

# Analysis and Perspective of Endodontics Standard Resident Training in China

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**Abstract:** As an important part of postgraduate education, Standard Resident Training (STR) plays a crucial role in the process of culturing a competent dental care provider who can independently treat the common oral infectious diseases. A systematic and comprehensive evaluation system is desiderating for realization of high-quality Endodontics resident training due to its discipline characteristics of highly specialized and strict operation. This paper analyzes the current status of resident training in our Endodontic Department and discusses how to improve the clinical skills and reasoning ability of residents, in order to construct a comprehensive resident training formative evaluation system in China.

**Keyword:** Endodontics; Postgraduate education; Standard Resident Training; Quality-improvement

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Medical education consists of three stages: undergraduate education, post-graduation education, and continuing medical education. Undergraduate education is a preliminary understanding of basic medical expertise; post-graduation medical education (resident/specialist training) is an essential process of the transition of basic theoretical knowledge into practice; and continuing medical education is a lifelong learning process for doctors to continuously improve their professional knowledge and practice skills, responding to technological de-

velopment and social needs for better medical service<sup>[1]</sup>.

As the vital part of post-graduate medical education, the standard resident training is systematic training process which enforces the professional ethics, medical theoretical knowledge and practice skills, eventually helps those, who freshly graduate from medical school with less clinical experience, develop into qualified physicians with good medical ethics, a certain level of professional technology, and clinical logical thinking ability, who can independently diagnose and treat common and frequently-occurring diseases<sup>[2]</sup>. At the end of 2013, the National Health Commission, jointing other six national departments including the national education, finance, human society, formulated and issued the "Guidance on the Establishment of the Standard Resident Training System (STR)". In 2014, the National Health Commission officially launched this program and set up first three hundred and seventy-one Standard Resident Training Bases throughout the nation. In 2015, the enrollment of residents for this had been spread to 31 provinces, which illustrated that the expected goal of the fully launched system has been successfully achieved<sup>[3]</sup>.

Since 2011, as one of the first batch of Standard Resident Training bases in Chongqing, Oral Medicine Standard Resident Training Base of Stomatological Hospital of Chongqing Medical University has taken the dental resident training jobs and became one of the first national training bases qualified by the Chinese government. The base covers five dental specialties including the Endodontics, Periodontitis, Oral mucosa, Preventive, and Pediatric dentistry. And the training

tasks are taken by eight clinic departments for residents with dental doctoral, master and bachelor degree. This article takes the standard resident training in the Department of Endodontics as an example, analyzes the current training situation and problems faced, and further discusses how to establish a reasonable standard resident training system to improve the training quality by taking into account the training practice.

## 1 Analysis of the current situation

Endodontics is an essential basic discipline with highly practical discipline, and puts high requirements both on theory and practice skills, not only involving the comprehensive basic dentistry knowledge but also other related-specialties knowledge, such as Prosthodontics and Oral Surgery<sup>[4]</sup>. “Standard Rules for Dental Standard Resident Training “ issued by the National Health Commission put forward detailed requirements for the training process, and clearly states that residents are required to master the etiology, pathogenesis and clinical symptoms, treatments and prognosis evaluation of frequently occurring endodontic diseases. Compared with other dental specialties, the clinical practice of Endodontics is more delicate and complicated which needs involvement of a great variety of treatment equipment. Particularly, the treatment of some complicated cases has to rely on fine eye-finger coordination manipulation to achieve. A successful endodontic care for saving nature tooth function in oral-facial system requires care provider master both solid theoretical knowledge and professional practice skills. This challenges us to explore a unique training method according to the characteristics of Endodontics, and also requires us to attach importance to theoretical knowledge in our daily training while giving more prominence to the development of practical skills.

### 1.1 Residents

In order to control the quality and source of students, our residency admissions exams include specialty theory exams, practical skills exams, and multidisciplinary interviews. According to the enrollment guidance, those that are dental undergraduates, dental master in study, and working professionals assigned for continuous training by working units, can enroll in the resident training program. However, the theory base and clinic skills level of the enrolled residents vary each other, some of whom have obtained medical certificates, but others haven't. Residents also have uneven ability

of understanding of endodontic diseases, and some of them are freshmen in Endodontics, who are likely to overlook the causes of the diseases and the law of development. They do not emphasize individualized diagnosis and treatment, and even not consider the long-term prognosis of treatment plans for patients, probably resulting in the lack of foresight, adaptability, and comprehensive clinical thinking while practicing medicine independently<sup>[5]</sup>. It is a challenge for us to teach them according to their aptitude instead of just training them in the same training mode.

### 1.2 Resident trainer

Clinical cadres with intermediate for more than three years or senior titles, who also conduct clinical practice guidance for undergraduate, graduate, and even the students attending in advanced study, are assigned to guide residents in clinic through “one-to-one” teaching way. All the guidance trainers should update to the newest development of clinic concepts, techniques and materials, and they also should have a high level of professionalism, including solid basic theoretical knowledge and professional knowledge, as well as a high level of communication skills. The faculty in our department are mainly young and middle-aged clinical cadres with rich clinical experience and undergraduate teaching experience. Facing the fact of the residents rotating in our department with different knowledge background and varied level of practice skills, how to implement consistent teaching and induce the residents' active learning requires our trainers not only improve their teaching ability but also explore the professional model consistent with our specialty characteristics<sup>[6]</sup>.

### 1.3 Professional characteristics of Endodontics

As one of the main basic disciplines of dentistry, Endodontics is a specialty that studies the etiology, treatment and prevention of common and frequent oral infectious diseases including caries, non-caries diseases, pulpal and periapical tissue diseases. In order to preserve the natural teeth and restore its physical function, the diagnosis and treatment of endodontics demand general and specialized knowledge of clinical disciplines, but also the adopt operations based on clinical examination and a fine touch sense for the root canal, which cannot be fully grasped by students through verbal instruction alone, but more through the accumulation of clinical experience.

On the other hand, with the advance of new oral materials and technologies, the microscopic

Endodontics has become the trend in modern dentistry for better prognosis, which includes root canal system perforation repair, calcified root canal management, removal of foreign objects in root canal, difficult root canal access, root canal retreatment, minimal invasive apical surgery, anterior aesthetic resin restorations, minimally invasive dental conservation and restorative operation, etc. These new and advanced materials and techniques require our trainer continuous learning to master the operation and improve its success rate. And some difficult procedures only can be performed by senior professionals. The chances to get in touch with these technologies for residents during their rotation time will undoubtedly be limited, which further affects the effectiveness of resident training<sup>[4]</sup>. Therefore, resident training is inevitably marginalized in the face of new materials and technologies

## **2 Prospective on Endodontics Standard Residents Training**

In order to solve the problem faced in the current Endodontics Standard Resident Training program in our training base, we need update our thinking way and integrate new teaching methods, further explore new training model and comprehensive formative evaluation system for continuously improve the quality of the standard resident training.

### **2.1 Strict standard resident training process**

We will strictly follow the “Standardized Training Content and Standard Oral Internal Medicine Training Rules for Resident” issued by National Health Commission in 2014, “Standardized Training Management Regulations for Resident Training in Stomatological Hospital of Chongqing Medical University” and “Standardized Training Personnel Management Regulations for Resident in Stomatological Hospital of Chongqing Medical University” issued by Stomatological Hospital of Chongqing Medical University to strengthen the monitor and management of whole training process, fully ensure the rotating time of each resident and strict the attendance management. We also need to examine the number of cases finished and the quality of clinical skills performed by each resident during their whole training period, the results are recorded once a month. These indicators are incorporated into the training formative evaluation system, and the records for each resident are saved in the files. All these measures are

taken to ensure the sufficient clinic cases the residents can finish, which helps them become sophisticated.

### **2.2 Emphasis on student-centered, talent-based teaching and ability training**

The residents currently comprise three types: dentists assigned by working unit for training, dental undergraduate with bachelor degree, and postgraduate students in study, who vary each other with levels of professional knowledge background and clinical skills. Some residents have some clinical experience and can complete some clinical operations independently, while some just graduated from the dental school who lack clinical experience and practice skills.

The Standard Resident Training program mainly focuses on enforcing professional ethics, improving clinical skills and cultivating reasoning ability for professionals through professional, integrated and standardized clinical training. Operating a large number of clinical real cases promotes to reduce the gap between theoretical knowledge and real clinic practice, deepen residents’ understanding for basic dental knowledge such as what each step of clinical treatment procedures is used for, and also build an independent critical thinking system. According to the clinical foundation and characteristics of each student, we follow the hierarchical advanced training mode of “from simple operation to complex operation” and “from in vitro operation to clinical practice”, for better implementing student-centered training. We set up endodontic skills training course. These courses include the clinical diagnosis and treatment technology of common and frequently occurring diseases in endodontics and provides standardized training basis for different level residents. We also can make use of the stimulation library and allow residents to practice the complicated skills enough before they apply in clinic. We also require residents to participate in Endodontics continuing education classes at all levels regularly, so that they can update with the new materials and technologies.

### **2.3 Continuously strengthen resident trainer team construction**

The most effective way for improve learning quality during resident training is still the one-to-one chairside teaching between trainer and resident. A senior trainer can judge the weakness of clinical skills practiced by resident through observing their manipulation not only because of their rich clinical experience but also due

to their solid professionalism. Somehow, the quality of trainer directly affects the efficiency of the training. An excellent clinician does not mean an excellent educator. A trainer in resident training not only show the professional skills but also dictates the key point of each manipulation in an effective way so that the resident could master the skills rapidly. Based on these, we select professionals with both clinical and teaching excellence to establish a resident teaching team, to ensure the quality of resident training. These young and middle-aged resident trainers have intermediate titles and above with rich clinical training experience and high-level talents. Trainer are evaluated regularly, organized to participate in the base, municipal or national training, and sent to prestigious institutions at home or abroad for studies and researches, in order to improve their professionalism and teaching ability. Every year, one or more trainers are assigned to participate in the resident training courses organized by the Chinese Stomatological Association, from which we can share and learn resident training experience.

At the same time, we actively perform the teaching reform in which we conduct and integrate various learner-centered teaching methods into our training process, including team-based learning, case-based learning, problem-based learning and so on<sup>[7]</sup>. Through these teaching reform measures, we hope to establish a teaching system suitable for the standard resident training with endodontic specialty characteristics and let it become normalization, in order to facilitate the cultivation of clinical logical thinking. In the aspect of clinical skill teaching, it aims to cultivate the ability to treat patient independently via standardized operation, which requires teachers to closely integrate the teaching process and teaching content with the frontier of professional development, and provide training and platforms for the latest operation techniques, such as microscopy-assisted therapy, ultrasound therapy, the three-dimensional preparatory filling system for root canals, dental water-laser assistance, chairside CAD/CAM and other advanced technologies. We also build a featured pain-free dentistry under assistance with the Nitrous oxide Sedation System and general anesthesia technique. Through these advancements, we will fulfill the improvement on Endodontics standard resident training.

#### **2.4 Gradual establishment of a systematic and digital chairside teaching system**

Endodontic diseases are mainly treated through the

delicate operation of fine equipment in root canal through the sense of touching. Traditional teaching is mainly achieved through theoretical teaching, clinical oral lectures by the trainer to the residents, residents' observation, and practical exercises to accumulate clinical experience<sup>[8]</sup>. With the development of new technology and materials, many complicated clinical cases with poor prognosis can be healed through minimally invasive modern treatment. However, the operation field is so small that residents hardly capture the details of the trainer's operation, thus they cannot experience the details of the operation through the direct observation on the deep anatomical structure. They build the whole operation process only by imaging in their minds via the trainer's dictation. The advent of dental microscope brings the Endodontics into the micro-world, and we end the era of "groping" in the dark and uncertainty of the treatment effectiveness. Under the microscope, we can observe details that were difficult to capture with the naked eye in the past and improve the fineness and accuracy of the operation, thus ensuring the certainty of the prognosis. Moreover, residents can observe the entire operation from the chairside through the image assistance system equipped with the microscope, which enhances the continuity and effectiveness of teaching<sup>[9]</sup>.

#### **2.5 Gradual establishment and improvement of an appropriate evaluation system**

Standard resident training actually is a systemic training which involves a cultivation network, including solid medical knowledge, medical competence, interpersonal and patient communication skills, professionalism, time-based learning and improvement, and large system-based learning capabilities. The residents' clinical medical work, medical record files, and quality control are all based on HIS, PACS, and EMR. These digital system platforms contribute to monitor and manage the whole medical service process of residents during their clinical rotation. Each resident relates his student ID to the trainer's faculty ID, and all the medical orders, prescriptions, medical records, and other data need to be checked in advance by the trainers, to avoid any possible error of each medical procedure<sup>[10]</sup>. Also, members of the departmental medical quality control team randomly check the resident's medical records, sample and summarize workload statistical reports (including diseases, techniques) and root canals treatment number each month, and make a report to the department or base director and the hospital resident

management office, in order to enable the trainees to complete their rotations requirement in the department and ensure the safety and quality of medical service. Before the graduation of each resident, we will get a comprehensive examination score according to every assessment scores during the rotations.

We adopt an assessment system that combines mentor with a teaching quality control team monitor, which means mentor accesses residents medical ethics and doctor-patient communication skills during the training period, while residents' attendance for clinic work, mini-lectures and complicated case discussion were assessed by resident secretaries. The quality control team organizes exit examination, which includes written test, medical history collection, oral examination, clinical skills, and case reports. It has the advantage of testing the general clinical quality of the residents more comprehensively and rapidly, so it is more operable. At the same time, a questionnaire is used to collect feedback from residents on the quality of teaching in order to continuously improve training quality.

### 3 Summary

The standard resident training is a complex systemic teaching process, which needs a complete and sound training model and also depends on the quality control at all stages during the training process. Endodontics is a highly professional specialty whose clinical operation is complicated. So, it requires more comprehensive standard resident training system comprised of excellent teaching team and outstanding clinical professionals to cultivate a competent dental care provider. We need identify the possible problems and explore the proper measures in order to ensure and improve the quality of our resident training.

### Conflict of Interests

We declare that we have no conflict of interest.

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