



Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.e-jds.com



Perspective article

How to become a dental equipment technician and overview of the dental equipment repair industry in Taiwan

Feng-Chou Cheng^{a,b,c}, Ling-Hsia Wang^{d**},
Chun-Pin Chiang^{e,f,g,h*}

^a Chia-Te Dental Clinic, New Taipei City, Taiwan

^b School of Life Science, College of Science, National Taiwan Normal University, Taipei, Taiwan

^c Science Education Center, National Taiwan Normal University, Taipei, Taiwan

^d Center for the Literature and Art, Hsin Sheng Junior College of Medical Care and Management, Taoyuan, Taiwan

^e Department of Dentistry, National Taiwan University Hospital, College of Medicine, National Taiwan University, Taipei, Taiwan

^f Graduate Institute of Clinical Dentistry, School of Dentistry, National Taiwan University, Taipei, Taiwan

^g Graduate Institute of Oral Biology, School of Dentistry, National Taiwan University, Taipei, Taiwan

^h Department of Dentistry, Hualien Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, Hualien, Taiwan

Received 2 January 2024

Available online 23 January 2024

KEYWORDS

Dental equipment
technician;
Dental equipment
repair industry;
Dental team;
Dental unit

The dental-associated professionals are important members of the dental team as they are employed in every type of the dental practice. They are the backbone of a

successful dental practice. They support dentists to provide more effective and efficient dental cares to the dental patients.^{1,2} In addition to the dentists, the dental

* Corresponding author. Department of Dentistry, Hualien Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, No. 707, Section 3, Chung-Yang Road, Hualien, 970, Taiwan.

** Corresponding author. Center for the Literature and Art, Hsin Sheng Junior College of Medical Care and Management, No. 418, Gaoping Section, Jhongfong Road, Longtan Township, Taoyuan, 32544, Taiwan.

E-mail addresses: milkegg5452001@gmail.com (L.-H. Wang), cpchiang@ntu.edu.tw (C.-P. Chiang).

<https://doi.org/10.1016/j.jds.2024.01.003>

1991-7902/© 2024 Association for Dental Sciences of the Republic of China. Publishing services by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

technicians are the only one dental-associated professional that has a well-established cultivated education system and is certified by the Ministry of Health and Welfare in Taiwan.^{2,3} The other dental-associated professionals including the dental assistants, the dental radiation technologists (also known as the certified medical radiation technologists engaged in dentistry), the dental nurses (also known as the certified nurses engaged in dentistry), and the oral hygienists in Taiwan.^{4–6}

Furthermore, there is also a career whose workplace is mainly at the dental institutions, but they are not part of the staff of the dental institutions. Although their number is small, they are closely related to the normal daily operations of the dental institutions. We are still pleased to consider this career as a member of the dental team. They are dental equipment technicians (DETs). A job as a dental equipment technician (DET) is a subcategory of the broader occupational category of the medical equipment repair personnel. This job involves the testing, adjusting, or repairing biomedical or electronic medical equipment in dentistry, especially the dental units.⁷ In this study, we attempted to explore how to become a DET and overview of the dental equipment repair industry in Taiwan through an interview with a very senior and highly experienced DET.

In this study, we used purposeful sampling to select a DET who had extensive experience in the dental equipment repair industry. We conducted the interview with this DET. Our questions for the DET and his answers during the interview are shown in Table 1. The interview outline had 5 major items related to the DETs in Taiwan, including (A) the story of this interviewed DET (B) the definition of the DET and the operation of the dental equipment repair industry in Taiwan; (C) how to become a DET in Taiwan (D) the characteristics of a DET in Taiwan; and (E) the assessment of the Taiwan's DET manpower demand and the future of the DET career. This interviewed DET started his DET career since 1992 when he was a junior college student. So far, he has been in the dental instrument repair industry for more than 30 consecutive years. According to his viewpoint, a DET, also known as a dental equipment repairer, is a sub-item of the broader occupational category of the medical equipment repair personnel. The job entails of the DET include the installation of a new equipment at the medical institutions (such as the main body of the dental units, the water supply and the power systems of the dental units, X-ray equipment, intraoral cameras, sterilization systems, dental handpieces, and so on), and the maintenance, repair, and records for the customer dental equipment. In the Taiwan's dental equipment repair industry, the DETs are employed in three types for their practice, including (1) those employed in the maintenance departments of the manufacturing or agent dental equipment companies; (2) those employed by the companies or individual studios that undertake the services of dental equipment repairing from other dental equipment companies; and (3) those employed by the companies or individual studios that specialize in the maintenance and repair of the dental equipment. For the models of dental institutions (or customers of the dental equipment) to call in the dental equipment repairing, they can submit a repair service request to the company that originally sold the equipment, or submit a repair service request directly to the company or individual studios that

Table 1 The questions for the dental equipment technician (DET) and his answers during the interview in this study.

Item	The questions for the DET and his answers
A	The story of this interviewed DET
1	How did you start learning the knowledge and techniques related to the work of a DET? In 1992, when I was studying at a junior college of engineering, I had to work part-time. My first part-time job was in the maintenance department of a dental unit manufacturing company. Thus, I started to learn the relevant knowledge and technology about the dental units, also known as the dental treatment chairs or dental chairs, in the factory from this job.
2	What is your experience working as a DET? I have been working as a DET continuously for more than 30 years. While I was in the school from 1992 to 1994, I worked and learned the assembly and repair of the dental units in the maintenance department of a dental unit manufacturing company. During my military service from 1994 to 1996, because of my experience in the medical equipment industry, I was selected into the Health Company of the Army. I was then assigned to the dental clinic of the Army in Penghu as a dental soldier, assisting a military dental officer in the dental procedures, purchasing the dental materials, and managing and repairing the dental equipment. Sometimes I was sent to other outlying island clinics to repair the dental equipment. After retiring from the Army in 1996, I returned to work in my original company. My work mainly included the on-site installation of new dental units and after-sales services related to the dental equipment maintenance and repair. In 2011, I started my own business and established a company selling the dental equipment until now.
3	What are the services of your company? The main business is the sales of the dental equipment and consumables, and the maintenance and repair of the dental equipment. The products sold in the dental equipment category are mainly the dental units.
B	The definition of a DET and the operation of the dental equipment repair industry in Taiwan
4	How do you personally define a DET and what are the job entails of a DET? I consider that a DET, also known as a dental equipment service technician, a dental equipment repair technician or a dental equipment repairer, is a sub-item of the broader occupational category of the medical equipment repair personnel. This job involves the testing, adjusting, or repairing the dental biomedical or electromedical equipment, especially the dental units. Its specific work content includes the installation of a new equipment at the medical institutions (such as the main body of the dental units, the water supply

(continued on next page)

Table 1 (continued)

Item	The questions for the DET and his answers
	and the power systems of the dental units, X-ray equipment, intraoral cameras, sterilization systems, dental handpieces, and so on), and the maintenance, repair, and records for the customer dental equipment. The duties of a DET are mainly to maintain or repair a dental equipment on-site to provide services to customers at a medical institution, but may on occasion also include the duties of maintenance and repair for a dental equipment sent back to the workshop.
5	What are the current types of a DET in the Taiwan's dental equipment repair industry? I summarize the following three types: (1) Manufacturing or agent dental equipment companies with the maintenance departments: The dedicated DET is responsible for the installation, test, and adjustment of a new dental equipment, while the maintenance and repair of a dental equipment for after-sales services is separately handled by the DET of the maintenance department. When there is an insufficient manpower of the DET for the maintenance and repair of the dental equipment, the companies or individual studios that specialize in the maintenance and repair of the dental equipment are also entrusted. (2) Manufacturing or agent dental equipment companies without the maintenance departments: Although the dedicated DET is responsible for the installation, test, and adjustment of the new dental equipment, the maintenance and repair of the dental equipment for after-sales services is outsourced to the companies or individual studios that specialize in the dental equipment repairing. (3) Companies or individual studios specializing in the maintenance and repair of the dental equipment.
6	What are the models of dental institutions (or customers of the dental equipment) to call in the dental equipment repairing? I summarize the following three models: (1) The customer submits a repair service request to the company that originally sold the dental equipment, and the company assigns its own DET to handle it. (2) The customer submits a repair service request to the company that originally sold the dental equipment, while the company entrusts a company or a personal studio that specializes in the dental equipment repairing to handle it. (3) The customer submits a repair service request directly to the company or individual studios that specialize in the dental equipment repairing.
C	How to become a DET in Taiwan
7	Does Taiwan currently have the DET-related training courses or certification systems?

Table 1 (continued)

Item	The questions for the DET and his answers
	In Taiwan, currently, no school or vocational training institution has offered the DET-related training courses, and the government or private entities have not set up a so-called DET licensing system.
8	Does Taiwan currently have laws and regulations regarding the DET? Taiwan currently has the "Medical Devices Act" and "Regulations for Management of Medical Devices Technicians", but there is no separate legal system for the management of dental devices in this regard. This set of laws and regulations includes the repair of diagnostic medical devices. Therefore, the repair work of common dental equipment (such as dental units) is not regulated by the above-mentioned laws and regulations, but the repair work of the dental X-ray equipment is regulated by it.
9	In Taiwan, what are the channels and training systems for learning the DET-related knowledge and techniques? Usually, a job seeker applies to a manufacturing or agent dental equipment company as mentioned above, or a company or an individual studio specializing in the maintenance and repair of the dental equipment. Then, the newcomer of the DET is led by a senior DET to learn the relevant knowledge and techniques through a master-apprentice and on-the-job training method.
10	In Taiwan, what are the academic requirements and suitable personality traits for working as a DET? There are no specific academic requirements for working as a DET. It is best to have a professional background in electronics and graduate from a junior college or above. In addition, the suitable personality traits for working as a DET are mainly the service enthusiasm and the ability for marketing, interpersonal communication, and teamwork skills.
D	The characteristics of a DET in Taiwan
11	Are there gender differences in the DET work in Taiwan? The DET work may involve the load-bearing work, which is more difficult for a woman. Based on my personal experience of working in this industry for more than 30 years, I have never met a female DET.
12	In Taiwan, how is the working environment and income of a DET? The working environment of the DET is mainly on-site at the dental institutions, including the hospital dental departments and the dental clinics, but may on occasion also include the workshops where the dental equipment is sent back for maintenance and repair. The salary of a DET is not as good as that of an engineer in the technology industry, but a skilled DET is not easily

Table 1 (continued)

Item	The questions for the DET and his answers
13	replaced and thus he usually has a stable job with a good salary and a good quality of life. In Taiwan, what is the situation of the DET's turnover behavior and intention? The senior DETs like me usually has a stable job and rarely wants to change their career, but the young or novice DETs indeed have a high turnover rate.
14	In Taiwan, is there an organization or a group that organizes the DETs and their functions? There is currently a nationwide Taiwan Dental Traders Association (TDTA), which also includes the dental equipment importers and manufacturers. In addition, the medical instruments commercial association also covers the dental equipment industry. The TDTA is related to the promotion of industrial development, the welfare of employees, the training for labor skills, and the autonomous management of industry and the friendship of peers.
E	The assessment of the Taiwan's DET manpower needs and the future of the DET career
15	What is your assessment of the Taiwan's DET manpower demand? A full-time DET should have the capacity to service 20–25 dental clinics or repair 80–100 dental units. According to the statistics from the Ministry of Health and Welfare, there were 7184 dental institutions (including 215 hospital dental departments and 6969 dental clinics) in Taiwan in 2022. The hospitals had a total of 2804 dental units. The part of hospitals required at least 28–35 DETs based on the number of the dental units. The part of dental clinics required at least 279–348 DETs based on the number of the dental clinics. These two parts totally required at least 307–383 DETs. Therefore, based on my personal experience, Taiwan needs at least 380 full-time DET manpower to maintain a good service quality for the maintenance and repair of the dental equipment.
16	In your opinion, what are the difficulties and challenges of the DET career in Taiwan? The difficulties of the DET career: The dentists or dental institution operators may not necessarily realize the importance of the DET and do not think it is worth providing good payment for the services of the DET. This requires a long-term operation of the DET to overcome. A competent DET should not only have the ability for repairing the dental units, but also have the ability for repairing the peripheral small equipment in the dental institutions such as the air compressors, the dental suction equipment, and the reverse osmosis system. They should win the recognition of their customers with good

(continued on next page)

Table 1 (continued)

Item	The questions for the DET and his answers
	technology and enthusiastic service spirit. The challenges of the DET career: The DET services are crucial to the normal and stable operation of the dental institutions. As the dental equipment upgrades and progresses, the DET should proactively seek to learn the related skills. The DET should have the ability to use transportation and the ability to respond quickly. Especially for those customers in the remote areas, providing the quick repair services is crucial to maintaining a good dental treatment quality for people in the remote areas. When a repair service order comes, the DET must correctly determine the materials and tools that are used for the repair at the first time to avoid ineffective on-site services. In addition, the DET should have the ability to provide the appropriate education and training (correct operation and daily maintenance of the dental equipment) to the dental staff, which helps to reduce the failure rate of the dental equipment. The DET should have basic knowledge of oral medicine, which helps the DET to communicate with the dental staff and understand their needs for the use of dental instruments and equipment.
17	In your opinion, what are the prospects of the DET career in Taiwan? In the dental materials and equipment industry, a skilled DET with marketing capabilities is irreplaceable. The senior DETs can also start their own businesses and continue to serve in this industry. Therefore, the DET is still a promising career that can be invested in a lifetime. With the rapid growth and advancement of the dental technology and the dental-related materials and equipment, in addition to the dental units, the dentists will increasingly rely on and require a variety of new dental equipment when performing their dental procedures. This means that the role of a DET will become more and more important in the dental industry in the future, and the demand for the DET manpower in the dental industry will continue to increase. In particular, those DETs who have the capabilities for the dental unit layout, the pipeline planning, and the moving line design of dental institutions can provide more diverse services to their customers.

specialize in the dental equipment repairing. When the companies that originally sold the dental equipment receives a repair request, they can assign their own DETs to handle it, or outsource it to other companies or personal studios that specialize in the dental equipment repairing.

In Taiwan, currently, there is no education or training system for learning to become a DET, and there is no licensing system of the DET. In addition, there is no separate legal system for the management of the dental equipment industry. However, the repair work of dental X-

ray equipment is regulated by the legal system of medical devices. Usually, a job seeker applies to a dental equipment company as a DET. Then, the newcomer of the DET is led by a senior DET to learn relevant knowledge and techniques through a master-apprentice and on-the-job training method. The suitable personality traits for working as a DET are mainly the service enthusiasm and the ability for marketing, interpersonal communication, and teamwork skills. Although there are no specific academic requirements for working as a DET, it is best to have a professional background in electronics. Perhaps due to the DET work involving the load-bearing work and electronics, this job is a male-dominated workforce. The working environment of the DET is mainly on-site at the dental institutions, including the hospital dental departments and the dental clinics, but may on occasion also include the workshops where the dental equipment is sent back for maintenance and repair. A skilled DET is not easily replaced and he usually has a stable job with a good salary and a good quality of life. Therefore, the senior DETs rarely change their career. There is currently a nationwide Taiwan Dental Traders Association (TDTA), which is related to the promotion of the industrial development, the welfare of employees, the training for labor skills, and the autonomous management of industry and the friendship of peers.

Furthermore, by the interviewed DET's assessment, a full-time DET should have the capacity to service 20–25 dental clinics or repair 80–100 dental units. Based on the 6969 dental clinics and the 2804 dental units of the hospital dental departments in Taiwan in 2022, the Taiwan's DET manpower demand totally required at least 307–383 DETs. Therefore, Taiwan needs at least 380 full-time DET manpower to maintain a good service quality for the maintenance and repair of the dental equipment. For the difficulties and challenges of the DET career, a competent DET should not only have the ability for repairing the dental units, but also have the ability for repairing the peripheral small equipment at the dental institutions such as the air compressors, the dental suction equipment, and the reverse osmosis system. They should win the recognition of their customers with good technology and enthusiastic service spirit. In addition, the DET services are crucial to the normal and stable operation of the dental institutions. As the dental equipment upgrades and progresses, the DET should proactively seek to learn the related skills. The DET should have the ability to use transportation and the ability to respond quickly. Especially for those customers in the remote areas, providing quick repair services is crucial to maintaining a good dental treatment quality for people in the remote areas. For the prospects of the DET career, the DET is still a promising career that can be invested in a lifetime. With the rapid growth and advancement of the dental technology and the dental-related materials and equipment, in addition to the dental units, the dentists will increasingly rely on and require a variety of new dental equipment when performing their dental procedures. This means that the role of a DET will become more and more important in the dental industry in the future, and the demand for the DET manpower in the dental industry will continue to increase.

Previous researches have rarely linked the DETs with a member of the dental team. This article tried to explore

overview of the dental equipment repair industry in Taiwan. Among members of the dental team in Taiwan, the careers of dentists and dental technicians have the well-established cultivated education system and are certified by the government.² Although the career of oral hygienists also has a well-established cultivated education system, its licensing system is still in planning.⁶ On the other hand, the dental radiation technologists or the dental nurses are the certified medical radiation technologists or nurses who are engaged in dentistry through the on-the-job training.⁵ The career of dental assistants is clearly defined in the Standard Occupational Classification System of Taiwan.⁴ Only the career of the DETs has no relevant regulations from the public sector. Furthermore, it is difficult to find research articles on the DET topics. There are no statistical data related to the DETs in the secondary data of government departments. The value of this study was the recording of overview of the Taiwan's dental equipment repair industry through an interview with a senior DET, and introducing the characteristics of a DET in Taiwan. In fact, this interviewed DET had more than 30 years of experience in the dental equipment repair work. We consider that his description of the Taiwan's DETs and the dental instrument repair industry during the interview is authoritative to a certain extent and has the reference value for future researches on the DETs. The dental-associated professionals are important to assist dentists for promoting the public oral health by their work, such as performing the auxiliary acts of dental procedures, providing the oral hygiene instruction to the dental patients, taking the dental X-ray, fabricating the prosthesis, and even repairing the dental equipment.² With the alliance of team resource management for the dental patients, it is believed to enhance the quality of oral healthcare and would reduce the oral health inequality.⁸ In Taiwan, the Department of Oral Health of the Ministry of Health and Welfare has been launched in May, 2022. It is the time to review the professionalism, occupation, and practice direction of dental-associated professionals in the daily dental practice.² However, the DETs should also be included.

Declaration of competing interest

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

Acknowledgments

None.

References

1. Kracher C, Breen C, McMahon K, et al. The evolution of the dental assisting profession. *J Dent Educ* 2017;81:eS30–e37.
2. Lin MT, Huang FM, Chang YC. Current dental-associated professionals in Taiwan. *J Dent Sci* 2023;18:923.
3. Cheng FC, Wang YL, Wang LH, Chang JYF, Liu SY, Chiang CP. Overview of dental education system and gender distribution of undergraduate dental students in Taiwan. *J Dent Sci* 2023;18:420–7.

4. Wang LH, Cheng FC, Lee MC, Liu SY, Chiang CP. Overview of dental assistants in Taiwan from 2009 to 2021. *J Dent Sci* 2022; 17:1640–7.
5. Cheng FC, Chen MH, Hsu PH, et al. Overview of dental radiation technologists in Taiwan. *J Dent Sci* 2022;17:1669–76.
6. Wang LH, Cheng FC, Liu WC, Tsai PF, Chiang CP. Overview of education system for oral hygienists in Taiwan. *J Dent Sci* 2022; 17:1704–13.
7. MyMajors. *Dental equipment technician career*. Available from: <https://www.mymajors.com/career/dental-equipment-technician/>. [Accessed 1 December 2023] [Data accessed.
8. Huang YK, Chang YC. Challenge and action of improving oral health inequities in the time of COVID-19 pandemic. *J Formos Med Assoc* 2022;121:1024–6.