

Article

Changes in Medical Students' Perceptions of Family Medicine Following a Clinical Rotation: A Rural–Urban Comparison in Romania

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Abstract

Background/Objectives: Romania faces a shortage of family physicians, particularly in rural areas. Undergraduate Family Medicine rotations may influence students' perceptions before residency selection, but the contribution of rural versus urban training settings remains insufficiently documented. This study examined differences between post-rotation perceptions and students' recalled pre-rotation perceptions, and explored whether these differences varied according to placement setting. **Methods:** This single-centre study used a single-administration retrospective pretest–posttest observational design. After completing the mandatory one-month Family Medicine rotation, 141 sixth-year medical students completed a questionnaire containing recalled pre-rotation and post-rotation ratings on 12 five-point Likert items. Paired comparisons used Wilcoxon signed-rank tests; multiple-testing corrections were applied within the defined item families. A baseline-adjusted model with robust standard errors examined rural placement. **Results:** The composite score increased from 3.62 ± 0.84 to 4.10 ± 0.74 (mean change 0.483; $W = 602.5$; $Z = -7.990$; $p < 0.001$; $r = 0.673$). All 12 paired item comparisons remained significant after Bonferroni correction. No rural–urban item comparison remained significant after correction. In the adjusted model, rural placement was not associated with a statistically significant difference in the post-rotation score ($\beta = 0.197$, 95% CI -0.002 to 0.397 ; $p = 0.053$). Among the 86 rurally exposed students, the mean willingness to practice rurally was 2.87/5. The apparent association with career intention was not retained when excluding the overlapping career-likelihood item (11-item composite: $H = 6.695$, $p = 0.153$). **Conclusions:** Students reported more favourable perceptions after the rotation than they recalled having before it, but their willingness to practice rurally remained limited. The uncontrolled, retrospective design does not permit causal attribution, and the data do not establish a rural-placement advantage or subsequent specialty choice.

Keywords: family medicine; undergraduate medical education; clinical rotation; career intention; rural medicine; student perceptions; Romania; primary care workforce



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1. Introduction

Romania faces a persistent shortage of family physicians, which has become one of the defining structural challenges in its primary healthcare system, due to inconsistent political action over the last two decades. In line with the trend observed at the European level, the population of family doctors in Romania is ageing, and this fact is also due to the small number of residency places for the Family Medicine specialty in the last 10 years. This situation especially affects rural and remote areas, where additional mechanisms are needed to attract and retain healthcare workers [1–3]. In Romania, family medicine is a specialty and a postgraduate training programme consisting of four years, half in a hospital setting and half in primary care facilities [4].

In response, starting in 2023, the Ministry of Health has progressively expanded the number of residency training positions available in Family Medicine; yet the specialty continues to attract a disproportionately small share of medical graduates. Recruitment patterns suggest that negative attitudes and misconceptions about primary care take root well before residency selection, during undergraduate training itself [5–8]. International evidence consistently shows that direct clinical exposure to Family Medicine during undergraduate studies is among the most effective tools for improving students' attitudes towards the specialty and, in some contexts, influencing their eventual career choices [9–13]. Studies from across Europe and beyond have documented that the quality, duration, and setting of primary care placements all contribute meaningfully to students' perceptions of the intellectual scope, professional value, and career attractiveness of Family Medicine [9,10,14–17]. Moreover, the World Health Organisation (WHO) recommends early exposure of students to rural practice as a useful measure to alleviate the shortage of healthcare workers, including in high-level education, such as doctors [18].

To begin with, in Romania, starting in 2017, a minimum two-week internship in rural areas was introduced through the training curriculum in the family medicine specialty precisely to expose residents to the characteristics of primary care activities in rural areas [4].

Rural Family Medicine is characterised by a broader scope of practice, greater clinical autonomy, and direct community engagement—features that may heighten students' appreciation of the specialty's complexity and societal role. At the same time, structural concerns about rural practice, including limited resources and professional isolation, may temper any such gains [19–21]. Differences between rural and urban populations have been reported across several public health priority areas, including vaccination, rehabilitation services, and the prevention and management of chronic diseases [22–24]. In the Romanian medical curriculum, the one-month mandatory Family Medicine clinical rotation in the sixth year of study represents the primary structured exposure to the specialty before residency selection. The mandatory undergraduate Family Medicine clinical rotation at the University of Medicine and Pharmacy of Craiova lasted four weeks in total, during which students rotated through outpatient clinics belonging to six teaching staff members of the Family Medicine Discipline. Of the 44 student groups completing the rotation, 19 groups were allocated one week at the single rural training site (Sadova, Dolj County) in addition to three weeks at urban outpatient clinics within Craiova, while the remaining 25 groups completed all four weeks exclusively at urban clinics. Allocation of groups to the rural component was not randomised; it followed the scheduling logistics of the rotation, determined by the number of teaching hours assigned to each staff member. A dimension that remains comparatively underexplored, particularly in the Romanian context, is whether training in rural versus urban primary care settings is associated with different attitudinal outcomes. The present study addresses two primary research questions: (1) Do students report different perceptions after completing the mandatory one-month Family

Medicine clinical rotation than they retrospectively recall having before it? (2) Do these within-participant differences vary according to whether students completed part of their rotation in a rural versus an exclusively urban setting? Secondary analyses examine career intention and gender without treating either as a moderator unless a formal interaction is tested.

2. Materials and Methods

2.1. Study Design and Setting

This was a single-centre, observational study using a single-administration, retrospective post-test design. The questionnaire was administered once, after completion of the mandatory undergraduate Family Medicine clinical rotation; within this single instrument, students retrospectively rated their perceptions both before and after the rotation. Consequently, the “pre-rotation” responses represent recalled rather than prospectively collected baseline assessments, and are subject to recall bias, including the potential influence of students’ post-rotation attitudes on their recollection of how they felt beforehand. As no separate baseline questionnaire was administered prior to the rotation, this design does not permit a true two-timepoint comparison, and any observed pre- to post-rotation differences should be interpreted as reflecting perceived change rather than independently measured change.

The study was conducted at the University of Medicine and Pharmacy of Craiova, Romania, during the 2025 academic year. In our medical curriculum, sixth-year students complete a compulsory one-month clinical internship in Family Medicine, which is the primary structured educational exposure to the specialty before residency selection.

For the present analysis, placement setting was operationalised from the questionnaire item asking whether the student had completed the Family Medicine rotation in a rural setting. A “yes” response was classified as rural placement exposure, whereas a “no” response was classified as exclusively urban exposure. Within the Family Medicine discipline of UMF Craiova, 6 teachers ensure the training of students according to the specific curriculum in family medicine in primary care medical offices, for 3 h each working day (5 days per week). One of the teachers has a medical office in a rural area, located 55 km away from Craiova. Each group is distributed in this way to four medical offices, one week in each office. Students are organised in series and groups, and the distribution is made in the order of group numbers and in the same sequence of teachers. This results in a uniform distribution during the year, and some groups are distributed for one week to the family medicine office in the rural area and for 3 weeks to the offices in the urban area, while other groups are distributed only to the offices in the urban area, spending one week at the same office.

Students carry out theoretical and practical activities: patient examinations, case studies, case reports, video consultations, and legislative discussions.

2.2. Study Instrument

Data were collected using a structured self-administered questionnaire developed specifically for this study. The questionnaire was administered once and contained the recalled pre-rotation and post-rotation ratings analysed here. The questionnaire was developed by the coordinator responsible for the rural rotation in collaboration with colleagues from the Department of Family Medicine, pilot-tested for clarity and comprehensibility with a separate group of students prior to final administration, and administered in Romanian—the native language of all participants—as a single, post-rotation instrument in which the career-intention item was rated retrospectively for both the pre- and post-rotation timepoints (Supplementary File S1).

The questionnaire included:

- Demographic characteristics;
- Career intention toward Family Medicine;
- 12 paired Likert-scale items evaluating perceptions of Family Medicine before and after the internship;
- Multiple-response items regarding motivations for choosing Family Medicine;
- Multiple-response items regarding perceived barriers;
- Items assessing attitudes toward rural practice.

The 12 perception items were rated on a 5-point Likert scale ranging from 1 (“strongly disagree”) to 5 (“strongly agree”).

The paired items explored several domains, including:

- Likelihood of choosing Family Medicine;
- Perceived professional value;
- Prestige;
- Professional autonomy;
- Role in prevention;
- Role in care coordination;
- Intellectual and clinical challenge;
- Opportunities for professional development.

A composite perception score was calculated as the arithmetic mean of the 12 Likert-scale items for each participant. Combining related Likert-type items into a multi-item score was considered appropriate for descriptive and model-based analyses, whereas individual items were retained as ordinal outcomes for rank-based inference [25]. All 141 records contained complete responses for the 12 recalled pre-rotation and 12 post-rotation items; consequently, no imputation was undertaken. The a priori theoretical rationale used during instrument development to combine the different item domains into one composite score remains to be confirmed.

2.3. Reliability Assessment

Internal consistency and preliminary dimensionality of the 12-item perception score were examined separately for the recalled pre-rotation and post-rotation responses. Cronbach’s alpha and McDonald’s omega were reported together with corrected Spearman item–total correlations. Sampling adequacy and factorability were evaluated using the Kaiser–Meyer–Olkin statistic and Bartlett’s test of sphericity. Exploratory one-factor solutions were estimated from Spearman correlation matrices, and parallel analysis was used to inform factor retention.

Internal consistency was high for both the recalled pre-rotation items (Cronbach’s $\alpha = 0.924$; McDonald’s $\omega = 0.928$) and the post-rotation items ($\alpha = 0.931$; $\omega = 0.941$).

- Corrected Spearman item–total correlations ranged from 0.476 to 0.768 for recalled pre-rotation responses.
- Corrected Spearman item–total correlations ranged from 0.455 to 0.804 for post-rotation responses.

Sampling adequacy was high (Kaiser–Meyer–Olkin = 0.897 and 0.921, respectively), and Bartlett’s tests were significant at both assessments (both $p < 0.001$). Exploratory parallel analysis supported retention of one factor at each assessment. In the corresponding one-factor solutions, loadings ranged from 0.472 to 0.797 for recalled pre-rotation responses and from 0.433 to 0.876 for post-rotation responses. These sample-specific results provide preliminary support for internal coherence and an approximately unidimensional structure, but they do not establish full instrument validity or responsiveness.

2.4. Statistical Analysis

The dataset was compiled, coded, cleaned, and verified in Microsoft Excel 365 (Microsoft Corp., Redmond, WA, USA). Reproducible analyses were specified for IBM SPSS Statistics version 26 (IBM Corp., Armonk, NY, USA), with the definitive numerical audit performed from the participant-level Excel dataset.

Categorical variables were summarised as frequencies (n) and percentages, using $N = 141$ as the denominator unless otherwise stated. Continuous variables were reported using mean $\pm$ standard deviation (SD) and median (interquartile range or observed range, as appropriate). Means for individual Likert items were used only as descriptive summaries and were presented alongside medians; response-category percentages were additionally reported for selected items to aid interpretation [25].

Distributional assessment considered the ordinal nature of the items, histograms, normal Q–Q plots, boxplots, skewness, outliers, and the distribution of paired change scores. Shapiro–Wilk tests were reported as supporting diagnostics rather than used as the sole basis for test selection. The recalled pre-rotation, post-rotation, and change-score distributions departed from normality ($W = 0.965, p = 0.001$; $W = 0.908, p < 0.001$; and $W = 0.837, p < 0.001$, respectively). Because item responses were ordinal and the composite change scores were non-normal, rank-based methods were used for the principal comparisons.

Recalled pre-rotation and post-rotation responses were compared using Wilcoxon signed-rank tests. The Wilcoxon statistic (W), standardised Z statistic, two-sided p -value, valid paired N , and effect size $r = |Z| / \sqrt{N}$ were reported.

Mann–Whitney U tests were retained for exploratory comparisons between independent groups. Baseline descriptions of the placement groups compared age and recalled pre-rotation score using Mann–Whitney tests. Sex, home address, and residence during medical studies were compared as binary categories using two-sided Fisher exact tests because some original categories were sparse. These tests describe detected differences and were not interpreted as equivalence tests.

- Rural versus urban-only placement was compared for recalled pre-rotation, post-rotation, and change scores.
- Female versus male participants were compared for post-rotation and change scores.

For reporting, the paired comparison of the 12-item composite was designated as the principal analysis. Item-level paired comparisons and the motivation and barrier families were secondary analyses with family-specific multiplicity control. Rural–urban, career-intention, and gender comparisons were exploratory. The primary rural-placement model used the post-rotation composite score as the outcome and adjusted for the recalled pre-rotation composite score, age, sex, home address, and residence during medical studies. Heteroscedasticity-consistent HC3 standard errors were used. Propensity-score matching was not undertaken: with the available sample and sparse covariate categories, matching could have discarded observations without addressing unmeasured confounding; the covariate-adjusted model therefore retained all participants. Career-intention groups were compared using the Kruskal–Wallis H test. Because career intention conceptually overlaps with the item assessing likelihood of choosing Family Medicine, a prespecified sensitivity analysis repeated this comparison using an 11-item composite that excluded that item. Gender analyses were treated as exploratory comparisons and were not interpreted as tests of confounding. Career intention was not included as a baseline covariate because it was recorded once and its timing relative to the rotation has not yet been confirmed; consequently, a within-participant transition matrix and McNemar–Bowker test were not estimable.

Effect sizes were reported as continuous estimates without assigning qualitative categories. Each motivation and barrier option was coded separately as selected or not

selected under the recalled pre-rotation and post-rotation conditions, and paired binary changes were assessed using continuity-corrected McNemar tests. Separate Bonferroni corrections were applied to four defined families: 12 paired perception items ($\alpha = 0.0042$), 12 rural–urban item comparisons ($\alpha = 0.0042$), eight motivation items ($\alpha = 0.0063$), and six barrier items ($\alpha = 0.0083$). Both unadjusted and Bonferroni-adjusted p -values are reported.

No a priori sample-size calculation was performed; all 141 valid paired records available in the final analytical dataset were included. A post hoc sensitivity analysis was therefore used to characterise, rather than retrospectively justify, the precision of the rural versus urban-only comparison. Under a standard-normal location-shift model, 100,000 simulations indicated that $n = 86$ versus $n = 55$ provided approximately 80% power for a two-sided Mann–Whitney U test at $\alpha = 0.05$ to detect $d \approx 0.50$ (corresponding approximately to $r = 0.24$). Smaller between-setting effects may have been missed, particularly after multiplicity correction, and confidence intervals are therefore emphasised. All tests were two-sided. Statistical significance was evaluated at $p < 0.05$ for the principal analysis and using the corresponding adjusted criterion for each defined family of multiple comparisons.

3. Results

3.1. Participant Characteristics

Of the 335 sixth-year medical students enrolled during the 2025–2026 study period, 141 completed the questionnaire, corresponding to an overall response rate of 42.09%. Among these, 158 students had completed the rural Family Medicine rotation and were therefore eligible to complete the rural-practice-specific section of the questionnaire; of these, 86 provided responses, yielding a response rate of 54.43% within this eligible subgroup. A total of 141 complete questionnaire records were included in the statistical analysis. The sample comprised 106 female (75.2%) and 35 male students (24.8%), with a mean age of 24.77 ± 1.77 years. During their studies, 131 participants (92.9%) resided in an urban area, seven (5.0%) in a rural area, and three (2.1%) in a suburban area. Home addresses were urban for 111 participants (78.7%), rural for 26 (18.4%), and suburban for four (2.8%). Eighty-six students (61.0%) reported some rural placement exposure, whereas 55 (39.0%) reported exclusively urban exposure (Table 1). According to the information currently available to the statistical team, the seven earliest timestamped records in the pre-filtering file were treated as test entries and were not retained in the analytical dataset; the formal exclusion rule and the numbers of students eligible, invited, and responding remain to be confirmed.

Regarding career intention toward Family Medicine, only 7.8% of students identified it as their first specialty choice, and a further 5.0% as their second. The most frequent response was conditional acceptance depending on the residency examination score (40.4%), followed by the third choice (26.2%). Notably, 20.6% reported they would not choose Family Medicine regardless of their examination score (Table 2).

3.2. Overall Within-Participant Difference in Perceptions of Family Medicine

Students reported more favourable perceptions after the rotation than they recalled having before it. The composite score increased from 3.618 ± 0.840 (median 3.75, IQR 3.00–4.25) to 4.102 ± 0.736 (median 4.25, IQR 3.67–4.75), with a mean within-participant change of 0.483 points (bootstrap 95% CI 0.371–0.606). The Wilcoxon signed-rank test yielded $W = 602.5$, $Z = -7.990$, $p < 0.001$, and $r = 0.673$. Scores increased in 108 participants (76.6%), were unchanged in 20 (14.2%), and decreased in 13 (9.2%).

Table 1. Demographic distribution of the sample (N = 141).

Variable	n	%
Sex		
Female	106	75.2%
Male	35	24.8%
Age (years)		
Mean $\pm$ SD ¹	24.77 $\pm$ 1.77	
Median (min–max)	24 (23–38)	
Residence during studies		
Urban	131	92.9%
Rural	7	5.0%
Sub-urban	3	2.1%
Home address		
Urban	111	78.7%
Rural	26	18.4%
Sub-urban	4	2.8%
Rural internship		
Yes	86	61.0%
No	55	39.0%

¹ SD = standard deviation.**Table 2.** Intention to choose Family Medicine (N = 141).

Response	n	%
Yes, if my score does not allow another option	57	40.4%
Yes, it is my third choice	37	26.2%
No, regardless of score	29	20.6%
Yes, it is my first choice	11	7.8%
Yes, it is my second choice	7	5.0%
Total	141	100%

3.3. Item-Level Changes in Perception

All 12 paired item comparisons were statistically significant after Bonferroni correction for the family of 12 tests. Table 3 reports the valid paired sample, descriptive statistics, W and Z statistics, unadjusted and adjusted *p*-values, and effect sizes for each item. Figure 1 provides a descriptive visual summary of the item-level ratings and the direction of within-participant change in the composite score.

Table 3. Recalled pre-rotation and post-rotation item scores and Wilcoxon signed-rank results (N = 141).

Item	Pre M $\pm$ SD; Med.	Post M $\pm$ SD; Med.	r	p (p_adj)	Z	W	Δ
Likelihood of choosing FM	2.24 $\pm$ 1.21; 2.0	2.88 $\pm$ 1.24; 3.0	0.521	<0.001 (<0.001)	−6.191	185.0	0.638
Central role in primary care	4.00 $\pm$ 1.07; 4.0	4.40 $\pm$ 0.89; 5.0	0.391	<0.001 (<0.001)	−4.649	234.0	0.397
Fulfilling specialty	3.35 $\pm$ 1.15; 3.0	3.90 $\pm$ 1.08; 4.0	0.515	<0.001 (<0.001)	−6.111	247.0	0.553
Respected among professionals	2.68 $\pm$ 1.29; 3.0	3.31 $\pm$ 1.21; 3.0	0.542	<0.001 (<0.001)	−6.431	252.5	0.631

Table 3. Cont.

Item	Pre M $\pm$ SD; Med.	Post M $\pm$ SD; Med.	r	p (p _{adj})	Z	W	Δ
Diverse development opportunities	3.28 $\pm$ 1.24; 3.0	3.97 $\pm$ 1.09; 4.0	0.557	<0.001 (<0.001)	−6.617	201.5	0.688
Essential in prevention/education	4.23 $\pm$ 0.98; 5.0	4.60 $\pm$ 0.73; 5.0	0.403	<0.001 (<0.001)	−4.785	81.0	0.369
Requires solid clinical training	4.10 $\pm$ 1.05; 4.0	4.47 $\pm$ 0.77; 5.0	0.381	<0.001 (<0.001)	−4.520	120.5	0.369
Modern, evolving specialty	3.59 $\pm$ 1.15; 4.0	4.11 $\pm$ 0.99; 4.0	0.473	<0.001 (<0.001)	−5.614	247.5	0.525
As valuable as other specialties	3.96 $\pm$ 1.22; 4.0	4.38 $\pm$ 0.92; 5.0	0.388	<0.001 (<0.001)	−4.606	143.0	0.418
Professional autonomy	4.05 $\pm$ 1.05; 4.0	4.30 $\pm$ 0.93; 5.0	0.292	0.001 (0.006)	−3.465	280.5	0.255
Stimulates clinical thinking	3.83 $\pm$ 1.12; 4.0	4.38 $\pm$ 0.90; 5.0	0.532	<0.001 (<0.001)	−6.317	84.0	0.546
Central in care coordination	4.11 $\pm$ 1.06; 4.0	4.52 $\pm$ 0.81; 5.0	0.406	<0.001 (<0.001)	−4.819	152.0	0.411
Composite score	3.62 $\pm$ 0.84; 3.75	4.10 $\pm$ 0.74; 4.25	0.673	<0.001 (—)	−7.990	602.5	0.483

M = mean; SD = standard deviation; Med. = median; Δ = post-rotation minus recalled pre-rotation mean; p_{adj} = Bonferroni-adjusted p -value for 12 paired comparisons; $r = |Z| / \sqrt{141}$. All 12 comparisons remained significant after correction.

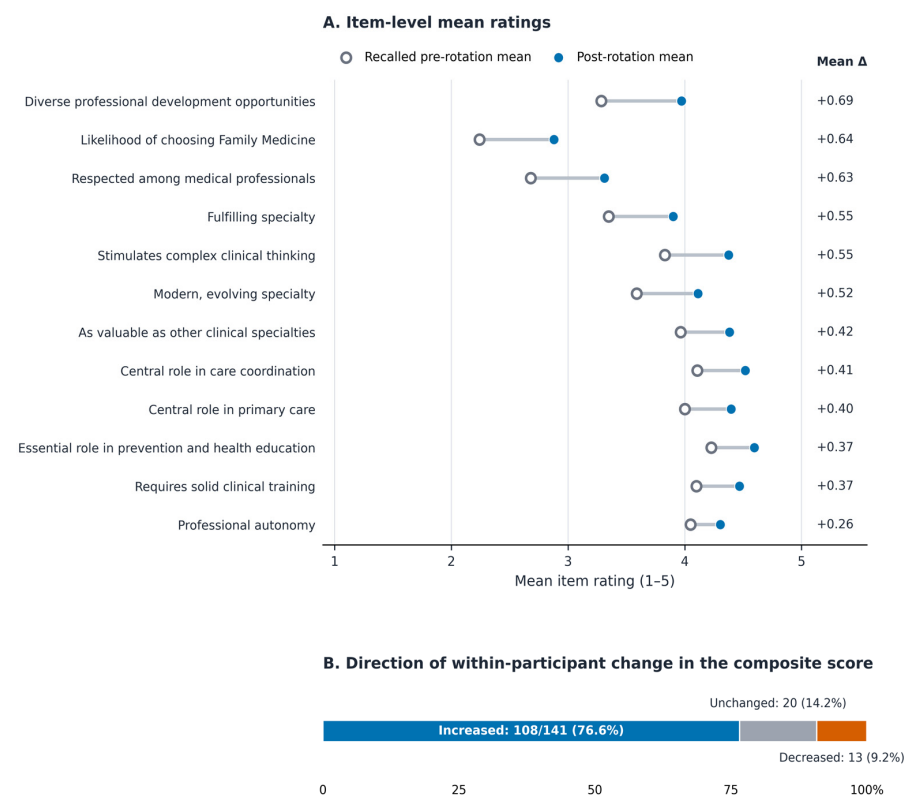


Figure 1. Item-level recalled pre-rotation and post-rotation mean ratings and direction of participant-level change in the composite perception score: **(A)** Horizontal dumbbell plot of the 12 five-point items, ordered by mean change; means are presented descriptively, whereas paired inference used Wilcoxon signed-rank tests. All 12 comparisons remained statistically significant after Bonferroni correction; **(B)** Participants whose composite score increased, remained unchanged, or decreased (N = 141).

The largest item-level effect sizes concerned diverse professional development opportunities ($\Delta = 0.688$, $r = 0.557$), being respected among medical professionals ($\Delta = 0.631$, $r = 0.542$), stimulation of complex clinical thinking ($\Delta = 0.546$, $r = 0.532$), likelihood of choosing Family Medicine ($\Delta = 0.638$, $r = 0.521$), and perceiving Family Medicine as a fulfilling specialty ($\Delta = 0.553$, $r = 0.515$). For these five items, the proportion selecting agree or strongly agree (ratings 4–5) increased, respectively, from 42.6% to 70.9%, 27.0% to 45.4%, 66.7% to 85.1%, 16.3% to 32.6%, and 43.3% to 65.2%. The corresponding disagree or strongly disagree proportions (ratings 1–2) decreased from 25.5% to 9.2%, 48.2% to 29.8%, 12.1% to 3.5%, 61.7% to 37.6%, and 19.9% to 9.2%. Effect sizes are reported as continuous estimates rather than assigned rigid categories.

Professional autonomy showed the smallest effect size ($r = 0.292$; unadjusted $p = 0.001$; adjusted $p = 0.006$). The highest response category had already been selected by 44.7% of participants for this item before the rotation and by 56.0% afterwards. Similarly high maximum-category proportions were observed for prevention and health education (51.8% before; 70.9% after) and care coordination (48.2% before; 67.4% after). These patterns may be compatible with restricted upward range but do not by themselves demonstrate a ceiling effect.

3.4. Motivations for and Perceived Barriers to Choosing Family Medicine

Motivations and perceived barriers were treated as paired binary outcomes. Table 4 reports the marginal frequencies, discordant pairs, continuity-corrected McNemar statistics, and unadjusted and Bonferroni-adjusted p -values for the eight motivation items. Five motivations remained significant after correction: flexibility in choosing the workplace, altruistic desire to help the community, work environment, impact on community health, and long-term patient relationships. Interest in holistic care increased from 26/141 (18.4%) to 38/141 (27.0%) but did not remain significant after correction (adjusted $p = 0.111$).

Table 4. Motivations for choosing Family Medicine before and after the rotation ($N = 141$; multiple responses).

Reason	Before <i>n</i> (%)	After <i>n</i> (%)	Yes → No	No → Yes	<i>p</i> _{adj}	<i>p</i>	χ^2
Work–life balance	115 (81.6)	111 (78.7)	16	12	1.000	0.571	0.321
Work environment	68 (48.2)	84 (59.6)	5	21	0.026	0.003	8.654
Flexibility in choosing workplace	56 (39.7)	82 (58.2)	2	28	<0.001	<0.001	20.833
Long-term patient relationships	39 (27.7)	60 (42.6)	4	25	0.002	<0.001	13.793
Impact on community health	39 (27.7)	73 (51.8)	5	39	<0.001	<0.001	24.750
Altruistic desire to help community	38 (27.0)	57 (40.4)	8	27	0.019	0.002	9.257
Interest in holistic care	26 (18.4)	38 (27.0)	4	16	0.111	0.014	6.050
Other	13 (9.2)	11 (7.8)	5	3	1.000	0.724	0.125

Percentages use $N = 141$. Yes → No and No → Yes are the discordant pairs used in the continuity-corrected McNemar test. p_{adj} = Bonferroni-adjusted p -value for eight motivation items.

Two perceived barriers remained significant after Bonferroni correction for six tests: limited career advancement opportunities decreased from 75/141 (53.2%) to 35/141 (24.8%; $\chi^2 = 31.688$; adjusted $p < 0.001$), and perception of Family Medicine as less prestigious decreased from 73/141 (51.8%) to 35/141 (24.8%; $\chi^2 = 31.114$; adjusted $p < 0.001$), (Table 5).

Financial considerations (51/141 [36.2%] to 40/141 [28.4%]; unadjusted $p = 0.022$) and limited knowledge of employment options (44/141 [31.2%] to 29/141 [20.6%]; unadjusted $p = 0.012$) did not remain significant after correction. Personal interest in other specialties increased from 77/141 (54.6%) to 88/141 (62.4%), but this difference was not statistically significant ($p = 0.082$).

Table 5. Perceived barriers to choosing Family Medicine before and after the rotation (N = 141; multiple responses).

Reason	Before n (%)	After n (%)	Yes → No	No → Yes	p_{adj}	p	χ^2
Personal interest in other specialties	77 (54.6)	88 (62.4)	11	22	0.490	0.082	3.030
Limited career advancement	75 (53.2)	35 (24.8)	44	4	<0.001	<0.001	31.688
Perceived as less prestigious	73 (51.8)	35 (24.8)	41	3	<0.001	<0.001	31.114
Financial considerations	51 (36.2)	40 (28.4)	15	4	0.131	0.022	5.263
Limited employment information	44 (31.2)	29 (20.6)	23	8	0.072	0.012	6.323
Lack of clinical practice	28 (19.9)	24 (17.0)	12	8	1.000	0.502	0.450
Other	1 (0.7)	1 (0.7)	—	—	—	—	—

Percentages use N = 141. Yes → No and No → Yes are the discordant pairs used in the continuity-corrected McNemar test. p_{adj} = Bonferroni-adjusted p -value for six prespecified barrier items; the rare “Other” response was not included in this family.

3.5. Attitudes Toward Rural Practice

Among the 86 students who completed part of their rotation in a rural setting, willingness to practise in a rural area in the future was moderate on average (mean = 2.87 ± 1.22 , median = 3.0), while the perceived importance of rural practice for their future career was comparatively low (mean = 2.35 ± 1.08 , median = 2.0) (Table 6).

Table 6. Attitudes toward rural practice—rural subgroup ($n = 86$).

Variable ($n = 86$)	Mean $\pm$ SD	Median	Range
Willingness to practise in a rural setting (1–5)	2.87 ± 1.22	3.0	1–5
Importance of rural practice in future career (1–5)	2.35 ± 1.08	2.0	1–5

SD = standard deviation. Scale: 1 = strongly disagree; 5 = strongly agree.

The mean willingness score of 2.87/5 should not be interpreted as evidence of increased rural career intention. More favourable post-rotation perceptions did not correspond to strong willingness to practise rurally. The questionnaire did not directly measure salaries, infrastructure, professional isolation, policy incentives, housing, or long-term employment decisions; consequently, these data cannot identify the structural causes of the observed willingness scores.

3.6. Rural Versus Urban Comparison

The rural and urban-only groups were compared on the measured characteristics available in the dataset (Table 7). No statistically significant difference was detected for

age ($U = 2682.0$, $p = 0.141$, $r = 0.124$), sex (Fisher $p = 0.844$), urban versus non-urban home address (Fisher $p = 1.000$), urban versus non-urban residence during medical studies (Fisher $p = 1.000$), or the recalled pre-rotation composite score ($U = 2035.5$, $p = 0.164$, $r = 0.117$). These nonsignificant comparisons do not demonstrate baseline equivalence and do not exclude residual confounding. Students with rural placements had a mean change of 0.589 points, compared with 0.318 points in the urban-only group, but the exploratory change-score comparison was not statistically significant ($U = 2728.0$, $p = 0.125$, $r = 0.129$). Post-rotation composite scores also did not differ significantly ($U = 2469.0$, $p = 0.661$, $r = 0.037$). Within-group post-versus-recalled-pre differences were detected for both the rural group ($W = 152.0$, $Z = -6.453$, $p < 0.001$, $r = 0.696$) and the urban-only group ($W = 158.0$, $Z = -4.632$, $p < 0.001$, $r = 0.625$). In the adjusted model, rural placement was associated with a 0.197-point higher post-rotation score, but the robust 95% CI included the null (-0.002 to 0.397 ; $p = 0.053$).

Table 7. Measured baseline characteristics and composite perception scores by placement setting.

Characteristic or Outcome	Any Rural Placement ($n = 86$)	Urban-Only Placement ($n = 55$)	Between-Group Comparison
Baseline characteristics			
Age, years	24.0 (24.0–25.0)	24.0 (24.0–25.0)	$U = 2682.0$; $p = 0.141$; $r = 0.124$
Female sex	64 (74.4%)	42 (76.4%)	Fisher $p = 0.844$; $\phi = 0.022$
Urban home address	68 (79.1%)	43 (78.2%)	Fisher $p = 1.000$; $\phi = 0.011$
Urban residence during studies	80 (93.0%)	51 (92.7%)	Fisher $p = 1.000$; $\phi = 0.006$
Composite scores			
Recalled pre-rotation score	3.55 ± 0.83 ; 3.67	3.73 ± 0.86 ; 3.92	$U = 2035.5$; $p = 0.164$; $r = 0.117$
Post-rotation score	4.14 ± 0.68 ; 4.29	4.04 ± 0.82 ; 4.17	$U = 2469.0$; $p = 0.661$; $r = 0.037$
Change score	0.589 ± 0.812 ; 0.333	0.318 ± 0.484 ; 0.167	$U = 2728.0$; $p = 0.125$; $r = 0.129$
Within-group post vs. recalled pre	95% CI 0.427–0.766	95% CI 0.194–0.450	—

Values are median (IQR), n (%), or mean $\pm$ SD; median, as indicated. CI = confidence interval; SD = standard deviation; U = Mann–Whitney statistic; $r = |Z| / \sqrt{N}$; ϕ = phi coefficient. Fisher exact tests compare binary categories. Change scores are post-rotation minus recalled pre-rotation scores. Between-group tests are exploratory and do not establish equivalence when nonsignificant.

Three item-level rural–urban change-score comparisons reached nominal significance: likelihood of choosing Family Medicine ($p = 0.020$), central role in primary care ($p = 0.016$), and requiring solid clinical training ($p = 0.022$). None met the Bonferroni-adjusted criterion of 0.0042; the corresponding adjusted p -values were 0.235, 0.190, and 0.263. These exploratory findings therefore do not establish domain-specific advantages of rural placement. Figure 2 separates the exploratory change-score distributions by placement from the baseline-adjusted rural-placement coefficient and its confidence interval.

3.7. Career Intention and Post-Rotation Perception

The original 12-item post-rotation composite differed across the five career-intention categories ($H = 16.130$, $df = 4$, $p = 0.003$). Because this score includes an item assessing the likelihood of choosing Family Medicine, the analysis was repeated using an 11-item composite that excluded that overlapping item. The sensitivity outcome did not differ significantly across the five categories ($H = 6.695$, $df = 4$, $p = 0.153$). Accordingly, the original association may have been partly mechanical and is not interpreted as evidence of

greater engagement, motivational amplification, or differential educational benefit. The five response categories were retained because they were prespecified and substantively distinct; no post hoc regrouping or inferential pairwise claims were made.

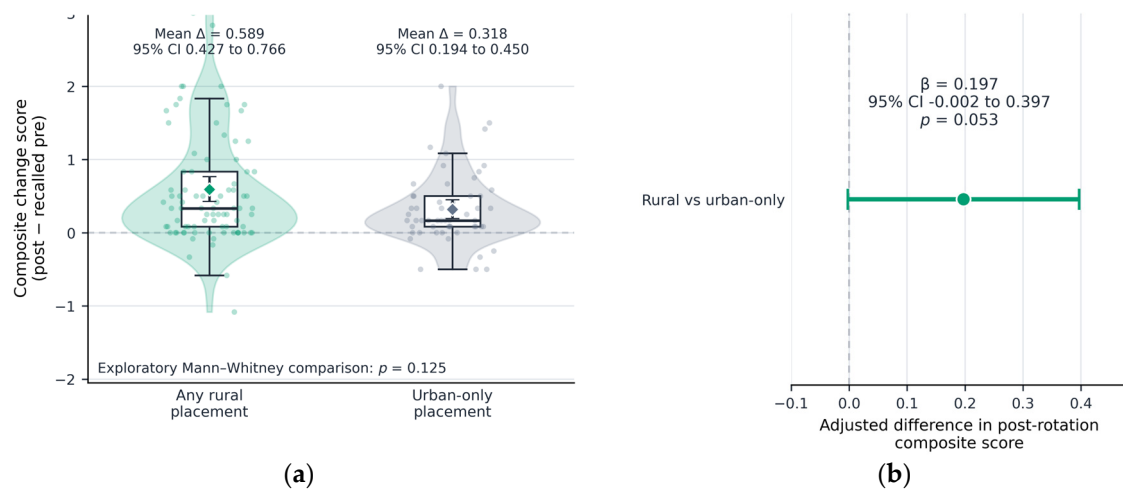


Figure 2. Placement-setting comparisons: (a) Distribution of participant-level composite change scores (post-rotation minus recalled pre-rotation) for students reporting any rural placement and those reporting exclusively urban placement. Violin densities, boxplots, individual observations, and mean changes with bootstrap 95% confidence intervals are shown; the Mann–Whitney comparison was exploratory ($p = 0.125$). (b) Baseline-adjusted rural-placement coefficient from the model of the post-rotation composite score, adjusted for recalled pre-rotation score, age, sex, home address, and residence during medical studies, with HC3 robust standard errors ($\beta = 0.197$, 95% CI -0.002 to 0.397 ; $p = 0.053$).

3.8. Gender Analysis

No statistically significant difference in post-rotation composite scores was detected between female ($n = 106$; mean 4.13 ± 0.71) and male students ($n = 35$; mean 4.00 ± 0.82 ; $U = 1982.5$, $p = 0.544$, $r = 0.051$). The change-score comparison was also nonsignificant ($p = 0.839$, $r = 0.017$). These unadjusted comparisons do not demonstrate the absence of confounding or establish that change was consistent across genders.

4. Discussion

Students reported more favourable perceptions of Family Medicine after completing the mandatory rotation than they recalled having before it. The within-participant difference was $r = 0.673$ and was observed across all 12 items after correction for multiple testing. Nevertheless, the single-administration retrospective pretest–posttest design cannot distinguish a contribution of the rotation from recall bias, response shift, social desirability, maturation, or other educational experiences. The findings should therefore be interpreted as an association rather than a causal effect [9,10,26]. Although the statistical evidence for a within-participant difference was strong, the practical importance of a 0.483-point mean difference on a five-point scale cannot be established because no minimally important difference has been validated for this study-specific instrument and change remains uncertain.

The largest changes concerned professional development opportunities, professional respect, complex clinical thinking, likelihood of choosing Family Medicine, and professional fulfilment. These patterns are compatible with a change in how students appraised the scope and standing of the specialty after clinical exposure. They do not, however, demonstrate that specific prior beliefs were misconceptions or that the rotation corrected them [26–28].

Items concerning professional autonomy, prevention, and care coordination showed smaller changes and relatively high proportions of maximum-category responses before the rotation. This may reflect restricted upward range, although high baseline means or maximum-category proportions alone do not establish a definitive ceiling effect.

The item-level rural–urban findings require particular caution. Although three comparisons reached nominal significance, none remained significant after correction for 12 tests. The adjusted model likewise did not provide conventional statistical evidence of a rural–placement difference in the post-rotation composite score ($p = 0.053$). The present data therefore do not establish domain-specific educational advantages of rural placements.

Both placement groups reported higher post-rotation than recalled pre-rotation scores, but the nonrandom allocation and absence of information on supervision, workload, patient volume, resources, travel, and accommodation limit between-setting interpretation. A nonsignificant baseline comparison cannot establish equivalence, and residual confounding by measured or unmeasured contextual factors remains plausible [15,18–20,29,30].

Students exposed to rural placements reported only moderate willingness to practise rurally. A brief rural clinical exposure (one week) may make the breadth, autonomy, and community role of Family Medicine more visible, yet it may be insufficient to alter longer-term decisions that also depend on living conditions and professional opportunities. This explanation is plausible rather than demonstrated by the present data. The study measured perceptions and stated willingness, not salaries, infrastructure, professional isolation, available positions, policy incentives, housing, or actual employment choices. In a recent Croatian study, students likewise reported concerns about rural working and living conditions and endorsed additional incentives; this regional parallel supports interpreting educational exposure within, rather than apart from, structural constraints [21]. Structural explanations may be considered in light of previous literature, but they should not be presented as factors directly demonstrated by these data [15,18–20,29,31–34].

The career-intention analysis also warrants restraint. The original association weakened and became nonsignificant after excluding the item that directly assessed likelihood of choosing Family Medicine. Career intention was recorded once, but its exact timing relative to the rotation remains to be confirmed; it is therefore not treated as a pre-existing vocational orientation. Engagement, expectations, attendance, academic performance, and intensity of clinical participation were not available in the analytical dataset; a motivational amplification mechanism is therefore not supported by the present study [9,13,35–42].

Several limitations frame interpretation. First, the uncontrolled, single-administration retrospective pretest–posttest design does not permit causal attribution. Recalled pre-rotation ratings may be affected by recall bias, response-shift bias, and implicit theories of change, while post-rotation ratings may be influenced by social desirability and awareness of the study aims. Second, placement allocation was nonrandom. Although age, sex, home address, residence during medical studies, and recalled pre-rotation score were included in an adjusted model, residual confounding by prior rural exposure, socioeconomic circumstances, transportation, accommodation, supervision quality, workload, and site resources remains plausible. Third, the questionnaire was developed for this study. The internal-consistency and exploratory factor-analytic results support coherent scoring in this sample but do not establish content, criterion, external validity, or responsiveness. Fourth, career intention was measured once, and the study lacked objective follow-up of residency choice. Finally, the single-centre sample and absence of an external control group limit generalisability and conclusions about durability.

Within these constraints, the study provides preliminary evidence that students' post-rotation perceptions were more favourable than their recalled pre-rotation perceptions. Prospective multicentre studies with independently collected baseline assessments, vali-

dated measures, comparable placement conditions, and follow-up of actual career choices are required. Where random allocation is impracticable, cohort-comparison or stepped-wedge designs across successive rotation schedules could strengthen causal interpretation.

5. Conclusions

In this single-centre retrospective pretest–posttest study, students reported more favourable perceptions of Family Medicine after completing the mandatory rotation than they recalled having before it. The consistent within-participant differences are compatible with a possible short-term educational contribution, but the uncontrolled design, single questionnaire administration, and potential recall and response-shift biases preclude causal inference or conclusions about lasting attitudinal change.

Rural exposure was not associated with a statistically significant adjusted difference in the overall post-rotation score, and no item-level rural–urban comparison remained significant after correction for multiple testing. More favourable perceptions also did not correspond to strong willingness to practise rurally; the study did not directly evaluate the structural determinants of rural career choice or subsequent specialty selection.

Prospective multicentre studies should use validated measures, independently collected baseline assessments, comparable placement conditions, cohort-comparison or stepped-wedge designs where appropriate, and longitudinal follow-up of actual residency and practice choices.

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Abbreviations

The following abbreviations are used in this manuscript:

FM	Family Medicine
SD	Standard Deviation
M	Mean
Med.	Median
Δ	Change score (post-rotation score minus recalled pre-rotation score)
UMF Craiova	University of Medicine and Pharmacy of Craiova

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