

A Comparative Performance of Medical Students At University of Arizona, College of Medicine – Phoenix in Rural and Urban Clinical Rotation Sites

Julia Ngoc-Kim Nguyen, Class of 2021. University of Arizona College of Medicine, Phoenix

Mentor: Jonathan Cartsonis, MD

Introduction

One major area of healthcare discrepancies is the shortage of physicians in rural regions. With increasing demands for rural physicians, recruitment and retention strategies were developed to increase incentives for rural trainings, but how effective are rural tracks in training future physicians to practice in rural settings?

Prior studies compared between rural and urban students and found no statistically significant differences, with the exception clinical examination scores and post-clerkship OSCE scores, in which rural students scored higher than their urban counterparts.

Research Question

PURPOSE: examine and compare performance of medical students at UACOMP in rural rotations and students in traditional urban rotations for clinical training

HYPOTHESIS: students participating in rural rotations perform equally well, if not better than their traditional urban counterparts

Materials and Methods

SETTING: We collected demographic and performance data from UACOMP medical students for the Classes of 2017, 2018, and 2019. Demographic data include: age, gender, race. Baseline performances include: undergraduate GPA and MCAT score, Year 1, Year 2, and Step 1 scores. Rotation sites were collected for each of the required core rotations during Year 3 and Year 4, along with clinical performance data includes: OSCE scores, clerkship shelf scores, and clerkship evaluation scores. Rotation sites, whether rural or urban, was by student choice. There was no obligation to partake in rural rotations. Criteria for rural location according to UACOMP. Our study has been waived by the IRB as it does not pertain any human research.

ANALYSIS: Comparisons of academic and clinical performances included: shelf examinations and clinical clerkship evaluations for required core rotations during Year 3 and Year 4. Analyses with non-parametric Wilcoxon Rank Sum to compare continuous variables, chi-squared analysis and Fisher's Exact to compare categorical variables, and 2-sided P-values with $p < 0.05$ for statistical significance, with linear regression adjusting for age, gender, race, graduating class, MCAT, and Step 1 scores.

Results

Table 1. Demographics of students without rural rotations and students with at least 1 rural rotation.

Variables	Overall N=241	No Rural Sites N=177	Yes Rural Sites N=64	P-value
Age, n (%)				0.041*
< 25	86 (35.7)	55 (31.1)	31 (48.4)	
25 - < 30	123 (51.0)	98 (55.4)	25 (39.1)	
≥ 30	32 (13.3)	24 (13.6)	8 (12.5)	
Gender, female (%)	128 (53.1)	91 (51.4)	37 (57.8)	0.41
Race, n (%)				0.091*
White	127 (52.7)	94 (53.1)	33 (51.6)	
AA	22 (9.13)	12 (6.78)	10 (15.6)	
Hispanic	53 (21.9)	38 (21.5)	15 (23.4)	
Other	39 (16.2)	33 (18.6)	6 (9.38)	
Class, n (%)				0.04*
2017	81 (33.6)	66 (37.3)	15 (23.4)	
2018	80 (33.2)	60 (33.9)	20 (31.3)	
2019	80 (33.2)	51 (28.8)	29 (45.3)	
Total GPA (mean, SD)	3.71 (0.25)	3.71 (0.24)	3.71 (0.26)	0.92
High MCAT (mean, SD)	508.9 (5.88)	508.7 (5.71)	509.5 (6.33)	0.39
STEP 1 (mean, SD)	224.1 (21.3)	224.5 (20.8)	222.8 (22.5)	0.59
MBLD (mean, SD)	82.8 (5.57)	82.7 (5.67)	83.1 (5.32)	0.68
Anatomy (mean, SD)	81.2 (11.6)	81.5 (11.1)	80.7 (12.9)	0.62
MSNS (mean, SD)	82.8 (5.64)	82.7 (5.64)	82.9 (5.67)	0.76
NLS (mean, SD)	84.1 (5.10)	84.2 (4.99)	83.8 (5.40)	0.60
CVH (mean, SD)	83.1 (6.46)	83.0 (6.22)	83.4 (7.12)	0.68
PRAB (mean, SD)	82.2 (6.54)	82.1 (6.62)	82.5 (6.34)	0.70
GIMDO (mean, SD)	81.9 (6.34)	81.7 (6.68)	82.4 (5.27)	0.43
REBLS (mean, SD)	81.8 (4.67)	81.8 (4.56)	81.6 (4.97)	0.71
ONC (mean, SD)	84.6 (5.18)	84.6 (4.87)	84.3 (5.99)	0.72

Table legend: MBLD- Molecular Basis of Life and Disease, MSNS- Musculoskeletal and Nervous System, NLS- Nervous System, CVH- Cardiovascular-Hematology, PRAB- Pulmonary, Renal, Acid-Base, GIMDO- Gastrointestinal System, Metabolism, Diabetes and Obesity, REBLS- Reproductive, Endocrine, and Behavior Through the Lifespan, ONC- Oncology. Wilcoxon Rank Sum to compare continuous variables. Chi-squared Analysis / Fisher's Exact to compare categorical variables.

Table 1 demonstrates demographics and other characteristics of both groups of students. Overall, both groups of students were similar in baseline performance, such as the means for undergraduate GPA, MCAT score, STEP 1 score, as well as Year 1 and Year 2 block scores. There was no significant difference in gender between the two groups ($p=0.41$).

Notably, there were statistically significant differences in the age break-down between the two groups. In the age group consisting of students 25 years or younger, we noted significantly more rural participation (48.4% with rural rotation sites vs. 31.1% without any rural site, $p=0.041$). In contrast, there was less rural participation in the 25 to 30 years age group (39.1% with rural rotation sites vs. 55.4% without any rural rotation site, $p=0.041$).

There was a statistically significant difference when comparing rural participation between the 2017, 2018, and 2019 cohorts, in that more rural participation was observed in the Class of 2019 in comparison to the Classes of 2018 and 2017 (45.3% compared to 31.3% and 23.4%, respectively, $p=0.04$).

Table 2. Comparison of student performance. Clerkship Evaluation Scores

Evaluations	Overall N=241	No Rural Sites N=177	Yes Rural Sites N=64	Beta (95% CI) ¹	p-value
Family Medicine	2.79 (0.19)	2.79 (0.18)	2.79 (0.20)	-0.008 (-0.06, 0.05)	0.75
Internal Medicine	2.62 (0.19)	2.61 (0.18)	2.67 (0.18)	0.07 (0.02, 0.13)	0.012*
Pediatrics	2.67 (0.19)	2.66 (0.19)	2.67 (0.17)	-0.01 (-0.07, 0.05)	0.71
Ob/Gyn	2.65 (0.19)	2.63 (0.19)	2.68 (0.19)	0.05 (-0.007, 0.11)	0.086*
Psychiatry	2.74 (0.17)	2.73 (0.15)	2.76 (0.13)	0.02 (-0.02, 0.06)	0.37
Surgery	2.63 (0.18)	2.63 (0.17)	2.63 (0.19)	0.009 (-0.04, 0.06)	0.72

¹Linear Regression adjusting for age, gender, race, graduating class, MCAT and Step 1 scores. Values presented are mean with standard deviations for clerkship evaluation scores, on a scale from 0 to 3.

Shelf Scores

Shelf	Overall N=241	No Rural Sites N=177	Yes Rural Sites N=64	Beta (95% CI) ¹	p-value
Family Medicine	77.0 (7.01)	76.7 (6.95)	77.8 (7.17)	1.20 (-0.92, 3.33)	0.27
Internal Medicine	77.4 (7.38)	77.3 (7.82)	77.4 (6.01)	0.61 (-1.65, 2.87)	0.59
Pediatrics	78.9 (7.25)	78.5 (7.81)	79.7 (5.41)	1.27 (-0.93, 3.48)	0.26
Ob/Gyn	79.5 (6.92)	79.2 (6.95)	80.5 (6.82)	1.35 (-0.78, 3.49)	0.21
Psychiatry	82.6 (6.86)	82.4 (6.82)	83.2 (6.99)	0.62 (-1.46, 2.70)	0.56
Surgery	76.4 (7.34)	76.3 (7.63)	76.8 (6.53)	0.59 (-1.68, 2.88)	0.61
Emergency Medicine	75.3 (7.13)	75.4 (7.36)	75.2 (6.48)	0.05 (-2.74, 2.83)	0.97
Neurology	80.3 (6.20)	80.2 (6.65)	80.6 (4.75)	0.67 (-1.72, 3.05)	0.58

¹Linear Regression adjusting for age, gender, race, graduating class, MCAT and Step 1 scores. Values presented are shelf scores with standard deviations.

Table 2 summarizes core clerkship evaluations and shelf scores for both groups of students, with calculated beta for regression and p-values for these beta calculations.

Notable is the evaluations for Internal Medicine clerkship, in which there was a statistically significance in the positive regression from the mean in evaluation scores for students with rural Internal Medicine rotation sites compared to their colleagues in traditional urban setting for Internal Medicine (beta 0.07, $p=0.012$).

And while OB/Gyn clerkship does not show a p-value of statistical significance, a similar positive regression is observed (beta 0.05, $p=0.086$).

Table 3. Comparison of student performance relative to total number of rural sites. Clerkship Evaluation Scores

Total # of Rural Sites	0 N=177	1 N=46	2 N=12	3 or more N=6	Beta (95% CI) ¹	p-value
Family Medicine	2.79 (0.19)	2.78 (0.22)	2.82 (0.12)	2.78 (0.21)	-0.002 (-0.04, 0.03)	0.92
Internal Medicine	2.62 (0.19)	2.67 (0.19)	2.70 (0.14)	2.68 (0.16)	0.05 (0.009, 0.08)	0.014*
Pediatrics	2.67 (0.19)	2.67 (0.16)	2.65 (0.19)	2.70 (0.27)	-0.009 (-0.05, 0.03)	0.60
Ob/Gyn	2.65 (0.19)	2.68 (0.19)	2.65 (0.23)	2.68 (0.13)	0.03 (-0.01, 0.06)	0.19
Psychiatry	2.74 (0.17)	2.76 (0.13)	2.80 (0.13)	2.76 (0.15)	0.007 (-0.02, 0.03)	0.59
Surgery	2.63 (0.18)	2.64 (0.18)	2.56 (0.21)	2.70 (0.13)	0.006 (-0.03, 0.04)	0.74

¹Linear Regression adjusting for age, gender, race, graduating class, MCAT and Step 1 scores. Values presented are mean with standard deviations for clerkship evaluation scores, on a scale from 0 to 3.

Shelf Scores

Total # of Rural Sites	0 N=177	1 N=46	2 N=12	3 or more N=6	Beta (95% CI) ¹	p-value
Family Medicine	76.7 (6.95)	77.7 (7.24)	80.7 (5.12)	73.0 (8.21)	0.49 (-0.94, 1.93)	0.50
Internal Medicine	77.3 (7.82)	77.9 (5.93)	73.7 (5.09)	80.3 (6.65)	0.37 (-1.19, 1.94)	0.64
Pediatrics	78.5 (7.81)	80.2 (5.16)	78.2 (6.57)	78.0 (5.47)	0.51 (-0.99, 2.02)	0.51
Ob/Gyn	79.2 (6.95)	80.4 (6.55)	80.2 (6.33)	81.4 (11.0)	0.86 (-0.57, 2.29)	0.24
Psychiatry	82.4 (6.82)	83.4 (6.76)	81.9 (7.09)	83.4 (10.1)	0.24 (-1.15, 1.64)	0.73
Surgery	76.3 (7.63)	77.2 (6.88)	75.8 (5.04)	74.8 (6.09)	0.03 (-1.50, 1.56)	0.97
Emergency Medicine	75.4 (7.36)	74.4 (6.46)	80.2 (5.35)	74.0 (6.37)	0.33 (-1.50, 2.16)	0.72
Neurology	80.2 (6.65)	79.9 (4.53)	81.6 (5.32)	84.0 (5.29)	0.98 (-0.58, 2.56)	0.22

¹Linear Regression adjusting for age, gender, race, graduating class, MCAT and Step 1 scores. Values presented are shelf scores with standard deviations.

Table 3 compares core clerkship evaluations and shelf scores in students without rural rotations to those with one, two, three or more rural rotations during Year 3 and Year 4.

Notable is the significant difference in the positive regression from the mean evaluation scores in Internal Medicine rotation with more rural rotations (beta 0.05, $p=0.014$).

Conclusion

Our findings demonstrate that medical students who participate in rural clinical rotation sites are not academically disadvantaged compared to their counterparts in urban clinical settings. Specifically, we have shown that in 3 consecutive cohorts of students at the University of Arizona, College of Medicine, Phoenix, all with similar undergraduate GPA, MCAT, STEP 1, as well as Year 1 and Year 2 block scores (to suggest academic comparability at baseline), achieved similar evaluations and shelf scores in Year 3 and Year 4.

Summary

This study serves evidence that rural-based medical education is effective. It is also encouraging that students participating in rural settings are at least not disadvantaged in comparison, and hopefully serves as to promote rural health professions program and its efficacy in preparing medical students to succeed.

Acknowledgements

I wish to thank my mentor Dr. Jonathan Cartsonis for his guidance, as well as Dr. Stapczynski for his support. I would also like to thank Paul Kang for serving as our data manager and his major contribution in data analyses.