

Residents' Perceptions of Implant Surgical Training in Advanced Education in Prosthodontic Programs

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Abstract

Purpose: The purpose of this study was to assess residents' perspectives on their implant surgical training in Advanced Education in Prosthodontic programs in the United States.

Materials and Methods: Questionnaires were distributed to all prosthodontic residents (N = 442). The 27 questions assessed the subjective and objective aspects of implant surgical training from the view of prosthodontic residents. The data were compiled and reported as frequencies. Descriptive statistics were used to analyze the data.

Results: One hundred and ninety-eight responses (44.8%) were received and analyzed. Forty-seven percent (94) of the respondents felt that the philosophy of their programs regarding implant placement in prosthodontics was "optional but encouraged," whereas 30% (60) felt that it was "mandatory." The majority of the respondents (73%, 144) stated that their programs allowed them to place implants for their own patients. For those respondents who placed their own implants, 40% (58) of them indicated that the level of their clinical training was "competent." Almost half of the respondents expressed that they would like to have a proficient level of clinical training in implant surgery by the completion of their residency programs. Forty-four percent (87) of the respondents felt their residency training adequately prepared them for implant surgery, whereas the other 37% (73) did not. For those who did not, 74% (55) felt their residency programs should have prepared them for implant surgical training.

Conclusion: The current generation of prosthodontic residents has an opportunity to place implants in their programs and would like to be trained in surgical aspects of implant dentistry at the level of competency or higher.

The majority of prosthodontists treat patients with implant-supported prostheses,¹ and approximately 12% of them surgically place implants for their patients.¹ Implant prosthodontics is a growing part of general dental practice and an integral part of prosthodontic specialty practice. Surgical training varies widely for prosthodontists, from self-trained training through continuing education or as part of their specialty programs.¹ Though most prosthodontists may deem their surgical training sufficient,¹ many could desire a more formalized course of study than is currently commonly available.

Many studies have assessed the implant curricula in predoctoral and advanced programs.²⁻¹² The most recent surveys have evaluated implant curricula in predoctoral programs.²⁻⁶ Most

dental schools allow predoctoral students to provide implant restorations,⁵⁻⁸ but few offer predoctoral students an opportunity to surgically place implants.^{2,9} The need to offer surgical training for implant placement is increasing and should be addressed in the current curricula for the students.

Fewer publications have assessed the current status of implant curricula for advanced specialty programs.¹⁰⁻¹² A 2004 survey conducted by the Educational Policy Subcommittee of the American College of Prosthodontists (ACP) examined the current status of implant curricula in Advanced Education in Prosthodontic (AEP) programs in the United States and Canada through the perspective of program directors, and included issues associated with surgical implant training for prosthodontic

residents.¹² The study observed that implant dentistry has become an integral part of AEP curricula and noted the evidence of incorporating implant surgical placement in programs. Since then, implant surgical learning expectations have been changed in the Commission on Dental Accreditation (CODA) standards for AEP programs.¹³

Implant surgical placement has been predicted as an integral component of future prosthodontic specialty practice, and residents' opinions could serve as an important part in advanced education program assessment toward achieving their future clinical practice goals. Melo *et al*¹⁰ evaluated the current status of implant surgery training from the viewpoint of oral and maxillofacial surgery (OMFS) residents and reported that some residents believed they were not adequately prepared for implant surgery. Blissett *et al*¹⁴ recently demonstrated that junior residents in AEP programs put a higher value on placing implants than did their senior classmates, suggesting that implant placement is an important factor to junior residents. A more recent study also showed the majority of AEP residents reported they had adequate knowledge in basic didactic and clinical dental implant prosthodontics;¹⁵ however, the authors did not investigate the residents' perspectives on their comprehensive implant training.

No published surveys have evaluated implant surgical training from the viewpoint of AEP residents in the United States. Therefore, the purpose of this study was to assess the residents' perspectives on their implant surgical training in AEP programs in the United States. The findings of the current study may provide insight for the specialty as it considers implementing implant surgical training for its program, for future residents, and for the specialty as a whole.

Materials and methods

A questionnaire was designed based on Melo *et al*'s survey¹⁰ with some modifications. The research protocol received exempt status by the Office for the Protection of Research Subjects and Institutional Review Board at the University of Illinois at Chicago (protocol number 2008-0867). The questionnaire contained 27 multiple-choice questions and required the respondents to check all answers pertaining to them. The questions assessed the subjective and objective aspects of implant surgical training from the view of prosthodontic residents.

The list of directors' names and addresses was obtained through the ACP Central Office. The questionnaires were first mailed to all 46 AEP program directors on January 26, 2009. Each program director received a cover letter describing the purpose of the study and thorough instructions, several surveys, and self-addressed prestamped envelopes without any form of labeling or identification. Each program director was asked to distribute the surveys to the residents and encourage them to complete the questionnaires. Participation in the study was voluntary, and the respondents were ensured that the questionnaire was anonymous. After the survey was mailed, all program directors were contacted by e-mail to ensure high participation.

The list of prosthodontic residents was also obtained from the ACP Central Office. This included 98% of all residents currently enrolled in AEP programs. The final questionnaire was mailed again to all prosthodontic residents on March 5,

2009. The instructions for the mailing included a paragraph asking the residents to disregard the mailing if they had already completed the questionnaire.

Upon receiving the questionnaires, raw data were entered into Microsoft Excel 2003 (Microsoft, Seattle, WA). The data were analyzed, compiled, and reported as frequencies.

Results

Of the 442 surveys, 198 questionnaires were returned, for a response rate of 44.8%. Seven questionnaires were returned due to an incorrect address. Two questionnaires were received after the deadline and were not included in the data analysis. Because not all respondents answered all items in the survey, the responses to the individual questions did not always represent 198 respondents. Not all returned questionnaires were completed. Some respondents missed the second page of the questionnaire entirely. Respondents were asked to skip items 12 to 27 if they answered "NO" to item 11; however, 23 respondents did not follow the instruction and answered the rest of the questionnaire. To evaluate the residents' experience on their surgical training, item 27 answers were analyzed for all respondents. The data from the 23 respondents (items 12 to 26) were disregarded for data analysis purposes. The responses are presented in Appendix 1.

The majority of respondents were from university-based programs (82%, 162). The distribution of the respondents was similar between first, second, and third years, with very few fourth year residents, who were presumably from 4-year combined prosthodontics/maxillofacial programs. The majority of the respondents felt that their programs were active in implant-related research (66%, 130), and the three most common implant research areas were clinical, combination of clinical and materials science, and materials science. Forty-seven percent (94) of the respondents felt that the philosophy of their programs regarding implant placement in prosthodontics was optional but encouraged, whereas 30% (60) felt that it was mandatory. Almost 50% (93) of the residents reported they received fewer than 30 hours of didactic training in implant placement in their programs, whereas 27% (54) reported more than 90 hours. As for who is teaching the didactic curriculum for implant placement in the program, 22% (44) reported prosthodontists, followed by a combination of periodontist-prosthodontist (13%, 26), and periodontist-OMFS-prosthodontist (12%, 23). Thirty-four percent (67) of respondents rated the level of their didactic training in implant surgery as in-depth, whereas the other 32% (64) rated it as understanding.

As for preclinical education, the majority of residents (61%, 122) indicated they received fewer than 10 hours of preclinical/laboratory simulation in implant placement. Twenty-three percent (45) of the residents reported that an implant company representative taught the preclinical/laboratory curriculum for placement, whereas 17% (33) reported they were taught by prosthodontists. Thirty-three percent (65) of respondents stated their preclinical/laboratory simulation courses in implant surgery were at the understanding level, whereas 26% (52) reported it as limited.

The majority of respondents (73%, 144) stated their programs allowed them to place implants for their own patients.

For those who responded *no*, they indicated that implants were placed mostly by a combination of periodontic and OMFS residents. In addition, they (47%, 21) indicated that the waiting period for implants to be placed by other specialty residents was mostly 4 to 6 weeks, and the results of the implant placement were acceptable. For those respondents who placed their own implants, 40% (58) of them indicated the level of their clinical training was competent, whereas 31% (45) reported a level of "exposure."

The majority of respondents (53%, 76) reported they would like to have a proficient level of clinical training in implant surgery when they complete their residency programs. Twenty-eight percent (41) reported that a prosthodontist was the supervisor during the implant placement surgery, followed by a periodontist (14%, 20). Almost an equal number of respondents stated that they received 0 to 10 hours (32%) and more than 30 hours (30%) of didactic and laboratory training before their first implant surgery.

Thirty-eight percent (54) of respondents reported that they use three implant systems, whereas 22% (31) reported two, and 21% (30) reported more than four. Computer-guided implant planning and surgery training were offered in their programs, according to the majority of the respondents. More than half the respondents (51%) stated they will place 0 to 5 implants this year. Thirty-three percent (48) estimated they will place more than 30 implants during their residency training; however, 23% (33) estimated they will only place 0 to 5 implants.

The majority of the respondents (53%, 75) estimated they will personally place and restore approximately 1% to 25% of the implants during their training. Forty-one percent (59) indicated the source of their surgical patients were their own patients. Nearly 50% of the respondents reported that they place implants in all regions of the mouth, for both partially and completely edentulous patients. The most common location to perform implant surgery was in the prosthodontic clinic (35%), followed by the oral surgery clinic (15%). The most common implant-related surgical procedure performed was implant placement only (33%, 48), followed by combination of implant placement, internal sinus floor elevation, socket preservation, and minor grafting and/or guided bone regeneration (17%, 24). Regarding implant-related bone grafting procedures, including sinus lift surgery, the majority of residents reported either they were not permitted to perform (31%, 45), or if they did (33%, 47), they only performed one to five procedures.

Nearly 50% of respondents reported that they felt confident with surgery after performing fewer than ten surgeries. Forty-four percent (87) stated that their residency training adequately prepared them for the implant surgery, whereas 37% (73) did not. For those who stated they were not adequately prepared to place implants, 74% (55) felt that their residency programs should have prepared them for implant surgical training.

Discussion

The results of the current study indicated that most AEP programs either mandated or encouraged their residents to place implants. Few residents were prohibited from placing implants. Sukotjo and Arbree¹² reported in 2008 that implant placement had been included in the Accreditation Standards for AEP pro-

grams.¹³ According to the CODA guideline implemented in January 2009, residents must participate in all phases of implant treatment, including implant placement, and didactic instruction must be provided at the in-depth level for implant prosthodontics.¹³ Additional standards elevated learning expectations for areas such as wound healing and conscious sedation. A prior study¹² noted that 43% of the responding programs either required or offered the option to their residents to place implants. The data of the current study demonstrated almost 85% of respondents had the same philosophy of their programs. Furthermore, most of the respondents stated they were allowed to surgically place implants in their programs. It has been observed that implant placement was already incorporated into the postgraduate prosthodontic curriculum and was implemented before 2004.¹²

Most respondents stated that their programs were active in implant research. According to CODA, research is a requisite portion of accreditation standards (Standard 6).¹³ All programs must be involved in research to maintain accreditation. Implant-related research could become a topic of interest for residents to fulfill their requirements. In addition, implant research may serve as a foundation for the residents to enhance their overall implant knowledge, hence, better prepare them in the clinical implant surgical training.

There seems to be a wide range of didactic training in implant placement. Almost half the respondents reported fewer than 30 hours of training, comparable to a previous study.¹⁰ Also, only one-third of the respondents rated their didactic training at the in-depth level. This data may be used by program directors to address perceived deficiencies in didactic training. It could be speculated that more time should be devoted to didactic training to prepare the residents to have in-depth knowledge to meet or exceed CODA standards. Perceptions of residents regarding the definition of "in-depth" could also differ from that of the program directors'.

Previous reports on predoctoral preclinical/laboratory education in implant dentistry show that most schools increased the time spent from 1 to 5 to 6 to 10 hours.⁴⁻⁶ The current study concurred with those times, as most respondents reported fewer than 10 hours of predoctoral preclinical/laboratory training. One can speculate that AEP residents may already be familiar with the simulation courses during their predoctoral training and therefore, do not need additional time for these fundamentals.

One interesting finding of the current study was that company representatives played a considerable role in teaching preclinical/laboratory implant placement. One of the possible explanations could be the need for access to the expensive surgical handpieces and other armamentarium. Though company representatives may be experienced and knowledgeable, the primary teaching responsibility should still fall on faculty members and trained dentists. The representatives may serve as the secondary or auxiliary personnel during the demonstration in the preclinical/laboratory training.

This study revealed that almost half the respondents would like to have clinical training at the level of proficiency in implant surgery by the completion of their residency programs; however, when asked to rate current clinical training, most felt it was either at a "competent" or "exposure" level. Definitions

for competency and proficiency were not well understood by the residents when they completed their surveys. In this study, well-defined descriptions of these definitions could have been developed to help the residents accurately describe their expectations, which may not really have been proficiency. This suggests there is a potential for curriculum assessment to meet residents' expectations for their future clinical practice. One can also speculate there is a difference between resident desires and actual skill levels achievable in a 36-month curriculum that also includes the prosthetic portion of therapy at the requisite proficiency level. Additional time may need to be allotted for surgical training, and this should be carefully evaluated and planned in a demanding AEP curriculum. One study questions the current AEP program duration to accommodate surgical training and raises the concern that increased program length may negatively affect the applicant pool in the future.¹ Future analysis of learning needs and AEP curriculum to effectively meet patient expectations within the scope of prosthodontic practice in future decades is warranted.

Implant care is a prosthetic-driven practice. Surgeons should follow surgical templates for placing implants at the proper position for the restorative dentists to avoid compromise of the final prosthetic result. Proper communication, treatment planning discussion, and a good team approach are important in achieving good clinical results for implant-supported care. The present study showed that more than half the implants placed by nonprosthodontic colleagues are acceptable. If not acceptable, some respondents felt that the surgeon did not use surgical templates for the placement. For patient-centered therapy, communication that heightens the awareness of prosthetic needs to achieve optimum esthetic, functional, and predictable success is not simply desirable, but mandatory.

The sources of the AEP resident surgical patients are mainly from either their own patients, or in combination with their own patients and patients referred by the predoctoral clinic. Most schools reportedly allow predoctoral students to clinically restore implants,⁵ with implant placement traditionally performed by OMFS and periodontics departments.^{7,8} The authors' current institution expects predoctoral students to participate in all phases of simple implant prosthodontics for their patients, including assisting in surgery and restoring implant-supported restorations. The surgical procedures are distributed to all three departments—OMFS, periodontics, and prosthodontics, with a 40%, 40%, and 20% case load, respectively. Prosthodontic residents participating in implant placement for the predoctoral students could be beneficial for both groups. Predoctoral students have one more venue to send their patients for implant placement, and in return, residents have more surgical experience. Predoctoral patients require more straightforward therapy with less potential risk of surgical complication. This actually has advantages for AEP residents in that they gain experience and confidence through simpler care and progress toward more complicated therapy.

A recent study² indicated that the prosthodontic specialty now takes the most responsible role for teaching implant prosthodontics at the predoctoral level; however, this study also noted a lack of adequately trained faculty in implant dentistry.² Most AEP program directors reported not having surgical training in implant dentistry.¹² For those who had surgical education,

training was generally limited. It may be prudent to recommend future prosthodontic educators have appropriate surgical experience, such as a well-defined course of surgical training, to be able to support implant placement in their institution. In this way, the imperative to prepare the AEP resident to be the leader of the team by providing adequate surgical and restorative training in implant prosthodontics could be accomplished.

Most respondents felt confident in performing implant surgery after placing fewer than ten implants. A previous study showed that OMFS residents felt confident after placing 10 to 30 implants.¹⁰ One probable explanation could be that OMFS residents tend to treat patients with more complex needs, compared to other specialties. Therefore, it may be reasonable to assume they need more training before feeling confident. In addition, OMFS residents do not have the extensive diagnostic and treatment curricular background associated with replacing teeth prosthodontic residents do.

The current study showed that almost half the respondents felt their residency programs adequately prepared them for implant surgery. Furthermore, for those respondents who reported being inadequately prepared, most felt their programs should have prepared them for implant surgery. In addition, a significant number of AEP residents did not respond to the survey. These observations provide an opportunity to address the need to improve the AEP surgical training experiences for future residents.

Limitations of the study

In this study, we acknowledge that the flow and design of the questionnaire can be improved. After evaluating the survey results, the authors felt that item 27 should have been placed before item 11. In this way, the opinions of those who were not allowed to place implants could have been inquired to aid future improvements. In this study, some respondents did not follow instructions when asked to skip questions. Since some answers depended on previous questions, the authors decided to discard the data for items 12 to 26 to prevent the skew of the results from the 23 respondents who did not follow instructions; however, since item 27 did not correlate with surgical clinical procedures, and serves as an important part of the survey, especially for those who were not allowed to place implants, responses to this question were included. Another drawback of this study is the area of complications was not considered. A prior study showed that a low rate of complications was observed, and if they occurred, were mostly handled by surgical specialists.¹² Since questions were not asked, it is not possible to make any assumptions on the current status of managing complications in AEP programs. Further, the question on whether the residents would place implants in their practice was not asked. It would have been important to observe the trends of future plans from the current generation of prosthodontists.

Conclusions

Within the limitations of this study, the following conclusions were drawn:

- (1) The majority of respondents felt that the philosophy of their programs regarding implant placement was either

mandatory or optional, but encouraged. Programs that prohibited implant placement were the minority.

- (2) The majority of respondents were able to place implants for their own patients, whereas some respondents were still not allowed to do so.
- (3) Almost half the respondents expressed that they would like to have a proficient level of clinical training in implant surgery by the completion of their residency programs. Eighty-five percent believed they should be trained to the level of competency or higher.
- (4) Forty-four percent (87) of the respondents felt their residency training adequately prepared them for the implant surgery whereas 37% (73) did not. For those who did not, 74% (55) felt that their residency programs should have prepared them for implant surgical training.

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Appendix I Survey of implant surgical training in advanced prosthodontic programs in the United States

1. What best describes your program?	N = 198
<input type="checkbox"/> Hospital-based	16 (8%)
<input type="checkbox"/> University-based	162 (82%)
<input type="checkbox"/> Military	18 (9%)
<input type="checkbox"/> Combination of Hospital-University	2 (1%)
2. What year of Prosthodontic training program are you in currently?	N = 198
<input type="checkbox"/> 1	65 (33%)
<input type="checkbox"/> 2	58 (29%)
<input type="checkbox"/> 3	68 (34%)
<input type="checkbox"/> 4	7 (4%)
3. Is your program active in implant research?	N = 198
<input type="checkbox"/> Yes	130 (66%)
<input type="checkbox"/> No	66 (33%)
<input type="checkbox"/> No info	2 (1%)
If so, what is the nature of implant research?	N = 130
<input type="checkbox"/> Clinical (1)	28 (22%)
<input type="checkbox"/> Materials science (2)	24 (18%)
<input type="checkbox"/> Animal (3)	1 (0.7%)
<input type="checkbox"/> In vitro (4)	12 (9%)
<input type="checkbox"/> No info	4 (3%)
	Combination of 1,2 = 25 (19%)
	Combination of 1,2,3,4 = 13 (10%)
	Combination of 1,2,4 = 11 (8%)
	Other combination = 12 (9%)
4. What is the philosophy of your program regarding placement of implants by prosthodontic residents?	N = 198
<input type="checkbox"/> Mandatory	61 (30%)
<input type="checkbox"/> Optional, but encouraged	94 (47%)
<input type="checkbox"/> Optional, but discouraged	15 (8%)
<input type="checkbox"/> Prohibited	12 (6%)
<input type="checkbox"/> Assist in placement only	6 (3%)
<input type="checkbox"/> Laboratory simulation only	3 (2%)
<input type="checkbox"/> No philosophy	3 (2%)
	Other combination (≤ 3 responses) = 4 (2%)
5. How many hours of <i>didactic</i> training in implant placement surgery do you receive in your program (systems, healing, techniques, protocols, literature review, etc)?	N = 198
<input type="checkbox"/> Less than 30 hours	93 (47%)
<input type="checkbox"/> 31-60 hours	31 (16%)
<input type="checkbox"/> 61-90 hours	20 (10%)
<input type="checkbox"/> More than 90 hours	54 (27%)

Continued

Appendix I Continued

6. Who teaches the <i>didactic</i> curriculum for implant placement in your program? (Please answer all that apply.)	N = 198
<input type="checkbox"/> Periodontist (1)	18 (9%)
<input type="checkbox"/> Oral surgeon (2)	8 (4%)
<input type="checkbox"/> Prosthodontist (3)	44 (22%)
<input type="checkbox"/> General dentist (4)	2 (1%)
<input type="checkbox"/> Company representative (5)	10 (5%)
<input type="checkbox"/> No info	9 (5%)
	Combination of 1,3 = 26 (13%)
	Combination of 1,2,3 = 23 (12%)
	Combination of 1,2,3,5 = 2 (6%)
	Combination of 1,3,5 = 10 (5%)
	Combination of 3,5 = 8 (4%)
	Combination of 1,2 = 6 (3%)
	Other combination (≤ 5 responses) = 22 (11%)
7. How would you rate your <i>didactic</i> training in implant surgery?	N = 198
<input type="checkbox"/> In depth	67 (34%)
<input type="checkbox"/> Understanding	64 (32%)
<input type="checkbox"/> Familiarity	26 (13%)
<input type="checkbox"/> Limited	41 (20%)
8. How many hours of <i>preclinical/laboratory</i> simulation courses in implant surgery do you receive in your program?	N = 198
<input type="checkbox"/> Less than 10 hours	122 (61%)
<input type="checkbox"/> 10–20 hours	54 (27%)
<input type="checkbox"/> 21–30 hours	8 (4%)
<input type="checkbox"/> More than 30 hour	12 (6%)
<input type="checkbox"/> No info	2 (1%)
9. Who teaches the <i>preclinical/laboratory</i> curriculum for implant placement in your program? (Please answer all that apply.)	N = 198
<input type="checkbox"/> Periodontist (1)	10 (5%)
<input type="checkbox"/> Oral surgeon (2)	4 (2%)
<input type="checkbox"/> Prosthodontist (3)	33 (17%)
<input type="checkbox"/> General dentist (4)	1 (0.5%)
<input type="checkbox"/> Company representative (5)	45 (23%)
<input type="checkbox"/> Other _____	13 (7%)
	Combination of 1,2,3 = 8 (4%)
	Combination of 1,3 = 12 (6%)
	Combination of 1,3,5 = 7 (4%)
	Combination of 1,5 = 7 (4%)
	Combination of 3,5 = 25 (13%)
	Other combination (≤ 5 responses) = 33 (17%)

Continued

Appendix I Continued

10. How would you rate your <i>preclinical/laboratory</i> simulation courses in implant surgery?	N = 198
<input type="checkbox"/> In depth	35 (17%)
<input type="checkbox"/> Understanding	65 (33%)
<input type="checkbox"/> Familiarity	41 (21%)
<input type="checkbox"/> Limited	52 (26%)
<input type="checkbox"/> No info	5 (3%)
11. Does your program allow you to place implants for patients who are your comprehensive care responsibility?	N = 196
<input type="checkbox"/> Yes	144 (73%)
<input type="checkbox"/> No	52 (27%)
<input type="checkbox"/> Other _____	0
<i>If answered "yes," please proceed to question #12–27</i>	
<i>If answered "no," please stop after #11C.</i>	
11a. Who surgically places the implants for your patients in your program? (Please answer all that apply.)	N = 47
<input type="checkbox"/> Periodontic resident (1)	3 (6%)
<input type="checkbox"/> Oral surgery resident (2)	0
<input type="checkbox"/> General dentistry resident (3)	0
<input type="checkbox"/> Periodontist (4)	1 (2%)
<input type="checkbox"/> Oral surgeon (5)	0
<input type="checkbox"/> Other _____	0
	Combination of 1,2 = 25 (53%)
	Combination of 1,2,4,5 = 8 (17%)
	Other combination (≤ 5 responses) = 9 (19%)
11b. On average, what is the waiting period for the implants to be placed when they are referred to other clinical services?	N = 45
<input type="checkbox"/> 2–4 weeks	8 (18%)
<input type="checkbox"/> 4–6 weeks	21 (47%)
<input type="checkbox"/> 6–8 weeks	10 (22%)
<input type="checkbox"/> More than 2 months	6 (13%)
11c. Are the results of implants placed by others acceptable?	N = 50
<input type="checkbox"/> Yes	29 (58%)
<input type="checkbox"/> No	4 (8%)
<input type="checkbox"/> Other _____	17 (34%)
<i>If No, please explain why</i>	

Continued

Appendix I Continued

12. How would you rate your <i>clinical</i> training in implant surgery?	N = 144
<input type="checkbox"/> Proficient	18 (13%)
<input type="checkbox"/> Competent	58 (40%)
<input type="checkbox"/> Exposed	45 (31%)
<input type="checkbox"/> Limited	22 (15%)
Other combination (≤ 5 responses) = 1 (0.7%)	
13. What level of <i>clinical</i> training in implant surgery would you like when you complete your residency program?	N = 144
<input type="checkbox"/> Proficient	74.5 (52%)
<input type="checkbox"/> Competent	48.5 (34%)
<input type="checkbox"/> Exposed	18 (13%)
<input type="checkbox"/> Limited	3 (2%)
14. Who provides direct supervision of implant placements in your program? (Please answer all that apply.)	N = 144
<input type="checkbox"/> Periodontist (1)	20 (14%)
<input type="checkbox"/> Oral surgeon (2)	10 (7%)
<input type="checkbox"/> Prosthodontist (3)	41 (28%)
<input type="checkbox"/> General dentist (4)	0
<input type="checkbox"/> Company representative (5)	0
<input type="checkbox"/> Other _____	2 (1%)
Combination of 1,2 = 16 (11%)	
Combination of 1,2,3 = 15 (10%)	
Combination of 1,3 = 15 (10%)	
Combination of 2,3 = 7 (5%)	
Other combination (≤ 5 responses) = 18 (13%)	
15. How many hours of <i>didactic</i> and <i>laboratory</i> training did you receive before your first implant surgery?	N = 139
<input type="checkbox"/> 0–10 hours	44 (32%)
<input type="checkbox"/> 11–20 hours	37 (27%)
<input type="checkbox"/> 21–30 hours	16 (12%)
<input type="checkbox"/> More than 30 hours	42 (30%)
16. How many implant systems do you use during your residency training?	N = 144
<input type="checkbox"/> 1	9 (6%)
<input type="checkbox"/> 2	31 (22%)
<input type="checkbox"/> 3	54 (38%)
<input type="checkbox"/> 4	19 (13%)
<input type="checkbox"/> More than 4	30 (21%)
Other combination (≤ 5 responses) = 1 (0.7%)	
17. Does your program offer computer-guided implant planning and surgery training?	N = 144
<input type="checkbox"/> Yes	117 (81%)
<input type="checkbox"/> No	27 (19%)

Continued

Appendix I Continued

18. Estimate the number of implants that you will place this year.	N = 144
<input type="checkbox"/> 0–5	73 (51%)
<input type="checkbox"/> 6–10	31 (22%)
<input type="checkbox"/> 11–20	20 (14%)
<input type="checkbox"/> 21 to 30	15 (10%)
<input type="checkbox"/> More than 30	5 (3%)
19. Estimate the total number of implants that you will place during your residency training.	N = 146
<input type="checkbox"/> 0–5	33 (23%)
<input type="checkbox"/> 6–10	23 (16%)
<input type="checkbox"/> 11–20	26 (18%)
<input type="checkbox"/> 21 to 30	16 (11%)
<input type="checkbox"/> More than 30	48 (33%)
20. Estimate the percentage of the implants that you will personally place and restore during your residency training.	N = 142
<input type="checkbox"/> 1–25%	75 (53%)
<input type="checkbox"/> 26–50%	26 (18%)
<input type="checkbox"/> 51–75%	13 (9%)
<input type="checkbox"/> 76–100%	28 (20%)
21. Indicate the source(s) of surgical patients during residency training. (Please answer all that apply.)	N = 143
<input type="checkbox"/> Own patients (1)	59 (41%)
<input type="checkbox"/> Patients referred by private practices (2)	0
<input type="checkbox"/> Patients referred by pre-doctoral clinic (3)	4 (3%)
<input type="checkbox"/> Patients referred by AEGD program (4)	0
<input type="checkbox"/> Other _____	3 (2%)
Combination of 1,2,3 = 17 (12%)	
Combination of 1,2,3,4 = 16 (11%)	
Combination of 1,3 = 22 (15%)	
Combination of 2,3 = 6 (4%)	
Other combination (≤ 5 responses) = 16 (11%)	
22. Indicate the types of implant patients for whom you will surgically provide care during residency training. (Please answer all that apply.)	N = 144
<input type="checkbox"/> Maxillary anterior (1)	0
<input type="checkbox"/> Maxillary posterior (2)	3 (2%)
<input type="checkbox"/> Mandibular anterior (3)	4 (3%)
<input type="checkbox"/> Mandibular posterior (4)	6 (4%)
<input type="checkbox"/> Fully edentulous maxilla (5)	1 (0.7%)
<input type="checkbox"/> Fully edentulous mandible (6)	1 (0.7%)
<input type="checkbox"/> Other _____	13 (9%)
Combination of 1,2,3,4 = 8 (6%)	

Continued

Appendix I Continued

	Combination of 1,2,3,4,5,6 = 71 (49%)
	Combination of 1,2,3,4,6 = 7 (5%)
	Other combination (≤ 5 responses) = 30 (21%)
23. Where do you perform implant placement in your residency program? (Please answer all that apply.)	N = 144
<input type="checkbox"/> Prosthodontic clinic (1)	51 (35%)
<input type="checkbox"/> Periodontology clinic (2)	14 (10%)
<input type="checkbox"/> Oral surgery clinic (3)	21 (15%)
<input type="checkbox"/> Hospital/operating room (4)	2 (1%)
<input type="checkbox"/> Implant center (5)	10 (7%)
<input type="checkbox"/> Other _____	4 (3%)
	Combination of 1,5 = 6 (4%)
	Combination of 2,3 = 18 (13%)
	Other combination (≤ 5 responses) = 18 (13%)
24. What kind of implant-related surgical procedures are you allowed to perform in your residency training? (Please answer all that apply.)	N = 144
<input type="checkbox"/> Implant placement (1)	48 (33%)
<input type="checkbox"/> Internal sinus floor elevation (2)	1 (0.7%)
<input type="checkbox"/> Socket preservation (3)	0
<input type="checkbox"/> Minor grafting and/or Guided bone regeneration (4)	0
<input type="checkbox"/> External sinus floor elevation (5)	0
<input type="checkbox"/> Other _____	0
	Combination of 1,2,3 = 8 (6%)
	Combination of 1,2,3,4 = 24 (17%)
	Combination of 1,2,3,4,5 = 13 (9%)
	Combination of 1,3 = 16 (11%)

Appendix I Continued

	Combination of 1,3,4 = 16(11%)
	Combination of 1,4 = 7 (5%)
	Other combination (≤ 5 responses) = 11 (8%)
	N = 143
25. Estimate the number of implant-related bone grafting procedures, including sinus lift surgeries, that you will perform during your program.	
<input type="checkbox"/> 1-5	47 (33%)
<input type="checkbox"/> 6-10	22 (15%)
<input type="checkbox"/> 11 to 20	14 (10%)
<input type="checkbox"/> More than 20	13 (9%)
<input type="checkbox"/> Not applicable. Residents are not permitted.	45 (31%)
	Other combination (≤ 5 responses) = 2 (1%)
26. How many implants did you place before you felt confident in performing implant surgery?	N = 117
<input type="checkbox"/> Less than 10	56 (48%)
<input type="checkbox"/> 10 to 30	43 (37%)
<input type="checkbox"/> 31 to 50	11 (37%)
<input type="checkbox"/> More than 50	7 (6%)
27. Do you feel that your residency training adequately prepared you for implant surgery?	N = 198
<input type="checkbox"/> Yes	87 (44%)
<input type="checkbox"/> No	73 (37%)
<input type="checkbox"/> No info	37 (19%)
<i>If answered "No," do you feel that your residency program should have prepared you for implant surgery?</i>	N = 74
<input type="checkbox"/> Yes	55 (74%)
<input type="checkbox"/> No	17 (23%)
<input type="checkbox"/> No info	2 (3%)

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