

Construction and Practice of a Three-Tiered Hierarchical Full-Chain Management System for Teaching Faculty in Standardized Residency Training

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Abstract: *Objective:* Faculty development is a critical component in the management of standardized residency training (SRT). In response to prominent issues at our institution—including imbalanced faculty echelon structure, unequal distribution of teaching loads, undifferentiated evaluation and incentives, and weaknesses in research-teaching integration—we constructed a three-tiered hierarchical full-chain faculty management system (primary reserve, backbone execution, and senior leadership) tailored to the characteristics of each specialty base. This system aims to establish a standardized and actionable operational mechanism for faculty cultivation, assessment, and incentive. *Methods:* Based on a full-coverage survey of SRT teaching faculty from September 2024 to September 2025, we analyzed the composition of the teaching staff, teaching activity implementation, faculty evaluations, and self-assessments. Drawing also on the faculty management experience of several high-performing SRT institutions, we developed a hierarchical evaluation system for SRT teaching faculty and established an integrated six-dimensional hierarchical management framework covering access, performance, training, assessment, incentive, and dynamic exit. *Results:* We completed the full-process institutional design grounded in the actual pain points identified in our survey. Differentiated rights, responsibilities, assessment indicators, and incentive standards were defined for the three faculty tiers, with specialty-specific provisions precisely addressing discipline-based issues, resulting in a complete implementation plan tailored to our hospital's realities. *Conclusion:* This hierarchical management system meets the differentiated management needs of multi-specialty SRT bases. It can be used for long-term standardized faculty governance at our institution and serves as a reference for similar comprehensive hospitals seeking to resolve challenges in homogenized faculty management through tiered system design.

Keywords: Standardized residency training; Teaching faculty; Hierarchical management; Teaching incentives; Faculty echelon

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1. Introduction

Standardized residency training (SRT) serves as the core vehicle for post-graduate medical education, and the quality of the teaching faculty directly determines the homogenization level of training outcomes^[1]. Practice at multiple tier3 general hospitals in China has confirmed that uniform, undifferentiated faculty management often leads to a series of administrative conflicts, including unreasonable assignment of teaching tasks, distorted assessment results, and insufficient motivation for teaching faculty^[2–4]. Current research on faculty competency models indicates that physicians at different professional titles and teaching years exhibit significant differences in teaching capacity and performance priorities, making a “one-size-fits-all” approach incompatible with the stratified competency characteristics of SRT faculty^[5].

From September 2024 to September 2025, we conducted a full-coverage survey across four specialty bases at our hospital—Internal Medicine, Surgery, General Practice, and Radiology. The raw data on faculty composition and teaching activities objectively revealed multiple realworld shortcomings: insufficient reserve of young instructors across all bases, with surgical faculty aged 30–40 accounting for only 11.67%; in General Practice, bachelor’sdegree holders comprised 46.67% while senior and professorlevel talents were scarce; over 90% of frontline foundational teaching was undertaken by attending physicians, while senior physicians showed low participation in bedside teaching; more than 60% of instructors reported that clinical work encroached on scheduled teaching time, and 59% considered the current teaching stipend insufficiently motivating.

Existing studies on hierarchical management have largely focused on a single specialty or a single assessment module^[6–8], lacking an integrated, fullcycle institutional design covering multiple disciplines (Internal Medicine, Surgery, General Practice, and Radiology) as well as the entire faculty lifecycle. In accordance with the *Content and Standards for Standardized Residency Training (2022 Edition)*^[1] and synthesizing domestic and international research on tiered teaching, the CIPP closedloop evaluation model, and teaching incentives^[4,9,13,14], we designed a threetiered hierarchical fullchain faculty management system that incorporates the realworld pain points identified in our survey. This system defines clear procedures for tiered access, differentiated performance, categorized training, quantified hierarchical assessment, gradient incentives, and dynamic promotion/demotion and exit, supported by standardized implementation forms, providing a practical institutional scheme for refined SRT faculty management at our hospital.

2. Data and theoretical basis for system construction

2.1. Baseline survey data from our institution

The survey covered 35 clinical departments, 140 active teaching faculty, and 95 rotating residents, drawing on four objective data sources: (1) SRT teaching platform records from September 2024 to September 2025—over 1,100 teaching activity records in Internal Medicine, 678 in Surgery, 374 in General Practice, and 432 in Radiology; (2) twoway evaluation data—1,065 records in total, comprising 544 instructor evaluations by residents and 521 resident evaluations by instructors; (3) 152 valid facultyspecific questionnaires (60 from Internal Medicine, 52 from Surgery, 40 from General Practice); and (4) stratified statistical reports on age, educational background, professional title, and years of practice for Internal Medicine, Surgery, and General Practice.

Key pain points in current SRT faculty management include:

- 1) Structural imbalance in faculty echelons: The teaching workforce across the four bases is concentrated

in the 40–50 age group, with a significant gap in young instructors aged 30–40—most pronounced in Surgery. General Practice has a relatively high proportion of bachelor's degree holders and a scarcity of master's/doctoral and senior title faculty, posing a long-term risk of teaching succession gaps.

2) Unequal distribution of teaching loads: Attending physicians undertake the majority of frontline foundational teaching—including minilectures, case discussions, skills training, and endofrotation assessments—while senior attending and associate chief physicians participate mainly in a small number of complex case discussions and evaluations. In Surgery and Radiology, the dual burden of clinical and teaching duties is particularly heavy.

3) Obvious tier-specific competency gaps: Faculty self-assessments scored highly in clinical operations and theoretical lecturing, but self-rated research innovation at only a moderate level. Radiology instructors showed specific weaknesses in pacing of filmreading sessions and hands-on guidance.

4) Pronounced work-teaching conflict and undiversified incentives: Over half of the instructors reported that routine clinical work encroached on fixed teaching time. The current teaching stipend is uniform, not differentiated by workload or faculty tier, thus yielding limited motivational effect.

5) Overly coarse evaluation system: The previous instructor evaluation consisted solely of a single overall score without quantified subdimensions, making it impossible to precisely identify specific teaching deficiencies, and lacking a closed-loop corrective process for low-scoring instructors.

2.2. Theoretical and literature support

1) National regulatory standards: The *Content and Standards for Standardized Residency Training (2022 Edition)* ^[1] explicitly requires each specialty base to establish tiered and categorized systems for faculty selection, cultivation, assessment, and incentive, and to balance teaching assignments across different levels of physicians.

2) Hierarchical faculty competency framework: Qi ^[5] constructed an onion model of SRT faculty competency, stratifying professional ethics, clinical ability, teaching capacity, and research skills. Srinivasan *et al.* ^[15] proposed tiered competency standards for clinical teaching, providing a theoretical foundation for the three-tier functional division in our system.

3) Specialty-based progressive teaching concepts: Yang *et al.* ^[6] and Gong ^[10] advocated for tiered teaching and tiered assessment for SRT faculty to address poor adaptability of uniform teaching across specialties.

4) CIPP four-dimensional closed-loop evaluation model: Shao Jiao ^[7] and Wu Lingyan ^[8] validated this model in laboratory medicine and general practice bases, respectively, demonstrating full-process quality control from context, input, and process to product, overcoming the limitations of single outcome-based evaluation.

5) Practical experience from tier-3 hospitals in China: Zhang *et al.* ^[2,3] established a full-chain tiered management model; Chen *et al.* ^[4] proposed a differentiated teaching incentive scheme based on teaching credits; Li *et al.* ^[9] designed tiered training modules; Zhang *et al.* ^[11] refined tiered performance appraisal; Wang *et al.* ^[12] clarified the implementation pathway with teaching files and standardized forms; and Zhen *et al.* ^[13] confirmed via the Gini coefficient that uneven teaching workload is a common problem in SRT, supporting the workload-balancing design of our system.

2.3. Overall architecture of the three-tiered hierarchical full-chain management system

The system is built on a six-dimensional closed-loop management framework: tiered access selection;

differentiated performance management; stratified and categorized training; quantified tiered closedloop assessment; gradient incentives; and dynamic promotion/demotion and exit mechanisms. It is accompanied by standardized paperbased and digital management forms, covering the full lifecycle of faculty from entry to exit. All institutional provisions are designed to address the specific deficiencies revealed in our survey. See **Figure 1**.

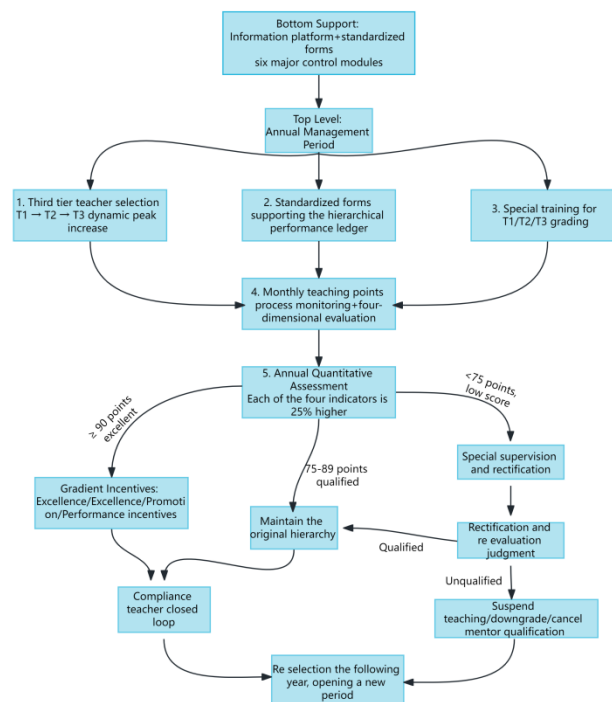


Figure 1. Closedloop architecture diagram of the threetiered hierarchical fullchain faculty management system for SRT

The main cyclic workflow: annual stratified selection and admission → stratified and differentiated performance dossier management → stratified and category-specific specialized training → monthly teaching credit statistics → annual stratified quantitative assessment → incentives for outstanding teaching faculty / six-month supervisory rectification for low-scoring teaching faculty → dynamic upward/downward tier adjustment / three-type exit mechanism → re-selection in the following year; Seven functional modules: admission module, performance management module, stratified training module, four-dimensional assessment and evaluation module, gradient incentive module, dynamic iteration module, and standardized form support module.

3. Complete institutional design of the three-tier stratified management system

3.1. Three-tier stratified admission criteria for teaching faculty (corresponding to the pain point of echelon imbalance)

Combining professional titles, age, years of teaching experience, and specialty characteristics, the teaching faculty are divided into three tiers: junior reserve faculty, backbone executive faculty, and senior leading faculty. Differentiated admission thresholds are established, and simultaneously, preferential

provisions for talent recruitment and pre-job training are set for general practice and radiology (**Table 1**).

Table 1. Core criteria for stratified admission of three-tier teaching faculty in standardized residency training

Teaching staff levels	Adapted population	Hard entry threshold	Core functional positioning	Rules for differentiated adjustment of specialized departments
Primary Reserve Faculty	30–40 years old young attending physicians, teaching experience <3 years	Bachelor's degree or above, holding hospital-level teaching certificate; no valid complaints on medical or teaching work in past 3 years; can guarantee 30 hours of dedicated teaching time per year	Young reserve, assist in basic teaching, not eligible to compete for responsible mentor	Priority to recruit young doctors with master's or doctoral degrees in general practice; primary radiology faculty must complete prejob training in imaging reading teaching before admission
Core Executive Faculty	40–50 years old attending (≥5 years) / associate chief physician, teaching experience ≥3 years	Fully participated in all standard residency training teaching activities, last year's comprehensive teaching evaluation passed; each mentor can supervise ≤2 residents per year	Core routine teaching, can compete for responsible mentor, undertake all routine basic teaching in the department	Surgery and radiology set annual maximum teaching activity load to avoid overload; excess tasks are assigned to senior faculty for sharing
Senior Leading Faculty	Associate chief physician or above, teaching experience ≥5 years	Accumulated ≥2 annual teaching excellence awards, capable of delivering thematic lectures and applying for teaching research projects	Overall teaching coordination in the discipline, teaching of difficult cases, onetoone mentoring of young faculty, leading researchteaching integration; mandatory involvement in basic teaching	Internal medicine coordinates multisubspecialty joint teaching; general practice leads community chronic disease and SOAP note teaching; radiology leads standardized reading and reportwriting teaching protocols

3.2. Stratified and differentiated duty performance management (addressing the imbalance in teaching workload)

In response to survey findings that teaching tasks are heavily concentrated among attending physicians while senior physicians are insufficiently involved at the grassroots level, a three-tier mandatory monthly duty system has been established, with no exemption clauses, to institutionally balance teaching workloads across levels.

1) Junior reserve faculty duties: primarily involve observing teaching ward rounds, assisting in medical record revision, and supporting hands-on skills training. Independent teaching tasks have a minimum threshold; completing six independent skill mini-lectures per year is a prerequisite for promotion to core faculty, and high-frequency lecturing duties are not assigned.

2) Core executive faculty duties: undertake routine departmental mini-lectures, case discussions, skills training, and exam setting and grading for rotations. After being appointed as mentor-in-charge, additional duties include monthly Mini-CEX and DOPS formative assessments, and full-cycle trainee tracking management. The department sets an annual cap on teaching activities per individual to prevent overload.

3) Senior leading faculty mandatory grassroots teaching duties (hospital-wide): deliver one lecture per month on difficult cases or cutting-edge topics; host one cross-subspecialty joint teaching ward round per month; lead one training base teaching seminar per quarter; provide one-on-one mentoring to at least two young faculty members throughout the year; lead a series of resident research literature reading courses. Failure to complete all mandatory tasks will result in a proportional deduction of annual teaching performance pay.

3.3. Stratified and categorized faculty training system (addressing capability gaps)

Based on faculty self-assessment data, modular training is tailored to the weaknesses of each of the three tiers, together with hospital-wide research training and radiology-specific teaching training:

- 1) Junior faculty training modules: basic teaching methods for residency training, practical application of Mini-CEX/DOPS tools, and standardized medical record instruction.
- 2) Core faculty training modules: teaching design for complex cases, communication and psychological support for trainees, and implementation of formative assessment.
- 3) Senior faculty training modules: application for residency teaching research grants, optimization of training base teaching systems, and supervisory interview techniques for low-performing faculty.
- 4) Hospital-wide and radiology-specific targeted training: a research mentoring course series offered twice annually to address the common weakness in research capacity across all faculty; the radiology department separately offers semi-annual specialized training on image reading pacing and practical instruction in radiology reporting, specifically targeting teaching deficiencies among low-scoring radiology faculty ^[6,10].

3.4. Stratified quantitative closed-loop assessment and evaluation system (addressing overly simplistic and one-dimensional teaching evaluations)

The previous single total-score evaluation model is replaced by a four-dimensional weighted scoring mechanism comprising 45% from the departmental assessment team, 45% from the training base assessment team, and 10% from trainee sub-item evaluations. Stratified and differentiated assessment indicators, multi-dimensional sub-item evaluation forms, and a closed-loop improvement process for low-scoring faculty have been established (**Table 2**).

Table 2. Summary of the annual assessment scoring structure for three-tier faculty

Faculty level	Core assessment dimensions and score weightings	Bonus/deduction item fluctuation range	Total score range
Junior Reserve Faculty	Basic teaching performance 50 points; Faculty training development 30 points; Student comprehensive evaluation 10 points	±10 points	0–110
Core Executive Faculty	Monthly routine teaching tasks 40 points; Fullcycle student training 30 points; Comprehensive teaching competency 20 points; Student subitem teaching evaluation 10 points	±10 points	0–110
Senior Leading Faculty	Mandatory downto theground leading teaching 35 points; Youth faculty mentoring 25 points; Researchteaching implementation 25 points; Teaching supervision management 15 points	±10 points	0–110

1) Optimization of trainee sub-item evaluation forms: The single total score is abolished, and six independent scoring dimensions are introduced: teaching preparation, clinical reasoning guidance, hands-on practical instruction, teaching pace appropriateness, medical record/report revision, and humanistic communication. The radiology training base additionally includes a specific scoring item for imaging report writing, so as to precisely identify subdeficiencies such as excessively rapid image reading pace and insufficient hands-on practice.

2) Grading standards for assessment: Excellent (≥ 95 points), Qualified (80–94 points), Needs Improvement (60–79 points), and Unqualified (< 60 points).

3) Closed-loop improvement process for low-scoring faculty: Faculty rated as “Needs Improvement” in the annual assessment will have their eligibility to apply as mentor-in-charge suspended for the following year; they will be assigned a 6month specialized retraining program with monthly supervision. Faculty who are rated “Unqualified” for two consecutive years will be subject to mandatory demotion or withdrawal procedures. The whole process is documented with the Supervision and Rectification Record Form for Low-Scoring Faculty to ensure paperbased traceability throughout, implementing the CIPP process improvement requirements^[6].

3.5. Stratified gradient incentives and teaching credit system (addressing insufficient motivation and workstudy conflicts)

Based on the existing teaching performance distribution rules of our hospital, a threetier incentive system is restructured, combining tiered basic performance pay, annual gradebased variable rewards/penalties, and teaching credit exchange, alongside a supporting system of fixed teaching time slots to reduce clinical workload.

1) Tiered monthly basic performance standards: Junior reserve faculty: 500 RMB/month; core executive faculty: 1,000 RMB/month; senior leading faculty: 1,500 RMB/month; those serving as mentorincharge receive an additional 2,000 RMB/person/month; base directors or teaching directors receive an extra 1,000 RMB/month, and teaching secretaries receive an extra 500 RMB/month.

2) Annual assessmentbased variable rewards/penalties: Faculty rated “Excellent” receive 120% of the annual teaching performance pay and are given priority recommendations for national or provinciallevel faculty training and teaching merit points for professional title evaluation. Faculty rated “Qualified” receive the full amount. Those rated “Needs Improvement” receive 70%, and those rated “Unqualified” receive only 50%.

3) Hospitalwide unified teaching credit ledger: It comprises four categories: training, teaching activities, teaching outcomes, and mentorship. Credits can be exchanged for external teaching training opportunities, internal teaching research special funds, and priority eligibility for annual excellence awards. The general practice base and radiology bases are additionally provided with specialtiespecific teaching subsidies to compensate for the shortage of specialty teaching resources.

4) Supporting workload reduction system: Each department designates a fixed halfday per week as exclusive teaching time, during which no heavy outpatient or surgical work is scheduled, thereby alleviating the practical conflict of clinical duties encroaching on teaching at the scheduling level.

3.6. Dynamic tier promotion/demotion and three types of exit mechanisms (achieving healthy iteration of the faculty team)

An annual selection of teaching faculty is conducted hospitalwide every August, during which promotion, demotion, and exit procedures are carried out concurrently, with the “Annual Faculty Selection Application Form” providing fullprocess approval traceability.

1) Dynamic promotion rules: Junior reserve faculty who have served for at least 3 years, achieved an annual assessment score ≥ 90 , and completed the required independent teaching tasks may apply for promotion to core faculty. Associate senior or above faculty with at least 5 years of teaching experience, two or more annual teaching excellence awards, and proven teaching research achievements may be designated

as senior leading faculty.

2) Dynamic demotion rules: Senior leading faculty who fail to complete the mandatory grassroots teaching tasks for two consecutive years or have an annual assessment score <85 will be demoted to core faculty. Core faculty with an annual assessment score <80, extensive omissions in teaching tasks, or concentrated negative trainee feedback will be demoted to junior reserve faculty, and their eligibility to apply as mentorincharge will be suspended.

3) Detailed rules for three types of exit:

Natural withdrawal: Faculty who are unable to continue teaching due to age or health conditions automatically withdraw from the teaching team.

Voluntary withdrawal: Faculty who apply to withdraw due to external training, assignment support, or personal health reasons; upon approval, teaching eligibility is suspended and may be restored at the original tier after the assignment ends.

Mandatory withdrawal: Faculty who fail the assessment for two consecutive years, are involved in major teaching complaints, or refuse to fulfill the mandatory grassroots duties of senior leading faculty will be barred from reapplying for teaching eligibility within three years.

3.7. Standardized supporting management forms (ensuring implementable execution of the system)

The entire system is supported by standardized management forms, with corresponding input modules established on the online residency teaching platform to achieve twoway synchronization between paper archives and digital ledgers:

(1) Annual Assessment Score Form for Junior Reserve Faculty; (2) Annual Assessment Score Form for Core Executive Faculty; (3) Annual Assessment Score Form for Senior Leading Faculty; (4) Annual Faculty Selection Application Form; (5) Teaching Credit Statistics Form; (6) Supervision and Rectification Record Form for LowScoring Faculty.

These forms cover the entire process from faculty admission, monthly credit statistics, annual stratified assessment, to supervision and rectification of lowscoring faculty, thereby resolving management pain points such as the disconnection between institutional rules and clinical practice, missing ledgers, and the lack of quantitative basis for assessments ^[11].

4. Discussion

4.1. The threetier stratified system precisely addresses the real management challenges across multiple training bases in our hospital

The raw survey data from our institution objectively revealed five inherent deficiencies: insufficient reserve of junior faculty, scarcity of highly educated general practice faculty, overloading of surgical and radiology core faculty in teaching, teaching deficiencies in the radiology specialty, weak research capacity across all faculty, and crude incentive and evaluation mechanisms. This system adopts stratification as its core logic. It optimizes the echelon structure from the entry point, balances teaching load through mandatory downward task assignments, uses stratified training to fill tierspecific capability gaps, employs stratified subitem assessments to pinpoint teaching defects accurately, and applies gradient scoring incentives to alleviate insufficient motivation. The entire set of provisions is designed in direct response to the practical problems

revealed by the survey, distinguishing it from generic, nontargeted stratification approaches ^[2].

At the same time, the system accommodates the differentiated characteristics of the four major specialties by setting exclusive management provisions for the heavy handson workload in surgery, the communitybased teaching nature of general practice, and the unique features of radiology imaging instruction, thereby avoiding maladaptation of a uniform system when implemented in specific specialties ^[6,8].

4.2. Stratified, closedloop, and formbased design resolves implementation difficulties

Most domestic studies on stratified management of residency training remain at the theoretical level, lacking supporting quantitative tools and closedloop improvement processes, which makes implementation prone to becoming perfunctory ^[12]. This study incorporates the CIPP closedloop evaluation theory ^[7] and integrates selection, duty performance, training, assessment, incentives, and promotion/demotion/exit into a complete cycle. It is supported by standardized quantitative forms, with all assessments, points, and corrective actions having paperbased records. At the same time, it interfaces with the hospital's digital residency training platform, reducing the manual statistical burden on teaching secretaries and base directors, and enabling traceable teaching processes, quantifiable assessment standards, and reviewable corrective actions.

4.3. Alignment of the system design with theoretical and industry standards

This system fully complies with the mandatory requirements for stratified faculty development in the *Content and Standards for Standardized Residency Training (2022 Edition)* ^[1], synthesizes mature domestic research findings on stratified competency, stratified training, differentiated incentives, and performance evaluation ^[4,5,9,11], and also references international studies on teaching workload balance ^[13,14]. It takes into account the reality of highintensity clinical work and prominent workstudy conflicts in Chinese hospitals, ensuring that the institutional provisions have strong clinical adaptability and do not deviate from the actual operating conditions of comprehensive hospitals.

4.4. Areas for improvement and medium to longterm planning

This paper has completed the full design of the institutional framework, stratification standards, and supporting forms, and has preliminarily entered the stage of full implementation. Quantitative improvement data will be collected after implementation, with subsequent medium and longterm followup comparisons: (1) after full operation, continuously collect dynamic data on stratified faculty teaching load, trainee subitem evaluations, faculty research participation, etc., and iteratively adjust task volumes, assessment weights, and pointredemption benefits year by year; (2) expand the coverage of stratified management to include faculty from communityaffiliated general practice bases, and refine the duallevel management rules for hospital and community settings; (3) enrich the types of incentives redeemable with teaching points, adding longterm incentives such as participation in teaching workshops and special research startup funds; (4) rely on senior leading faculty to routinely conduct teaching project incubation, systematically enhance the research output capacity of all residency training faculty, and gradually improve the inherent weakness in selfassessed research ability.

5. Conclusion

Based on the real survey data covering all four residency training bases in our hospital from 2024 to 2025,

and targeting the five persistent problems—imbalanced faculty echelon, uneven teaching load, crude evaluation, monotonous incentives, and specialty-specific teaching deficiencies—and integrating excellent domestic and international medical education theories and practical experiences, we have constructed a three-tier stratified full-chain faculty management system comprising junior reserve, core executive, and senior leading tiers. The system covers the entire lifecycle processes of faculty admission, differentiated duty performance, stratified and categorized training, stratified quantitative closed-loop assessment, gradient point incentives, and dynamic promotion/demotion/exit, supported by standardized implementation forms, and includes differentiated adaptation provisions for the specialties of internal medicine, surgery, general practice, and radiology. The entire scheme is designed based on the objective survey-identified weaknesses of our hospital, fits the actual operation of residency training bases in comprehensive hospitals, and can be directly applied to standardize the management of our residency faculty. At the same time, it can provide a complete and replicable reference for the stratified faculty system design for other tertiary hospitals facing similar homogeneous management challenges.

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