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Original Article

# The training effectiveness of dental trainees in postgraduate year training program for dentists

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## KEYWORDS

Postgraduate year training program for dentists;  
Dental clinic;  
Joint group;  
Single hospital

**Background/purpose:** Taiwan's two-year postgraduate year training program for dentists (PGYD) has been implemented since 2010. However, there was no relevant study for confirming the training effectiveness of PGYD trainees. This study evaluated whether different training institution attributes and different training modes for PGYD trainees could result in differences in the achievement of PGYD training purposes.

**Materials and methods:** We adopted the questionnaire survey to collect the views of PGYD trainees on the training effectiveness of PGYD and further evaluated whether different training institution attributes and different training modes for PGYD trainees could result in

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differences in the achievement of PGYD training purposes.

*Results:* For the “patient-centered” learning environment and the management ability to be a responsible dental clinic owner, the views of PGYD trainees in dental clinics and district hospitals were more positive than those in medical centers. For the clinical professional ability and the management ability to be a responsible dental clinic owner, the views of PGYD trainees in joint group were more positive than those in single hospital.

*Conclusion:* We conclude that both hospitals and dental clinics can achieve PGYD training purposes. The smaller training institutions (dental clinics or district hospitals) are better training institution attributes and the joint group is the better training mode to achieve PGYD training purposes. The joint groups with medical centers combining many dental clinics, especially those in remote areas, may be an excellent training mode, because this training mode has the high potential to subsequently balance the distribution of dentists in Taiwan.

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## Introduction

The Ministry of Health and Welfare commissioned the Joint Commission of Taiwan to handle the two-year postgraduate year training program for dentists (PGYD), and it has been ten years since the implementation of PGYD in July 2010. The main reason for the implementation of this program was the spread of the severe acute respiratory syndrome (SARS) epidemic in 2003, which highlighted the inadequacy of general medical education (also including dental education) in Taiwan. Therefore, the medical and dental profession promoted introspection and decided to strengthen the clinical education of newly postgraduate practitioners, which resulted in the implementation of PGYD. In addition, according to Article 18 of Taiwan’s Medical Law, a physician or dentist who wants to become a clinic (medical or dental clinic) owner must complete two-year postgraduate clinical training. Therefore, PGYD was born in accordance with the national health policy.

One of the purposes of the two-year PGYD is to provide clinical training for new-entry dentists based on the concepts of “patient-centered” and “comprehensive dental treatment”. Moreover, the other purposes of this program are to familiarize the dental trainees with the diagnosis and treatment of general dental diseases, and to cultivate general dentists who can obtain the abilities to work independently, can make clear judgments and be responsible for treatment, and can arrange consultations or referrals if needed.<sup>1,2</sup>

In the past, some studies believed that postgraduate general medical training for dentists can improve the clinical ability, management ability, and professionalism of new-entry dentists.<sup>1,3–5</sup> However, this hypothesis has not been verified by related studies. In particular, the basic problems whether the smaller training institutions (such as dental clinic and district hospital) are better training institution attributes than the larger training institutions (such as regional hospital and medical center) and whether joint group is a better training mode than single hospital for improving the clinical ability, management ability, and professionalism of new-entry dentists are still not clear. Therefore, this study tried to use the questionnaire survey

for verification of these basic problems. We hope that the results of this study may be used as important references for making the future PGYD policy.

## Materials and methods

In this study, we adopted the questionnaire survey to collect the views of PGYD trainees on the training effectiveness of PGYD in Taiwan since 2010. These methods were described as follows.

### PGYD trainees

Taiwan PGYD has been implemented since 2010. There was no public information on the exact number of dentists who have completed PGYD training since the implementation of PGYD. However, a government program reported that the cumulative number of dentists who received PGYD training by 2015 was 1950.<sup>1</sup> In this study, the subjects of the questionnaire survey were the dentists who have completed PGYD training or those in PGYD training in 2018.

### Sampling process

Since there was no national list of dentists who have completed PGYD training or those in training in 2018, we could not conduct the questionnaire survey by random sampling. Even though, we could conduct the questionnaire survey by purposive sampling. Through our past teaching and practice experience, in early 2018, we used emails, messages, and communication software to send out invitations of the questionnaire survey to dentists we knew, especially those who were in charge of the dental department of a hospital or a dental clinic. For those who were willing to assist in the questionnaire survey, we mailed the paper questionnaires to their institutions (hospitals or dental clinics), waited for them to fill out the questionnaires and to send them back to us, and completed the collection of the questionnaires before August 2018.

## Survey tool

All PGYD trainees who were invited to join in this study were at their free will to fill out the questionnaires without the pressure from the investigators. The structured questionnaire was used as the survey tool. The questions included the basic demographic data such as their gender, date of birth, and highest education, as well as the status of PGYD training such as their training institution attributes, training modes, and whether they had completed the training or still in training right now. The training institution attributes included the independent dental clinics, group-operated chain dental clinics, district hospitals, regional hospitals, and medical centers. The training modes included the single clinic, single hospital, joint group-dental clinic as the main training institution, and joint group-hospital as the main training institution. In addition, the investigated questions were about the PGYD trainees' self-assessment for the agreement on whether the training purposes had been achieved. Moreover, these questions were described as follows: (1) The training institution provides a learning environment based on the concept of "patient-centered" as a basic medical model. (2) The training institution provides a learning environment based on the concept of "comprehensive dental treatment" as a basic medical model. (3) After PGYD training, trainees can obtain the clinical professional ability (for example, he or she is familiar with the diagnosis and treatment of general dental diseases). (4) After PGYD training, trainees can obtain the ability to work alone (for example, they can independently complete the diagnosis and treatment work and manage the daily operation of dental institutions). (5) After PGYD training, trainees can become a general dentist who is responsible for treatment and arranging consultations or referrals with independent and clear judgment. (6) After PGYD training, trainees can obtain the management ability to be a responsible dental clinic owner.

In these investigated questions, the answer was designed to let the participant to raise a score ranging from 1 to 4. If the intensity or response for each question was extremely agreed, the score was 4. In contrast, if the intensity or response for each question was not extremely agreed, the score was 1. The mean score was 2.5 or more, which meant that on average, answerers agreed that the investigated items were important, and the higher the score, the higher the degree of their agreement. The participants were suggested to fill the score in fresh memory.

## Statistical analysis

All data collected were stored in excel files and used for statistical analysis. The differences in the mean score (the degree of agreement) of each investigated item were compared among PGYD trainees of different genders and education, of different training institution attributes, and in different training modes, as well as between PGYD trainees who had completed the training and those still in training by Student's *t*-test and F-test. Then, the Post Hoc test was used as least significance difference (LSD) procedure. Moreover, the result was considered to be significant if the *P*-value was less than 0.05.

## Results

### Demographic data

In this study, 283 PGYD trainees filled out the questionnaires (Table 1). Of these 283 answerers, there were 165 (58.30%) males and 118 (41.70%) females. Their average age when they filled out the questionnaires was 31.32 years, and the average age when they completed the PGYD training was 28.92 years. For the highest academic qualifications, there were 267 (94.35%) having doctor of dental surgery (DDS) degrees and 16 (5.65%) having master degrees (Table 1).

### The status of PGYD training

For training institution attributes of these answerers, there were 175 (61.84%) trained in hospitals. Of these 175 trainees, 93 (32.86%) were trained in medical centers, and 54 (19.08%) in regional hospitals, and 28 (9.89%) in district hospitals. For the remaining 108 (38.16%) dentists trained in

**Table 1** The distribution of 283 PGYD trainees who filled out the questionnaires.

	Male (%)	Female (%)	Total (%)
<b>Education</b>			
Doctor of dental surgery	153 (54.06%)	114 (40.28%)	267 (94.35%)
Master	12 (4.24%)	4 (1.41%)	16 (5.65%)
<b>Training institution attributes</b>			
Independent dental clinics	20 (7.07%)	12 (4.24%)	32 (11.31%)
Group-operated chain dental clinics	50 (17.67%)	26 (9.19%)	76 (26.86%)
District hospitals	16 (5.65%)	12 (4.24%)	28 (9.89%)
Regional hospitals	28 (9.89%)	26 (9.19%)	54 (19.08%)
Medical centers	51 (18.02%)	42 (14.84%)	93 (32.86%)
<b>Training modes</b>			
Single clinic	22 (7.77%)	11 (3.89%)	33 (11.66%)
Single hospital	79 (27.92%)	72 (25.44%)	151 (53.36%)
Joint group-clinic as the main training institution	47 (16.61%)	26 (9.19%)	73 (25.80%)
Joint group-hospital as the main training institution	17 (6.01%)	9 (3.18%)	26 (9.19%)
<b>PGYD training status</b>			
Those who had completed the training	146 (51.59%)	97 (34.28%)	243 (85.87%)
Those still in training	19 (6.71%)	21 (7.42%)	40 (14.13%)
<b>Total</b>	165 (58.30%)	118 (41.70%)	283 (100%)

dental clinics, there were 32 (11.31%) in independent dental clinics, and 76 (26.86%) in group-operated chain dental clinics. For the training modes, there were 151 (53.36%) trained in a single hospital. Of the rest of 132 trainees, 33 (11.66%) were trained in a single clinic, 73 (25.80%) in a joint group-dental clinic as the main training institution, and 26 (9.19%) in a joint group-hospital as the main training institution. For the training status, 243 (85.87%) answerers had completed the training, and 40 (14.13%) was still in training (Table 1).

### The degree of the agreement on the training purposes of PGYD

There were six investigated items for training purposes of PGYD. The agreement on the degree of importance of each training purpose of PGYD was very high and all the mean scores and the proportion of those who answered as important of each investigated item were over 3 and 90%, except for the purpose (6) that had 2.50 and 48.76% for the mean score and the proportion, respectively (Table 2). This indicates that the 283 PGYD trainees highly agreed that PGYD training institutions can provide a “patient-centered” and “comprehensive dental treatment” learning environment, and after the PGYD training, they can obtain the clinical professional ability to work alone and to become a general dentist. However, for the management ability to be a responsible dental clinic owner, their points of view were more conservative (Table 2).

Among 283 PGYD trainees of different genders, the mean scores of all training purposes of PGYD had no significant differences, indicating that the views of 283 PGYD trainees of different genders were consistent. On the other hand, among 283 PGYD trainees of different education levels, the mean score of the training purpose (6) of PGYD for trainees with DDS degree was significantly higher than those with master degree ( $P < 0.05$ ), indicating that for the management ability to be a responsible dental clinic owner, the views of PGYD trainees with master degree were more conservative than those with DDS degree (Table 2).

### Comparisons of the agreement on the training purposes among 283 PGYD trainees of different training institution attributes

Among 283 PGYD trainees of different training institution attributes, the mean scores of all training purposes of PGYD trainees in medical centers were lower than those in independent dental clinics, group-operated chain dental clinics, district hospitals, and regional hospitals (Table 3). However, the mean scores of the training purposes (1) and (6) of those in independent dental clinics, group-operated chain dental clinics, district hospitals, and regional hospitals were all significantly higher than those in medical centers, indicating that for the “patient-centered” learning environment and the management ability to be a responsible dental clinic owner, the views of PGYD trainees in various non-medical center training institutions were more positive than those in medical centers (Table 3).

Among training institution attributes grouped by scale, the mean scores of the training purposes (1) and (6) of PGYD trainees in dental clinics and those in regional and district hospitals were significantly higher than those in medical centers, indicating that for the “patient-centered” learning environment and the management ability to be a responsible dental clinic owner, the views of PGYD trainees in the smaller training institutions were more positive than those in the larger training institutions (Table 3). Furthermore, among 283 PGYD trainees trained in dental clinics or hospitals, the mean scores of all training purposes of PGYD trainees in dental clinics were higher than those in hospitals, although no significant difference was found (Table 3).

### Comparisons of the agreement on the training purposes among 283 PGYD trainees in different training modes

Among 283 PGYD trainees trained in different training modes, the mean scores of the training purposes (3), (4) and (6) of those in joint group-clinic as the main training

**Table 2** The agreement on the degree of importance of each training purpose of PGYD for 283 PGYD trainees expressed as the mean score ( $\pm$ standard deviation) and the proportion of those who answered as important of each investigated item.

	Purpose (1)	Purpose (2)	Purpose (3)	Purpose (4)	Purpose (5)	Purpose (6)
All answerers (N = 283)						
Mean score $\pm$ standard deviation	3.28 $\pm$ 0.54	3.28 $\pm$ 0.53	3.27 $\pm$ 0.52	3.17 $\pm$ 0.54	3.23 $\pm$ 0.53	2.50 $\pm$ 0.74
Number and proportion of those who answered as important	272 (96.11%)	272 (96.11%)	272 (96.11%)	263 (92.93%)	269 (95.05%)	138 (48.76%)
Gender	Mean score $\pm$ standard deviation					
Male (N = 165)	3.29 $\pm$ 0.52	3.27 $\pm$ 0.53	3.31 $\pm$ 0.51	3.19 $\pm$ 0.57	3.26 $\pm$ 0.53	2.54 $\pm$ 0.77
Female (N = 118)	3.25 $\pm$ 0.57	3.30 $\pm$ 0.53	3.21 $\pm$ 0.54	3.14 $\pm$ 0.51	3.19 $\pm$ 0.53	2.44 $\pm$ 0.69
Student's <i>t</i> -test	0.56	-0.37	1.54	0.67	1.03	1.11
Significance	NS	NS	NS	NS	NS	NS
Education level	Mean score $\pm$ standard deviation					
Doctor of dental surgery (N = 267)	3.28 $\pm$ 0.53	3.29 $\pm$ 0.53	3.27 $\pm$ 0.53	3.17 $\pm$ 0.54	3.23 $\pm$ 0.53	2.52 $\pm$ 0.74
Master (N = 16)	3.19 $\pm$ 0.66	3.19 $\pm$ 0.54	3.25 $\pm$ 0.45	3.13 $\pm$ 0.62	3.25 $\pm$ 0.45	2.19 $\pm$ 0.54
Student's <i>t</i> -test	0.67	0.74	0.15	0.34	-0.13	2.30
Significance	NS	NS	NS	NS	NS	<0.05

NS: not significant.

**Table 3** The comparisons of the agreement on the training purposes among 283 PGYD trainees of different training institution attributes.

	Purpose (1)	Purpose (2)	Purpose (3)	Purpose (4)	Purpose (5)	Purpose (6)
Training institution attributes	Mean score $\pm$ standard deviation					
A. Independent dental clinics (N = 32)	3.50 $\pm$ 0.51	3.34 $\pm$ 0.54	3.25 $\pm$ 0.57	3.22 $\pm$ 0.55	3.25 $\pm$ 0.57	2.63 $\pm$ 0.55
B. Group-operated chain dental clinics (N = 76)	3.26 $\pm$ 0.60	3.26 $\pm$ 0.55	3.36 $\pm$ 0.48	3.22 $\pm$ 0.51	3.25 $\pm$ 0.52	2.55 $\pm$ 0.74
C. District hospitals (N = 28)	3.53 $\pm$ 0.51	3.43 $\pm$ 0.50	3.39 $\pm$ 0.57	3.39 $\pm$ 0.50	3.46 $\pm$ 0.51	2.96 $\pm$ 0.64
D. Regional hospitals (N = 54)	3.33 $\pm$ 0.48	3.37 $\pm$ 0.49	3.24 $\pm$ 0.58	3.09 $\pm$ 0.59	3.19 $\pm$ 0.59	2.46 $\pm$ 0.82
E. Medical centers (N = 93)	3.10 $\pm$ 0.49	3.18 $\pm$ 0.53	3.18 $\pm$ 0.49	3.09 $\pm$ 0.54	3.17 $\pm$ 0.48	2.29 $\pm$ 0.70
F-test	6.12	1.88	1.60	2.28	1.81	5.35
Significance	<0.001	NS	NS	NS	NS	<0.001
Post Hoc test	A > B, E; B > E; C > B, E; D > E	C > E; D > E	B > E	C > D, E	C > D, E	A > E; B > E; C > B, D, E; D > E
Training institution attributes grouped by scale	Mean score $\pm$ standard deviation					
A. Dental clinics (N = 108)	3.33 $\pm$ 0.58	3.29 $\pm$ 0.55	3.32 $\pm$ 0.51	3.22 $\pm$ 0.52	3.25 $\pm$ 0.53	2.57 $\pm$ 0.69
B. Regional and district hospitals (N = 82)	3.40 $\pm$ 0.49	3.39 $\pm$ 0.49	3.29 $\pm$ 0.58	3.20 $\pm$ 0.58	3.28 $\pm$ 0.58	2.63 $\pm$ 0.79
C. Medical centers (N = 93)	3.10 $\pm$ 0.49	3.18 $\pm$ 0.53	3.18 $\pm$ 0.49	3.09 $\pm$ 0.54	3.17 $\pm$ 0.48	2.29 $\pm$ 0.70
F-test	8.37	3.39	1.95	1.69	1.01	5.88
Significance	<0.001	<0.05	NS	NS	NS	<0.01
Post Hoc test	A > C; B > C	B > C	—	—	—	A > C; B > C
Training institution attributes grouped by clinic or hospital	Mean score $\pm$ standard deviation					
Dental clinics (N = 108)	3.33 $\pm$ 0.58	3.29 $\pm$ 0.55	3.32 $\pm$ 0.51	3.22 $\pm$ 0.52	3.25 $\pm$ 0.53	2.57 $\pm$ 0.69
Hospitals (N = 175)	3.24 $\pm$ 0.51	3.28 $\pm$ 0.52	3.23 $\pm$ 0.53	3.14 $\pm$ 0.56	3.22 $\pm$ 0.53	2.45 $\pm$ 0.76
Student's <i>t</i> -test	1.37	0.11	1.40	1.28	0.42	1.36
Significance	NS	NS	NS	NS	NS	NS

NS: not significant.

institution were significantly higher than those in single hospital, indicating that for the clinical professional ability, the ability to work alone, and the management ability to be a responsible dental clinic owner, the views of PGYD trainees in joint group-clinic as the main training institution were more positive than those in single hospital (Table 4).

Furthermore, among training modes grouped by single clinic, single hospital or joint group, the mean scores of the training purposes (3) and (6) of those in joint group were significantly higher than those in single hospital, indicating that for the clinical professional ability and the management ability to be a responsible dental clinic owner, the views of PGYD trainees in joint group were more positive than those in single hospital (Table 4). Among 283 PGYD trainees trained in single institution or joint group, the mean scores of the training purposes (3) and (6) of PGYD trainees in joint group were significantly higher than those in single institution ( $P < 0.05$ , Table 4).

### Comparisons of the agreement on the training purposes between 243 PGYD trainees who had completed the training and 40 PGYD trainees still in training

For a total of 283 PGYD trainees, the mean scores of all training purposes of 40 PGYD trainees still in training were higher than 243 PGYD trainees who had completed the training, although no significant difference was found. Moreover, 40 PGYD trainees still in training tended to give more positive views on all training purposes of PGYD (Table 5).

### Discussion

General clinical training for dentists after graduation has become a trend internationally. Many countries regulate that dental graduates who pass examination and obtain a

**Table 4** The comparisons of the agreement on the training purposes among 283 PGYD trainees in different training modes.

	Purpose (1)	Purpose (2)	Purpose (3)	Purpose (4)	Purpose (5)	Purpose (6)
Training modes	Mean score ± standard deviation					
A. Single clinic (N = 33)	3.27 ± 0.67	3.21 ± 0.55	3.15 ± 0.51	3.15 ± 0.44	3.21 ± 0.55	2.45 ± 0.71
B. Single hospital (N = 151)	3.25 ± 0.52	3.28 ± 0.52	3.22 ± 0.53	3.12 ± 0.56	3.21 ± 0.52	2.41 ± 0.78
C. Joint group-clinic as the main training institution (N = 73)	3.38 ± 0.54	3.34 ± 0.56	3.42 ± 0.50	3.27 ± 0.56	3.29 ± 0.54	2.61 ± 0.68
D. Joint group-hospital as the main training institution (N = 26)	3.15 ± 0.46	3.19 ± 0.49	3.27 ± 0.53	3.19 ± 0.49	3.27 ± 0.53	2.73 ± 0.60
F-test	1.58	0.75	3.24	1.35	0.46	2.28
Significance	NS	NS	<0.05	NS	NS	NS
Post Hoc test	-	-	C > A, B	C > B	-	C > B; D > B
Training modes grouped by single clinic, single hospital or joint group	Mean score ± standard deviation					
A. Single clinic (N = 33)	3.27 ± 0.67	3.21 ± 0.55	3.15 ± 0.51	3.15 ± 0.44	3.21 ± 0.55	2.45 ± 0.71
B. Single hospital (N = 151)	3.25 ± 0.52	3.28 ± 0.52	3.22 ± 0.53	3.12 ± 0.56	3.21 ± 0.52	2.41 ± 0.78
C. Joint group (N = 99)	3.32 ± 0.53	3.30 ± 0.54	3.38 ± 0.51	3.25 ± 0.54	3.28 ± 0.54	2.65 ± 0.66
F-test	0.62	0.36	3.98	1.82	0.67	3.19
Significance	NS	NS	<0.05	NS	NS	<0.05
Post Hoc test	-	-	C > A, B	-	-	C > B
Training modes grouped by single institution or joint group	Mean score ± standard deviation					
Single institution (N = 184)	3.25 ± 0.55	3.27 ± 0.52	3.21 ± 0.52	3.13 ± 0.54	3.21 ± 0.52	2.42 ± 0.76
Joint group (N = 99)	3.32 ± 0.53	3.30 ± 0.54	3.38 ± 0.51	3.25 ± 0.54	3.28 ± 0.54	2.65 ± 0.66
Student's <i>t</i> -test	-1.01	-0.47	-2.74	-1.89	-1.16	-2.51
Significance	NS	NS	<0.05	NS	NS	<0.05

NS: not significant.

**Table 5** The comparisons of the agreement on the training purposes between 243 PGYD trainees who had completed the training and 40 PGYD trainees still in training.

	Purpose (1)	Purpose (2)	Purpose (3)	Purpose (4)	Purpose (5)	Purpose (6)
PGYD training status	Mean score ± standard deviation					
Those who had completed the training (N = 243)	3.26 ± 0.55	3.26 ± 0.53	3.26 ± 0.52	3.16 ± 0.55	3.22 ± 0.52	2.49 ± 0.72
Those still in training (N = 40)	3.38 ± 0.49	3.40 ± 0.50	3.33 ± 0.53	3.23 ± 0.53	3.30 ± 0.56	2.55 ± 0.85
Student's <i>t</i> -test	-1.26	-1.51	-0.73	-0.69	-0.86	-0.48
Significance	NS	NS	NS	NS	NS	NS

NS: not significant.

dentist license must undergo a clinical training course of one to two years before they can have the qualifications for free practice across the country. However, different dental education systems may affect the design of the training system for dentists after graduation.<sup>1</sup>

The dental schools in the United States enroll college graduates and provide four-year dental education. Dental graduates take examinations for dental licensure according to the regulations of each state. Dental licensure in the United States is currently determined on a state-by-state basis. Although the utilization of a general dentistry post-graduate year one (PGY-1) residency as a path to licensure

has been implemented as an option in multiple states, it is only mandatory as a component of licensure in New York and Delaware.<sup>5</sup> Therefore, American dental scholars also have different opinions. Some believe that the PGY-1 system for dental graduates provides benefits and should be mandatory in dental education, and others believe that PGY-1 should be available for dental graduates, but it should not be mandatory.<sup>5</sup>

In addition, the dental schools in Japan enroll high-school graduates and have six-year dental education. After dental graduates have obtained a dentist license, they cannot practice freely anywhere in Japan. Because Japan

implemented mandatory vocational training for dentists (so-called junior resident year) in 2006, the new-entry dentists need to receive one-year postgraduate clinical training before they can practice freely anywhere or become the owner of a dental clinic in Japan.<sup>6,7</sup>

However, the dental schools in Taiwan are the same as those in Japan. Our dental schools enroll high-school graduates and have six-year dental education. However, after dental graduates have obtained a dentist license, they can practice freely anywhere in Taiwan. Although Taiwan also implemented two-year postgraduate year training program for dentists (PGYD) since 2010, it is not mandatory. Moreover, medical regulations only require the new-entry dentists to receive two-year PGYD training before they can enter the dental specialist training or become the owner of a dental clinic.<sup>8–12</sup>

The internship course of sixth grade year in Taiwan's dental schools is conducted in university hospitals, medical centers or regional hospitals that meet the qualifications of teaching hospitals.<sup>1,2</sup> Under certain conditions, our dental interns can directly contact patients for dental treatment. This internship course also has minimal requirements, such as performance of a certain number of cases of tooth extraction, full-mouth scaling, periodontal treatment phase I, tooth fillings, root canal therapy, fixed dentures, and removable dentures, etc.

Because the PGY-1 training for dental graduates in the United States and the one-year vocational training for dentists in Japan are both clinical training for new-entry dentists to obtain the qualifications for free practice, some American dental scholars even think that PGY-1 is like a required fifth grade year of a dental school.<sup>13</sup> Therefore, it is not difficult to find that although the internship course of sixth grade year in Taiwan's dental schools is still a pre-doctoral curriculum, its characteristic is similar to those of PGY-1 training in the United States and vocational training in Japan. The characteristic of the two-year PGYD training in Taiwan is undoubtedly the first two years of dental specialist training or professional training for dental clinic owners. Furthermore, in 2017, Taiwan had a constitutional interpretation by the grand justices stating that the language, medical culture, and disease types of clinical practice training (or clinical internship course) in foreign dental schools are different from those in Taiwan and cannot replace the internship course of sixth grade year in domestic dental schools. Therefore, it is reasonable that graduates of foreign dental schools must still complete a one-year internship course in a teaching hospital in Taiwan before they can take the national dentist license examination.<sup>1</sup>

Regarding the discussion on whether the PGY-1 is mandatory in the United States, the two main barriers are the insufficient number of postdoctoral positions to accommodate all the graduates and the high cost for the PGY-1 training.<sup>14,15</sup> In Taiwan, the number of newly-issued dentists has been between 400 and 500 each year in the past 10 years, and the positions required for two-year PGYD training is estimated to be 900. In 2020, the Ministry of Health and Welfare approved 206 PGYD training programs with 541 training institutions (including 90 hospitals and 451 dental clinics). On average, each training institution only needs to provide at least 2 positions to meet the demand. In

addition, Taiwan's dentists who participated in PGYD training are for the first two years of dental specialist training or professional training to become a dental clinic owner and not for the right of free practice. Therefore, Taiwan does not have the same challenges as the implementation of PGY-1 in the United States. We are more concerned about the outcomes of the implementation of PGYD, such as the achievement of training purposes, the differences in training effectiveness for PGYD trainees of different training institution attributes and in different training modes, as well as other potential outcomes, such as the impact on the number of new dental clinics, the lifelong career of PGYD trainees, and their choice of practice locations after PGYD training.

According to government statistics, there are approximately 325 new-entry dentists participating in PGYD training every year.<sup>1</sup> If there are about 450 newly issued dentists each year, it means that about 72% of them will choose to receive PGYD training, and the number of positions for PGYD training is still enough. On the other hand, the participants in our study were dentists who participated in PGYD training before 2017. The estimate for the cumulative number of dentists who received PGYD training by 2017 is 2600. Therefore, the number of samples in this study is estimated to account for at least 10% (283/2600) of the PGYD trainees who had completed the PGYD training or still in training, indicating that the study samples are still somewhat representative.

In this study, according to the PGYD trainees' self-assessment for the agreement on whether the training purposes have been achieved, the results indicate that PGYD trainees highly agree that PGYD training institutions can provide a "patient-centered" and "comprehensive dental treatment" learning environment, and after PGYD training, they can obtain the clinical professional ability and skills to work alone and to become a general dentist. However, for the management ability to be a responsible dental clinic owner, their views were more conservative. Regardless of PGYD trainees who had completed the training or those still in training, their views were the same. We believe that all PGYD trainees are based on the internship training (in the teaching hospitals) of sixth grade year in domestic dental schools. They are also dentists who have passed the national license examination after graduation. The relevant knowledge and skills have been well prepared, so they have sufficient ability to be qualified for the PGYD training.<sup>1</sup> Therefore, it is important that the internship training of sixth grade year in domestic dental schools is also the preparation work for dentists before entering the PGYD training.

In terms of training institution attributes, the smaller training institutions, such as dental clinics or district hospitals, are more likely to achieve the training purposes of PGYD than the larger training institutions, such as medical centers, especially in the "patient-centered" learning environment and the management ability to be a responsible dental clinic owner. In fact, more than 85% of dentists in Taiwan work in dental clinics. In 2019, there were 6874 dental clinics in Taiwan, and the average number of dentists per dental clinic was only 1.88.<sup>9,16</sup> Therefore, the smaller training institutions, such as dental clinics, are more likely to represent the real world of the practice

environment of dentists in Taiwan. Some studies believe that repeated operation of dental treatment procedures is an important factor in improving clinical skills of dental trainees.<sup>3–5</sup> We also believe that the environment of a dental clinic can provide more patients, and their dental trainees must learn to deal with all kinds of oral problems on the same patient, including direct treatment, consultation, and referral. Therefore, dental clinics are more likely to provide a “patient-centered” and “comprehensive dental treatment” learning environment, and learning opportunities for repeated operation of dental treatment procedures, as well as exposure to the management level of a dental clinic. The training model of the larger training institutions, such as medical centers, allows dental trainees to learn the clinical skills of dental treatment in individual dental specialties, and of course the dental trainees are not involved in dental clinic management.

In terms of training modes, the joint group is more likely to achieve the training purposes than the single institution, especially in the clinical professional ability and the management ability to be a responsible dental clinic owner. In a joint group, PGYD trainees can have more patients to perform dental treatment procedures, can obtain the opportunity to directly observe and learn clinic management in a dental clinic, and can also learn advanced dental treatment procedures in a hospital. Therefore, for PGYD trainees, the joint group may be the best training mode. Although the single hospital is not the best training mode, especially only in medical centers, the larger training institutions do have richer and more complete training resources. Therefore, joint groups formed by university hospitals (or medical centers) and many dental clinics may be the best training mode that combine both the advantages of hospitals and dental clinics. Previous studies also found that the locations of dental trainees’ training institutions may affect their choice of practice locations after training.<sup>1,17,18</sup> Therefore, it is recommended to increase a large number of dental clinics, especially those in remote areas, to join the training groups of university hospitals. We think that this may promote the redistribution of dentists and slow down the phenomenon of excessive concentration of dentists in the metropolitan areas.<sup>1</sup>

In this study, we conclude that domestic dental graduates already have a certain degree of clinical ability, and both hospitals and dental clinics can achieve PGYD training purposes. The smaller training institutions (dental clinics or district hospitals) are better training institution attributes and the joint group is the better training mode to achieve PGYD training purposes. Taiwan’s PGYD policy should consider that the joint groups with medical centers combining many dental clinics, especially those in remote areas, may be an excellent training mode, because this training mode has the high potential to subsequently balance the distribution of dentists in different regions in Taiwan.

### Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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