Postprint of an Evaluative Study on the Clinical Competence of Rural Order-Oriented Graduates Trained Through the "5+3" Pathway in Township Health Centers of Guangxi Zhuang Autonomous Region

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Abstract

Background The free training program for rural order-directed medical students is an important initiative in China aimed at alleviating the shortage of general practitioners in rural areas and effectively strengthening the capacity building of rural primary healthcare teams, but its long-term effectiveness in talent cultivation has not yet been effectively evaluated. Objective By evaluating the consultation abilities of rural order-directed graduates trained through the "5+3" pathway in Guangxi Zhuang Autonomous Region within the real-world setting of rural township health centers, this study objectively examines the effectiveness of talent capacity cultivation in the free training program for rural order-directed medical students and proposes optimized strategies for strengthening primary healthcare team capacity building. Methods From July to August 2023, this study employed stratified sampling and cluster sampling methods to enroll 75 rural order-directed graduates working in township health centers as the study group and 41 general practitioners and assistant general practitioners not trained through the "5+3" pathway working in the same township health centers as the control group, across four cities in Guangxi Zhuang Autonomous Region (Nanning, Wuzhou, Guigang, and Chongzuo). Eight trained standardized patients (SPs) visited the township health centers to register for consultations with the study subjects, and the entire consultation process was recorded on video. Relevant experts were then invited to review the videos and score the subjects' consultation abilities based on a previously constructed evaluation index system for general practitioners' consultation capabilities. Multivariate logistic regression analysis was used to analyze factors influencing consultation ability. Results The study group achieved significantly higher total consultation ability scores

and scores on dimensions 1-7 than the control group in the real-world township health center setting; however, the study group' s scores did not reach the passing threshold in four dimensions: patient reception and history taking, patient management, physician behavior and patient relationship, and preventive care, while the control group scored low across all dimensions. Consultation duration, whether medical records were written, whether standardized residency training was completed, educational background, and region were influencing factors of consultation ability among all subjects ($P<0.05$); educational background and whether medical records were written were influencing factors of consultation ability in the study group ($P<0.05$). Conclusion Rural order-directed graduates trained through the "5+3" pathway demonstrated significantly superior consultation abilities compared to local general practitioners and assistant general practitioners not trained through the "5+3" pathway in rural primary care settings, indicating that the long-term talent cultivation effectiveness of the free training program for rural order-directed medical students has met expectations. Nevertheless, multiple measures must be implemented, including continuing the rural order-directed medical student training program, reforming the continuing medical education model in rural primary care, strengthening training in "three basics" clinical medical knowledge and skills, adding rural primary care practice components in undergraduate and postgraduate education stages, and emphasizing the importance of medical record writing, to continuously improve the clinical competencies of rural order-directed graduates and strengthen rural primary healthcare team capacity building.

Full Text

Preamble

An Assessment Research on Consultation Competence of RTME Graduates Trained via the "5+3" Pathway in Township Health Centers in Guangxi Zhuang Autonomous Region

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Abstract

Background: The Rural-oriented Free Tuition Medical Education (RTME) program represents a key policy initiative in China aimed at alleviating general practitioner (GP) shortages in rural areas and strengthening the rural primary healthcare workforce. However, the long-term effectiveness of this competency-based training model remains inadequately evaluated.

Objective: This study assessed the consultation competence of RTME graduates trained through the "5+3" pathway in authentic rural township health center settings across Guangxi Zhuang Autonomous Region. By objectively examining the long-term outcomes of RTME competency cultivation, we aimed to provide evidence-based optimization strategies for enhancing rural primary healthcare workforce capacity.

Methods: Between July and August 2023, we employed stratified and cluster sampling to recruit 75 RTME graduates currently serving in township health centers across four Guangxi municipalities (Nanning, Wuzhou, Guigang, and Chongzuo) as the study group. The control group comprised 41 GPs and assistant GPs working in the same facilities who had not undergone "5+3" training. Eight qualified standardized patients (SPs) visited participants unannounced, and their entire consultations were video-recorded. Expert reviewers subsequently scored these recordings using a GP consultation competence assessment instrument developed in our prior research. Multivariate logistic regression identified factors influencing consultation competence.

Results: The study group demonstrated significantly higher total scores across all seven assessment dimensions compared to the control group. However, the study group failed to achieve passing scores in four dimensions: patient reception and history-taking, patient management, physician behavior and patient relationships, and preventive care, while the control group scored poorly across all dimensions. Consultation duration, medical record documentation, residency training completion, educational attainment, and geographic region significantly influenced consultation competence ($P<0.05$). For RTME graduates specifically, educational level and medical record documentation were significant predictors ($P<0.05$).

Conclusion: RTME graduates trained via the "5+3" pathway exhibited substantially superior consultation competence in rural primary care settings compared to locally trained GPs, confirming that the RTME program achieves its intended long-term competency development goals. Nevertheless, continuous improvement measures are essential, including: sustaining RTME implementation, reforming rural continuing medical education models, strengthening training in fundamental clinical knowledge and skills, integrating rural practice ex-

periences into undergraduate and postgraduate curricula, and emphasizing the critical importance of medical record documentation. These strategies will further enhance RTME graduates' clinical capabilities and strengthen rural primary healthcare workforce development.

Keywords: General practitioners; Consultation competence; Rural primary healthcare human resources; RTME graduates; Assessment indicator system for GP consultation competence; "5+3" pathway

Introduction

The Rural-oriented Free Tuition Medical Education (RTME) program constitutes a crucial national strategy to address GP shortages in rural China, enhance overall primary healthcare workforce quality, and improve rural health service delivery. In 2018, the first cohort of RTME graduates completed eight years of training—five years of undergraduate medical education followed by three years of standardized residency training in family medicine—and began their mandatory service commitments in rural township health centers. These graduates now bear primary responsibility for delivering quality primary healthcare to local residents.

A critical question concerns whether these extensively trained RTME graduates can competently perform in rural township health centers, as this directly reflects the program' s long-term effectiveness. The "5+3" training pathway rarely incorporates rural township health centers as clinical teaching sites during either undergraduate or postgraduate education, creating a substantial gap in rural practice exposure. This deficiency likely increases adaptation difficulties for RTME graduates when they begin rural service and raises uncertainty about their ability to demonstrate adequate job competence in these settings.

Evaluating RTME graduates' consultation competence in authentic rural environments provides an objective method to assess the program' s long-term training outcomes. Identifying specific strengths and weaknesses in their rural practice capabilities offers crucial insights for refining RTME implementation and strengthening primary healthcare workforce development. However, few domestic studies have addressed this issue, primarily due to the lack of culturally appropriate clinical competency assessment tools and the challenges of implementing workplace-based assessment (WPBA).

This study utilized a consultation competence assessment instrument for primary care GPs that we previously developed based on the internationally recognized Leicester Assessment Package (LAP). By evaluating both RTME graduates and locally trained GPs in real-world rural township health centers across Guangxi, we aimed to: (1) objectively assess the long-term competency outcomes of the RTME program, (2) identify demographic factors influencing consultation competence among rural GPs and RTME graduates, and (3) provide

optimization strategies for enhancing rural primary healthcare workforce capacity.

Methods

1.1 Study Participants

We recruited RTME graduates who completed the "5+3" training pathway and were currently fulfilling their service commitments in Guangxi township health centers as the study group. The control group consisted of GPs and assistant GPs working in the same health centers who had not received "5+3" training.

Study group inclusion criteria: (1) Completion of five-year undergraduate medical education plus three-year standardized family medicine residency training as part of the RTME program; (2) Currently serving in a township health center; (3) Possession of a medical practice license with family medicine registration; (4) Signed informed consent for study participation.

Exclusion criteria for both groups: (1) Not engaged in frontline clinical work during the study period; (2) Absent from the health center during data collection (e.g., on training leave, maternity leave, or personal leave); (3) Identification of SPs as non-authentic patients during consultations.

Control group inclusion criteria: (1) Employment in the same township health center as enrolled RTME graduates; (2) Possession of a medical practice or assistant practice license with family medicine registration; (3) Signed informed consent.

Prior to data collection, we sent research invitations and informed consent forms to all potential participants (both RTME graduates and non- "5+3" GPs/assistant GPs), explaining the study' s purpose, methods, and data usage. Participants who agreed to video recording signed consent forms and returned them via email. Participants could withdraw at any time. The study received ethical approval from Guangxi Medical University (Approval No.: 20220202).

1.2 Sampling Strategy and Sample Size Calculation

We employed stratified and cluster sampling between July and August 2023. Stratification was based on geographic location (eastern, southern, western, and northern Guangxi) and 2021 municipal GDP rankings. We selected Nanning, Wuzhou, Guigang, and Chongzuo as sample cities. All RTME graduates currently serving in township health centers within these cities were recruited as the study group. For each RTME graduate, we enrolled two non- "5+3" GPs or assistant GPs from the same health center as controls.

Minimum sample size was calculated based on pilot data from 16 RTME graduates and 8 non-"5+3"GPs in Nanning. Using two-independent-sample rank-sum

test for sample size estimation with a standard deviation (σ) of 9.91 and mean difference (δ) of 7, we set α=0.05 and power=0.9. PASS 2021 software calculated required minimum samples of 70 for the study group and 35 for the control group.

1.3 Assessment Instrument and Scoring Criteria

Based on our previously developed GP consultation competence assessment system derived from LAP, we designed clinical observation points for each indicator to create the assessment scale. Four senior GPs with extensive experience revised the draft to produce the final version. The instrument comprises seven dimensions with 42 evaluation items:

1. Patient reception and history-taking
2. Physical examination
3. Patient management
4. Problem-solving
5. Physician behavior and patient relationships
6. Preventive care
7. Medical record documentation (see Appendix 1)

Each item scores 0-4 points: 0=no correct behavior; 1=some correct behavior; 2=moderate correct behavior with obvious omissions; 3=mostly correct behavior with some omissions; 4=comprehensive correct behavior without omissions. Total possible scores range from 0-164 (the theoretical maximum was 168, but item 3.4 "appropriate time utilization" was not applicable to our cases and excluded). Scores are categorized as: 0-1=very low; 1.0-2.0=low; 2-2.5=pass; 2.5-3.0=good; 3.0-4.0=very good.

For dimensions 1-6 combined: 0-34=very low; 34-68=low; 68-85=pass; 85-102=good; 102+=very good. For all seven dimensions: 0-41=very low; 41-82=low; 82-102.5=pass; 102.5-123=good; 123+=very good. We also collected demographic data including gender, age, education, practice qualifications, professional titles, residency training, work location, and years of practice for subsequent analysis.

1.4 Evaluation Cases and Standardized Patient Implementation

Based on our prior research identifying the ten most common conditions treated by Guangxi primary care GPs, we selected coronary heart disease and type 2 diabetes as evaluation cases. Both cases comprehensively cover all seven competency dimensions. Two senior physicians from tertiary hospitals reviewed and finalized the case scripts.

We recruited eight female SPs aged 45-63 years with education levels ranging from middle school to junior college. All SPs completed a two-day training program covering SP roles, case content, and video recording equipment. We assessed SP simulation quality using the Simulated Quality of Standardized

Patient Scale (SQSPS). Final SP quality scores ranged from 90-93 (median=91), with each item scoring 4-5, meeting established standards for evaluation tasks.

In July-August 2023, the eight SPs were divided into four pairs and, accompanied by research team members, visited the four sample cities. SPs presented as patients with stable angina or type 2 diabetes to both study and control group physicians, with entire consultations video-recorded for subsequent evaluation.

1.5 Expert Evaluation Process

Between October-November 2023, four experts independently reviewed videos and scored consultations using the assessment instrument. Expert selection criteria included: (1) senior professional title; (2) $ $5 years of general practice experience with familiarity in primary care; (3) practical experience in primary care workforce evaluation; (4) voluntary participation.

The evaluation process involved: (1) expert review and familiarization with the assessment instrument; (2) blinded independent evaluation of 10 identical videos with filenames concealed to remove identifying information about location, physician name, or training pathway; (3) calculation of intraclass correlation coefficients (ICC) to assess inter-rater reliability using the formula:

ICC = (MSR - MSE) / [MSR + (k-1)MSE + k/n(MSC - MSE)]

Where MSR=mean square between raters, MSE=mean square error, MSC=mean square between cases, k=number of raters, n=number of cases. ICC<0.5 indicates poor reliability, 0.5-0.75 moderate, and >0.75 good reliability.

Initial ICCs for seven dimensions ranged 0.766-0.895, with total score ICC=0.795. After discussion and consensus-building on discrepancies, second-round ICCs improved to 0.766-0.895 for dimensions and 0.932 for total score, demonstrating excellent inter-rater reliability. Each expert then evaluated 29 videos with similar distribution across cities and physician groups.

1.6 Statistical Analysis

We used EpiData for data entry and SPSS 27.0 for analysis, with ORIGIN 2024 generating radar charts to visualize median scores relative to maximum possible scores. Normally distributed continuous data are presented as mean±SD; non-normally distributed data as median (P25, P75). Between-group comparisons used Mann-Whitney U tests for continuous variables and ^{2} or Fisher' s exact tests for categorical variables. Pearson or Spearman correlation analyses examined univariate associations. Multivariate ordinal logistic regression models identified factors influencing consultation competence, with P<0.05 considered statistically significant.

Results

2.1 Expert Inter-Rater Reliability

The inter-rater reliability analysis demonstrated strong consistency among expert reviewers. After initial rating discrepancies were resolved through consensus discussion, intraclass correlation coefficients exceeded 0.75 for all seven dimensions and reached 0.932 for total scores, confirming robust evaluation reliability .

2.2 Participant Demographics

We initially recruited 102 RTME graduates and 61 non- "5+3" GPs/assistant GPs. After excluding those who declined participation or were unavailable, the final sample comprised 75 RTME graduates (study group) and 41 control physicians, meeting minimum sample size requirements. Participants were distributed across 4 cities, 39 counties, and 72 township health centers in Guangxi.

Significant between-group differences existed in gender, education level, age, years of primary care experience, qualification type, and residency training completion ($P<0.05$) . The study group was younger, more highly educated, and universally completed residency training compared to controls.

2.3 Assessment Completion Rates

All participants completed evaluation of the first six dimensions (patient reception/history-taking, physical examination, patient management, problem-solving, physician behavior/patient relationships, and preventive care). For medical record documentation (dimension 7), 44 study group physicians (58.7%) and 11 controls (26.8%) provided records for evaluation.

2.4 Consultation Competence Scores and Duration

Score ranges for dimensions 1-6 were 19-103 (study group) versus 8-67 (control); for all seven dimensions, ranges were 48-126 versus 17-71. The study group achieved significantly higher mean scores across all dimensions and total scores ($P<0.001$) .

Median scores revealed that study group performance reached pass or good levels in dimensions 2 (physical examination), 4 (problem-solving), 7 (medical records), and overall total score (51.2% of maximum). However, dimensions 1 (patient reception/history-taking), 3 (patient management), 5 (physician behavior/patient relationships), and 6 (preventive care) remained at low levels, achieving only 33.9%, 41.7%, 33.3%, and 25.0% of maximum scores respectively [Figure 1: see original paper].

Both groups demonstrated particular weaknesses in specific items. Study group median scores fell below 2 points (failing level) for items 1.1, 1.7, 1.9-1.11, 1.13-

1.14, 2.1, 3.6-3.7, 5.2, 6.1-6.3, and 7.4. Control group scores were below 2 points for items 1.1-1.2, 4.2-4.5, 5.2-5.3, 6.1-6.3, 7.1, and 7.3-7.7 [APPENDIX 2].

Consultation duration was significantly longer in the study group [13.72 (10.57, 19.12) minutes] compared to controls [8.23 (5.8, 10.95) minutes] (Z=-5.250, P<0.001).

2.5 Multivariate Analysis of Consultation Competence Factors

Multivariate ordinal logistic regression analysis identified consultation duration, medical record documentation, residency training completion, educational level, and geographic region as significant predictors of consultation competence among all participants (P<0.05). For RTME graduates specifically, educational level and medical record documentation were the only significant factors (P<0.05) .

Univariate analyses showed positive correlations between competence scores and: residency training completion, medical record documentation, higher education level, longer consultation duration, and certain geographic regions. Years of primary care experience and professional title showed no significant association [APPENDIX 3] [APPENDIX 4].

Discussion

3.1 RTME Program Achieves Intended Competency Development Outcomes

Our findings demonstrate that RTME graduates trained via the "5+3" pathway significantly outperformed non- "5+3" local GPs across all seven consultation competence dimensions. This confirms that the RTME program successfully achieves its long-term competency cultivation objectives. The "5+3" model represents the standard global approach to family medicine training, proven effective in multiple countries for enhancing clinical capabilities and alleviating rural physician shortages. Our study provides new evidence that this pathway is equally applicable to China' s rural medical workforce development.

From a competency development perspective, the RTME program is successful and warrants continued implementation. However, retention remains concerning: only 20-30% of Guangxi RTME graduates who completed their three-year rural service commitments remained in township health centers, similar to the 28.57% reported nationally. This low retention rate, combined with the lengthy training period, results in limited coverage of rural populations. Sustained and expanded RTME enrollment is essential to continuously improve both the quantity and quality of rural primary care workforce.

3.2 Reform Rural Continuing Medical Education to Optimize Content and Improve Quality

Despite superior performance, RTME graduates still fell short of passing scores in multiple dimensions, indicating that even comprehensive undergraduate and postgraduate training requires ongoing continuing medical education (CME) to maintain competency. Our data show residency training completion and higher education correlate positively with consultation competence, underscoring that enhanced education and training effectively improve clinical capabilities.

However, rural GPs have limited CME opportunities, making it difficult to maintain and advance clinical skills in rural settings. We must accelerate CME reforms in rural areas, leveraging "Internet+" technologies to deliver online training that accommodates rural physicians' schedules without requiring absence from clinical duties. Specific competency gaps identified in our study—particularly in history-taking, physical examination, clinical reasoning, prevention, and physician-patient communication—suggest CME content needs substantial revision. Currently, CME primarily focuses on specialty-specific advances while neglecting fundamental clinical skills that rural physicians urgently need to strengthen.

3.3 Adjust Undergraduate and Postgraduate Curricula to Enhance Rural Practice Adaptation

Our findings reveal that both groups exhibited superficial history-taking, frequently omitted physical examinations, over-relied on ancillary tests, and neglected preventive measures and patient education. This reflects a systemic overdependence on technology at the expense of fundamental clinical skills.

Currently, neither undergraduate medical education nor family medicine residency training for RTME students adequately incorporates rural primary care practice experiences. This leaves graduates with minimal exposure to rural healthcare environments and their unique characteristics before service commencement. Rural facilities, facing shortages of both personnel and equipment, demand particularly strong competencies in history-taking, physical examination, clinical reasoning, disease prevention, patient self-management, and priority population care. Curricula should integrate rural practice rotations and increase theoretical education on rural health services during both undergraduate and postgraduate training to better prepare graduates for rural service realities.

3.4 Emphasize Medical Record Documentation to Enhance Service Standardization

Less than half of participants completed medical record documentation, with most citing patient refusal or inability to print electronic records. However, our analysis revealed significant positive correlation between documentation and consultation competence scores. Video reviews showed that physicians

who documented records often supplemented their consultations with additional questions or examinations during the documentation process, thereby improving their scores. Medical records are legally binding documents in primary care that must accurately reflect patient encounters and be provided to patients. Health administrative departments should emphasize documentation importance through regulatory inspections of record presence and quality to enhance service standardization.

Conclusion

RTME graduates trained via the "5+3" pathway demonstrate significantly superior consultation competence in rural primary care settings compared to locally trained GPs, confirming that the RTME program achieves its intended long-term competency development goals. However, continuous improvement measures are essential: sustaining RTME implementation, reforming rural CME models, strengthening fundamental clinical knowledge and skills training, integrating rural practice experiences into undergraduate and postgraduate education, and emphasizing medical record documentation importance. These strategies will progressively enhance RTME graduates' clinical capabilities and strengthen rural primary healthcare workforce development.

Limitations

This study focused on Guangxi RTME graduates, limiting generalizability due to sample size and regional representation. Additionally, we evaluated only undergraduate-level RTME graduates, excluding those trained through the "3+2" junior college pathway, which restricts the applicability of our findings.

Author Contributions

SHEN Ying conceptualized and designed the study. ZHAO Can and CHEN Peimeng managed SP recruitment, training, and evaluation. ZHAO Can, PENG Houxuan, XI Qian, QIN Li, and LIANG Ruiying collected and organized data. SHEN Ying and GU Jinmei developed evaluation cases and coordinated expert video reviews. SHEN Ying, ZHAO Can, and ZUO Yanli performed statistical analysis and manuscript writing. SHEN Ying supervised the project and finalized the manuscript. All authors approved the final version.

Conflict of Interest Disclosure: The authors declare no competing interests.

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Appendices

Appendix 1: Consultation Competence Assessment Scale

Dimension 1: Patient Reception and History-Taking - 1.1 Self-introduction: No introduction=0; Warm, professional introduction=4 - 1.4 Attentive listening: No verbal/non-verbal efforts to relax patient=0; Multiple efforts=4 - 1.5 Clarifying unclear information: No clarification=0; Multiple clarifications=4 - 1.9 Identifying reasons for visit: Uses incomprehensible terms=0; All questions understood=4 - 1.11 Considering bio-psycho-social factors: No psychosocial inquiry=0; Explores psychosocial context=4 - 1.12 Systematic data collection: Disorganized or premature examination=0; Logical sequence=4 - 1.13 Summarizing history: No summary=0; Summarizes with patient verification=4 - 1.14 Ensuring history completeness: No review=0; Effective review and supplementation=4

Dimension 2: Physical Examination - 2.1 Targeted examination: Completely incorrect or unskilled=0; Correct and skilled=4 - 2.2 Proper equipment use: No or incorrect use=0; Correct and considerate use=4 - 2.3 Privacy protection: No privacy measures=0; Adequate protection=4

Dimension 3: Patient Management - 3.1 Collaborative management planning: No plan=0; Comprehensive plan=4 - 3.2 Appropriate use of tests/referrals/medications: All incorrect=0; Correct and detailed=4 - 3.3 Improving healthcare-seeking behavior: No discussion=0; Effective improvement attempts=4 - 3.4 Time utilization: Not applicable - 3.5 Clear communication and reassurance: No explanation=0; Appropriate reassurance=4 - 3.6 Verifying patient understanding: No verification=0; Detailed verification=4 - 3.7 Follow-up arrangement: No arrangement=0; Appropriate arrangement=4

Dimension 4: Problem-Solving - 4.1 Appropriate diagnosis: Completely incorrect=0; Correct and complete=4 - 4.3 Information integration: No or incorrect application=0; Correct application=4 - 4.4 Applying medical knowledge: Not based on medical knowledge=0; Based on comprehensive knowledge=4

Dimension 5: Physician Behavior and Patient Relationships - 5.1 Establishing professional relationship: Poor relationship=0; Good relationship=4

- 5.2 Sensitivity to patient needs: Ignores needs=0; Understands needs=4 - 5.3 Understanding attitude impact: Poor attitude=0; Collaborative relationship=4

Dimension 6: Preventive Care - 6.1 Health promotion opportunities: No recommendations=0; Comprehensive recommendations=4 - 6.2 Explaining preventive measures: No explanation=0; Detailed explanation=4 - 6.3 Promoting healthy lifestyles: No behavior correction=0; Active promotion=4

Dimension 7: Medical Record Documentation - 7.1 Accurate documentation: No records=0; Correct and complete=4 - 7.2 Recording visit date: Absent=0; Complete date=4 - 7.3 Recording history/examination findings: Absent=0; Complete=4 - 7.4 Prescription completeness: Absent=0; Complete with details=4 - 7.6 Recording diagnosis: Absent=0; Complete and standardized=4 - 7.7 Recording management plan: Absent=0; Complete and standardized=4

Appendix 2: Items Scoring <2 Points by Group

Study Group Median Scores (P25, P75): - 1.1 Self-introduction: 0 (0,0) - 1.7 Clarifying information: 1 (1,2) - 1.9 Identifying visit reason: 1 (0,2) - 1.10 Using understandable terms: 0 (0,2) - 1.11 Bio-psycho-social factors: 1 (0.5,2) - 1.13 History summary: 1 (0,2) - 1.14 History completeness: 0 (0,0) - 2.1 Targeted examination: 1 (0,2) - 3.6 Verifying understanding: 1 (0,2) - 3.7 Follow-up arrangement: 1 (0,2) - 5.2 Sensitivity to needs: 1 (0,3) - 6.1 Health promotion: 1 (0,2) - 6.2 Explaining prevention: 1 (0,2) - 6.3 Lifestyle promotion: 1 (0,2) - 7.4 Prescription documentation: 1 (0,3)

Control Group Median Scores (P25, P75): - 1.1 Self-introduction: 0 (0,0) - 1.2 Building rapport: 0 (0,0) - 4.2 Appropriate diagnosis: 0 (0,1) - 4.3 Information integration: 0 (0,1) - 4.4 Knowledge application: 0 (0,1) - 4.5 Recognizing limitations: 0 (0,1) - 5.1 Professional relationship: 0 (0,1) - 5.2 Sensitivity to needs: 0 (0,1) - 5.3 Attitude impact: 0 (0,1) - 6.1 Health promotion: 0 (0,1) - 6.2 Explaining prevention: 0 (0,1) - 6.3 Lifestyle promotion: 0 (0,0.5) - 7.1 Visit documentation: 1 (1,2) - 7.3 History/exam documentation: 1 (1,2) - 7.4 Prescription documentation: 1 (0,2) - 7.7 Management plan: 1 (0,1.5)

Appendix 3: Univariate Analysis of Consultation Competence

All Participants (n=116): - Residency training: r=0.512, P<0.001 - Medical record documentation: r=0.447, P<0.001 - Educational level: r=0.384, P<0.001 - Consultation duration: r=0.370, P<0.001 - Geographic region: r=0.324, P<0.001 - Age: r=-0.274, P=0.003 - Years of practice: r=-0.251, P=0.007

RTME Graduates (n=75): - Medical record documentation: r=0.468, P<0.001 - Educational level: r=0.387, P=0.001 - Consultation duration: r=0.276, P=0.017

Appendix 4: Variable Assignment

- **Consultation competence total score (dimensions 1-6):** Low=1, Low-Medium=2, Medium-High=3, High=4 (based on quartiles)
- **Medical record documentation:** No=0, Yes=1
- **Educational level:** Junior college=0, Bachelor=1, Graduate=2
- **Residency training:** No=0, Yes=1
- **Geographic region:** Chongzuo=1, Guigang=2, Nanning=3, Wuzhou=4
- **Age, consultation duration, years of practice:** Continuous variables

Note: Figure translations are in progress. See original paper for figures.