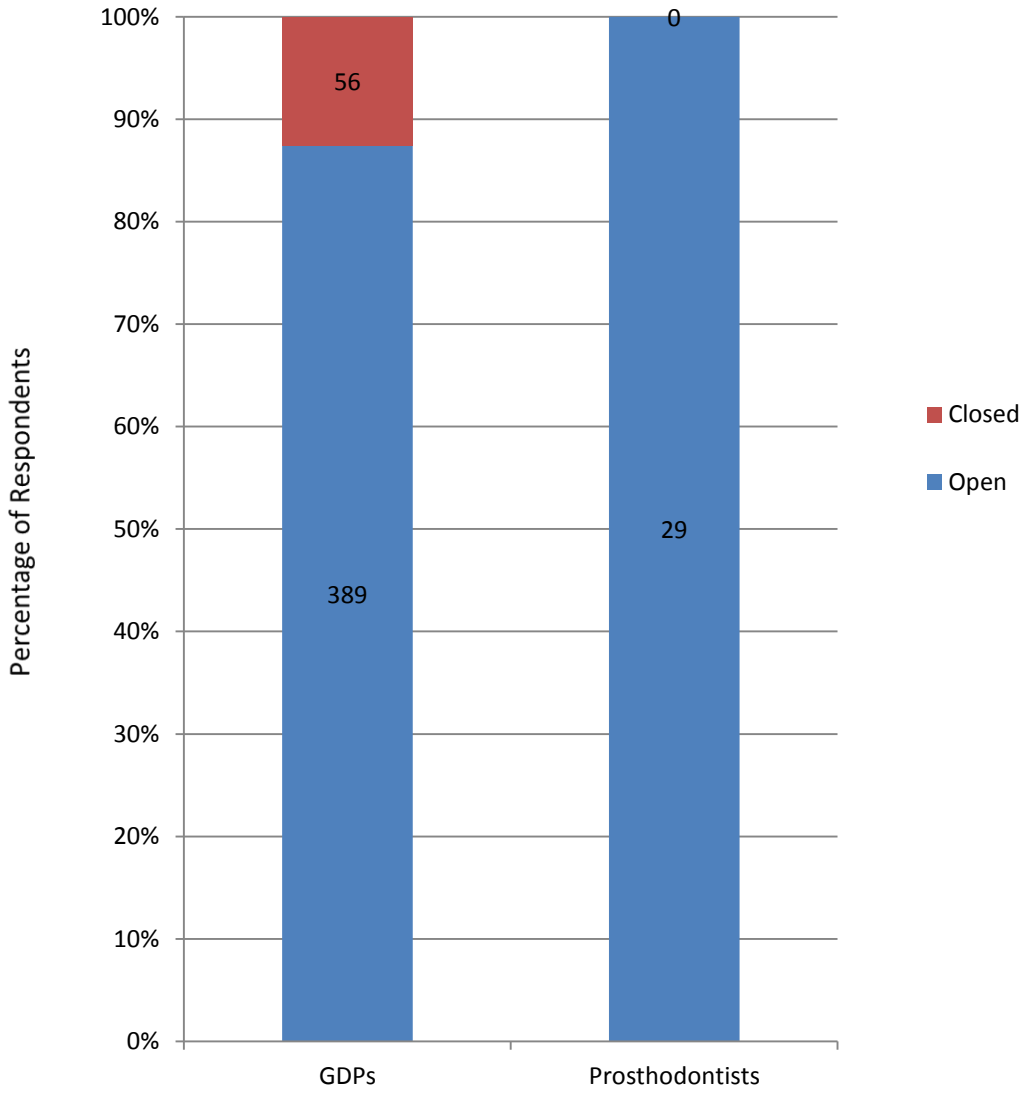
Unfortunately, the above definitions were thought to be assumed knowledge and therefore not provided to respondents in the surveys, which resulted in some uncertainty concerning the meanings of the terms used. This became evident in the feedback received from a number of participants. Consequently, the data collected in Tables 3.31 to 3.38 and Figures 3.29 to 3.36 below may not be a true representation of the respondents' actual practice, and therefore serve as a very approximate indication only.

Table 3.31 and Figure 3.29 reveal the most frequently used types of impression trays by IP GDPs and prosthodontists for single-implant-supported crowns:

Table 3.31. Most Frequently Used Types of Impression Trays by IP GDPs and Prosthodontists for Single-implant-supported Crowns

	GDPs	Prosthodontists
Open	389 (87.42%)	29 (100%)
Closed	56 (12.58%)	0
Total	**445**	**29**

Figure 3.29. Most Frequently Used Types of Impression Trays by IP GDPs and Prosthodontists for Single-implant-supported Crowns



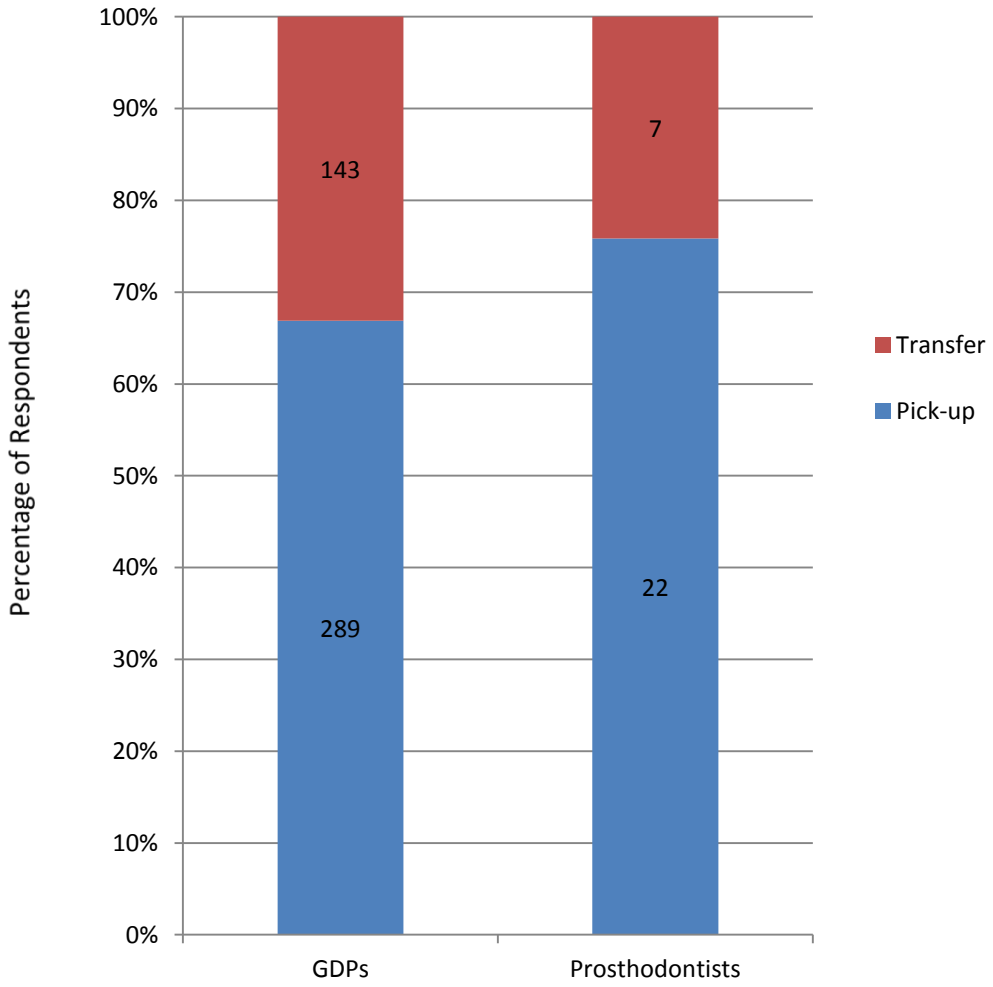
Open impression trays appear to be the preferred type by both GDPs and prosthodontists by far, with 87.42% of the former and all of the latter indicating their tendency to use it in cases of single-implant-supported crowns.

Table 3.32 and Figure 3.30 present the most frequently employed conventional impression techniques by IP GDPs and prosthodontists for single-implant-supported crowns:

Table 3.32. Most Frequently Used Conventional Impression Techniques by IP GDPs and Prosthodontists for Single-implant-supported Crowns

	GDPs	Prosthodontists
Pick-up	289 (66.90%)	22 (75.86%)
Transfer	143 (33.10%)	7 (24.14)
Total	**432**	**29**

Figure 3.30. Most Frequently Used Conventional Impression Techniques by IP GDPs and Prosthodontists for Single-implant-supported Crowns



The pick-up impression technique seems to be used more frequently by both GDPs and prosthodontists, with approximately two thirds of the former and three quarters of the latter subscribing to it.

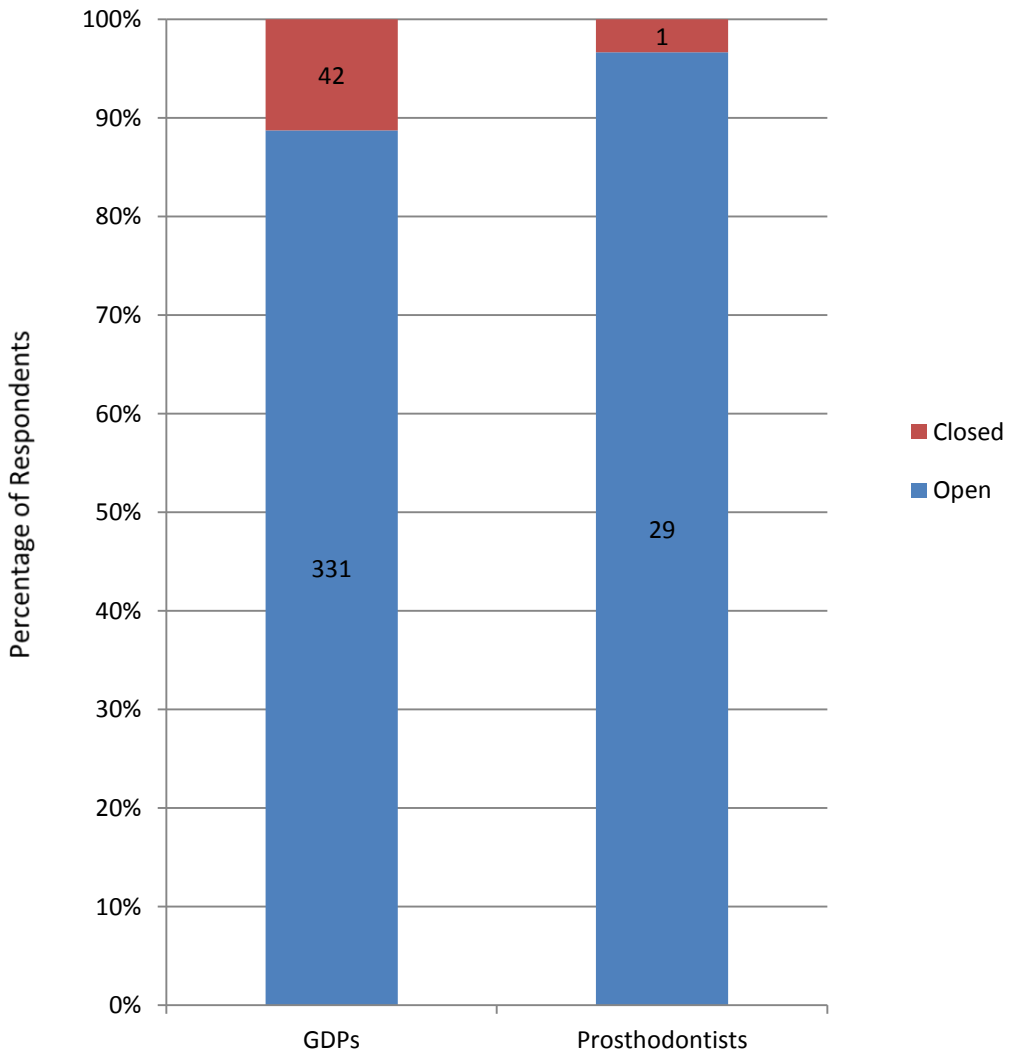
<u>Survey Question</u>: If you acquire your impressions conventionally, please indicate the type of impression tray and impression technique you would use most often in the case of a multiple-implant bridge (non-full-arch).

Table 3.33 and Figure 3.31 show the most frequently used types of impression trays by IP GDPs and prosthodontists in cases involving multiple-implant-supported non-full-arch bridges:

Table 3.33. Most Frequently Used Types of Impression Trays by IP GDPs and Prosthodontists for Multiple-implant-supported Non-full-arch Bridges

	GDPs	Prosthodontists
Open	331 (88.74%)	29 (96.67%)
Closed	42 (11.26%)	1 (3.23%)
Total	**373**	**30**

Figure 3.31. Most Frequently Used Types of Impression Trays by IP GDPs and Prosthodontists for Multiple-implant-supported Non-full-arch Bridges



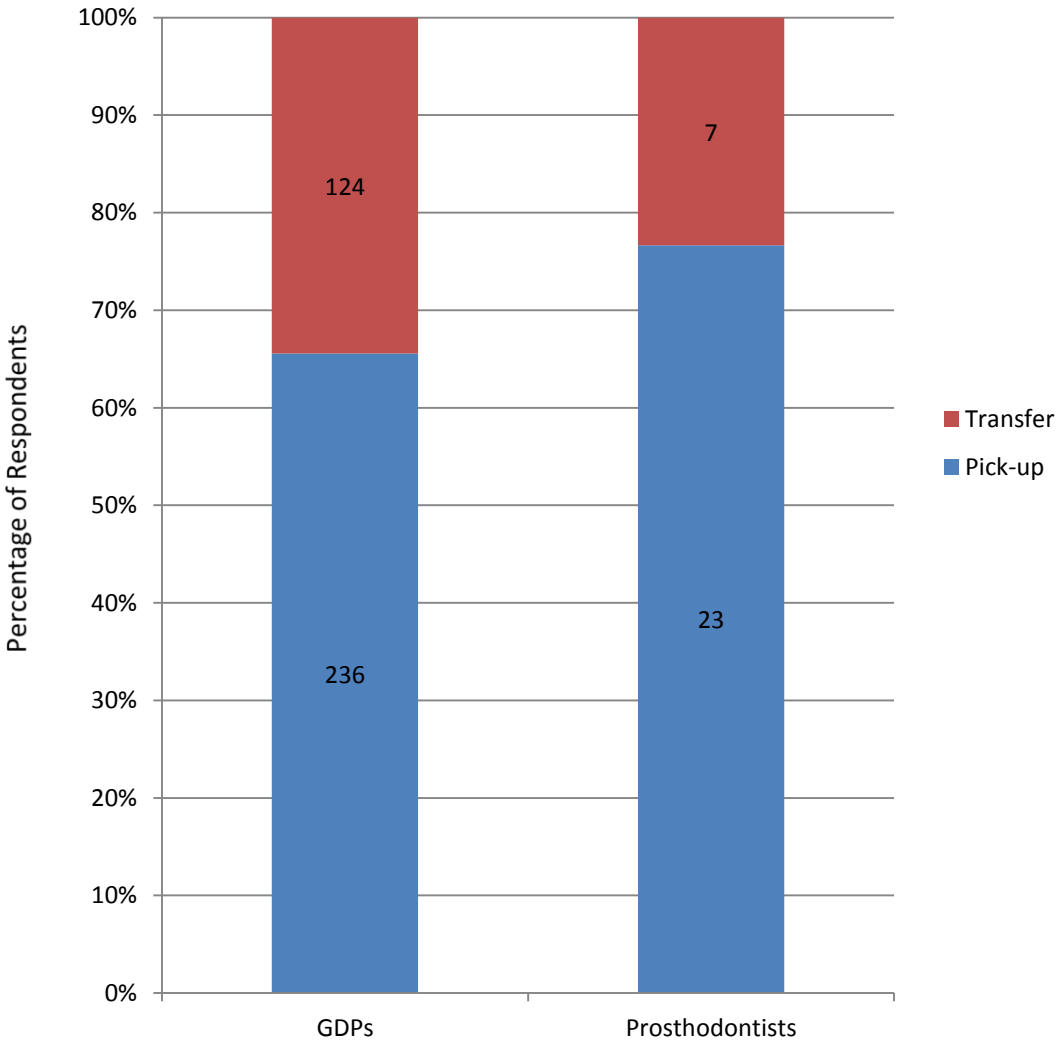
The trend here is reminiscent of that for single-implant-supported crowns, with open impression trays constituting an overwhelming majority in both groups of practitioners.

Table 3.34 and Figure 3.32 display the most frequently employed conventional impression techniques by IP GDPs and prosthodontists in cases involving multiple-implant-supported non-full arch bridges:

Table 3.34. Most Frequently Used Conventional Impression Techniques by IP GDPs and Prosthodontists for Multiple-implant-supported Non-full-arch Bridges

	GDPs	Prosthodontists
Pick-up	236 (65.56%)	23 (76.67%)
Transfer	124 (34.44%)	7 (23.33%)
Total	**360**	**30**

Figure 3.32. Most Frequently Used Conventional Impression Techniques by IP GDPs and Prosthodontists for Multiple-implant-supported Non-full-arch Bridges



Once again, a pattern displaying the predominance of the pick-up impression technique is observed here across both respondent groups. The proportions here greatly resemble those pertaining to single crowns.

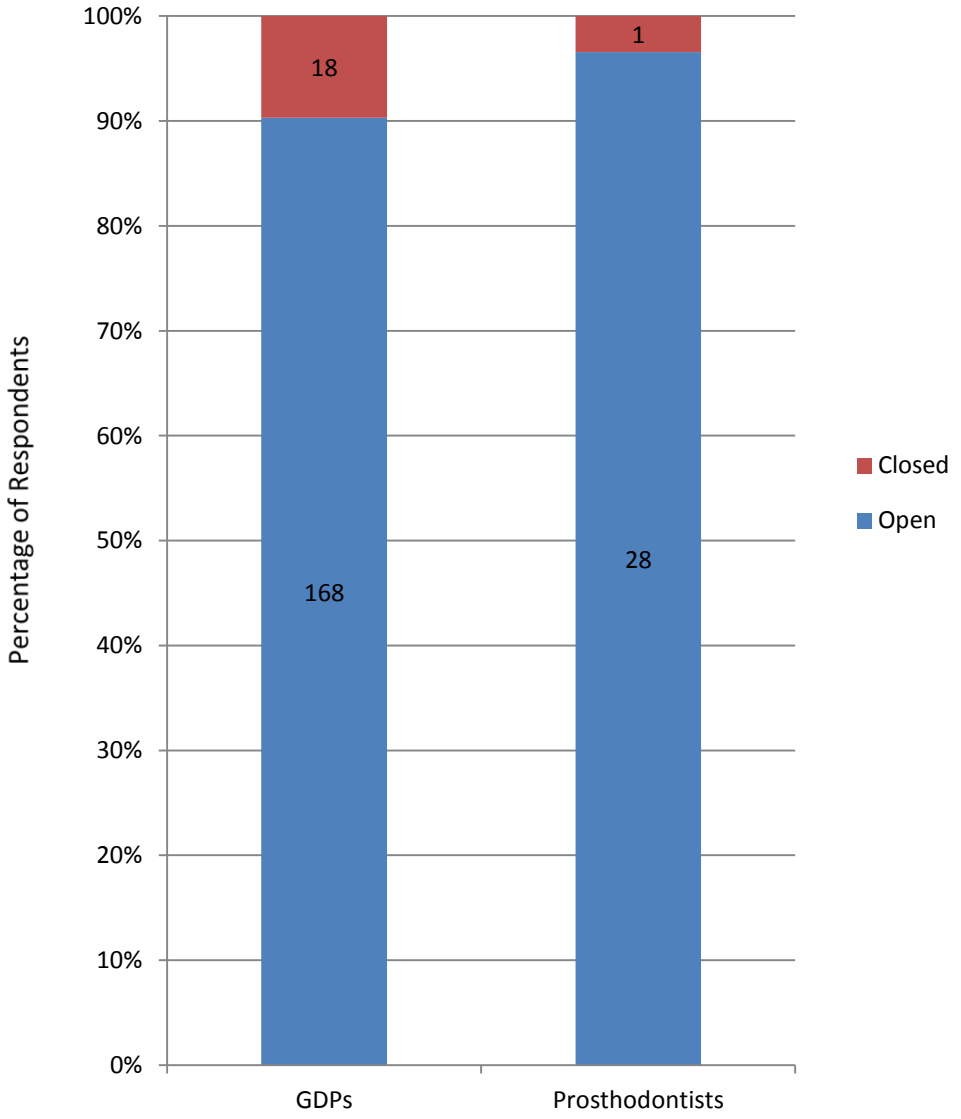
<u>Survey Question</u>: If you acquire your impressions conventionally, please indicate the type of impression tray and impression technique you would use most often in the case of a full-arch fixed prosthesis.

Table 3.35 and Figure 3.33 depict the most frequently used types of impression trays by IP GDPs and prosthodontists in cases involving full-arch implant-supported fixed prostheses:

Table 3.35. Most Frequently Used Types of Impression Trays by IP GDPs and Prosthodontists for Full-arch Implant-supported Fixed Prostheses

	GDPs	Prosthodontists
Open	168 (90.32%)	28 (93.33%)
Closed	18 (9.68%)	1 (6.67%)
Total	**186**	**30**

Figure 3.33. Most Frequently Used Types of Impression Trays by IP GDPs and Prosthodontists for Full-arch Implant-supported Fixed Prostheses



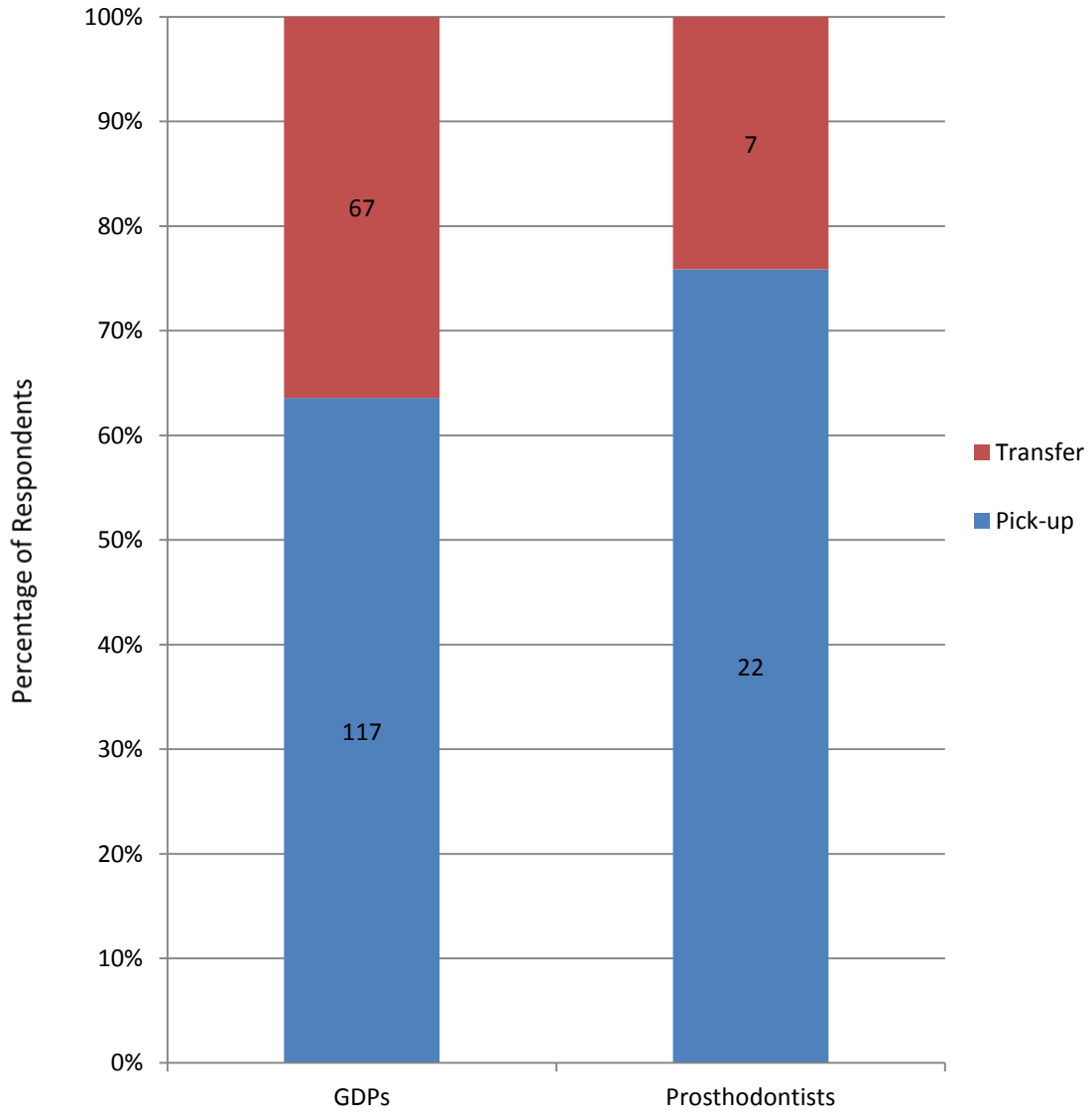
Again, open impression trays are clearly the favoured choice for both GDPs and prosthodontists in situations involving full-arch implant-supported fixed prostheses, having been selected by over 90% of these respondents.

Table 3.36 and Figure 3.34 reveal the most frequently employed conventional impression techniques by IP GDPs and prosthodontists in cases involving full-arch implant-supported fixed prostheses:

Table 3.36. Most Frequently Used Conventional Impression Techniques by IP GDPs and Prosthodontists for Full-arch Implant-supported Fixed Prostheses

	GDPs	Prosthodontists
Pick-up	117 (63.59%)	22 (75.86%)
Transfer	67 (36.41%)	7 (24.14%)
Total	**184**	**29**

Figure 3.34. Most Frequently Used Conventional Impression Techniques by IP GDPs and Prosthodontists for Full-arch Implant-supported Fixed Prostheses



It is interesting to note that even though the numbers of respondents may change from one clinical situation to the next (in this case, GDPs practising full-arch implant-supported fixed prostheses are considerably fewer than those involved in single-implant-supported crowns and bridges), the proportions of respondents belonging to each response category have so far curiously remained relatively consistent. The pick-up technique is preferred by

approximately two thirds of GDPs and three quarters of prosthodontists when acquiring impressions in cases of full-arch implant-supported fixed prostheses. This closely mirrors the corresponding percentages for the previous two types of prostheses.

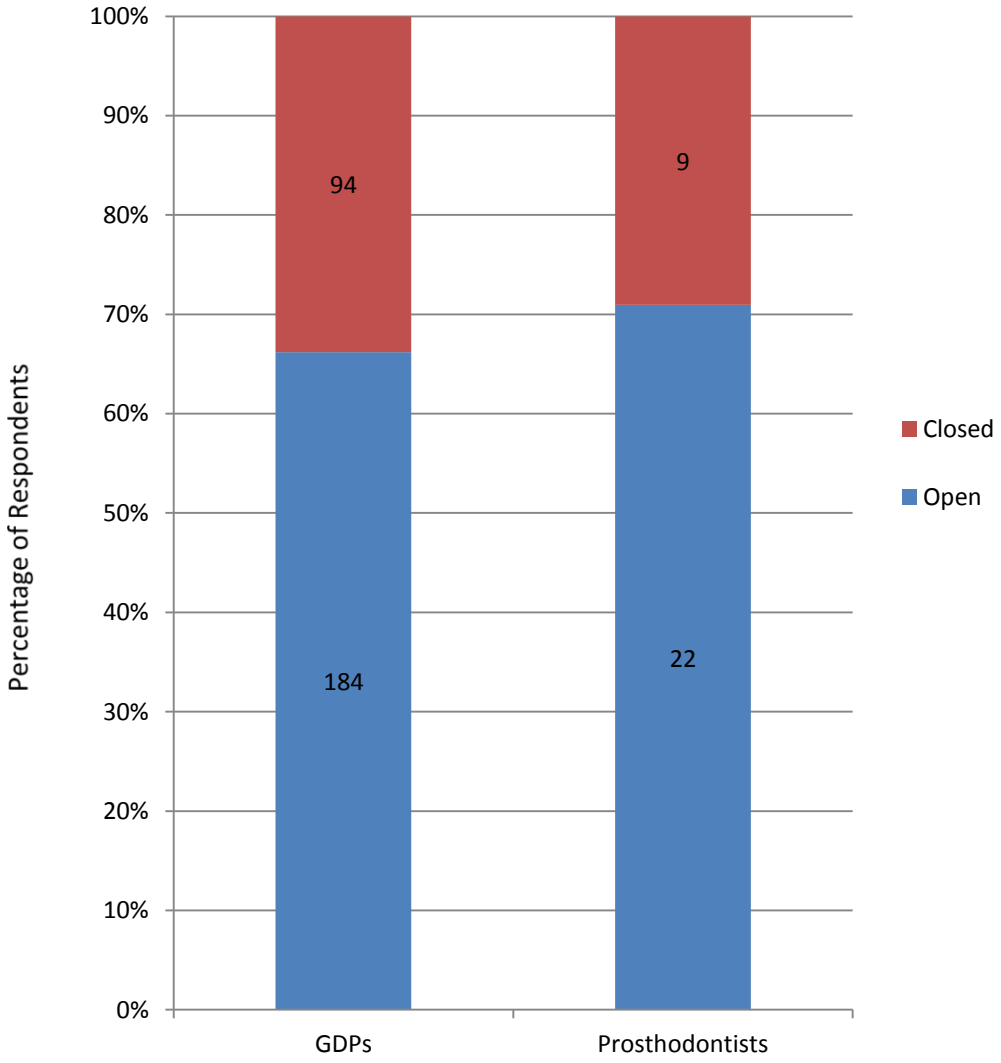
<u>Survey Question</u>: If you acquire your impressions conventionally, please indicate the type of impression tray and impression technique you would use most often in the case of an implant-retained overdenture.

Table 3.37 and Figure 3.35 present the most frequently used types of impression trays by IP GDPs and prosthodontists in cases involving implant-retained overdentures:

Table 3.37. Most Frequently Used Types of Impression Trays by IP GDPs and Prosthodontists for Implant-retained Overdentures

	GDPs	Prosthodontists
Open	184 (66.19%)	22 (70.97%)
Closed	94 (33.81%)	9 (29.03%)
Total	**278**	**31**

Figure 3.35. Most Frequently Used Types of Impression Trays by IP GDPs and Prosthodontists for Implant-retained Overdentures



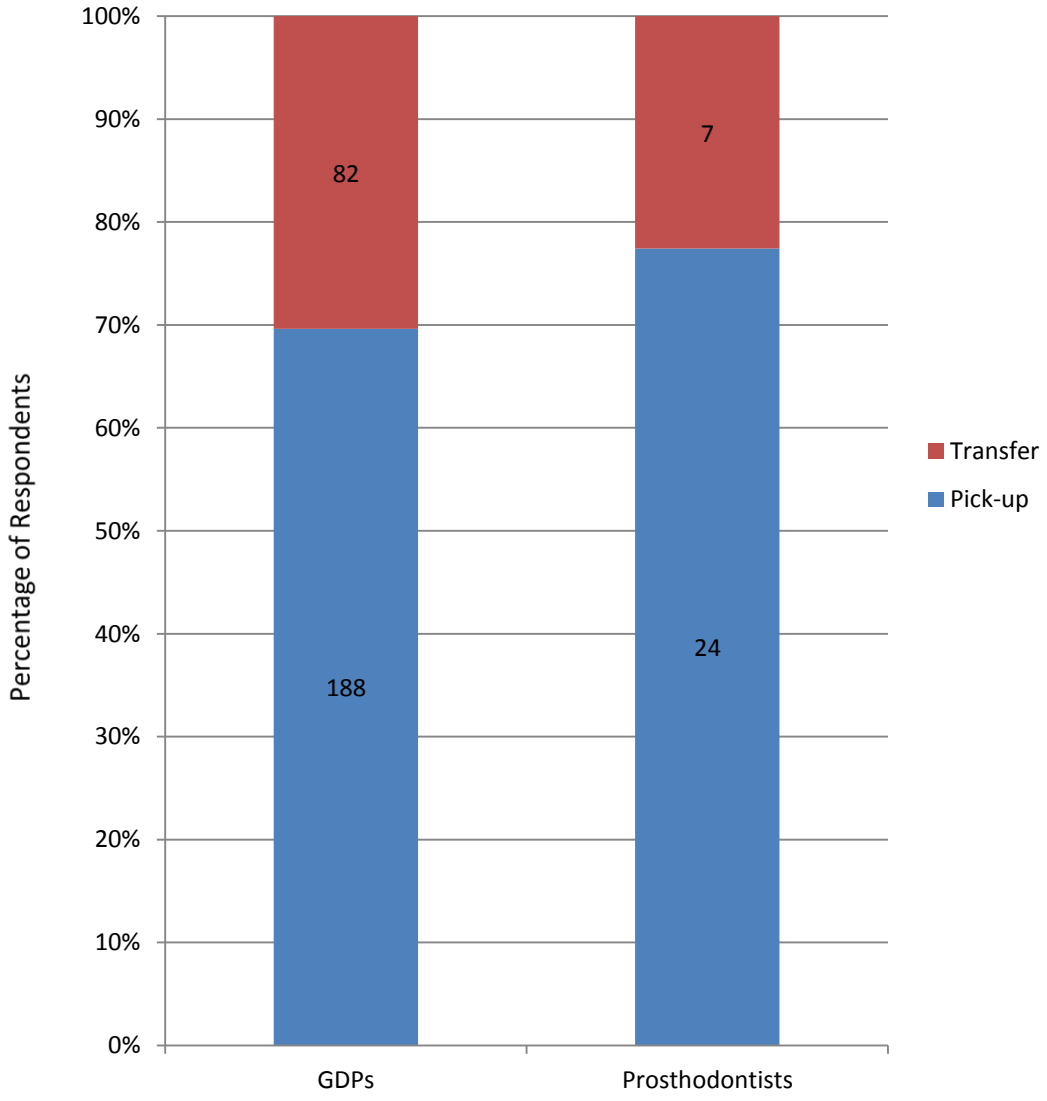
The percentages of GDPs and prosthodontists preferring open trays have fallen here compared with the previous prostheses. However, the status of open trays as the more prevalent option remains unchanged, being selected by approximately two thirds of the respondents as their most commonly utilised type.

Table 3.38 and Figure 3.36 illustrate the most frequently employed conventional impression techniques by IP GDPs and prosthodontists in cases involving implant-retained overdentures:

Table 3.38. Most Frequently Used Conventional Impression Techniques by IP GDPs and Prosthodontists for Implant-retained Overdentures

	GDPs	Prosthodontists
Pick-up	188 (69.63%)	24 (77.42%)
Transfer	82 (30.37%)	7 (22.58%)
Total	**270**	**31**

Figure 3.36. Most Frequently Used Conventional Impression Techniques by IP GDPs and Prosthodontists for Implant-retained Overdentures



The same pattern for impression techniques, which has persisted throughout, is again echoed in implant-retained overdentures. The pick-up method has emerged once more as the favoured option of both GDPs and prosthodontists in similar proportions.

Overall, despite a certain degree of unforeseen confusion over terminology generated by the failure to provide specific definitions for the terms ‘open’, ‘closed’, ‘pick-up’ and ‘transfer’, the key message conveyed by Tables 3.31 to 3.38 and Figures 3.29 to 3.36 is that open impression trays and the pick-up technique appear to be favoured by both GDPs and prosthodontists for all major types of implant-related prostheses.

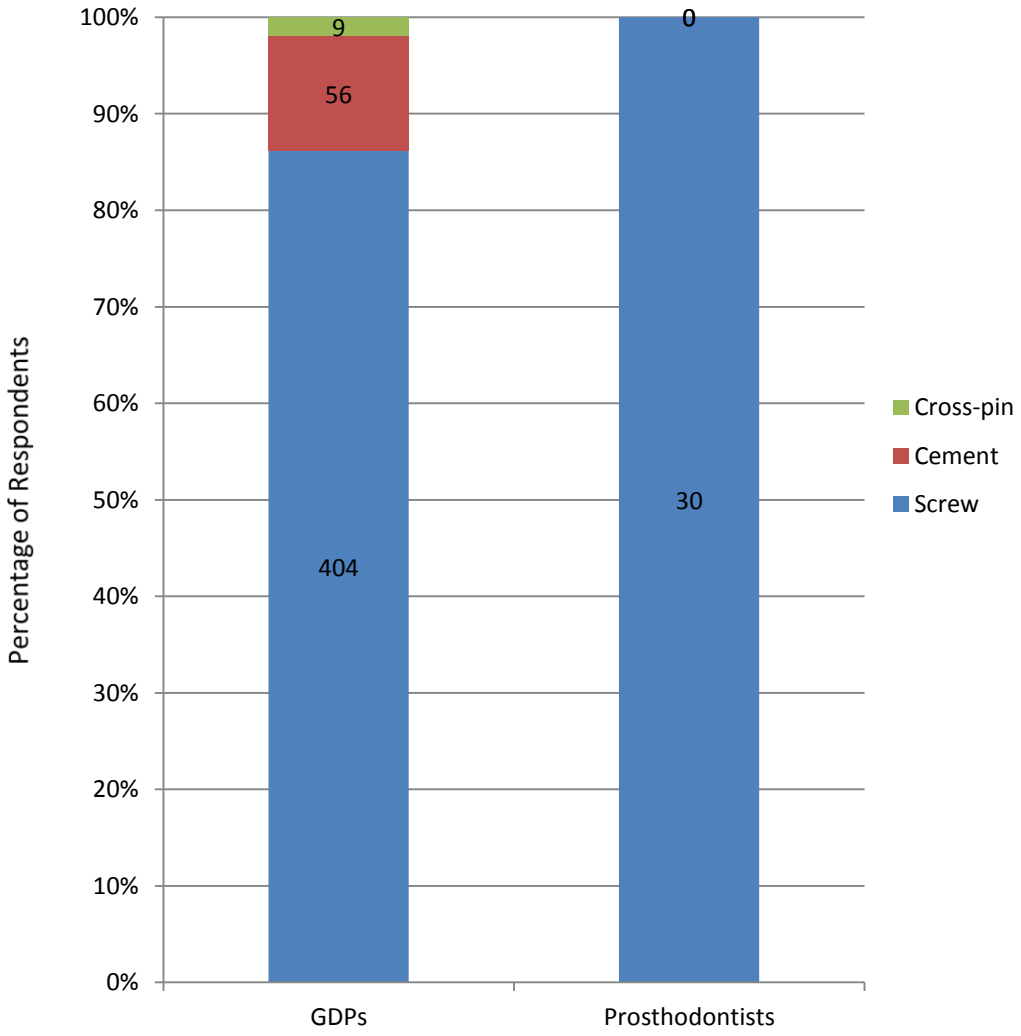
<u>Survey Question</u>: Please indicate the method of prosthesis retention you would ideally prefer in cases of single tooth replacements and multiple-implant bridges (non-full-arch).

With respect to the means of prosthesis retention in cases of single-implant-supported crowns and multiple-implant-supported non-full-arch bridges, the preferences of IP GDPs and prosthodontists are presented in Table 3.39 and Figure 3.37.

Table 3.39. Preferred Means of Prosthesis Retention by IP GDPs and Prosthodontists for Single-implant-supported Crowns

	GDPs	Prosthodontists
Screw	404 (86.14%)	30 (100%)
Cement	56 (11.94%)	0
Cross-pin	9 (1.92%)	0
Total	**469**	**30**

Figure 3.37. Preferred Means of Prosthesis Retention by IP GDPs and Prosthodontists for Single-implant-supported Crowns



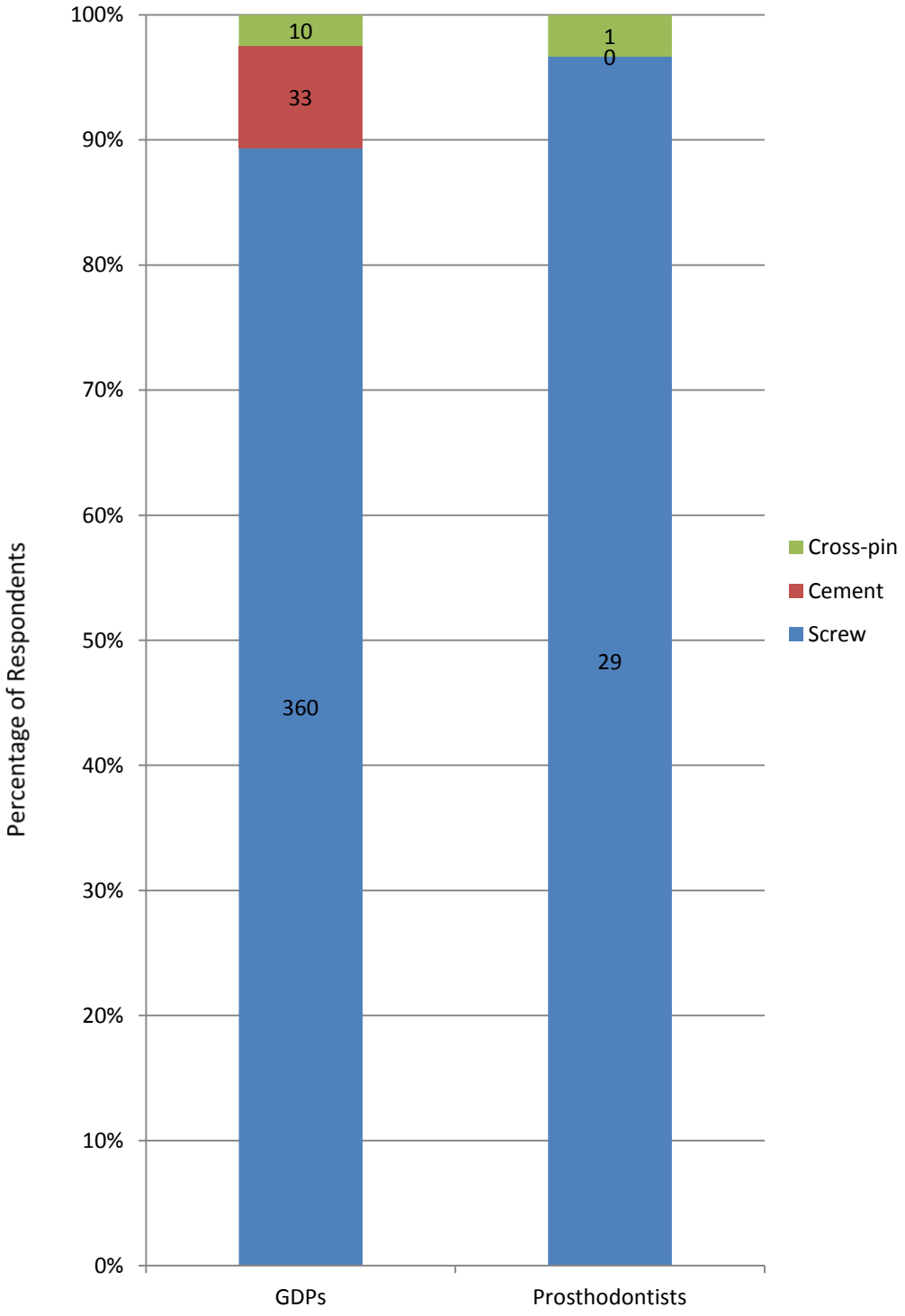
The great majority of GDPs (i.e. 86.14%) and all prosthodontists appear to prefer screw-retention for single-implant-supported crowns, possibly because this method offers relative ease of prosthesis retrieval should a repair or replacement be required. Only a very minor percentage of GDPs (i.e. less than 2%) have indicated preference for cross-pins.

The respondents' retention method preferences for non-full-arch multiple-implant-supported bridges are displayed in Table 3.40 and Figure 3.38.

Table 3.40. Preferred Means of Prosthesis Retention by IP GDPs and Prosthodontists for Multiple-implant-supported Non-full-arch Bridges

	GDPs	Prosthodontists
Screw	360 (89.33%)	29 (96.67%)
Cement	33 (8.19%)	0
Cross-pin	10 (2.48%)	1 (3.33%)
Total	**403**	**30**

Figure 3.38. Preferred Means of Supra-fixture Prosthesis Retention by IP GDPs and Prosthodontists for Multiple-implant-supported Non-full-arch Bridges



The retention method preference patterns are largely similar for implant-supported bridges and crowns across both respondent groups. There appears to be a slight reduction in the preference for cement within the GDP group for bridges compared with crowns, which only serves to highlight the popularity of retention by screws for fixed implant-supported prostheses.

<u>Survey Question</u>: Which type(s) of dental laboratory are you employing for implant-related prosthetic work? Please select all that apply.

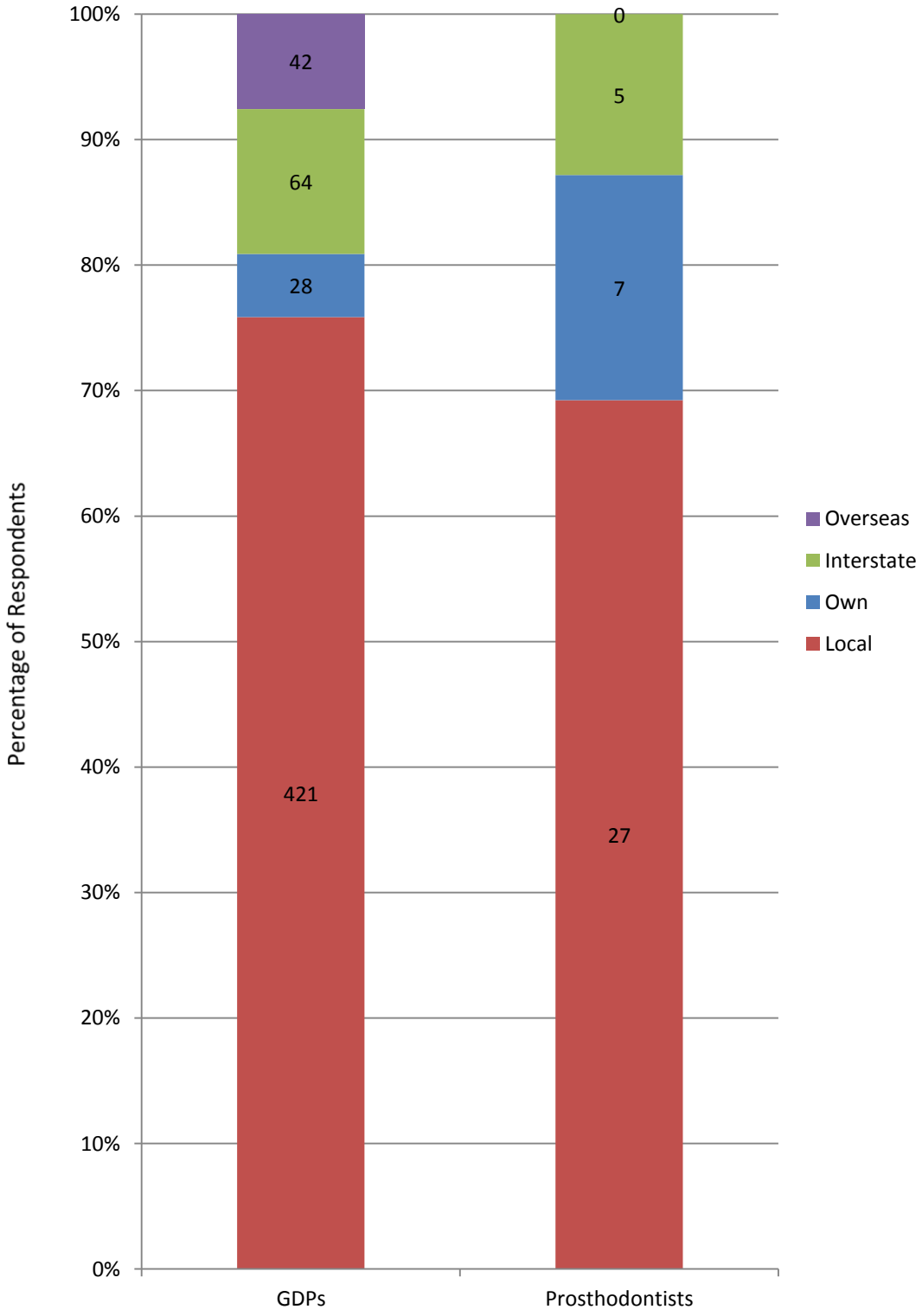
IP GDPs and prosthodontists were also asked about the types of dental laboratories they utilised for implant-associated prosthetic work. Multiple responses were allowed here since some practitioners may prefer to employ more than one type of laboratory depending on the nature of the work involved. Table 3.41 and Figure 3.39 outline the participants' responses:

Table 3.41. Types of Dental Laboratories Employed by IP GDPs and Prosthodontists for Implant-related Prosthetic Work

	GDPs	Prosthodontists
Own	28 (5.05%)	7 (17.95%)
Local	421 (75.86%)	27 (69.23%)
Interstate	64 (11.53%)	5 (12.82%)
Overseas	42 (7.57%)	0
Total	**555***	**39***

** The total number of responses exceeds that of subjects due to multiple response choices made by some of them.*

Figure 3.39. Types of Dental Laboratories Employed by IP GDPs and Prosthodontists for Implant-related Prosthetic Work



Local dental laboratories occupy approximately three quarters of GDPs' and two thirds of prosthodontists' responses, establishing it as the mainstream option for both groups of practitioners. At 11.53% and 12.82% for GDPs and prosthodontists, respectively, interstate laboratories seem to be equally popular among members of both groups.

Prosthodontists appear to demonstrate a greater tendency to use their own personal laboratories than GDPs, as indicated by the threefold higher percentage of such laboratories in that group. The reasons for this may be twofold: 1) the additional training and experience in laboratory prosthetic procedures are undertaken as an integral part of prosthodontic specialty education, allowing prosthodontists to gain greater competence and confidence in this respect; 2) prosthodontists are likely to practise a larger quantity of prosthodontic procedures than GDPs, and would therefore have a greater use for a laboratory of their own.

Another difference between GDPs and prosthodontists lies in their use of overseas laboratories, which constitutes 7.57% of GDPs' choices but was selected by none of the prosthodontists'.

<u>Survey Question</u>: For a single implant-supported prosthesis in an ungrafted site in the upper anterior region, in an otherwise fit and healthy 30-year-old patient with an Angle Class I occlusal scheme, what would you believe to be the chance of having the patient return 10 years after insertion with:

A) **The implant being mobile and in need of removal?**

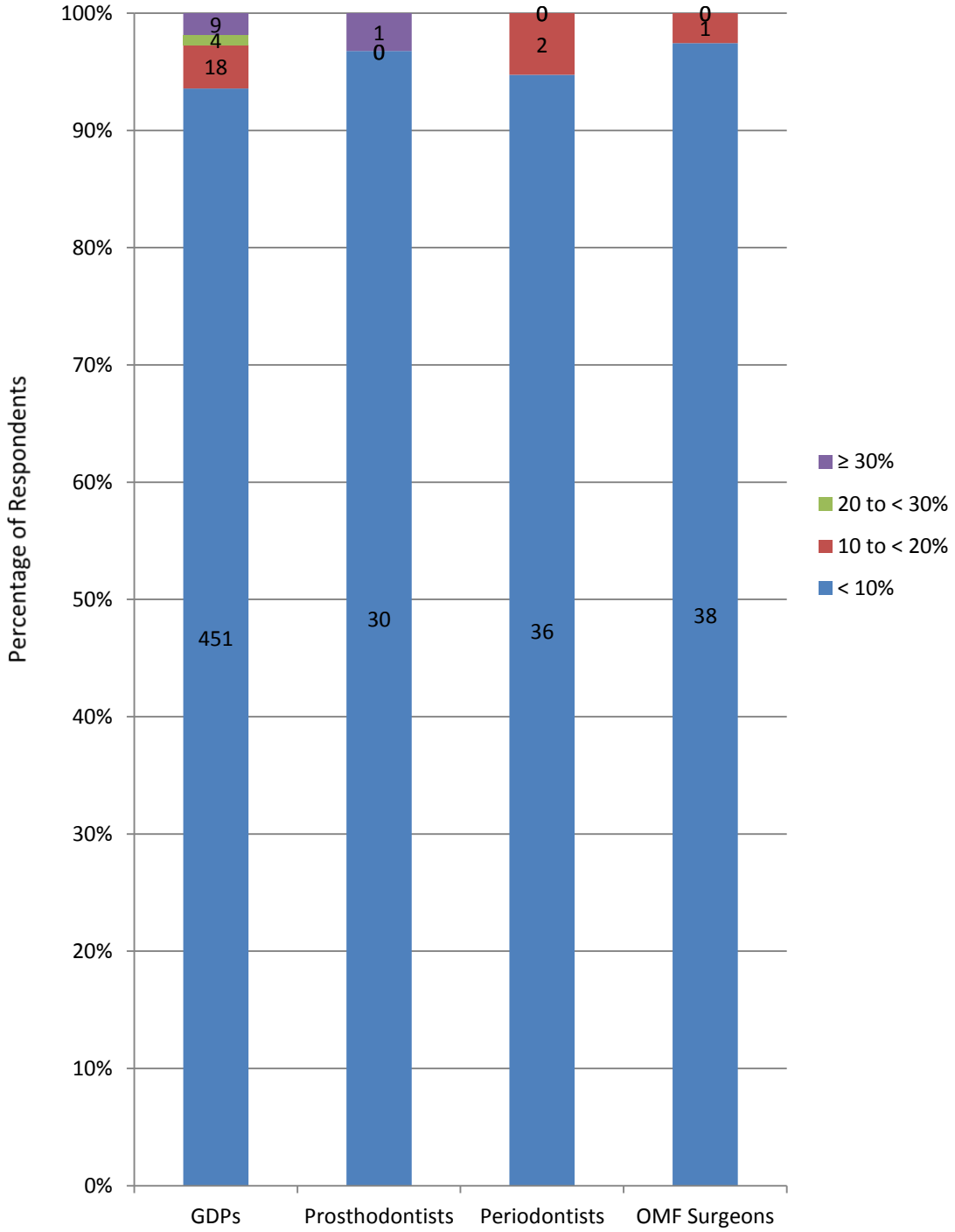
B) **The prosthetic component(s) being damaged and in need of replacement?**

All implant-practising respondents were presented with the above hypothetical clinical scenario, which was designed to elicit their individual opinions regarding some contentious issues in implant dentistry. Table 3.42 and Figure 3.40 summarise the respondents' estimations of the risk of having the patient return ten years after prosthesis insertion with the implant being mobile and in need of replacement:

Table 3.42. Clinical Scenario: Estimated Risk by IP Respondents of Implant Being Mobile and Needing Replacement 10 Years After Prosthesis Insertion

	GDPs	Prosthodontists	Periodontists	OMF Surgeons
< 10%	451 (93.57%)	30 (96.77%)	36 (94.74%)	38 (97.44%)
10 – 19%	18 (3.73%)	0	2 (5.26%)	1 (2.56%)
20 – 29%	4 (0.83%)	0	0	0
≥ 30%	9 (1.87%)	1 (3.23%)	0	0
Total	**482**	**31**	**38**	**39**

Figure 3.40. Clinical Scenario: Estimated Risk by IP Respondents of Implant Being Mobile and Needing Replacement 10 Years After Prosthesis Insertion



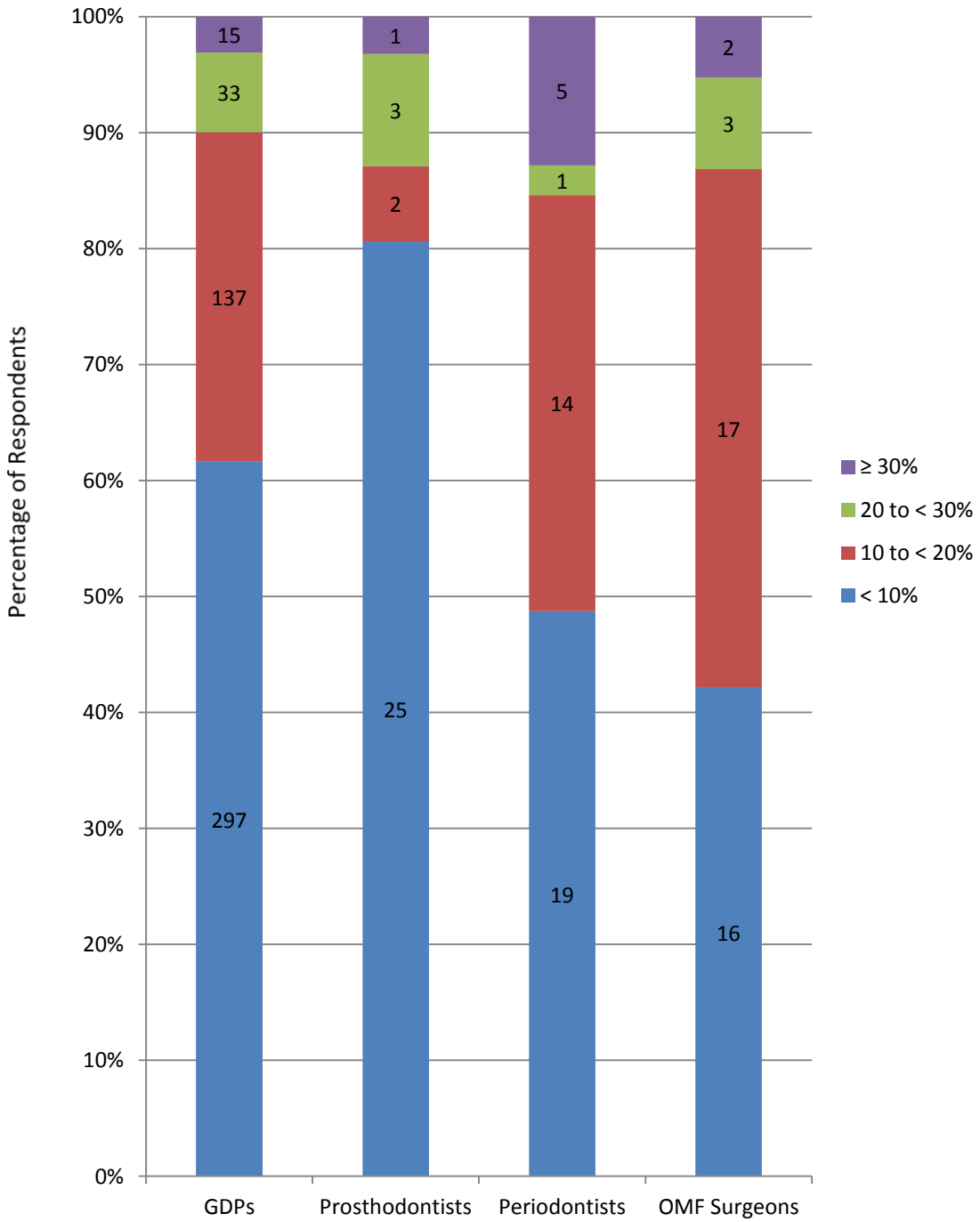
The most prominent feature is that all respondents appear to exhibit a high level of faith in the ability of an implant to remain in situ after ten years of function. Well over 90% of each respondent group indicated that they believe the risk of experiencing a complete failure of the fixture within ten years to be below 10%. Interestingly, a minute proportion of respondents, represented by nine GDPs and one single prosthodontist, lie at the opposite end of the spectrum believing the risk of total fixture failure to be 30% or greater after ten years.

Table 3.43 and Figure 3.41 summarise the respondents' estimations of the risk of having the patient return ten years after prosthesis insertion with the prosthetic component being damaged and in need of replacement.

Table 3.43. Clinical Scenario: Estimated Risk by IP Respondents of Prosthesis Being Damaged and Needing Replacement 10 Years After Prosthesis Insertion

	GDPs	Prosthodontists	Periodontists	OMF Surgeons
< 10%	297 (61.62%)	25 (80.65%)	19 (48.72%)	16 (42.11%)
10 – 19%	137 (28.42%)	2 (6.45%)	14 (35.90%)	17 (44.74%)
20 – 29%	33 (6.85%)	3 (9.68%)	1 (2.56%)	3 (7.89%)
≥ 30%	15 (3.11%)	1 (3.23%)	5 (12.82%)	2 (5.26%)
Total	**482**	**31**	**39**	**38**

Figure 3.41. Clinical Scenario: Estimated Risk by IP Respondents of Prosthesis Being Damaged and Needing Replacement 10 Years After Prosthesis Insertion



In contrast to their attitude towards the implant, the respondents exhibited mixed but generally less optimistic feelings regarding the ten-year performance of the prosthetic component. While the majority of GDPs and prosthodontists (i.e. 61.62% and 80.65%, respectively) believe the risk of a major prosthetic complication to be less than 10% over ten years, other practitioners appear appreciably less optimistic. Less than half of periodontists and OMF surgeons share this view, while more than one third of the former and nearly half of the latter estimate the risk to be between ten and twenty percent. A chi-square test indicates differences to be significant at $p < 0.05$ ($\chi^2 = 12.41$, d.o.f. = 1, $p < 0.01$). The more pessimistic opinions of periodontists and OMF surgeons may arise from the fact that these specialists are more likely to be requested to manage failed implant cases, meaning that their more frequent exposures to such scenarios could have swayed them towards their current mindset. Meanwhile, between ten to approximately fifteen percent of each group of respondents deem the risk to be between twenty to thirty percent or even higher.

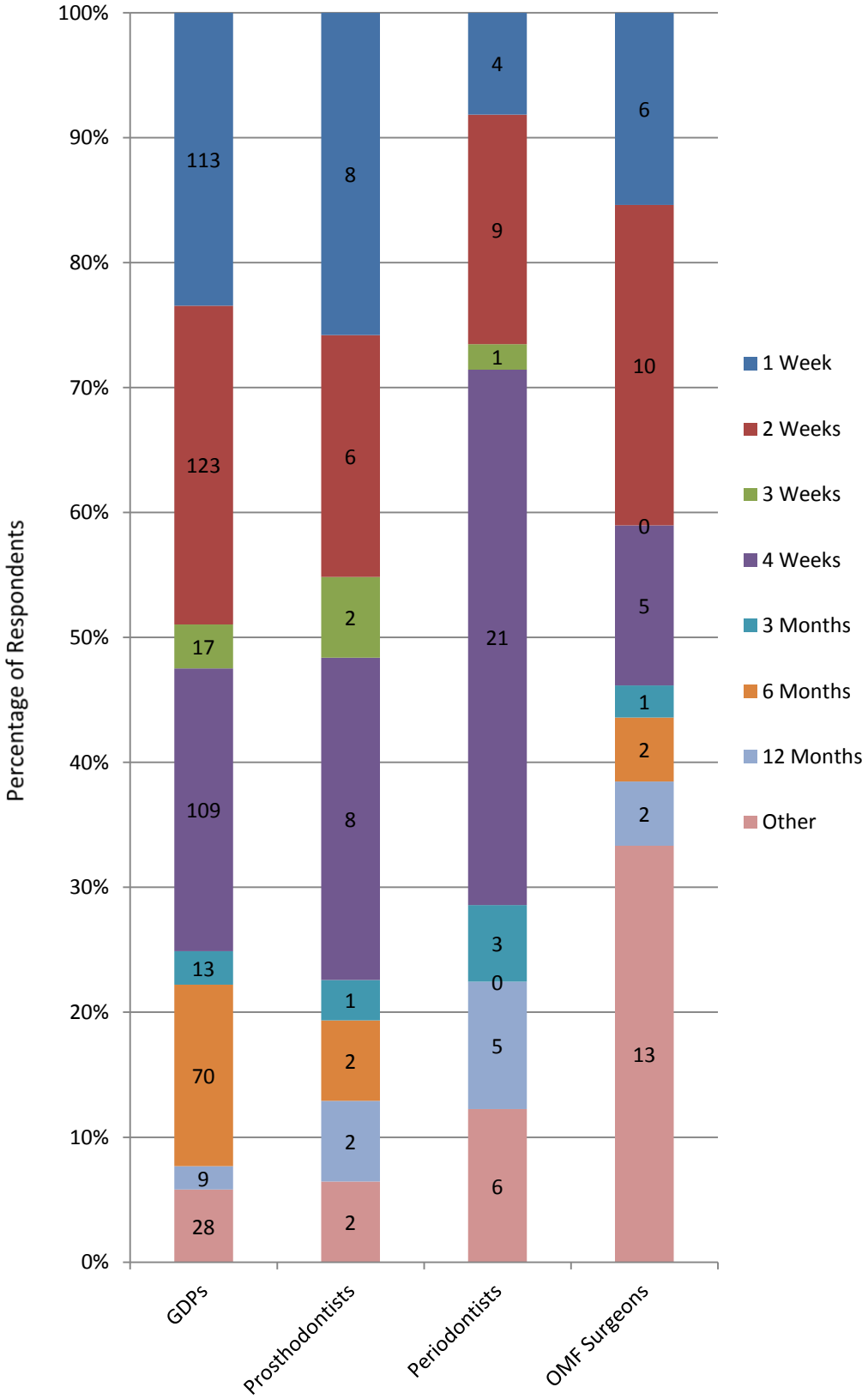
<u>Survey Question</u>: In the same clinical scenario as outlined in the previous question, assuming complete patient satisfaction with the treatment outcome and absence of any complications, how soon would you review the patient after insertion of the prosthesis?

The participants' responses to this question are organised in Table 3.44 and Figure 3.42.

Table 3.44. Clinical Scenario: Time of Post-prosthesis-insertion Review

	GDPs	Prosthodontists	Periodontists	OMF Surgeons
1 Week	113 (23.44%)	8 (25.81%)	4 (10.53%)	6 (15.38%)
2 Weeks	122 (25.31%)	6 (19.35%)	9 (23.68%)	10 (25.64%)
3 Weeks	17 (3.53%)	2 (6.45%)	1 (2.63%)	0
4 Weeks	108 (22.41%)	8 (25.81%)	19 (50%)	5 (12.82%)
3 Months	13 (2.70%)	1 (3.23%)	3 (7.89%)	1 (2.56%)
6 Months	70 (14.52%)	2 (6.45%)	0	2 (5.13%)
12 Months	9 (1.87%)	2 (6.45%)	5 (13.16%)	2 (5.13%)
Other	28 (5.81%)	2 (6.45%)	6 (15.79%)	13 (33.33%)
Total	**482**	**31**	**38**	**39**

Figure 3.42. Clinical Scenario: Time of Post-prosthesis-insertion Review



A large variety of responses were received for this particular question. In general, the relatively prominent choices across all four respondent groups are: ‘1 Week’, ‘2 Weeks’ and ‘4 Weeks’. A comparable percentage of GDPs also selected ‘6 Months’. The ‘Other’ category mainly consists of vague responses such as ‘At the next routine recall/review (of an unspecified period)’ and ‘Leaving the review to the restorative colleague’. Most OMF surgeons in this category indicated their preference for the restorative clinician to perform the post-prosthesis-insertion review.

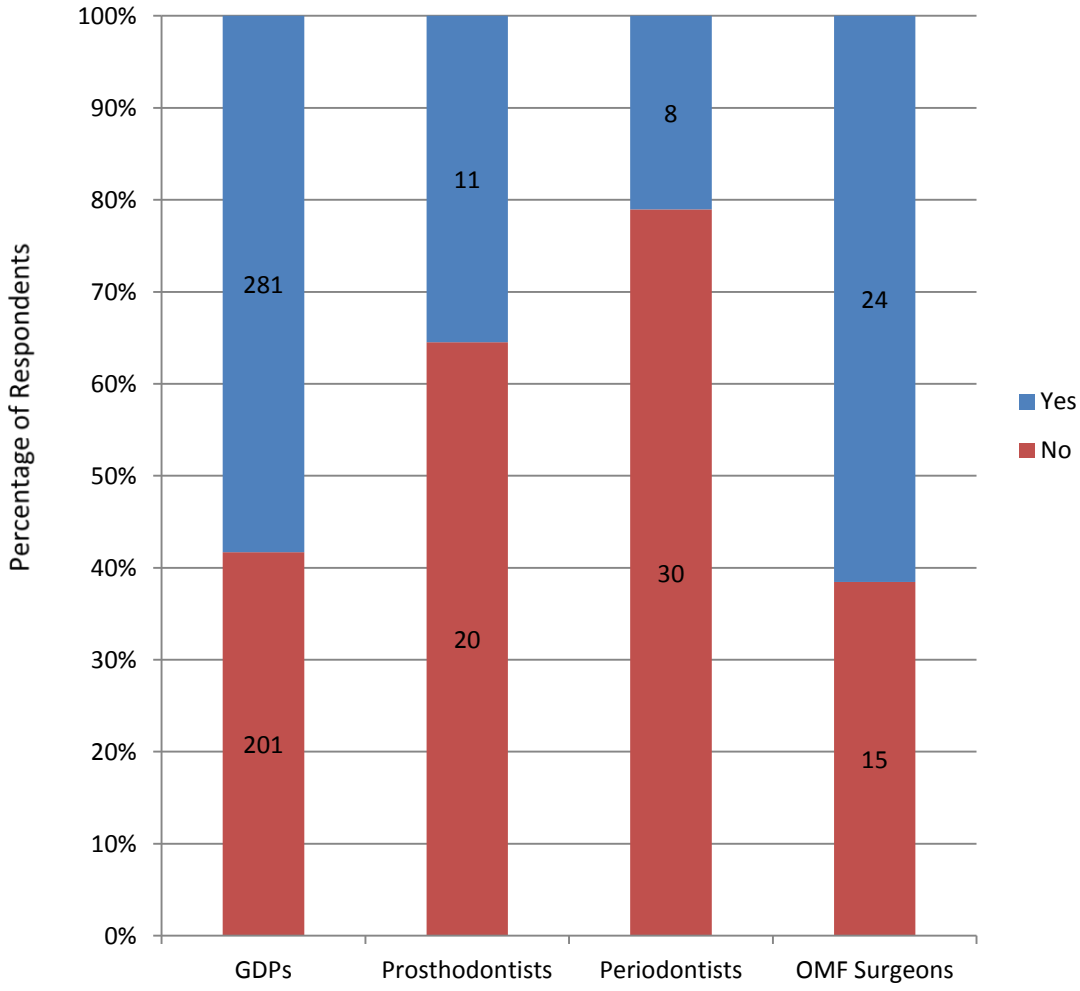
<u>Survey Question</u>: In the same clinical scenario as outlined previously, do you believe the length of the implant used needs to be at least as long as the height of the crown it supports?

Table 3.45 and Figure 3.43 illustrate IP respondents' opinions regarding the concept of crown-to-root (or crown-to-implant) ratio for single-implant-supported crowns in a relatively non-stressful location.

Table 3.45. Clinical Scenario: Need Fixture Length Be Equal To or Greater Than Prosthetic Crown Height?

	GDPs	Prosthodontists	Periodontists	OMF Surgeons
Yes	281 (58.30%)	11 (35.48%)	8 (21.05%)	24 (61.54%)
No	201 (41.70%)	20 (64.52%)	30 (78.95%)	15 (38.46%)
Total	**482**	**31**	**38**	**39**

Figure 3.43. Clinical Scenario: Need Fixture Length Be Equal To or Greater Than Prosthetic Crown Height?



Interestingly, it appears that conflicting opinions exist among the respondent groups: while the majority of prosthodontists and periodontists believe it unnecessary for fixture-to-crown ratio to be at least one, an opposing view seems to prevail among approximately 60% of GDPs and OMF surgeons. A chi-square test indicates differences to be significant at $p < 0.05$ ($\chi^2 = 25.25$, d.o.f. = 3, $p < 0.001$).

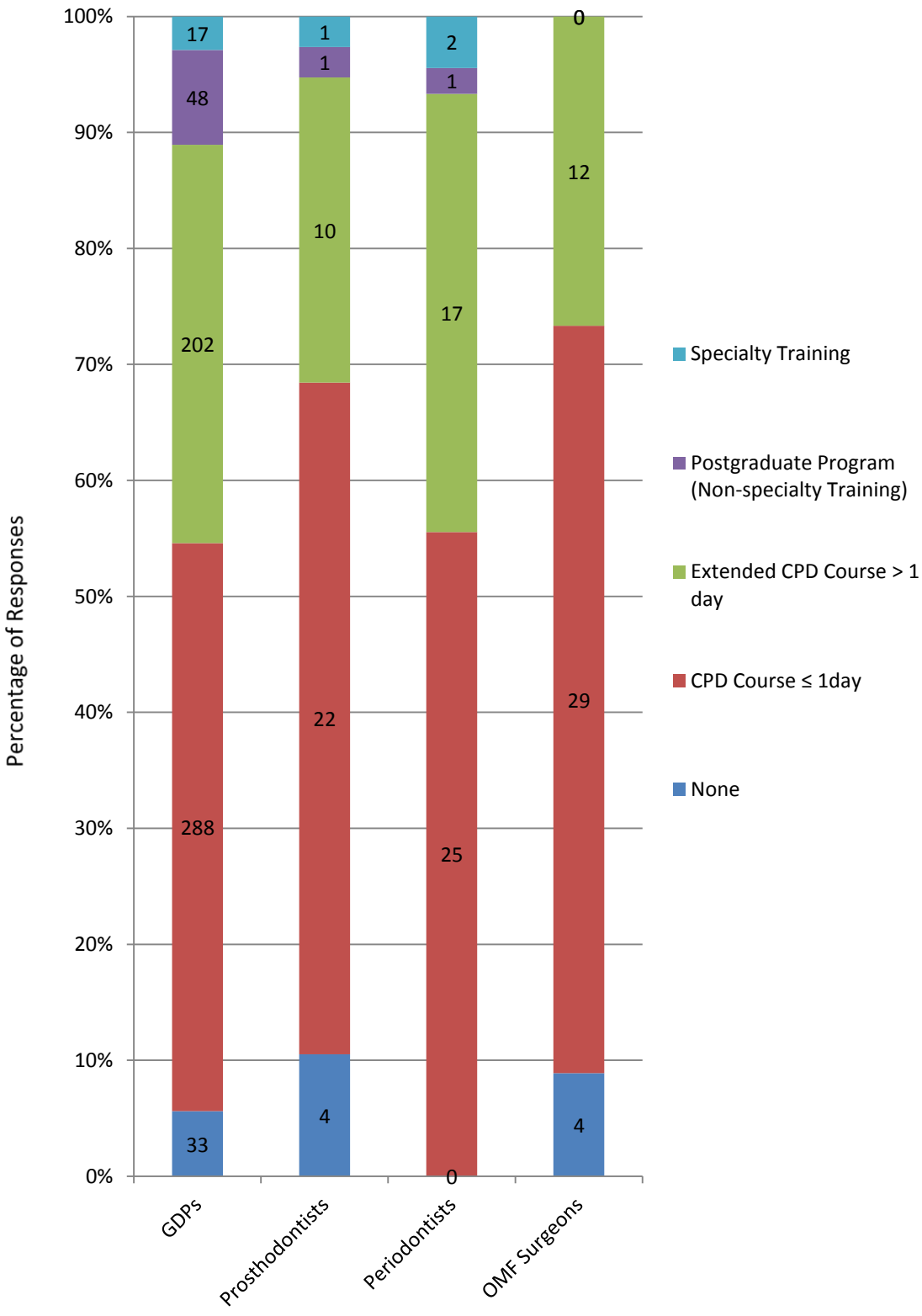
<u>Survey Question</u>: What kind(s) of further education in implant dentistry are you intending to undertake in the foreseeable future?

IP respondents' attitudes towards implant dentistry education with respect to program types are shown in Table 3.46 and Figure 3.44. As in the corresponding question for NIP participants, multiple response choices were allowed to cater for practitioners who are willing to undertake more than one form of education.

Table 3.46. IP Respondents' Attitudes towards Implant Dentistry Education: Types of Educational Programs				
	GDPs	**Prosthodontists**	**Periodontists**	**OMF Surgeons**
None	33 (5.61%)	4 (10.53%)	0	4 (8.89%)
CPD* Course ≤ 1 day	288 (48.98%)	22 (57.89%)	25 (55.56%)	29 (64.44%)
Extended CPD Course > 1 day	202 (34.35%)	10 (26.32%)	17 (37.78%)	12 (26.67%)
Postgraduate Program (Non-specialty Training)	48 (8.16%)	1 (2.63%)	1 (2.22%)	0
Specialty Training	17 (2.89%)	1 (2.63%)	2 (4.44%)	0
Total	**588***	**38***	**45***	**45***

** The total number of responses exceeds the number of subject since some of the respondents have selected more than one response.*

Figure 3.44. IP Respondents' Attitudes towards Implant Dentistry Education: Types of Educational Programs



Compared with the attitudes of NIP respondents, the proportion of IP participants intending to undertake further education in implant dentistry is considerably higher: over 90% of the responses of GDPs, periodontists and OMF surgeons, as well as nearly 90% of prosthodontists' choices indicate a positive intention to undertake an educational program of some form. The most popular types of programs are clearly revealed to be one-day and extended CPD courses, which together constitute over 80% of the responses from GDPs and prosthodontists, and over 90% of those from periodontists and OMF surgeons.

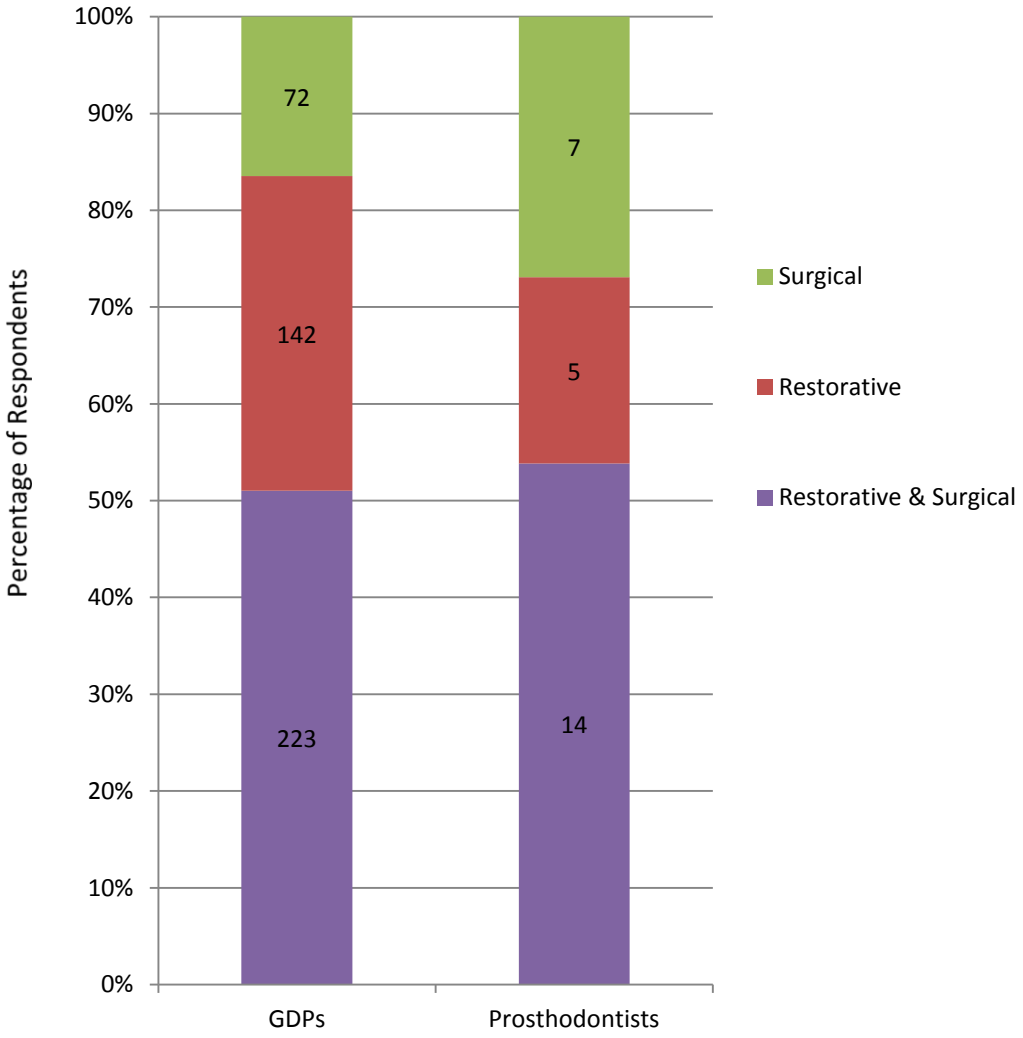
<u>Survey Question</u>: If you are considering undertaking further education in implant dentistry, which aspects(s) of it would you like to improve in?

IP GDPs and prosthodontists' future educational intentions with respect to specific aspects (i.e. restorative and/or surgical) of implant dentistry are presented in Table 3.47 and Figure 3.45.

Table 3.47. Attitudes of IP GDPs and Prosthodontists towards Implant Dentistry Education: Specific Aspects

	GDPs	Prosthodontists
Restorative	142 (30.21%)	5 (16.67%)
Surgical	72 (15.32%)	7 (23.33%)
Restorative & Surgical	223 (47.45%)	14 (46.67%)
Total	**470**	**30**

Figure 3.45. Attitudes of IP GDPs and Prosthodontists towards Implant Dentistry Education: Specific Aspects



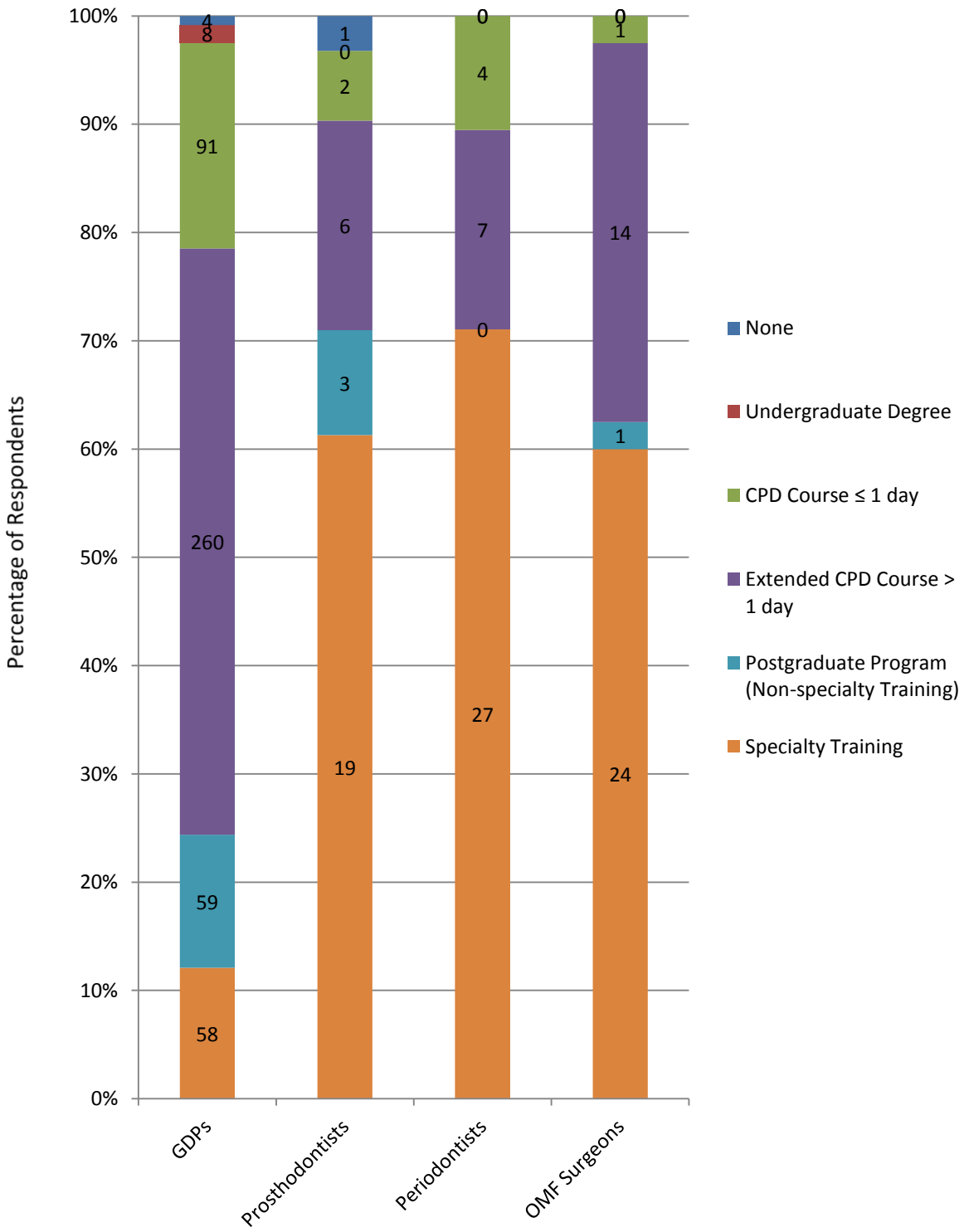
Slightly over half of GDPs and prosthodontists who intend to undertake further education in implant dentistry have indicated a preference to focus on both restorative and surgical aspects. The next most common choice differs between GDPs and prosthodontists, being restorative aspects alone for the former group (30.21%) and solely surgical aspects for the latter (23.33%).

<u>Survey Question</u>: What is the highest level of education in implant dentistry you have attained/are undertaking?

Table 3.48 and Figure 3.46 display the highest levels of education in implant dentistry attained or being undertaken by IP participants:

Table 3.48. Highest Levels of Education in Implant Dentistry Attained/Currently Undertaken by IP Respondents				
	GDPs	**Prosthodontists**	**Periodontists**	**OMF Surgeons**
None	4 (0.83%)	1 (3.23%)	0	0
Undergraduate Degree	8 (1.67%)	0	0	0
CPD Course ≤ 1 day	91 (18.96%)	2 (6.45%)	4 (10.53%)	1 (2.50%)
Extended CPD Course > 1 day	260 (54.17%)	6 (19.35%)	7 (18.42%)	14 (35%)
Postgraduate Program (Non-specialty Training)	59 (12.29%)	3 (9.68%)	0	1 (2.50%)
Specialty Training	58 (12.08%)	19 (61.29%)	27 (71.05%)	24 (60%)
Total	**480**	**31**	**38**	**40**

Figure 3.46. Highest Levels of Education in Implant Dentistry Attained/Currently Undertaken by IP Respondents



As expected, nearly all respondents have experienced a certain degree of education in implant dentistry beyond the undergraduate level. 97.5% of GDPs, 96.77% of prosthodontists as well as all periodontists and OMF surgeons are educated at the level of one-day CPD courses or higher. Among GDPs, extended CPD programs apply to the greatest percentage of respondents (i.e. 54.17%); while specialty training applies to between approximately 60% and 71% of specialists. Although the percentage of specialists having experienced implantology education at the level of specialty training may not be as high as perhaps expected, it should be noted that some of the specialist respondents could have completed their training before implant dentistry became a part of their specialties' formal educational curricula.

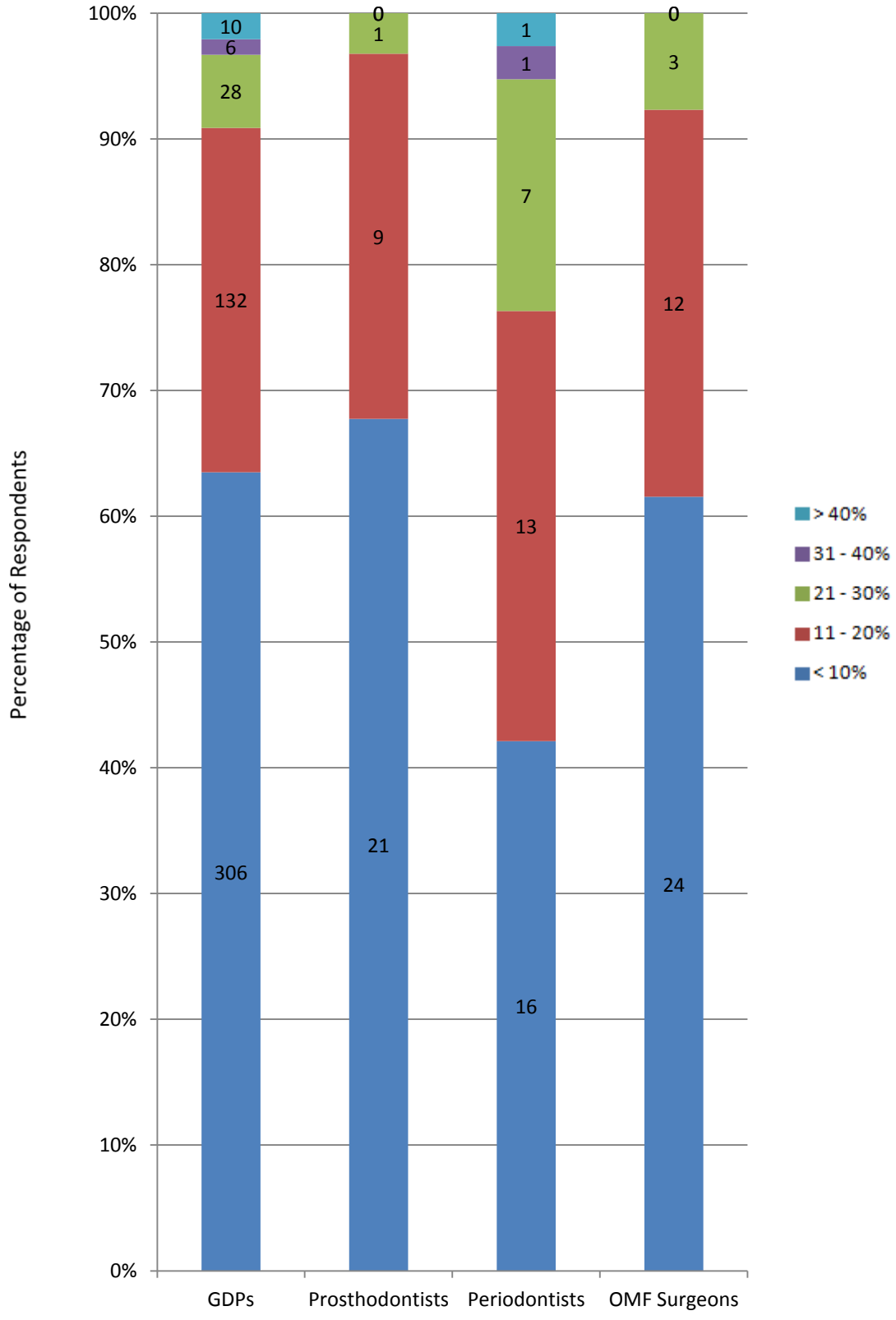
3.5 Peri-implantitis

The subsequent section of the survey revolves around peri-implantitis which, for the purpose of this investigation, is defined as a pathotic condition characterised by the presence of a periodontal pocket depth of 5mm or greater, bleeding and/or purulence on probing, and concomitant radiographic evidence of alveolar bone loss associated with an inserted implant. The IP respondents' estimations of the prevalence of peri-implantitis are revealed in Table 3.49 and Figure 3.47.

Survey Question: Defining peri-implantitis as a pathotic condition characterised by the presence of a periodontal pocket depth of 5mm or greater, bleeding and/or pus on probing, and radiographic evidence of alveolar bone loss around an implant, what would be your estimate of the overall prevalence of peri-implantitis?

Table 3.49. IP Respondents' Estimations of the Prevalence of Peri-implantitis				
	GDPs	**Prosthodontists**	**Periodontists**	**OMF Surgeons**
< 10%	306 (63.49%)	21 (67.74%)	16 (42.11%)	24 (61.54%)
10 – 20%	132 (27.39%)	9 (29.03%)	13 (34.21%)	12 (30.77%)
21 – 30%	28 (5.81%)	1 (3.23%)	7 (18.42%)	3 (7.69%)
31 – 40%	6 (1.24%)	0	1 (2.63%)	0
> 40%	10 (2.07%)	0	1 (2.63%)	0
Total	**482**	**31**	**38**	**39**

Figure 3.47. IP Respondents' Estimations of the Prevalence of Peri-implantitis



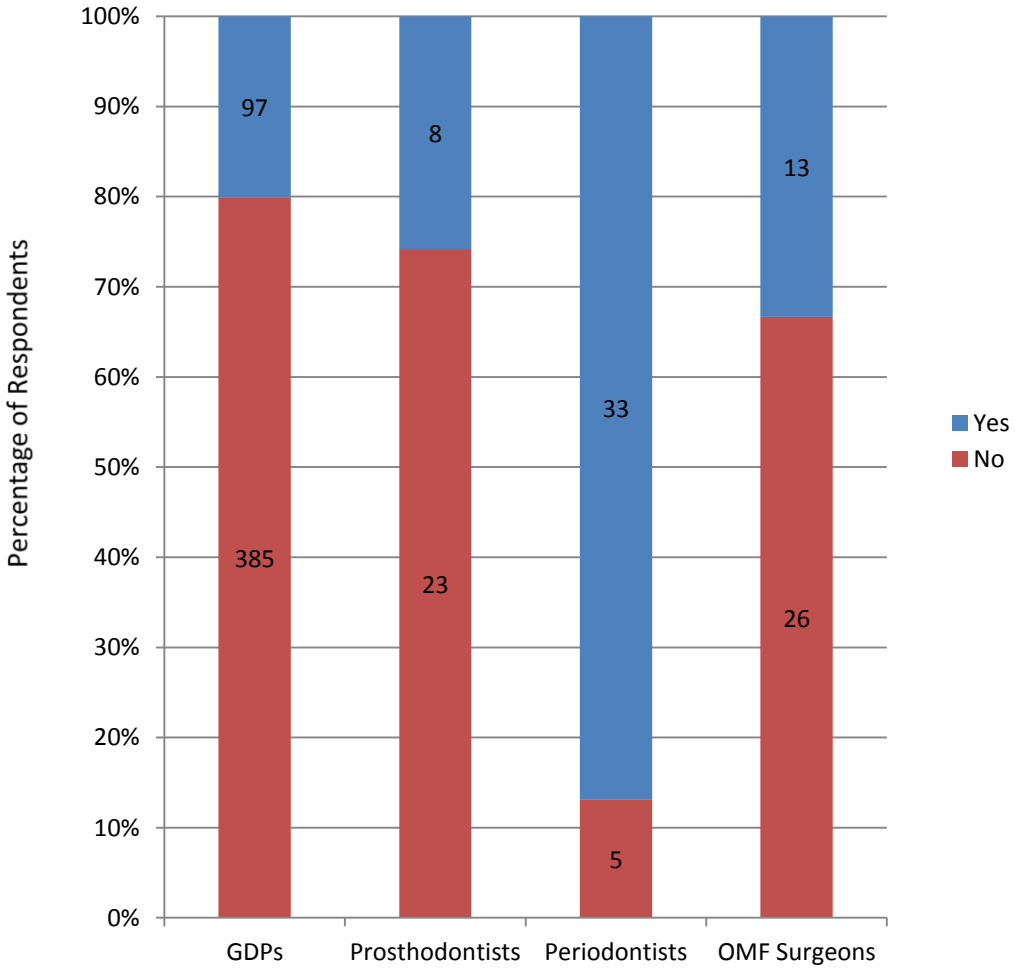
The estimations of the prevalence of peri-implantitis by all respondents lie predominantly below the threshold of 21%. While between 60% to 70% of GDPs, prosthodontists and OMF surgeons deem the prevalence to be less than 10%, periodontists appear to be less optimistic with 42.11% agreeing with this estimate. The percentages of respondents opting for 10% to 20% remain fairly consistent across all four groups, ranging from 27.39% among GDPs to 32.21% in periodontists. The proportion of respondents believing the prevalence of peri-implantitis to be over 20% is also highest among periodontists by a considerable margin: 23.68% compared with the next highest of 9.12% in GDPs. The higher estimates by periodontists are perhaps to be expected considering the likelihood that these specialists are the group that manage peri-implantitis most frequently, meaning that they encounter the condition more often than other practitioners.

<u>Survey Question</u>: Do you routinely treat cases of peri-implantitis?

The proportion of IP respondents who routinely treat cases of peri-implantitis are displayed in Table 3.50 and Figure 3.48.

Table 3.50. IP Respondents – Routinely Treat Peri-implantitis?				
	GDPs	**Prosthodontists**	**Periodontists**	**OMF Surgeons**
Yes	97 (20.12%)	8 (25.81%)	33 (86.84%)	13 (33.33%)
No	385 (79.88%)	23 (74.19%)	5 (13.16%)	26 (66.67%)
Total	**482**	**31**	**38**	**39**

Figure 3.48. IP Respondents - Routinely Treat Peri-implantitis?



The term 'routinely' was open to personal interpretation by the respondent since no specific frequency was defined in the surveys. Despite this arbitrary margin, it is clear that the group that treats peri-implantitis most frequently are periodontists, with over 85% of them having reported routine management of this condition. In contrast, the counterparts in the other three groups are much lower, ranging from barely over 20% of GDPs to one third of OMF surgeons. This considerable difference helps to explain the periodontists' higher prediction of the prevalence of peri-implantitis earlier.

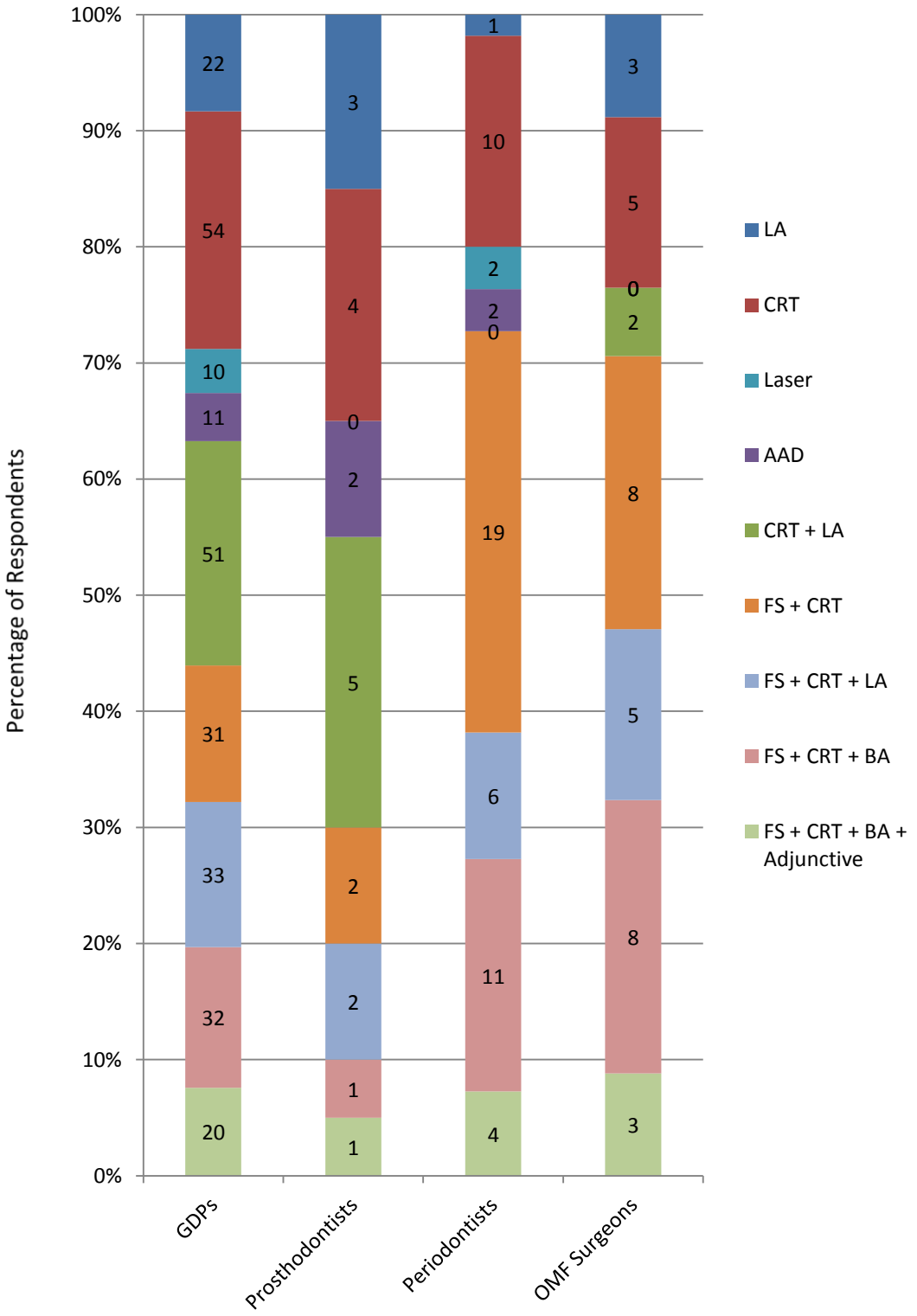
<u>Survey Question</u>: If you routinely treat cases of peri-implantitis, please select from below the method(s) of treatment which most closely match(es) the one(s) you most frequently employ.

The methods of treatment of peri-implantitis utilised by IP Respondents are displayed in Table 3.51 and Figure 3.49 Multiple response choices were permitted for the question relating to this aspect since a practitioner may well employ multiple treatment modalities depending on the nature of the condition such as severity and location.

Table 3.51. Treatment Modalities for Peri-implantitis Utilised by IP Respondents				
	GDPs	**Prosthodontists**	**Periodontists**	**OMF Surgeons**
Local Antibiotic (LA)	22 (8.33%)	3 (5%)	1 (1.82%)	3 (8.82%)
Curettage (CRT)	54 (20.45%)	4 (20%)	10 (18.12%)	5 (14.71%)
CRT + LA	51 (19.32%)	5 (25%)	0	2 (5.88%)
Air-abrasive Device (AAD)	11 (4.17%)	2 (10%)	2 (3.64%)	0
Laser	10 (3.79%)	0	2 (3.64%)	0
Flap Surgery (FS) + CRT	31 (11.74%)	2 (10%)	19 (34.55%)	8 (23.53%)
FS + CRT + LA	33 (12.50%)	2 (10%)	6 (10.91%)	5 (14.71%)
FS + CRT + Bone Augmentation (BA)	32 (12.12%)	1 (5%)	11 (20.00%)	8 (23.53%)
FS + CRT + BA + Adjunct (e.g. LA, AAD)	20 (7.58%)	1 (5%)	4 (7.27%)	3 (8.82%)
Total	**264***	**20***	**55***	**34***

** The total number of responses exceeds that of subjects due to multiple response choices made by some of them.*

Figure 3.49. Treatment Modalities for Peri-implantitsis Utilised by IP Respondents



The general pattern here suggests that a wide variety of treatment regimens are employed by all IP respondents when managing peri-implantitis. One noticeable feature is that methods of greater surgical complexity (i.e. involving flap surgery and more) represent an appreciably greater percentage of periodontists' and OMF surgeon's responses. This is consistent with the predominantly surgical nature of their roles in implant dentistry, and may be a reflection of the greater severity of the cases referred to them for management. Interestingly, it appears that GDPs are more likely than prosthodontists to employ approaches involving flap surgery, since these constitute nearly 45% of the former group's responses as opposed to 30% of the latter's.

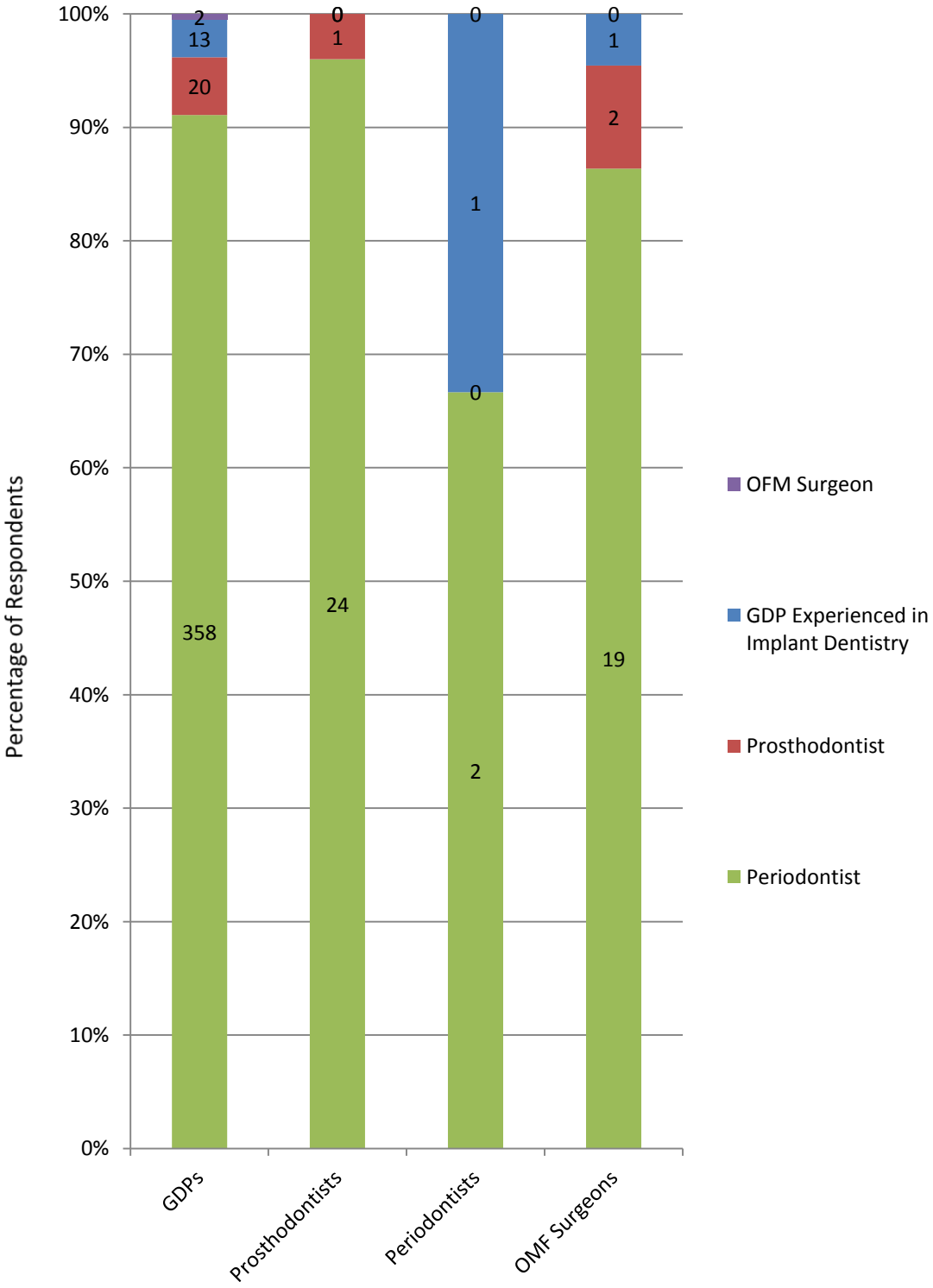
The most popular treatment modalities appear to differ among the respondent groups. While curettage alone and curettage with local antibiotic application seem to be the most frequently performed procedures by GDPs and prosthodontists, periodontists more often perform curettage, flap surgery with curettage in addition to flap surgery with curettage and bone augmentation. The latter two of these three approaches seem to be the most common techniques for OMF surgeons as well.

<u>Survey Question</u>: If you routinely refer cases of peri-implantitis to another practitioner for management, please indicate which type of practitioner you most frequently refer to.

IP respondents who routinely refer cases of peri-implantitis to other practitioners for management were asked to indicate their preferred destinations of referral. Their responses are outlined in Table 3.52 and Figure 3.50.

Table 3.52. Referral Patterns of IP Respondents for Cases of Peri-implantitis					
		REFERRAL ORIGIN			
		GDPs	**Prosthodontists**	**Periodontists**	**OMF Surgeons**
REFERRAL RECIPIENT	**GDP Experienced in Implant Dentistry**	13 (3.31%)	0	1 (33.33%)	1 (4.55%)
	Prosthodontist	20 (5.09%)	1 (4%)	0	2 (9.09%)
	Periodontist	358 (91.09%)	24 (96%)	2 (66.67%)	19 (86.36%)
	OMF Surgeon	2 (0.51%)	0	0	0
Total		**393**	**25**	**3**	**22**

Figure 3.50. Referral Patterns of IP Respondents for Cases of Peri-implantitis



In concordance with the trends observed so far, periodontists clearly receive the largest proportion of peri-implantitis referrals from GDPs and other specialists. They are shown to be receiving approximately 90% of such referrals from GDPs, prosthodontists and OMF surgeons. The number of periodontists who choose to refer cases of peri-implantitis to other practitioners totals only three.

3.6 Problematic Dental Implant Cases from Overseas

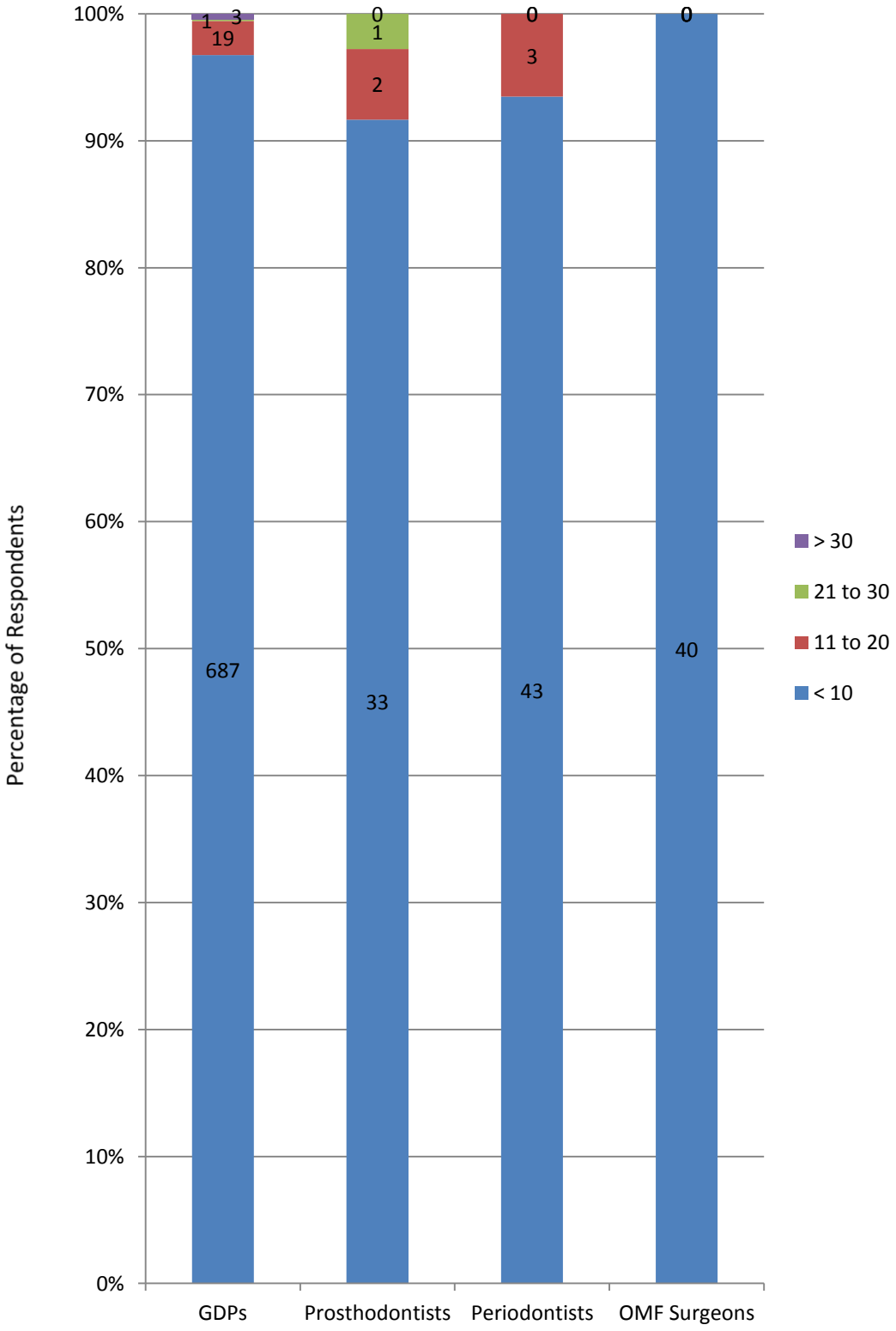
<u>Survey Question</u>: On average, approximately how many PROBLEMATIC cases involving implants placed and/or restored overseas do you see every month? Please include any cases that had been completed either partially or fully abroad.

All respondents, regardless of implant practising status, were asked to provide an approximate indication of the number of problematic implant-related cases from overseas encountered in their practice over a one-month period. Their responses are presented in Table 3.53 and Figure 3.51.

Table 3.53. Numbers of Problematic Dental Implant Cases from Overseas Encountered by All Respondents Over One Month

	GDPs	Prosthodontists	Periodontists	OMF Surgeons
< 10	687 (96.76%)	33 (91.67%)	43 (93.48%)	40 (100%)
11 – 20	19 (2.68%)	2 (5.56%)	3 (6.52%)	0
21 - 30	1 (0.14%)	1 (2.78%)	0	0
> 30	3 (0.42%)	0	0	0
Total	**710**	**36**	**46**	**40**

Figure 3.51. Numbers of Problematic Dental Implant Cases from Overseas Encountered by All Respondents Over One Month



Fortunately, it appears that problematic cases involving dental implants are generally not very common, being encountered fewer than ten times per month by more than 90% of all respondents. However, the greater frequencies reported by minor percentages of GDPs, prosthodontists and periodontists may be partly due to the recently noted phenomenon of 'dental implant tourism' (Barrowman *et al.* 2010), and may give rise to some concern.

3.7 Comparing Non-implant-practising and Implant-practising GDPs

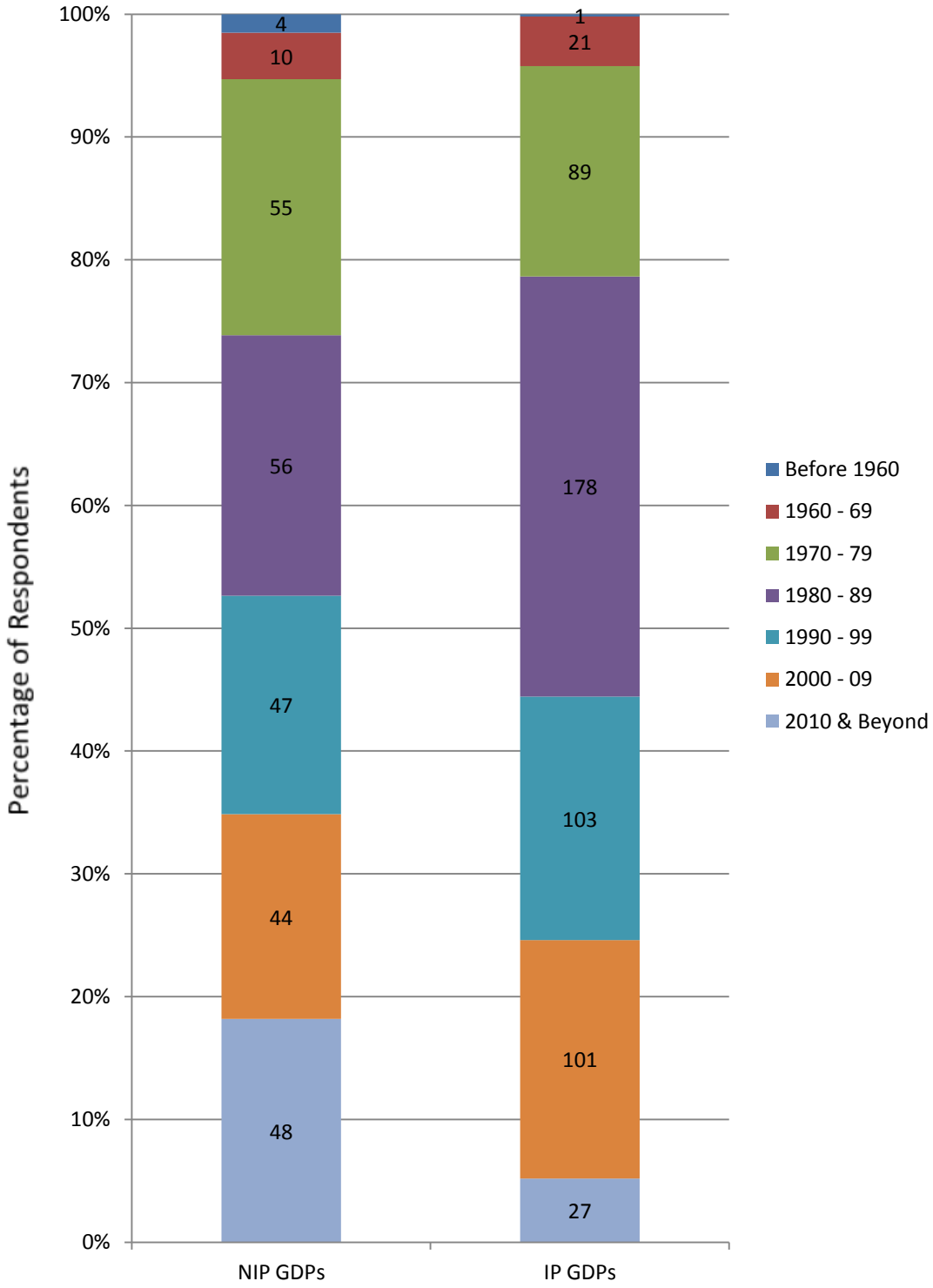
Having analysed the responses of all participants, it would be convenient at this point to re-organise selected parts of the collected data relevant to both non-implant-practising (NIP) and implant-practising (NIP) GDPs so that the two groups' characteristics could be directly compared. A parallel exercise for the specialist groups would not be of appreciable value since the number of NIP specialist participants is far too low.

<u>Survey Question</u>: Please indicate the year of your completion of dental/prosthodontic/periodontic/oral and maxillofacial surgical training.

Table 3.54 and Figure 3.52 display the times of completion of dental training for NIP and IP GDPs.

Table 3.54. Times of Completion of Dental Training for NIP and IP GDPs		
	NIP	**IP**
Before 1960	4 (1.51%)	1 (0.19%)
1960 – 69	10 (3.79%)	21 (4.04%)
1970 – 79	55 (20.83%)	89 (17.12%)
1980 – 89	56 (21.21%)	178 (34.23%)
1990 – 99	47 (17.80%)	103 (19.81%)
2000 – 09	44 (16.67%)	101 (19.42%)
2010 & Beyond	48 (18.18%)	27 (5.19%)
Total	**264**	**520**

Figure 3.52. Times of Completion of Dental Training for NIP and IP GDPs



No conspicuous difference appears to exist between NIP and IP GDPs in terms of their training completion times. A notable variation worthy of comment concerns the '2010 & Beyond' category, which represents 18.18% of NIP GDPs and only 5.19% of IP GDPs. This seems reasonable since the youngest practitioners are less likely to have had adequate time and experience to acquire additional education in implant dentistry and commence its practice.

<u>Survey Question</u>: In which State(s) and/or Territory(ies) are you practising?

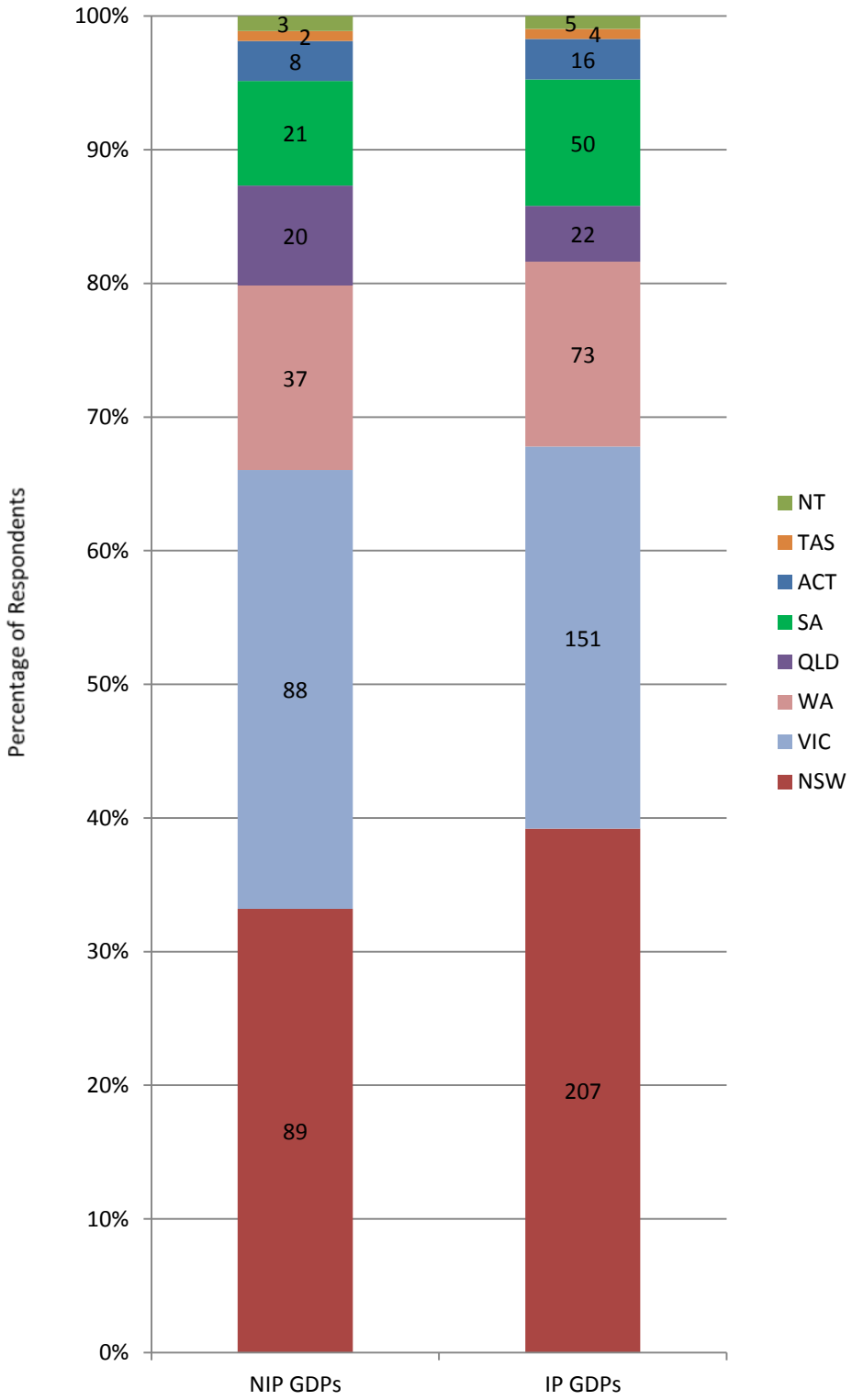
Table 3.55 and Figure 3.53 depict the geographical distribution of GDPs' practices as categorised by State/Territory, which appears to be overall rather similar between NIP and IP practitioners. Multiple response choices were allowed for this question in consideration of respondents who practise in more than one State or Territory.

Table 3.55. Geographical Distribution of NIP and IP GDPs' Practices by State/Territory

	NIP	IP
ACT	8 (2.99%)	16 (3.03%)
NSW	89 (33.21%)	207 (39.20%)
NT	3 (1.12%)	5 (0.95%)
QLD	20 (7.46%)	22 (4.17%)
SA	21 (7.84%)	50 (9.47%)
TAS	2 (0.75%)	4 (0.76%)
VIC	88 (32.84%)	151 (28.60%)
WA	37 (13.81%)	73 (13.83%)
Total	**268***	**528***

** The total number of responses exceeds that of subjects due to multiple response choices made by some of them.*

Figure 3.53. Geographical Distribution of NIP and IP GDPs' Practices by State/Territory

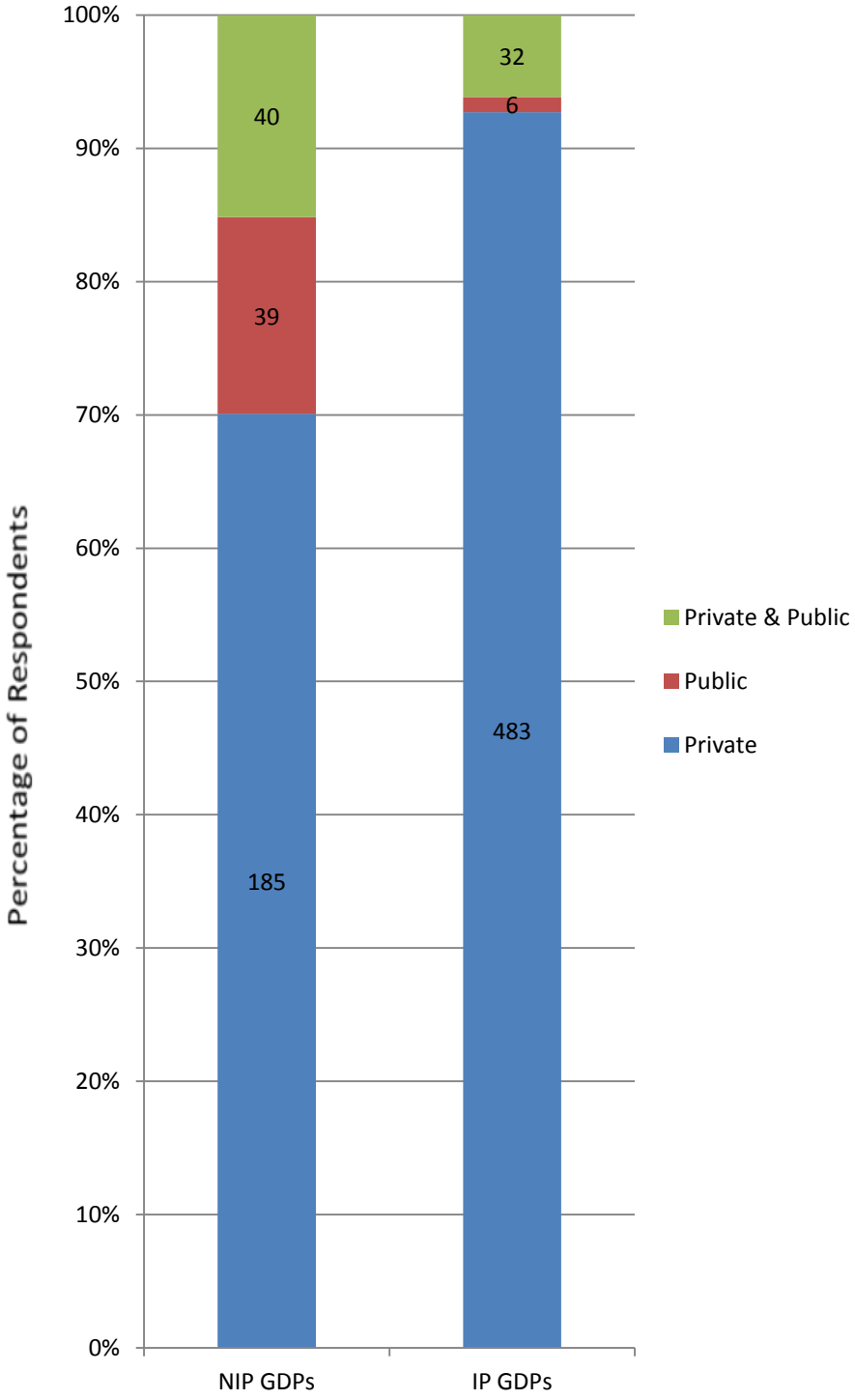


<u>Survey Question</u>: Are you working in the private and/or public sector(s)?

Table 3.56 and Figure 3.54 outline the sectors in which GDP participants practised.

Table 3.56. NIP and IP GDPs' Practising Sectors		
	NIP	**IP**
Private	185 (70.08%)	483 (92.71%)
Public	39 (14.77%)	6 (1.15%)
Private & Public	40 (15.15%)	32 (6.14%)
Total	**264**	**521**

Figure 3.54. NIP and IP GDPs' Practising Sectors



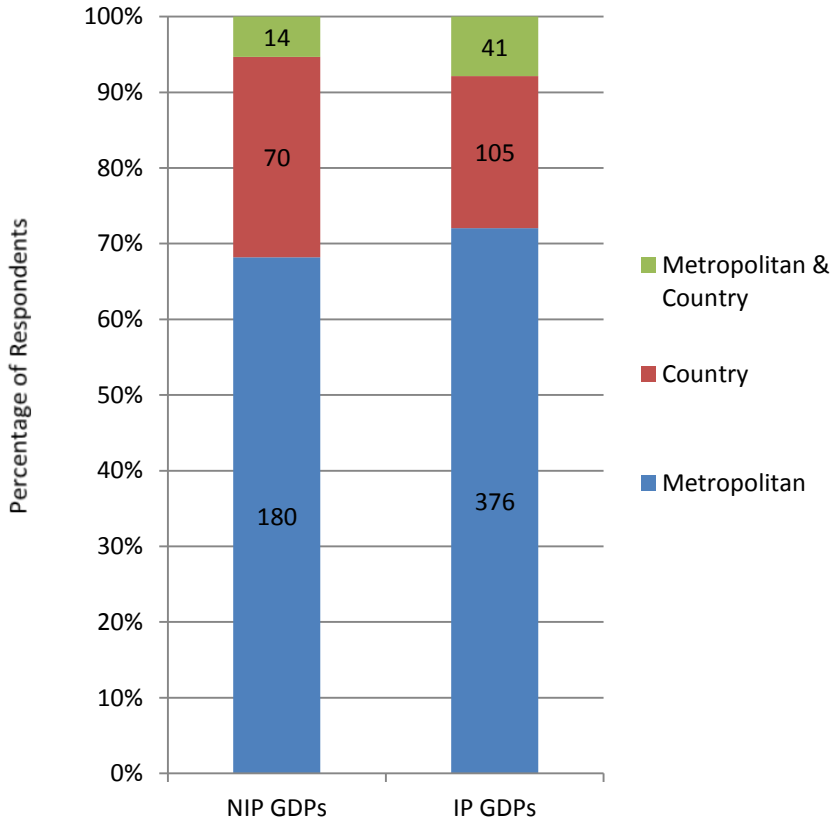
Given that the availability of dental implant-related treatment is relatively limited in the public sector, one might well expect a greater proportion of NIP GDPs to be found there compared with IP GDPs. This is confirmed by the findings here, as sharply illustrated by the 14.77% of NIP GDPs and a mere 1.15% of IP GDPs working in the public sector alone. Furthermore, the percentage of practitioners working in both public and private sectors is more than twice as high in the NIP group as in the IP one.

<u>Survey Question</u>: What is/are the location(s) of the practice(s) you are working at?

Table 3.57 and Figure 3.55 indicate NIP and IP GDPs' practice locations.

Table 3.57. NIP and IP GDPs' Practice Locations		
	NIP	**IP**
Metropolitan	180 (68.18%)	376 (72.17%)
Country	70 (26.52%)	105 (20.15%)
Metropolitan & Country	14 (5.30%)	40 (7.68%)
Total	**264**	**521**

Figure 3.55. NIP and IP GDPs' Practice Locations



No obvious differences seem to affect the location profile between NIP and IP GDPs, except for a reasonably minor increase in the percentage of regional practitioners within the NIP group (i.e. 26.52% versus 20.15%). Generally, it appears that NIP and IP GDPs are similarly distributed across metropolitan and regional areas.

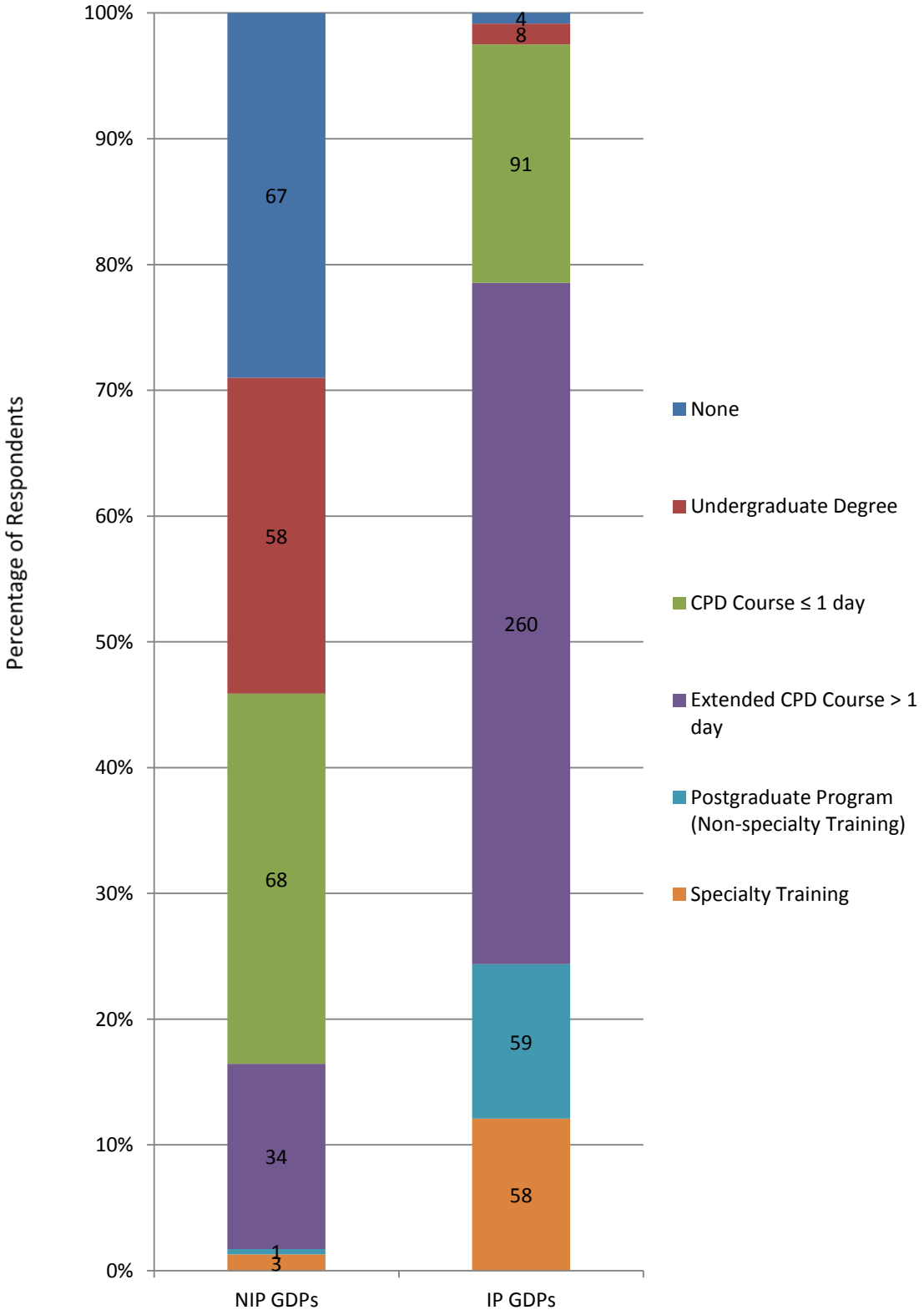
<u>Survey Question</u>: What is the highest level of education in implant dentistry you have attained or are undertaking?

Table 3.58 and Figure 3.56 compare the highest levels of education in implant dentistry attained or being undertaken by NIP and IP GDP participants:

Table 3.58. Highest Levels of Education in Implant Dentistry Attained/Currently Undertaken by NIP and IP GDPs

	NIP	IP
None	67 (29.00%)	4 (0.83%)
Undergraduate Degree	58 (25.11%)	8 (1.67%)
CPD* Course ≤ 1 day	68 (29.44%)	91 (18.96%)
Extended CPD* Course > 1 day	34 (14.72%)	260 (54.17%)
Postgraduate Program (Non-specialty Training)	1 (0.43%)	59 (12.29%)
Specialty Training	3 (1.30%)	58 (12.08%)
Total	**231**	**480**

Figure 3.56. Highest Levels of Education in Implant Dentistry Attained/Currently Undertaken by NIP and IP GDPs



It is not surprising that considerably more IP GDPs have experienced education in implant dentistry and to higher levels compared with their NIP counterparts. The difference is quite distinct: 97.5% of IP dentists have been educated in implantology beyond the undergraduate level, while the same applies to only 45.89% of NIP practitioners. Additionally, more than three quarters of IP GDPs have experienced extended CPD courses or more while less than one fifth of NIP GDPs have done so.

Chapter Four:

Discussion

4.1 The Prevalence of Implant Dentistry Practice

The results of this investigation indicate that 66.37% of GDPs, 86.11% of prosthodontists, 82.98% of periodontists and 97.67% of OMF surgeons are presently involved in the clinical practice of implant dentistry in Australia. However, these figures may not be a flawless reflection of reality. Based on the response rates, although reasonable percentages of the selected dental specialists ranging from 34.07% to 41.76% participated in this study, only an estimated 7.61% of GDPs in the nation elected to do so. Fortunately, a reasonable degree of similarity exists in demographic and geographic characteristics between this study's GDP respondents and Australia's entire GDP population in AIHW's dental workforce data from 2012, which may compensate for the present study's relatively low GDP response rate to a certain extent. Meanwhile, it is also possible that the entire participant population may be somewhat over-represented by implant-practising clinicians since these individuals may be more likely than their NIP colleagues to participate in research projects relevant to implant dentistry.

Limitations aside, the relatively large percentage of 66.37%, or virtually two thirds, of implant-practising GDPs found by this study is higher than most corresponding figures from other studies published previously, which range from 1.3% to 81.25% in various regions of the world (Akeredolu *et al.* 2007; Brandt *et al.* 2000; Gibson & Barclay 2006; Jüngling *et al.* 2008; Reid *et al.* 2005; Spratley & Coyne 1995). It should be noted that the highest figures of this range, such as 81.25% (Brandt *et al.* 2000) and 70% (Jüngling *et al.* 2008), are not entirely free from bias. The study by Brandt and associates (2000) involved

a select group of 32 general practitioners undertaking an extended CPD course in implant dentistry, which largely accounts for the high proportion of IP participants since IP GDPs are more likely than NIP GDPs to undertake related continuing education in this field, a trait which has been revealed by findings of this investigation. Meanwhile, the study by Jüngling's group (2008) included IP specialists as well as GDPs in its 100-subject population. Considering the noticeably higher proportions of such specialists involved in implant dentistry, as again indicated by this investigation, it would have been almost inevitable for this study's figure to be at least slightly exaggerated. Hence, the present percentage of 66.37% of IP GDPs in Australia may well be at or near the peak of the range, which would agree with one's expectations due to the rapid popularisation of implant dentistry in recent times.

4.2 Characteristics of Implant Dentistry Practice

Nearly one third (i.e. 30.08%) of IP GDPs indicated that they perform implant-related procedures at least once per week or more frequently. The corresponding figure is considerably higher for IP specialists, ranging from 69.23% for OMF surgeons to 87.09% for prosthodontists. The study by Jüngling's group (2008) conducted in the USA classified clinicians who undertook implant-associated procedures at least twice per week as 'frequent-implant users', and 35% of its subjects that included both GDPs and specialists were assigned to this category. If the criterion for 'frequent implant users' were slightly modified to 'at least once per week' in the current study, then the overall combined percentage of respondents belonging to this group would be 24.54%.

It appears that not only is implant dentistry practised by a considerable proportion of GDPs in Australia, but those doing so are also reasonably experienced in the task. According to this study's results, over two thirds of IP GDPs have reportedly been involved in the restorative facet of implant dentistry for six to ten years or longer, and nearly one third of them in the surgical facet for the same durations. Combining this with the fact that approximately 30% of IP GDPs undertake implant-related procedures at least once per week, it can perhaps be ventured that an appreciable proportion of the current GDP population would be fairly experienced in implant dentistry.

GDPs who do not practise implant dentistry refer over half of their implant-related cases to either IP GDPs or prosthodontists, and the majority of the remainder to periodontists. The

fact that primarily restorative practitioners receive these referrals suggests the preponderance of the philosophy of 'prosthetically driven' implant treatment planning. The importance of this concept was outlined by Garber (1995), who explained that the use of implant-supported restorations in aesthetically critical regions necessitated the guidance of implant placement primarily by the final position of the highly visible prosthesis rather than by purely the underlying anatomy. This view was reiterated by Hess and associates in 1998, and is now commonly accepted.

As perhaps to be expected, IP GDPs tend to refer most often to prosthodontists for implant-related restorative procedures, while the bulk of their referrals for surgical procedures are received by periodontists and OMF surgeons. The proportion of referrals from IP GDPs to periodontists is slightly greater than that to OMF surgeons, while the reverse trend is observed in referrals from IP prosthodontists. Together with NIP GDPs' referring pattern, these findings suggest that, compared with OMF surgeons, periodontists tend to receive a larger share of implant-related referrals from GDPs.

Amongst IP GDPs, it is interesting to observe that nearly as many practise both restorative and surgical aspects of implant dentistry as there are practising solely the restorative facet, as indicated by their respective percentages of 42.52% and 51.24%. Although the proportion of the former group is lower than the 77% from the results of Ng and colleagues' survey of GDPs in Hong Kong in 2008, the significance of surgical implant practice has no doubt been highlighted. Meanwhile, the fact that a substantial percentage of practitioners elect to practise both surgical and restorative procedures is understandable considering the advantages of this approach, the most important one being the exercise of a greater degree of personal control over the final clinical outcome. This is, of course, predicated on the

possession of adequate levels of surgical and restorative competency by the clinician.

IP GDPs have been revealed to be active in the provision of various types of implant-associated dental prostheses in both fixed and removable forms, including single-implant-supported crowns, non-full-arch multiple-implant-supported bridges, full-arch implant-supported fixed prostheses, and implant-retained overdentures. Generally, as the complexity of the prosthesis increases, the numbers of practitioners as well as their extent of practice correspondingly fall. For instance, over 99% of IP GDPs practise single-implant-supported crowns while less than half are involved in full-arch implant-supported fixed prostheses. Meanwhile, 43.15% provide both surgical and restorative services in case of the former treatment but less than half of this percentage (i.e. 18.05%) do so in the latter. In contrast, this trend is much less palpable for IP prosthodontists, which is to be expected due to these specialists' greater collective experience and higher levels of training in implant dentistry. Interestingly, the somewhat unexpectedly high percentage of IP GDPs not practising implant-retained overdentures (i.e. 34.44%) may highlight a need for greater focus on removable implant prosthodontics in CPD educational programs.

Regarding the brands of implants used, popular ones dominating the arena proved to be, as one might expect, familiar prominent names including Nobel Biocare™, Straumann™ and Dentsply (Astra)™, followed by Biomet 3i™, Neoss™ and Southern™. Altogether, these brands constitute over 70% of all respondents' choices. GDPs and prosthodontists appear to share similar patterns of preference predominated by Straumann™ and Nobel Biocare™; while periodontists indicated a considerably higher tendency to use Straumann™ and Dentsply (Astra)™ rather than Nobel Biocare™. Meanwhile, OMF surgeons are more likely to choose Nobel Biocare™. These differences in utilisation patterns may partially

reflect marketing patterns of implant manufacturers as well as the training regimens of the specialists.

In light of the increasing use of digital technology in dentistry in recent years, this study gauged the respondents' clinical use of digital scanning in impression acquisition for different types of implant-related dental prostheses. According to Galhano and colleagues (2012), three-dimensional (3D) scanners have been used in dentistry for over two decades, progressively improving during that time such that the accuracy of their digitally generated impressions has become comparable to that of conventional impressions. Not only can intraoral digital impression acquisition overcome clinical difficulties associated with the gag reflex, it also eliminates the need for certain procedures and materials associated with the conventional approach, such as special trays, master impression materials, impression disinfection and its physical transportation to the laboratory. An added advantage, particularly in today's digital information age, is the convenience of data storage and access associated with digital impressions.

Wismeijer and colleagues (2014) conducted a survey of thirty patients treated with non-full-arch fixed implant-supported restorations, whose final impressions were acquired both conventionally and via intraoral digital scanning. The results of this study indicated that the patients, none of whom exhibited an overt gap reflex, generally preferred digital scanning largely due to the absence of an uncomfortable impression material, though they did note its longer chairside working time.

Findings from the present study have confirmed the beginning of intra-oral digital scanning's permeation into implant dentistry in Australia, though only to a minor extent

and mainly limited to single-tooth restorations and some FPDs. Likely impediments to widespread utilisation of intraoral digital scanners include the additional training and considerable financial investments required to manipulate the associated equipment and software, as well as this approach's limitations with respect to full-arch-type prostheses.

The surveys' questions concerning the types of impression tray (i.e. 'open' and 'closed') and techniques (i.e. 'pick-up' and 'transfer') posed a challenge for some of the respondents. Since the meanings of these terms were taken as assumed knowledge, their definitions were not provided in the surveys. This has somewhat compromised the accuracy of responses owing to certain participants' non- or miscomprehension. With this drawback in mind, the overall impression generated by those who responded points to the predominance of the use of open impression trays and the pick-up technique by both GDPs and prosthodontists for all four types of implant-supported/retained prostheses. In hindsight, it would perhaps have been useful to have conducted a pilot study involving a smaller respondent population to identify potential areas of ambiguity in the surveys, prior to their official distribution.

The accuracy of impression techniques has been a subject of much focus and contention. A systematic review by Lee and colleagues (2008) suggested that both the pick-up and transfer methods were equally accurate when used in situations involving three implants or fewer; however, the pick-up technique with open impression trays was generally found to be more accurate when the number of implants exceeded three. A more recent systematic review by Papaspyridakos and associates published in 2014 largely concurred with this, concluding that the pick-up technique carried out in open trays produced more accurate impressions for edentulous cases but proved to be no more precise in partially dentate

situations. It therefore seems that the GDP and prosthodontist participants of this study are well justified in collectively favouring open impression trays and the pick-up method.

The manner of retention for implant-supported prostheses, whether by cement or screw, has also been a subject of much debate that is associated with prolific research. Retention by cement involves attaching the prosthesis to the implant abutment using a luting agent, in much the same manner as a conventional prosthesis is cemented onto a prepared tooth or core. In contrast, retention by screw requires the prosthesis and abutment to be connected to the fixture via a screw whose head is accessible through a channel on the surface of the prosthesis.

One of the greatest conveniences of retention by screw is the ready retrievability of the prosthesis for repair or replacement. Since no cement is used, the prosthetic component may be simply unscrewed from the abutment by accessing the screw channel from the restoration's surface. This leads to perhaps the most frequently cited drawback for screw-retained restorations: the presence of the screw channel on the surface of the prosthesis may well render its aesthetic outcome unsatisfactory, especially if it is located in a cosmetically critical region. However, this disadvantage can be overcome with judicious prosthetically driven treatment planning so that the implant is placed at an appropriate location and angulation such that the position of the screw channel can be well concealed. Additional surgical procedures such as bone augmentation may sometimes be required to realise this objective (Chee & Jivraj 2006).

Although screw-retained restorations were plagued by relatively frequent mechanical complications in the past largely due to screw loosening, improvements in componentry

over time have significantly reduced this issue. Meanwhile, an undeniable advantage of retention by screw is its applicability in suboptimal conditions where an implant abutment of ideal dimensions, particularly vertical height, cannot be accommodated. Without adequate abutment height and tapering, retention of the prosthesis by cement will be compromised. However, this issue does not apply to screw-retained restorations (Chee & Jivraj 2006).

Biologically, peri-implant tissues associated with screw-retained restorations generally tend to be healthier than those surrounding cemented ones mainly due to the absence of excess (or any) cement in the former case. An *in vitro* study by Linkevicius and colleagues (2010) on cemented implant-supported restorations demonstrated that it is virtually impossible to completely eliminate subgingival excess cement, even for specialists. Any residual cement may then contribute to plaque retention as well as inflammation of the peri-implant tissues. For instance, a clinical study by Weber and associates (2006) involving the post-treatment monitoring of 152 implants placed in 80 patients revealed that both mean gingival sulcus bleeding and plaque scores were significantly greater for cemented restorations than screw-retained ones at one year and three years.

A systematic review of survival and complication rates of cemented and screw-retained implant-supported restorations by Sailer and colleagues (2012) found that, although both types of restorations performed similarly in terms of survival and complications rates over five years, cemented restorations demonstrated more serious biological complications characterised by fixture loss and alveolar bone loss of greater than 2mm, while screw-retained restorations were associated with more mechanical issues. However, screw-retained restorations' ready retrievability helped to mitigate the effects of their mechanical

complications. Owing to this and their superior biocompatibility, the authors recommended screw retention as the preferable option.

A more recent systematic review on the same subject by Wittneben and associates published in 2014 concluded even more positively regarding the performance of screw-retained restorations. The results of this review indicated that these restorations survived equally well compared with cemented ones over five years, but suffered fewer mechanical and biological complications overall.

IP GDPs' and prosthodontists' preference for retention via screw proved to be overwhelming. 86.14% of the former and all of the latter favoured it for single-implant-supported crowns, while those preferring it for implant-supported FPDs stand out at 89.33% and 96.67%, respectively.

Interestingly, very minor percentages (i.e. up to 3.33%) of IP GDPs and prosthodontists indicated their preference for cross-pinning as a method of retention for implant-supported restorations. Cross-pinning involves the use of a small transverse screw to affix a prosthesis to an implant abutment when the placement of a conventional screw channel would compromise the aesthetic outcome or structural integrity (Gervais *et al.* 2008). The greatest advantage of this approach is its preservation of prosthesis retrievability without degrading the restoration's cosmetic result. A survey of Australian prosthodontists conducted by Sambrook and colleagues (2012) regarding the retention of single-implant-supported prostheses revealed that cross-pinning was the least preferred and used retention method, while retention by screw was favoured by the majority (i.e. 77%), some of whom indicated that they would choose cross-pinning as an alternative should retention by screw

prove impossible. Interestingly, this study also identified retention by cement as the most favoured approach by prosthodontists in Queensland, perhaps due to associated advantages such as accommodation for implant malalignment and greater fitting passivity.

While the flexibility offered by cross-pinning can be highly useful in judiciously selected cases, a number of factors still impede its widespread use, such as relative complexity of construction, variations in specific design features, the existence of an unfilled spaced within the prosthetic supra-structure, and unproven long-term retentive power.

Naturally, retention via screw is not without its disadvantages, such as increased laboratory components and manufacturing cost, weakening of the prosthesis' veneering porcelain and possible occlusal interferences caused by the screw channel, as well as posing a greater surgical demand on implant placement (Shadid & Sadaqa 2012). However, in view of the evidence in the literature as well as the practicality offered by screw-retained restorations, it appears that IP GDPs and prosthodontists in this study have good reason behind their general preference for retention by screw.

There appears to be a rise in Australian dentists' patronage of overseas dental laboratories in recent years, possibly due to the attraction of comparable quality produced at lower fees. This process has also been greatly facilitated by the popularisation of digital scanning technology which enables virtually instantaneous transfer of information worldwide. While no IP prosthodontists reported utilisation of offshore laboratories in this study, approximately 7.5% of IP GDPs' responses indicated their use. Considering the growing competition currently faced by all dental clinicians largely due to rapidly rising numbers of new graduates in the country (Preiss 2013), along with the growth of digital dental

technology, it would not be unreasonable to speculate that offshore laboratory services will be utilised by an increasing number of Australian practitioners in the foreseeable future. In the meantime, this study's findings indicate that local and interstate laboratories remain as providers of the great majority of implant-related prosthetic work.

Abundant data has been generated in the dental literature concerning the survival and complication rates of implant-supported restorations. The hypothetical clinical scenario in the surveys involving an implant-supported single crown being placed in the maxillary anterior region of a healthy thirty-year-old patient was designed to gauge IP respondents' perceptions regarding the survival of an implant and its prosthesis in a relatively non-stressful situation.

Over 90% of all respondents exhibited confidence in the ability of the fixture to survive (i.e. remain *in situ*) after ten years in function, believing its chance of failing at this stage to be less than 10%. This appears to agree well with the findings of systematic reviews on the survival and complication rates of implant-supported single crowns conducted by Jung and associates published in 2008 and 2012. In the first analysis, the authors found the five-year survival rate of fixtures to be 96.8%. Since this study did not provide any ten-year data, it may be assumed that the five-year survival figure would fall over a longer period in function. This was confirmed by results from the second review, which yielded both five- and ten-year survival rates. According to these, the five-year survival rate for fixtures of 97.2% decreased slightly to 95.2% at ten years, notwithstanding biological complications such as peri-implant mucositis and peri-implantitis.

In contrast, the respondents were less certain of the ten-year survival performance of the

prosthetic component, a considerable proportion of them having indicated perceived failure rates of 10% to 20% or higher. The systematic review by Jung and colleagues (2008) found the five-year survival rate of implant-supported crowns to be either 91.2% or 95.4% depending on whether it was fully porcelain or metal-ceramic. As expected, the more recent review by the same lead author (Jung *et al.* 2012) revealed a reduction in the prosthetic survival rate from 96.3% at five years to 89.4% at ten years. Although this figure appears to be relatively high, it should be noted that the rate of mechanical complications amounted to a total of 16.4% and was chiefly characterised by screw-loosening, loss of retention, and veneering material fracture in descending order. Theoretically, any one of these complications, if sufficiently severe, can result in the need to replace the prosthetic component within ten years. This means that the percentage of single crowns that fail within ten years could potentially be noticeably higher than 10%. This may account for the difference in participants' opinions concerning the performance of prosthetic component and fixture.

The survey question on the time of post-prosthesis-insertion review elicited a large variety of different responses ranging from one week to twelve months. Among these, the more prominent choices throughout all respondent groups in general include '1 week', '2 weeks' and '4 weeks', altogether constituting the responses of 71.16% of GDPs, 70.97 of prosthodontists, 84.21% of periodontists and 53.84% of OMF surgeons. Although no particular reasons were mentioned by the respondents for their preferences, it is pleasing to observe that the majority of them elect to review implant-supported prostheses within the first month of function, during which period an implant may begin to be affected by the biological complication known as peri-implant mucositis.

Peri-implant mucositis refers to inflammation of the soft tissues immediately surrounding an osseointegerated implant and/or its restoration. It is believed to be induced by the presence of oral bacteria, and may potentially develop into peri-implantitis, a more severe form of peri-implant disease characterised by inflammation and loss of alveolar bone, which may eventually lead to loss of the implant (Heitz-Mayfield *et al.*2011). Clinical experimental studies have demonstrated that it is possible for peri-implant mucositis to develop within three weeks if biofilm is permitted to accumulate (Pontoriero *et al.* 1994; Zitzmann *et al.* 2001), hence it would be advisable for the clinician to review the implant and prosthesis within one month of function to inspect for possible signs of peri-implant mucositis as well as ensure adequate oral hygiene.

The crown-to-implant (C/I) ratio refers to the proportional relationship between the length of the crown of an implant-supported restoration and that of the fixture. The crown is measured from the most coronal surface of the restoration to the most coronal bone contact, while the implant is measured from the most coronal bone contact to the apex of the fixture. The C/I ratio is not a static entity, continually changing due to progressive loss of the peri-implant alveolar bone. Theoretically, a higher C/I ratio represents a compromise in prognosis and survivability since the lever mechanics involved would render the restoration more vulnerable to the detrimental effects of lateral occlusal forces (Quaranta *et al.* 2014).

With the advent of short implants, which are often placed at sites containing low levels of bone, the influence of the C/I ratio on restoration survival has become particularly relevant. A systematic review conducted by Blanes (2009) revealed very limited data on this subject, deeming only two studies as suitable for inclusion. This review found a cumulative

survival rate of 94.1 % over a mean monitoring period of six years for implant-supported restorations with C/I ratios of greater than two. Additionally, no definitive associations between C/I ratio and peri-implant bone loss or mechanical complications could be ascertained. A more recent systematic review by Quaranta and colleagues published in 2014 included a slightly higher number of six studies. The results of this review suggested that elevation in C/I ratio did not appear to reduce cumulative survival rates of implant-supported restorations, nor did it affect biological complications. However, the review did identify a possible association between higher C/I ratios and certain mechanical complications, including abutment loosening for single crowns and abutment fracturing in posterior regions.

Although not strictly specific to the C/I ratio, a number of fairly recent systematic reviews concerning the survival of short implant-supported restorations have indicated that such implants can be considered a viable treatment option with comparable survival rates to those of regular-length implants at least in the short to mid-term, and especially if implants with roughened surfaces are used (Kotsovilis *et al.* 2009; Telleman *et al.* 2011; Annibali *et al.* 2012; Atieh *et al.* 2012). It would therefore seem reasonable that, in the presence of data collected over limited follow-up observational periods, using implants that are at least as long as the prosthetic crown height in non-overtly stressful situations is not absolutely necessary. According to relevant results of the present study, this appears to be the prevailing view among the majority of prosthodontist and periodontist respondents.

In recent years, the phenomenon of ‘dental tourism’ has become increasingly popular in regions where patients may consider dental treatment to be costly and/or prolonged in terms of waiting time. These regions include countries such as the United Kingdom,

United States, and Australia. Turner (2008) commented on this phenomenon in an opinion paper, in which dental tourism is defined as the act of travelling across the national border in order to obtain dental treatment, usually at a lower cost, with providers located in a foreign nation. While lack of affordability and access have prompted patients to seek dental care outside their local areas, several factors have undoubtedly played a crucial role in facilitating the spread of dental tourism, particularly in developed countries. These include economical air travel, the Internet which offers plentiful advertising coupled with ease of communication, and the added convenience of being able to engage in leisurely tourist activities during the course of treatment.

According to Turner (2008), one of the most serious concerns in relation to dental tourism is the great variation in the standard of treatment received. While some patients have been able to obtain an excellent level of care, others were rendered substandard services that have led to detrimental ramifications. Another major issue with having complex dental treatments performed outside the country lies in their maintenance and complication management, the critical importance of which is often disregarded by patients prior to undergoing treatment. Implant dentistry is perhaps one of the best examples to illustrate this concern. Once a patient leaves the country where treatment is performed, problems with accountability and access to care immediately come into play. Furthermore, complications affecting implant therapy can arise both surgically and prosthetically, and are potentially very severe. A vast range of different brands of implants is used throughout the world, each with its own specifically tailored componentry and equipment. Hence it can often be extremely difficult for a local practitioner to manage the complications of an implant-supported restoration placed abroad owing to challenges in identifying the implant system used and procuring the materials and equipment required for any rectifying treatment. It is therefore not surprising that many clinicians are reluctant and often unable

to assist the patient under such circumstances despite their professional and ethical duties to do so (Barrowman *et al.* 2010).

In order to gain a general idea of the frequency of problems arising from dental implant treatments rendered overseas, IP respondents of the present study were asked to indicate the approximate number of such problems encountered over a one-month period. 96.76% of GDPs, 91.67% of prosthodontists, 93.48% of periodontists and all OMF surgeons reported seeing fewer than ten such cases, suggesting that these have yet to become a common occurrence. However, considering the relative rarity of problematic implant cases, it may have been more helpful to divide the category of 'less than ten cases' into smaller increments such as 'less than five cases' and 'six to ten cases', in order to allow a more precise indication.

Meanwhile, the higher frequency of encounters estimated by a minority of respondents (i.e. 3.24% of GDPs, 8.34% of prosthodontists and 6.52% of periodontists) is of some concern, bearing in mind the approximate nature of the estimates and the fact that the meaning of the term 'problematic' was open to individual interpretation. Most of these encounters lie in the '11 – 20' range, with five practitioners indicating even higher numbers. It is possible for the overall prevalence of problematic implant cases from overseas to rise in the foreseeable future as implant dentistry practice becomes more widespread in developing Southeast Asian countries, which are common tourist destinations for Australian consumers. There is therefore a need to raise the public awareness of major potential difficulties associated with dental tourism, which may be financially viable in the short term but could ultimately result in a greater biological and fiscal cost.

4.3 Peri-implantitis and Its Management

The prevalence of peri-implantitis can be considered at two levels: the percentage of patients affected and that of the number of implants placed. The prevalence at the patient level is usually higher since a fair number of patients have had multiple implants placed without all of them being affected by peri-implantitis. The variations in the respondents' estimations of the prevalence of peri-implantitis somewhat mirrors the large range of figures reported in the literature by numerous reviews. A review on the definition and prevalence of peri-implant diseases by Zitzmann and Berglundh (2008) stated a scarcity of relevant data and could only include two studies, which respectively reported peri-implantitis prevalence figures of 12% and 43% of implants placed. This was echoed in the consensus of the Sixth European Workshop on Periodontology concerning peri-implant diseases published in the same year (Lindhe & Meyle 2008). More recently, Atieh and colleagues (2013) conducted a systematic review encompassing a greater number of studies. The nine studies included in their weighted meta-analysis yielded an overall mean peri-implantitis prevalence estimate of 9.6% of implant placed. Another systematic review on the epidemiology of peri-implant diseases by Derks and Tomasi (2014) included eleven studies as well as relevant meta-analyses. This review did not consider peri-implantitis at the implant level, instead generating a weighted mean prevalence figure of 22% of patients treated. This figure fairly closely matches the corresponding one from Atieh's group (2013), which is 18.8%. All evidence considered, it is probable that the true prevalence of peri-implantitis is in the 10% to 20% range depending on the level of disease occurrence. This is not markedly different from the respondents' own estimations in the present study. Over 90% of IP GDPs', prosthodontists' and OMF surgeons' estimates do not exceed 20%,

though more than 60% of these respondents believe the prevalence to be under 10%. Periodontists, on the other hand, hold a more pessimistic view, with 42.11% selecting '< 10%', 34.21% choosing '10 – 20%', and the remaining 23.68% opting for higher ranges. The higher estimates of periodontists can be readily explained by the fact that this is the group of specialists who manage peri-implantitis most frequently. Among IP periodontists, 86.84% indicated that they routinely treat this condition, compared with the range of 20.12% to 33.33% found in the other respondent groups.

Regarding the treatment of peri-implantitis, a conclusively efficacious treatment approach has yet to emerge despite the rich repertoire of strategies of varying degrees of success that have been clinically trialled and documented (Esposito 2012). There is, however, very recent evidence indicating that the majority of therapeutic approaches are capable of effecting a clinical improvement in at least the short term, with surgical procedures more likely to produce a favourable outcome at twelve months than non-surgical measures (Heitz-Mayfield & Mombelli 2014). This is partially reflected in the responses of this study's participants, which comprised a large range of different treatment regimens. Since the respondents were not requested to indicate the severity of the cases they managed, it is impossible to match their treatment approaches to the guidelines established by the CIST protocol. Irrespective of disease severity, common treatment regimens implemented by the respondents include curettage, curettage with local antibiotic application, flap surgery plus curettage, and flap surgery with curettage and bone augmentation. The latter three of these four regimens appear to be relatively effective in view of the evidence presented by recent systematic reviews (Esposito *et al.* 2012; Faggion *et al.* 2013, Heitz-Mayfield & Mombelli 2014).

4.4 Attitudes of General Dental Practitioners towards Continuing Education in Implant Dentistry

Findings from this study revealed a strong demand for continued education in implant dentistry among both NIP and IP GDPs. Over 50% of the NIP group's responses indicated positive intention to undertake some form of continuing educational program, the most popular types being one-day CPD courses (25.96%) and extended CPD courses (21.05%). As for those wishing to experience further education, 40% indicated preference for solely restorative aspects while 54.81% expressed interest in both restorative and surgical facets. As perhaps to be expected, feedback from the IP group proved to be even more enthusiastic: 94.39% of responses demonstrated desire for further education with the majority opting for one-day CPD programs (48.98%) and extended CPD courses (34.35%). Similar to NIP GDPs, the majority of IP practitioners desiring further learning comprise those preferring restorative aspects alone (30.21%) and those electing both restorative and surgical aspects (47.45%). In both NIP and IP groups, respondents opting for the surgical facet alone constitute the minority (i.e. 5.19% and 15.32%, respectively).

For providers of continuing professional educational programs in implant dentistry, the current attitudes of GDPs confirm the existence of a significant demand for such programs, particularly in the form of one-day-long and extended CPD courses. Although programs focusing on restorative aspects would seem to benefit a greater proportion of practitioners, there is certainly a strongly perceived need for surgical education as well.

4.5 Relating Implant-practising GDPs' Practice to Their Education Levels

In terms of the highest levels of implant dentistry education attained or being undertaken by all GDP respondents, it is clear that IP GDPs have a collective advantage compared with their NIP colleagues. In the NIP GDP group, 29% of respondents have had no implant-related education, while the corresponding percentage in the IP group is less than 1%. The proportion of respondents having undertaken educational programs of higher levels (i.e. extended CPD course > 1 day or higher) is also considerably greater in the IP group, being nearly fivefold of its counterpart in the NIP group (i.e. 78.54% versus 16.45%).

As mentioned in Chapter One, the Australian Consensus Workshop on Implant Dentistry University Education (ACWIDUE) developed a set of practice guidelines matching the complexity levels of implant-related cases with corresponding levels of education required for their management (refer to Table 1.2 on page 11). The practice patterns and education levels of IP GDPs were compared with these guidelines in order to reveal any noticeable discrepancies.

It has been shown in Table 3.58 and Figure 3.56 (pages 194 to 195) that 103 of the 480 IP GDP respondents in this study (i.e. 21.46%) reported not having experienced any implant-related education beyond one-day CPD courses. According to ACWIDUE's guidelines, such a level of educational background is generally deemed inadequate for a general dentist to be providing patients with any implant-related treatments clinically. Furthermore,

Table 4.1 below presents the highest levels of implant-related education associated with IP GDPs whose practice involves full-arch fixed implant-supported prostheses:

Table 4.1. Highest Levels of Education in Implant Dentistry Attained/Currently Undertaken by IP GDPs Whose Practice Involves Full-arch Fixed Implant-supported Prostheses	
None	0
Undergraduate Degree	1 (0.47%)
CPD Course ≤ 1 day	14 (6.64%)
Extended CPD Course > 1 day	106 (50.24%)
Postgraduate Program (Non-specialty Training)	43 (20.38%)
Specialty Training	47 (22.27%)
Total	**211**

As shown above, among the 211 IP GDPs who indicated involvement in the provision of full-arch fixed implant-supported prostheses, 121 (i.e. 57.35%) of them have yet to complete any educational programs beyond the level of extended CPD courses. This appears to be in conflict with the guidelines prescribed by ACWIDUE, which stipulate that the type of treatment in question belongs in the 'Advanced' or possibly 'Complex' category, and should therefore not be performed by practitioners possessing any training less than a graduate diploma in dental implantology.

At this point, one may be gaining the impression that an appreciable percentage of IP GDPs may be practising outside the scope of their training. However, a respondent's level of education does not always accurately reflect their degree of competency, which is the result of not only formal education but also experience and tutelage from more experienced

colleagues if available. Increasing experience and assistance from senior colleagues may well enable some clinicians to practise beyond the scope recommended by ACWIDUE's guidelines, which, after all, are not legally binding. It is also worth mentioning that most of these practitioners would have been practising implant dentistry prior to the advent of ACWIDUE's guidelines, before any official distinct definition of the scope of implant practice. However, for those practising beyond the ACWIDUE's guidelines, the issue of engaging in a scope of practice without substantiation by formal certification is imminent, especially when treatment outcomes become problematical. Apart from undesirable consequences for the patient, the potential dento-legal ramifications can be severe.

According to Lam (2014), dentistry-related litigation has been on the rise in recent times and is likely to continue increasing. Featuring prominently in dental litigation is implant dentistry, partly due to the high cost and procedural risk associated with it. This is further compounded by a tenuous implantology educational experience in the undergraduate curriculum, which leaves many implantology-pursuing dental graduates little choice but to obtain their training in this challenging discipline through continuing professional education. Unfortunately, most graduates' continuing education takes the form of sporadic short courses since they are usually fully committed to work and therefore can ill-afford the ample time and effort required to complete formal postgraduate programs that thoroughly prepare them for the clinical practice of implant dentistry. Since the quality and quantity of continuing professional education required for implant practice are currently not prescribed, GDPs are permitted to practise their chosen scope of procedures without any further required training. It follows that there is likely to be an appreciable variation in the standard of care provided by GDPs in general. This helps to account for the relatively high frequency of implants' involvement in dental litigation, and also possibly highlights

the need for more stringent regulation of the practice of implant dentistry.

In the event of a legal complaint, it may well be difficult to defend a practitioner for a procedure they have not received sufficient official training in. Under the current circumstances of practice autonomy and a legal environment that is shifting away from medical paternalism towards greater patient rights (Lam 2014), there is a strong case to be made that general dentists involved in the practice of implant dentistry should strive to achieve appropriate levels of continuing professional development not only to remain abreast of the continuously evolving body of knowledge in this field, but also to ensure that their level of certifiable education qualifies them for the range of treatment they are providing their patients.

Chapter Five:

Summary, Conclusions and Recommendations

This survey of dental practitioners across Australia has revealed that implant dentistry is currently practised restoratively and/or surgically by approximately two thirds of general dental practitioners and over 80% of prosthodontists, periodontists and OMF surgeons. Implant-practising GDPs appear to be reasonably experienced in implant-related procedures, with a considerable proportion being actively involved in both restorative and surgical aspects. Furthermore, they collectively provide a comprehensive variety of treatments ranging from single-tooth restorations to full-arch reconstructions, though the numbers of practitioners as well as extent of involvement tend to fall as the complexity of treatment increases.

The referring patterns of all GDPs for implant-related cases suggest the predominance of the philosophy of prosthetically driven fixture placement. Periodontists seem to receive a greater share of surgical referrals than OMF surgeons, while prosthodontists receive the highest proportion of restorative referrals.

The most commonly used brands of implants by GDPs and specialists include Nobel Biocare™, Straumann™ and Dentsply (Astra)™, followed by Biomet 3i™, Neoss™ and Southern™. Altogether, these brands constitute over 70% of the respondents' choices.

In general, no glaring discrepancies emerged between the opinions of IP GDPs and specialists with respect to most technical and theoretical aspects of implant dentistry, including impression acquisition approach, method of prosthesis retention, estimated fixture and prosthesis survival rates, post-prosthesis-insertion review times, and estimated prevalence of peri-implantitis. Consensus with relevant evidence in the literature was in general found for all of these topics. However, GDPs and OMF surgeons' perspective on the crown-to-implant ratio collectively differ from that of prosthodontists and periodontists,

and appears to be less concordant with the presently available evidence.

The occurrence of problematic implant-related cases from overseas seems to be uncommon overall, though a very minor proportion of participants reported alarmingly high figures. This underscores the need to raise public awareness concerning potential difficulties and problematic consequences of dental tourism, not only for patients but also for local practitioners who are often required to deal with challenging complications arising from this phenomenon.

Nearly 80% of all GDPs expressed a desire to pursue continuing education in implant dentistry, most preferably via one-day-long and extended continuing professional development courses. This implies a strong demand for educational programs in this field.

A noteworthy finding which has emerged from this study is that an appreciable proportion of IP GDPs appear to be practising beyond the scope warranted by their levels of education in implantology, if the guidelines established by the Australian Consensus Workshop on Implant Dentistry University Education (ACWIDUE) were strictly followed. This may lead to unpleasant legal ramifications in the event of an unsuccessful treatment outcome, especially in the presently litigious and patient-rights-favouring legal climate. Considering the relatively costly and high-risk nature of implant dentistry, it may well be beneficial for both patients and practitioners to have stricter regulation of the practice of this discipline enacted.

Based on the findings of this investigation, the following recommendations can be made:

1) Implementation of more stringent regulation of dental implant practice based on practitioners' educational levels and experiences.
2) Placement of greater emphasis on removable prosthodontics (i.e. implant-retained overdentures) in CPD courses on dental implantology for general dental practitioners.
3) Development and dissemination of a consistent standard of terminology in order to address practitioners' confusion over jargon such as "pick-up", "transfer", "open tray" and "closed tray".
4) Wherever possible, augmentation of implant-related education and clinical experience, even if observational, in undergraduate dental curricula.
5) Promotion of patient education with respect to potential difficulties associated with ‘dental tourism’, especially when complex and high-risk procedures such as major surgical and restorative treatments are performed overseas with no ready access to regular post-treatment monitoring and maintenance.

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Appendix:

Questionnaires Used in This Study

GENERAL DENTAL PRACTITIONERS (GDPs):

NOT PRACTISING DENTAL IMPLANTS

(Note: Questions labelled with an asterisk* are compulsory, meaning that a respondent would not be able to proceed to the next section of the survey if they had neglected to answer such a question. However, all participants were free to exit the survey at any time by manually exiting their Internet browser window.)

1. **Please enter the final five digits of your work telephone number (landline) as your entry code for the prize draw:**

   _____

2. ***Please indicate the year of your completion of dental training:**

   _____

3. ***Are you practising on a full- or part-time basis?**

   ☐ Full-time

   ☐ Part-time

4. **If practising part-time, how many hours, on average, are you working per week?**

   _____

5. ***In which State(s) and/or Territory(ies) are you practising?**

- ☐ ACT
- ☐ NSW
- ☐ NT
- ☐ QLD
- ☐ SA
- ☐ TAS
- ☐ VIC
- ☐ WA

6. ***Are you working in the private and/or public sector(s)?**

   - ☐ Private
   - ☐ Public
   - ☐ Private & Public

7. ***What is/are the location(s) of the practice(s) you are working at?**

   - ☐ Metropolitan
   - ☐ Country
   - ☐ Metropolitan & Country

8. ***Are you practising surgical and/or restorative aspect(s) of implant dentistry? (Note: Skip Logic is applied to this question so that the subsequent set of questions will differ based on the participant's response.)**

   - ☐ Yes
   - ☐ No

9. ***If you are not practising implant dentistry, which type of practitioner do you most frequently refer your implant dentistry cases to?**

   ☐ General Dental Practitioner with experience in implant dentistry

   ☐ Oral & Maxillofacial Surgeon

   ☐ Periodontist

   ☐ Prosthodontist

   ☐ Other (please specify): _____

10. **Please indicate your reason(s) for referring implant dentistry cases:**

    _____

    _____

    _____

    _____

11. ***What kind(s) of further education in implant dentistry are you intending to undertake in the foreseeable future?**

    ☐ None

    ☐ Continuing professional education course(s) ≤ 1day

    ☐ Extended training program > 1 day

    ☐ Postgraduate diploma or degree (excluding specialist training)

    ☐ Accredited specialist training program

12. ***If you were to undertake further education in implant dentistry, which aspect(s) of it would you like to improve your education in?**

    ☐ Not planning to undertake further dental implant-related education

- ☐ Restorative
- ☐ Surgical
- ☐ Restorative & Surgical

13. *On average, approximately how many PROBLEMATIC cases involving implants placed and/or restored overseas do you see every month? Please include any cases that had been completed either partially or fully abroad.

- ☐ < 10
- ☐ 11 – 20
- ☐ 21 – 30
- ☐ > 30

14. *What is the highest level of education in implant dentistry you have attained or are undertaking?

- ☐ Have not had any education in implant dentistry
- ☐ Undergraduate degree
- ☐ Continuing professional education course(s) ≤ 1 day
- ☐ Extended training program > 1 day
- ☐ Postgraduate diploma or degree (excluding specialty training)
- ☐ Accredited specialty training program

15. Please feel welcome to enter any further comments:

_____

_____

GENERAL DENTAL PRACTITIONERS (GDPs):

CURRENTLY PRACTISING DENTAL IMPLANTS

(Note: Questions labelled with an asterisk* are compulsory, meaning that a respondent would not be able to proceed to the next section of the survey if they neglected to answer such a question. However, all participants were free to exit the survey at any time by manually exiting their Internet browser window.)

1. **Please enter the final five digits of your work telephone number (landline) as your entry code for the prize draw:**

   _____

2. ***Please indicate the year of your completing of dental training:**

   _____

3. ***Are you practising on a full- or part-time basis?**

   ☐ Full-time

   ☐ Part-time

4. **If practising part-time, how many hours, on average, are you working per week?**

   _____

5. ***In which State(s) and/or Territory(ies) are you practising?**

- ☐ ACT
- ☐ NSW
- ☐ NT
- ☐ QLD
- ☐ SA
- ☐ TAS
- ☐ VIC
- ☐ WA

6. ***Are you working in the private and/or public sector(s)?**

   - ☐ Private
   - ☐ Public
   - ☐ Private & Public

7. ***What is/are the location(s) of the practice(s) you are working at?**

   - ☐ Metropolitan
   - ☐ Country
   - ☐ Metropolitan & Country

8. ***Are you practising surgical and/or restorative aspect(s) of implant dentistry? (Note: Skip Logic is applied to this question so that the subsequent set of questions will differ based on the participant's response.)**

   - ☐ Yes
   - ☐ No

9. *If you are practising implant dentistry, how often do you perform implant-related procedures?

- ☐ At least once a day
- ☐ At least once a week
- ☐ At least once a month
- ☐ Less often than once a month

10. *What aspect(s) of implant dentistry are you practising?

- ☐ Restorative aspect only
- ☐ Surgical aspect only
- ☐ Restorative & Surgical aspects

11. *How long have you been practising restorative aspect of implant dentistry for?

- ☐ 1 to 5 years
- ☐ 6 to 10 years
- ☐ > 10 years
- ☐ Not practising

12. *How long have you been practising surgical aspect of implant dentistry for?

- ☐ 1 to 5 years
- ☐ 6 to 10 years
- ☐ > 10 years
- ☐ Not practising

13. *For each of the following clinical situation (A to D), please indicate the extent of your practice:

	Restorative only	Surgical only	Restorative & Surgical	Not Practising
A) Single tooth replacement	☐	☐	☐	☐
B) Multiple-implant bridge (non-full-arch)	☐	☐	☐	☐
C) Full-arch fixed prosthesis	☐	☐	☐	☐
D) Implant-retained overdenture	☐	☐	☐	☐

14. If you are referring to (an)other practitioner(s) for any aspect of dental implant treatment, please indicate the type(s) of practitioner(s) you refer to for the following aspects of treatment:

	GDP with experience in implant dentistry	**Oral & Maxillofacial Surgeon**	**Periodontist**	**Prosthodontist**	**Other**
Restorative	☐	☐	☐	☐	☐
Surgical	☐	☐	☐	☐	☐

15. *Which brand(s) of dental implant are you using most frequently?

- ☐ BioHorizons
- ☐ Biomet 3i
- ☐ Calcitek
- ☐ Dentsply (Astra)
- ☐ MDI (IMTEK)
- ☐ MIS
- ☐ Neoss
- ☐ Nobel Biocare
- ☐ Southern
- ☐ Straumann
- ☐ Other (please specify): _____

16. ***Which method do you use MOST OFTEN to acquire impressions of implant fixtures and/or abutments in each of the following clinical situations (A to D)?**

	Conventionally (using impression trays & elastomeric materials	Digital Scanning	Not Practising
A) Single tooth replacement	☐	☐	☐
B) Multiple-implant bridge (non-full-arch)	☐	☐	☐
C) Full-arch fixed prosthesis	☐	☐	☐
D) Implant-retained overdenture	☐	☐	☐

17. **If you acquire your impressions conventionally, please indicate the type of impression tray you would use MOS OFTEN in each of the following clinical situations (A to D):**

	Open	Closed	Not Practising

A) Single tooth replacement	☐	☐	☐
B) Multiple-implant bridge (non-full-arch)	☐	☐	☐
C) Full-arch fixed prosthesis	☐	☐	☐
D) Implant-retained overdenture	☐	☐	☐

18. If you acquire your impressions conventionally, please indicate the type of impression technique you would use MOS OFTEN in each of the following clinical situations (A to D):

	Pick-up	**Transfer**	**Not Practising**
A) Single tooth replacement	☐	☐	☐
B) Multiple-implant bridge (non-full-arch)	☐	☐	☐
C) Full-arch fixed prosthesis	☐	☐	☐

D) Implant-retained overdenture	☐	☐	☐

19. *For each of the following clinical situations (A and B), please indicate the method of prosthesis retention you would ideally prefer:

	Screw	**Cement**	**Cross-pin**	**Not Practising**
A) Single tooth replacement	☐	☐	☐	☐
B) Multiple-implant bridge (non-full-arch)	☐	☐	☐	☐

20. *Which type(s) of dental laboratory are you employing for implant-related prosthetic work? Please select all that apply:

☐ Own

☐ Local

☐ Interstate

☐ Overseas

21. ***For a single implant-supported prosthesis in an ungrafted site in the upper anterior region, in an otherwise fit and healthy 30-year-old patient with an Angle Class I occlusal scheme, what would you believe to be the chance of having the patient return 10 year after insertion with:**

	< 10%	10 to < 20%	20 to < 30%	≥ 30%
A) The implant fixture being mobile and in need of removal?	☐	☐	☐	☐
B) The prosthetic component(s) being damaged and in need of replacement?	☐	☐	☐	☐

22. ***In the same clinical scenario as outline in the previous question, assuming complete patient satisfaction with the treatment outcome and absence of any complications, how soon would you review the patient after insertion of the prosthesis?**

☐ 1 week

☐ 2 weeks

☐ 3 weeks

☐ 4 weeks

☐ Other (please specify): _____

23. *In the same clinical scenario as outlined previously, do you believe the length of the implant used needs to be at least as long as the height of the crown it supports?

☐ Yes

☐ No

24. *Defining peri-implantitis as a pathotic condition characterised by the presence of a periodontal pocket depth of 5mm or greater, bleeding and/or pus on probing, and radiographic evidence of alveolar bone loss around an implant, what would be your estimate of the overall prevalence of peri-implantitis?

☐ < 10%

☐ 10 – 20%

☐ 21 – 30%

☐ 31 – 40%

☐ > 40%

25. *Do you routinely treat cases of peri-implantitis?

☐ Yes

☐ No

26. If you routinely treat cases of peri-implantitis, please select from below the method(s) of treatment which most closely match(es) the one(s) you most frequently employ:

- ☐ Application of Local Antibiotic(s) (e.g. metronidazole)
- ☐ Curettage
- ☐ Curettage + Local Antibiotic(s)
- ☐ Air-abrasive Device (e.g. Vector™)
- ☐ Laser (e.g. Er:YAG)
- ☐ Flap Surgery + Curettage
- ☐ Flap Surgery + Curettage + Local Antibiotic(s)
- ☐ Flap Surgery + Curettage + Bone Augmentation (auto-/allo-/xenograft)
- ☐ Flap Surgery + Curettage + Bone Augmentation + Adjunctive Procedure (e.g. Air-abrasion, Laser)

27. If you routinely refer cases of peri-implantitis to another practitioner for management, please indicate which type of practitioner you most frequently refer to:

- ☐ GDP with experience in implant dentistry
- ☐ Oral & Maxillofacial Surgeon
- ☐ Periodontist
- ☐ Prosthodontist

28. *What kind(s) of further education in implant dentistry are you intending to undertake in the foreseeable future?

- ☐ None
- ☐ Continuing professional education course(s) ≤ 1day
- ☐ Extended training program > 1 day
- ☐ Postgraduate diploma or degree (excluding specialist training)
- ☐ Accredited specialist training program

29. *If you were to undertake further education in implant dentistry, which aspect(s) of it would you like to improve your education in?

- ☐ Not planning to undertake further dental implant-related education
- ☐ Restorative
- ☐ Surgical
- ☐ Restorative & Surgical

30. *On average, approximately how many PROBLEMATIC cases involving implants placed and/or restored overseas do you see every month? Please include any cases that had been completed either partially or fully abroad.

- ☐ < 10
- ☐ 11 – 20
- ☐ 21 – 30
- ☐ > 30

31. *What is the highest level of education in implant dentistry you have attained or are undertaking?

- ☐ Have not had any education in implant dentistry
- ☐ Undergraduate degree
- ☐ Continuing professional education course(s) ≤ 1 day
- ☐ Extended training program > 1 day
- ☐ Postgraduate diploma or degree (excluding specialty training)
- ☐ Accredited specialty training program

32. Please feel welcome to enter any further comments:

_____

_____

_____

_____

PROSTHODONTISTS:

NOT PRACTISING DENTAL IMPLANTS

(<u>Note</u>: Questions labelled with an asterisk* are compulsory, meaning that a respondent would not be able to proceed to the next section of the survey if they neglected to answer such a question. However, all participants were free to exit the survey at any time by manually exiting their Internet browser window.)

1. ***Please indicate the year of your completion of prosthodontic training:**

   _____

2. ***Are you practising prosthodontics on a full- or part-time basis?**

   ☐ Full-time

   ☐ Part-time

3. **If practising part-time, how many hours, on average, are you working per week?**

   _____

4. ***In which State(s) and/or Territory(ies) are you practising?**

   ☐ ACT

   ☐ NSW

   ☐ NT

   ☐ QLD

- ☐ SA
- ☐ TAS
- ☐ VIC
- ☐ WA
- ☐ Other (please specify) _____

5. ***Are you working in the private and/or public sector(s)?**
   - ☐ Private
   - ☐ Public
   - ☐ Private & Public

6. ***What is/are the location(s) of the practice(s) you are working at?**
   - ☐ Metropolitan
   - ☐ Country
   - ☐ Metropolitan & Country

7. ***Are you practising surgical and/or restorative aspect(s) of implant dentistry? (Note: Skip Logic is applied to this question so that the subsequent set of questions will differ based on the participant's response.)**
   - ☐ Yes
   - ☐ No

8. ***If you are not practising implant dentistry, which type of practitioner do you most frequently refer your implant dentistry cases to?**
   - ☐ General Dental Practitioner with experience in implant dentistry

- ☐ Oral & Maxillofacial Surgeon
- ☐ Periodontist
- ☐ Prosthodontist
- ☐ Other (please specify): _____

9. Please indicate your reason(s) for referring implant dentistry cases:

_____

_____

_____

_____

10. *What kind(s) of further education in implant dentistry are you intending to undertake in the foreseeable future?

- ☐ None
- ☐ Continuing professional education course(s) ≤ 1day
- ☐ Extended training program > 1 day
- ☐ Postgraduate diploma or degree (excluding specialist training)
- ☐ Accredited specialist training program

11. *If you were to undertake further education in implant dentistry, which aspect(s) of it would you like to improve your education in?

- ☐ Not planning to undertake further dental implant-related education
- ☐ Restorative
- ☐ Surgical
- ☐ Restorative & Surgical

12. *On average, approximately how many PROBLEMATIC cases involving implants placed and/or restored overseas do you see every month? Please include any cases that had been completed either partially or fully abroad.

- ☐ < 10
- ☐ 11 – 20
- ☐ 21 – 30
- ☐ > 30

13. *What is the highest level of education in implant dentistry you have attained or are undertaking?

- ☐ Have not had any education in implant dentistry
- ☐ Undergraduate degree
- ☐ Continuing professional education course(s) ≤ 1 day
- ☐ Extended training program > 1 day
- ☐ Postgraduate diploma or degree (excluding specialty training)
- ☐ Accredited specialty training program

14. Please feel welcome to enter any further comments:

_____

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_____

_____

PROSTHODONTISTS:

CURRENTLY PRACTISING DENTAL IMPLANTS

(<u>Note</u>: Questions labelled with an asterisk* are compulsory, meaning that a respondent would not be able to proceed to the next section of the survey if they neglected to answer such a question. However, all participants were free to exit the survey at any time by manually exiting their Internet browser window.)

1. ***Please indicate the year of your completion of prosthodontic training:**

   _____

2. ***Are you practising prosthodontics on a full- or part-time basis?**

   ☐ Full-time

   ☐ Part-time

3. **If practising part-time, how many hours, on average, are you working per week?**

   _____

4. ***In which State(s) and/or Territory(ies) are you practising?**

   ☐ ACT

   ☐ NSW

   ☐ NT

   ☐ QLD

- ☐ SA
- ☐ TAS
- ☐ VIC
- ☐ WA

5. ***Are you working in the private and/or public sector(s)?**
   - ☐ Private
   - ☐ Public
   - ☐ Private & Public

6. ***What is/are the location(s) of the practice(s) you are working at?**
   - ☐ Metropolitan
   - ☐ Country
   - ☐ Metropolitan & Country

7. ***Are you practising surgical and/or restorative aspect(s) of implant dentistry? (Note: Skip Logic is applied to this question so that the subsequent set of questions will differ based on the participant's response.)**
   - ☐ Yes
   - ☐ No

8. ***If you are practising implant dentistry, how often do you perform implant-related procedures?**
   - ☐ At least once a day
   - ☐ At least once a week

- ☐ At least once a month
- ☐ Less often than once a month

9. *What aspect(s) of implant dentistry are you practising?

- ☐ Restorative aspect only
- ☐ Surgical aspect only
- ☐ Restorative & Surgical aspects

10. *How long have you been practising restorative aspect of implant dentistry for?

- ☐ 1 to 5 years
- ☐ 6 to 10 years
- ☐ > 10 years
- ☐ Not practising

11. *How long have you been practising surgical aspect of implant dentistry for?

- ☐ 1 to 5 years
- ☐ 6 to 10 years
- ☐ > 10 years
- ☐ Not practising

12. *For each of the following clinical situation (A to D), please indicate the extent of your practice:

	Restorative	**Surgical only**	**Restorative &**	**Not**

	only		Surgical	Practising
A) Single tooth replacement	☐	☐	☐	☐
B) Multiple-implant bridge (non-full-arch)	☐	☐	☐	☐
C) Full-arch fixed prosthesis	☐	☐	☐	☐
D) Implant-retained overdenture	☐	☐	☐	☐

13. If you are referring to (an)other practitioner(s) for any aspect of dental implant treatment, please indicate the type(s) of practitioner(s) you refer to for the following aspects of treatment:

	GDP with	Oral &	Periodontist	Prosthodontist	Other

	experience in implant dentistry	**Maxillofacial Surgeon**			
Restorative	☐	☐	☐	☐	☐
Surgical	☐	☐	☐	☐	☐

14. *Which brand(s) of dental implant are you using most frequently?

- ☐ BioHorizons
- ☐ Biomet 3i
- ☐ Calcitek
- ☐ Dentsply (Astra)
- ☐ MDI (IMTEK)
- ☐ MIS
- ☐ Neoss
- ☐ Nobel Biocare
- ☐ Southern
- ☐ Straumann
- ☐ Other (please specify): _____

15. *Which method do you use MOST OFTEN to acquire impressions of implant fixtures and/or abutments in each of the following clinical situations (A to D)?

	Conventionally	**Digital Scanning**	**Not Practising**

	(using impression trays & elastomeric materials		
A) Single tooth replacement	☐	☐	☐
B) Multiple-implant bridge (non-full-arch)	☐	☐	☐
C) Full-arch fixed prosthesis	☐	☐	☐
D) Implant-retained overdenture	☐	☐	☐

16. If you acquire your impressions conventionally, please indicate the type of impression tray you would use MOS OFTEN in each of the following clinical situations (A to D):

	Open	**Closed**	**Not Practising**
A) Single tooth replacement	☐	☐	☐
B) Multiple-implant bridge	☐	☐	☐

(non-full-arch)			
C) Full-arch fixed prosthesis	☐	☐	☐
D) Implant-retained overdenture	☐	☐	☐

17. If you acquire your impressions conventionally, please indicate the type of impression technique you would use MOS OFTEN in each of the following clinical situations (A to D):

	Pick-up	**Transfer**	**Not Practising**
A) Single tooth replacement	☐	☐	☐
B) Multiple-implant bridge (non-full-arch)	☐	☐	☐
C) Full-arch fixed prosthesis	☐	☐	☐
D) Implant-retained overdenture	☐	☐	☐

18. *For each of the following clinical situations (A and B), please indicate the method of prosthesis retention you would ideally prefer:

	Screw	Cement	Cross-pin	Not Practising
A) Single tooth replacement	☐	☐	☐	☐
B) Multiple-implant bridge (non-full-arch)	☐	☐	☐	☐

19. *Which type(s) of dental laboratory are you employing for implant-related prosthetic work? Please select all that apply:

- ☐ Own
- ☐ Local
- ☐ Interstate
- ☐ Overseas

20. *For a single implant-supported prosthesis in an ungrafted site in the upper anterior region, in an otherwise fit and healthy 30-year-old patient with an Angle Class I occlusal scheme, what would you believe to be the chance of having the patient return 10 year after insertion with:

	< 10%	10 to < 20%	20 to < 30%	≥ 30%
A) The implant fixture being mobile and in need of removal?	☐	☐	☐	☐
B) The prosthetic component(s) being damaged and in need of replacement?	☐	☐	☐	☐

21. *In the same clinical scenario as outline in the previous question, assuming complete patient satisfaction with the treatment outcome and absence of any complications, how soon would you review the patient after insertion of the prosthesis?

☐ 1 week

☐ 2 weeks

☐ 3 weeks

☐ 4 weeks

☐ Other (please specify): _____

22. *In the same clinical scenario as outlined previously, do you believe the length of the implant used needs to be at least as long as the height of the crown it supports?

- ☐ Yes
- ☐ No

23. *Defining peri-implantitis as a pathotic condition characterised by the presence of a periodontal pocket depth of 5mm or greater, bleeding and/or pus on probing, and radiographic evidence of alveolar bone loss around an implant, what would be your estimate of the overall prevalence of peri-implantitis?

- ☐ < 10%
- ☐ 10 – 20%
- ☐ 21 – 30%
- ☐ 31 – 40%
- ☐ > 40%

24. *Do you routinely treat cases of peri-implantitis?

- ☐ Yes
- ☐ No

25. If you routinely treat cases of peri-implantitis, please select from below the method(s) of treatment which most closely match(es) the one(s) you most frequently employ:

- ☐ Application of Local Antibiotic(s) (e.g. metronidazole)
- ☐ Curettage
- ☐ Curettage + Local Antibiotic(s)

- ☐ Air-abrasive Device (e.g. Vector™)
- ☐ Laser (e.g. Er:YAG)
- ☐ Flap Surgery + Curettage
- ☐ Flap Surgery + Curettage + Local Antibiotic(s)
- ☐ Flap Surgery + Curettage + Bone Augmentation (auto-/allo-/xenograft)
- ☐ Flap Surgery + Curettage + Bone Augmentation + Adjunctive Procedure (e.g. Air-abrasion, Laser)

26. If you routinely refer cases of peri-implantitis to another practitioner for management, please indicate which type of practitioner you most frequently refer to:

- ☐ GDP with experience in implant dentistry
- ☐ Oral & Maxillofacial Surgeon
- ☐ Periodontist
- ☐ Prosthodontist

27. *What kind(s) of further education in implant dentistry are you intending to undertake in the foreseeable future?

- ☐ None
- ☐ Continuing professional education course(s) ≤ 1day
- ☐ Extended training program > 1 day
- ☐ Postgraduate diploma or degree (excluding specialist training)
- ☐ Accredited specialist training program

28. *If you were to undertake further education in implant dentistry, which aspect(s) of it would you like to improve your education in?

- ☐ Not planning to undertake further dental implant-related education
- ☐ Restorative
- ☐ Surgical
- ☐ Restorative & Surgical

29. *On average, approximately how many PROBLEMATIC cases involving implants placed and/or restored overseas do you see every month? Please include any cases that had been completed either partially or fully abroad.

- ☐ < 10
- ☐ 11 – 20
- ☐ 21 – 30
- ☐ > 30

30. *What is the highest level of education in implant dentistry you have attained or are undertaking?

- ☐ Have not had any education in implant dentistry
- ☐ Undergraduate degree
- ☐ Continuing professional education course(s) ≤ 1 day
- ☐ Extended training program > 1 day
- ☐ Postgraduate diploma or degree (excluding specialty training)
- ☐ Accredited specialty training program

31. Please feel welcome to enter any further comments:

_____

_____

PERIODONTISTS:

NOT PRACTISING DENTAL IMPLANTS

(<u>Note</u>: Questions labelled with an asterisk* are compulsory, meaning that a respondent would not be able to proceed to the next section of the survey if they neglected to answer such a question. However, all participants were free to exit the survey at any time by manually exiting their Internet browser window.)

1. ***Please indicate the year of your completion of periodontic training:**

   _____

2. ***Are you practising periodontics on a full- or part-time basis?**

   ☐ Full-time

   ☐ Part-time

3. **If practising part-time, how many hours, on average, are you working per week?**

   _____

4. ***In which State(s) and/or Territory(ies) are you practising?**

   ☐ ACT

   ☐ NSW

   ☐ NT

   ☐ QLD

- ☐ SA
- ☐ TAS
- ☐ VIC
- ☐ WA
- ☐ Other (please specify) _____

5. ***Are you working in the private and/or public sector(s)?**
   - ☐ Private
   - ☐ Public
   - ☐ Private & Public

6. ***What is/are the location(s) of the practice(s) you are working at?**
   - ☐ Metropolitan
   - ☐ Country
   - ☐ Metropolitan & Country

7. ***Does the scope of your practice include implant dentistry? (Note: Skip Logic is applied to this question so that the subsequent set of questions will differ based on the participant's response.)**
   - ☐ Yes
   - ☐ No

8. ***If you are not practising implant dentistry, which type of practitioner do you most frequently refer your implant dentistry cases to?**
   - ☐ General Dental Practitioner with experience in implant dentistry

☐ Oral & Maxillofacial Surgeon

☐ Periodontist

☐ Prosthodontist

☐ Other (please specify): _____

9. Please indicate your reason(s) for referring implant dentistry cases:

_____

_____

_____

_____

10. *What kind(s) of further education in implant dentistry are you intending to undertake in the foreseeable future?

☐ None

☐ Continuing professional education course(s) ≤ 1day

☐ Extended training program > 1 day

☐ Postgraduate diploma or degree (excluding specialist training)

☐ Accredited specialist training program

11. *On average, approximately how many PROBLEMATIC cases involving implants placed and/or restored overseas do you see every month? Please include any cases that had been completed either partially or fully abroad.

☐ < 10

☐ 11 – 20

☐ 21 – 30

☐ > 30

12. *What is the highest level of education in implant dentistry you have attained or are undertaking?

☐ Have not had any education in implant dentistry

☐ Undergraduate degree

☐ Continuing professional education course(s) ≤ 1 day

☐ Extended training program > 1 day

☐ Postgraduate diploma or degree (excluding specialty training)

☐ Accredited specialty training program

13. Please feel welcome to enter any further comments:

_____

_____

_____

_____

PERIODONTISTS:

CURRENTLY PRACTISING DENTAL IMPLANTS

(<u>Note</u>: Questions labelled with an asterisk* are compulsory, meaning that a respondent would not be able to proceed to the next section of the survey if they neglected to answer such a question. However, all participants were free to exit the survey at any time by manually exiting their Internet browser window.)

1. ***Please indicate the year of your completion of periodontic training:**

   _____

2. ***Are you practising periodontics on a full- or part-time basis?**

   ☐ Full-time

   ☐ Part-time

3. **If practising part-time, how many hours, on average, are you working per week?**

   _____

4. ***In which State(s) and/or Territory(ies) are you practising?**

   ☐ ACT

   ☐ NSW

   ☐ NT

   ☐ QLD

- ☐ SA
- ☐ TAS
- ☐ VIC
- ☐ WA
- ☐ Other (please specify) _____

5. ***Are you working in the private and/or public sector(s)?**
   - ☐ Private
   - ☐ Public
   - ☐ Private & Public

6. ***What is/are the location(s) of the practice(s) you are working at?**
   - ☐ Metropolitan
   - ☐ Country
   - ☐ Metropolitan & Country

7. ***Does the scope of your practise include dental implants? (Note: Skip Logic is applied to this question so that the subsequent set of questions will differ based on the participant's response.)**
   - ☐ Yes
   - ☐ No

8. **How many years have you been working with dental implants for?**

   _____

9. ***How often do you perform dental implant-related procedures?**

- ☐ At least once a day
- ☐ At least once a week
- ☐ At least once a month
- ☐ Less often than once a month

10. ***Which brand(s) of dental implant are you using most frequently?**

- ☐ BioHorizons
- ☐ Biomet 3i
- ☐ Calcitek
- ☐ Dentsply (Astra)
- ☐ MDI (IMTEK)
- ☐ MIS
- ☐ Neoss
- ☐ Nobel Biocare
- ☐ Southern
- ☐ Straumann
- ☐ Other (please specify): _____

11. ***For a single implant-supported prosthesis in an ungrafted site in the upper anterior region, in an otherwise fit and healthy 30-year-old patient with an Angle Class I occlusal scheme, what would you believe to be the chance of having the patient return 10 year after insertion with:**

	< 10%	10 to < 20%	20 to < 30%	≥ 30%
C) The implant fixture being mobile and in need of removal?	☐	☐	☐	☐
D) The prosthetic component(s) being damaged and in need of replacement?	☐	☐	☐	☐

12. *In the same clinical scenario as outline in the previous question, assuming complete patient satisfaction with the treatment outcome and absence of any complications, how soon would you review the patient after insertion of the prosthesis?

- ☐ 1 week
- ☐ 2 weeks
- ☐ 3 weeks
- ☐ 4 weeks
- ☐ Other (please specify): _____

13. *In the same clinical scenario as outlined previously, do you believe the length of the implant used needs to be at least as long as the height of the crown it supports?

☐ Yes

☐ No

14. *Defining peri-implantitis as a pathotic condition characterised by the presence of a periodontal pocket depth of 5mm or greater, bleeding and/or pus on probing, and radiographic evidence of alveolar bone loss around an implant, what would be your estimate of the overall prevalence of peri-implantitis?

☐ < 10%

☐ 10 – 20%

☐ 21 – 30%

☐ 31 – 40%

☐ > 40%

15. *Do you routinely treat cases of peri-implantitis?

☐ Yes

☐ No

16. If you routinely treat cases of peri-implantitis, please select from below the method(s) of treatment which most closely match(es) the one(s) you most frequently employ:

☐ Application of Local Antibiotic(s) (e.g. metronidazole)

☐ Curettage

☐ Curettage + Local Antibiotic(s)

☐ Air-abrasive Device (e.g. Vector™)

☐ Laser (e.g. Er:YAG)

- ☐ Flap Surgery + Curettage
- ☐ Flap Surgery + Curettage + Local Antibiotic(s)
- ☐ Flap Surgery + Curettage + Bone Augmentation (auto-/allo-/xenograft)
- ☐ Flap Surgery + Curettage + Bone Augmentation + Adjunctive Procedure (e.g. Air-abrasion, Laser)

17. If you routinely refer cases of peri-implantitis to another practitioner for management, please indicate which type of practitioner you most frequently refer to:

- ☐ GDP with experience in implant dentistry
- ☐ Oral & Maxillofacial Surgeon
- ☐ Periodontist
- ☐ Prosthodontist

18. *What kind(s) of further education in implant dentistry are you intending to undertake in the foreseeable future?

- ☐ None
- ☐ Continuing professional education course(s) ≤ 1day
- ☐ Extended training program > 1 day
- ☐ Postgraduate diploma or degree (excluding specialist training)
- ☐ Accredited specialist training program

19. *On average, approximately how many PROBLEMATIC cases involving implants placed and/or restored overseas do you see every month? Please include any cases that had been completed either partially or fully abroad.

- ☐ < 10

- ☐ 11 – 20
- ☐ 21 – 30
- ☐ > 30

20. *What is the highest level of education in implant dentistry you have attained or are undertaking?

- ☐ Have not had any education in implant dentistry
- ☐ Undergraduate degree
- ☐ Continuing professional education course(s) ≤ 1 day
- ☐ Extended training program > 1 day
- ☐ Postgraduate diploma or degree (excluding specialty training)
- ☐ Accredited specialty training program

21. Please feel welcome to enter any further comments:

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_____

_____

_____

ORAL & MAXILLOFAICAL SURGEONS:

NOT PRACTISING DENTAL IMPLANTS

(<u>Note</u>: Questions labelled with an asterisk* are compulsory, meaning that a respondent would not be able to proceed to the next section of the survey if they neglected to answer such a question. However, all participants were free to exit the survey at any time by manually exiting their Internet browser window.)

1. ***Please indicate the year of your completion of oral & maxillofacial surgical training:**

   _____

2. ***Are you practising oral & maxillofacial surgery on a full- or part-time basis?**

   ☐ Full-time

   ☐ Part-time

3. **If practising part-time, how many hours, on average, are you working per week?**

   _____

4. ***In which State(s) and/or Territory(ies) are you practising?**

   ☐ ACT

   ☐ NSW

   ☐ NT

- ☐ QLD
- ☐ SA
- ☐ TAS
- ☐ VIC
- ☐ WA
- ☐ Other (please specify) _____

5. ***Are you working in the private and/or public sector(s)?**
   - ☐ Private
   - ☐ Public
   - ☐ Private & Public

6. ***What is/are the location(s) of the practice(s) you are working at?**
   - ☐ Metropolitan
   - ☐ Country
   - ☐ Metropolitan & Country

7. ***Does the scope of your practice include implant dentistry? (Note: Skip Logic is applied to this question so that the subsequent set of questions will differ based on the participant's response.)**
   - ☐ Yes
   - ☐ No

8. ***If you are not practising implant dentistry, which type of practitioner do you most frequently refer your implant dentistry cases to?**

☐ General Dental Practitioner with experience in implant dentistry

☐ Oral & Maxillofacial Surgeon

☐ Periodontist

☐ Prosthodontist

☐ Other (please specify): _____

9. Please indicate your reason(s) for referring implant dentistry cases:

_____

_____

_____

_____

10. *What kind(s) of further education in implant dentistry are you intending to undertake in the foreseeable future?

☐ None

☐ Continuing professional education course(s) ≤ 1day

☐ Extended training program > 1 day

☐ Postgraduate diploma or degree (excluding specialist training)

☐ Accredited specialist training program

11. *On average, approximately how many PROBLEMATIC cases involving implants placed and/or restored overseas do you see every month? Please include any cases that had been completed either partially or fully abroad.

☐ < 10

☐ 11 – 20

☐ 21 – 30

☐ > 30

12. *What is the highest level of education in implant dentistry you have attained or are undertaking?

☐ Have not had any education in implant dentistry

☐ Undergraduate degree

☐ Continuing professional education course(s) ≤ 1 day

☐ Extended training program > 1 day

☐ Postgraduate diploma or degree (excluding specialty training)

☐ Accredited specialty training program

13. Please feel welcome to enter any further comments:

_____

_____

_____

_____

ORAL & MAXILLOFACIAL SURGEONS:

CURRENTLY PRACTISING DENTAL IMPLANTS

(Note: Questions labelled with an asterisk* are compulsory, meaning that a respondent would not be able to proceed to the next section of the survey if they neglected to answer such a question. However, all participants were free to exit the survey at any time by manually exiting their Internet browser window.)

1. ***Please indicate the year of your completion of oral & maxillofacial surgical training:**

   _____

2. ***Are you practising oral & maxillofacial surgery on a full- or part-time basis?**

   ☐ Full-time

   ☐ Part-time

3. **If practising part-time, how many hours, on average, are you working per week?**

   _____

4. ***In which State(s) and/or Territory(ies) are you practising?**

   ☐ ACT

   ☐ NSW

   ☐ NT

- ☐ QLD
- ☐ SA
- ☐ TAS
- ☐ VIC
- ☐ WA
- ☐ Other (please specify) _____

5. ***Are you working in the private and/or public sector(s)?**
   - ☐ Private
   - ☐ Public
   - ☐ Private & Public

6. ***What is/are the location(s) of the practice(s) you are working at?**
   - ☐ Metropolitan
   - ☐ Country
   - ☐ Metropolitan & Country

7. ***Does the scope of your practise include dental implants? (Note: Skip Logic is applied to this question so that the subsequent set of questions will differ based on the participant's response.)**
   - ☐ Yes
   - ☐ No

8. **How many years have you been working with dental implants for?**

   _____

9. ***How often do you perform dental implant-related procedures?**

- ☐ At least once a day
- ☐ At least once a week
- ☐ At least once a month
- ☐ Less often than once a month

10. ***Which brand(s) of dental implant are you using most frequently?**

- ☐ BioHorizons
- ☐ Biomet 3i
- ☐ Calcitek
- ☐ Dentsply (Astra)
- ☐ MDI (IMTEK)
- ☐ MIS
- ☐ Neoss
- ☐ Nobel Biocare
- ☐ Southern
- ☐ Straumann
- ☐ Other (please specify): _____

11. ***For a single implant-supported prosthesis in an ungrafted site in the upper anterior region, in an otherwise fit and healthy 30-year-old patient with an Angle Class I occlusal scheme, what would you believe to be the chance of having the patient return 10 year after insertion with:**

	< 10%	10 to < 20%	20 to < 30%	≥ 30%
E) The implant fixture being mobile and in need of removal?	☐	☐	☐	☐
F) The prosthetic component(s) being damaged and in need of replacement?	☐	☐	☐	☐

12. ***In the same clinical scenario as outline in the previous question, assuming complete patient satisfaction with the treatment outcome and absence of any complications, how soon would you review the patient after insertion of the prosthesis?**

    ☐ 1 week

    ☐ 2 weeks

    ☐ 3 weeks

    ☐ 4 weeks

    ☐ Other (please specify): _____

13. ***In the same clinical scenario as outlined previously, do you believe the length of the implant used needs to be at least as long as the height of the crown it supports?**

☐ Yes

☐ No

14. *Defining peri-implantitis as a pathotic condition characterised by the presence of a periodontal pocket depth of 5mm or greater, bleeding and/or pus on probing, and radiographic evidence of alveolar bone loss around an implant, what would be your estimate of the overall prevalence of peri-implantitis?

☐ < 10%

☐ 10 – 20%

☐ 21 – 30%

☐ 31 – 40%

☐ > 40%

15. *Do you routinely treat cases of peri-implantitis?

☐ Yes

☐ No

16. If you routinely treat cases of peri-implantitis, please select from below the method(s) of treatment which most closely match(es) the one(s) you most frequently employ:

☐ Application of Local Antibiotic(s) (e.g. metronidazole)

☐ Curettage

☐ Curettage + Local Antibiotic(s)

☐ Air-abrasive Device (e.g. Vector^{TM})

☐ Laser (e.g. Er:YAG)

- ☐ Flap Surgery + Curettage
- ☐ Flap Surgery + Curettage + Local Antibiotic(s)
- ☐ Flap Surgery + Curettage + Bone Augmentation (auto-/allo-/xenograft)
- ☐ Flap Surgery + Curettage + Bone Augmentation + Adjunctive Procedure (e.g. Air-abrasion, Laser)

17. If you routinely refer cases of peri-implantitis to another practitioner for management, please indicate which type of practitioner you most frequently refer to:

- ☐ GDP with experience in implant dentistry
- ☐ Oral & Maxillofacial Surgeon
- ☐ Periodontist
- ☐ Prosthodontist

18. *What kind(s) of further education in implant dentistry are you intending to undertake in the foreseeable future?

- ☐ None
- ☐ Continuing professional education course(s) ≤ 1day
- ☐ Extended training program > 1 day
- ☐ Postgraduate diploma or degree (excluding specialist training)
- ☐ Accredited specialist training program

19. *On average, approximately how many PROBLEMATIC cases involving implants placed and/or restored overseas do you see every month? Please include any cases that had been completed either partially or fully abroad.

- ☐ < 10

- ☐ 11 – 20
- ☐ 21 – 30
- ☐ > 30

20. *What is the highest level of education in implant dentistry you have attained or are undertaking?

- ☐ Have not had any education in implant dentistry
- ☐ Undergraduate degree
- ☐ Continuing professional education course(s) ≤ 1 day
- ☐ Extended training program > 1 day
- ☐ Postgraduate diploma or degree (excluding specialty training)
- ☐ Accredited specialty training program

21. Please feel welcome to enter any further comments:

_____

_____

_____

_____