

Outcomes of a Preclinical Rural Medicine Elective at an Urban Medical School

William J. Crump, MD; R. Steve Fricker, MPA; Craig H. Ziegler, MA

Background and Objectives: *The University of Louisville School of Medicine Trover Campus (ULTC) was established in rural west Kentucky in 1998 with the purpose of increasing the number of rural physicians. Utilizing the affinity model, a primary goal of the ULTC is to encourage rural students to pursue a medical education and return to rural Kentucky for practice. One aspect of this geographically separate clinical campus includes a Rural Medicine Elective (RME) offered during the basic science years. We report here the effect of the RME on student opinions and knowledge concerning rural practice, as well as initial effects on specialty and rural practice choice. Methods: Opinion responses and knowledge on a written exam using a pre-RME and post-RME survey for the 2004–2009 classes were analyzed. Pre-RME opinion items were examined descriptively (n=36). Pre- and post-opinion responses (n=23) and summation scores of 11 domains on exam questions (n=50) were compared using the Wilcoxon Signed Rank test. The proportion of students choosing family medicine and subsequent practice site choice were also measured. Results: RME student opinions about rural practice indicated improved agreement with information as presented in the course material. Similarly, on 11 knowledge examination summation scores, pre- and post-exam results showed significant increases in 10 domains. The pre-test answers provided an interesting baseline of beliefs. RME students were far more likely to choose family medicine than their classmates, and initial results show an increased likelihood of subsequent rural practice. Conclusions: The initial outcomes of the RME are encouraging and indicate such an elective can maintain positive opinions about rural practice among rural students attending an urban medical school. The RME is also successful in increasing students' knowledge about rural practice and may maximize the likelihood that they will choose rural practice.*

(Fam Med 2010;42(10):717-22.)

The problem of physician maldistribution has resulted in many rural areas remaining underserved despite the recent slight increase in production of primary care physicians.¹ Many educational strategies have been considered to address this issue, with the most popular being the optimum implementation of the “affinity” model.² Essentially, this concept asserts that the most effective way to produce rural physicians is to admit medical students from rural backgrounds that show interest in returning to similar environments and support them in this decision throughout their education. Because so much of their time in college and medical

school is spent in non-rural areas, this strategy includes methods of minimizing the negative effects of “urban disruption.” This disruption occurs as the rural students become accustomed to big-city amenities and meet friends and future spouses who have urban roots.

A recent review summarized the various methods that have been reported to maximize the affinity model. These have included targeted rural admissions, exposure to rural issues and role models during the preclinical years, regional clinical campuses based in smaller communities, and rural residency training.³ In Kentucky, the problem of rural underserved is especially acute, with almost 60% of counties designated as Health Profession Shortage Areas (HPSAs). Studies from both traditional medical schools in the state support the applicability of the affinity model.^{4,5}

To address this issue, the University of Louisville School of Medicine (ULSOM) in 1998 established a regional rural campus in Madisonville, a town of 20,000

From the University of Louisville School of Medicine, Trover Campus, Madisonville, KY (Dr Crump and Mr Fricker); and University of Louisville School of Medicine, Health Science Campus, Louisville, KY (Mr Ziegler).

that is 150 miles southwest of Louisville. The Trover Foundation, an integrated health system with a large multi-site multispecialty clinic and a regional tertiary care hospital, was the partner in this effort. Trover had been involved in rural education in Madisonville since 1954, hosting the first family practice residency in the state and providing a site for the required M-3 surgery clerkship since the mid-1970s.⁶

During the study period, the Trover Campus accepted up to 12 rising M-3s from each year's total ULSOM class of 135. Candidates applied during the M-2 year, interviewed, and some were selected to move to Madisonville for all of their M-3 and M-4 rotations. Summaries of patient logs, evaluations, and test scores have shown that the Trover Campus students' performance mirrors the students who remain in Louisville.⁷ To keep rural students interested during their preclinical years, the Madisonville AHEC had hosted 4-week summer sessions including a stipend and housing for rising M-1 and M-2 ULSOM students since 1993.^{8,9,10}

In the early years of these programs, it was discovered that many rural M-1 and M-2 students who had demonstrated interest by attending the summer programs were not returning to Madisonville for subsequent programs. This made it increasingly difficult to fill the M-3 class with rural students. Feedback from the students who chose not to return revealed that once in the urban Louisville environment they were making new relationships, sometimes committing to long-term housing, and perhaps hearing negative things about rural practice.⁷ To continue to keep the rural students interested in returning to a rural area for training and practice, it became clear that an activity during the school year was necessary. This understanding resulted in the development of a Rural Medicine Elective (RME) as a way to maintain interest among rural preclinical students at the downtown Louisville campus. The curriculum components and outcomes of the first few students were reported previously.¹¹ This report provides longer-term outcomes and a replicable structure for educators with similar interests.

Previously reported efforts to maintain student interest in rural health include summer activities such as the University of Washington Rural/Underserved Opportunities Program (R/UOP), which is a 4-week rural experience between the M-1 and M-2 year¹² and the Illinois Rural Medical Education (RMED) program that provides a rural health curriculum across all 4 years of medical school.¹³ The Duluth program of the University of Minnesota includes preceptorships during the M-1 and M-2 years for rural students who then move to Minneapolis for their clinical years.¹⁴ One effort placed M-1 students in communities for a 3-day preceptorship and found that the experience had little effect on interest in rural practice.¹⁵

Our study adds to this literature by reporting a longitudinal intervention across an entire preclinical academic year that brings the rural content to the urban medical school environment.

Methods

A pre- and post-prospective study was used to answer our specific research questions of whether an elective experience taught to rural students in an urban environment across a 9-month period can (1) assess student opinions about rural practice and correct inaccurate opinions and (2) increase student knowledge about important rural practice issues. Ideally, the long-term effect of this educational intervention should be measured by (3) rural practice and specialty choice. Because of the long time period needed to answer this last question in large numbers, we assessed this only initially, using historical controls of the entire classes of both allopathic schools in the state.

Description of Program and Opinion/Exam Questions

M-2 students at ULSOM are required to complete 32 contact hours of electives, usually done during the second semester. A wide variety of options are available, including traditional lectures and credit for time spent working in student-led free clinics. The rural medicine elective was begun in 2000 and qualifies for 16 of these contact hours. Any student can choose the RME, but almost all who do are from rural backgrounds.

The associate dean of the Trover Campus (WJC, a practicing rural family physician himself) acted as the course director. Each month during the school year, he traveled to Louisville and facilitated a 2.5-hour evening session that included an informal meal. A different rural physician served as the visiting professor in each session, selected based on their knowledge of the night's topics, coordinated by the Kentucky Academy of Family Physicians. The discussion was framed by a practice scenario followed by a list of questions that were provided to the students in advance (available from the authors). Each student selected two topics of interest and was the "expert" for the night. The visiting professor then provided a commentary on the students' presentations. Students' and speaker's spouses or significant others were invited to attend.

A basic topic list for the RME was established first from a text¹⁶ and then refined by discussions with students listing the most common myths they had heard about rural practice. This list was used as both a guide for curriculum and as the basis of a pre- and post-knowledge test. Rather than develop and test a new opinion measure, a previously published measure was adapted to this use.¹⁵ This 21-question, 6-point Likert scale was anchored with "Very Unlikely" and "Very Likely." Cronbach's Alpha for the 21-item instru-

ment on this sample was deemed adequate, $\alpha=0.72$. An identical 44-item true/false knowledge exam was completed at the first and last session each year, and written evaluations were completed at the end of each year. The 44 items addressed 11 domains applicable to rural practice where each domain was made up of four questions. Go to http://www.stfm.org/fmhubs/fm2010/November/Crump_Appendix1.pdf for an appendix that displays the 11 domains, the 44 knowledge exam questions, and their correct responses. The correct responses on the four questions associated with each domain were tabulated for each student creating 11 summation correct domain scores where the student's scores could range from 0 (no correct responses) to 4 (all correct responses).

At the first session each year, the opinion measure instrument¹⁵ was administered to provide a baseline needs assessment of the current class. As an opinion posttest, the same scale was administered at the last session each year for three classes. Pretest and posttest data for the graduating classes of 2004, 2005, and 2007 were available for the opinion survey ($n=23$) while data for the knowledge test were available for the Classes 2004 through 2009 ($n=50$). Practice site location was determined by matching physician's location of practice as reported to the Kentucky Medical Association against the ULSOM residency match lists for Class of 2003 through 2006.

Data Analysis

SPSS (SPSS, 2010) v18.0 was used to analyze the data after initially being entered into Microsoft Excel v2003 spreadsheets. Descriptive statistics of the pretest opinion Likert-scaled survey were calculated. Pretest and posttest data of the five most pertinent items on the opinion Likert scale and the 11 summation correct domain scores were analyzed using the Wilcoxon Signed Rank Exact test. A total correct item score was also calculated for all 44 exam items and a pretest and posttest comparison of the mean scores were performed using a paired t test. All tests were two-tailed and alpha levels set at convention, $P \leq .05$.

The study was reviewed by the University of Louisville Institutional Review Board and determined to be exempt.

Results

Ninety-eight percent of students participating in the RME were from rural towns, and 96% were Kentuck-

ians. Four were married at the time of the elective, and one had a child. Seventy-four percent were men.

Table 1 shows the pre-course items in the opinion survey,¹⁵ where their means were ranked in descending order from "Very Likely" to "Very Unlikely." Opinions on most of the 21 baseline items were considered accurate based on the material taught in the course. Five items were not, and the wording was reversed on some, with the result that two means were expected to increase after the course, and two would be expected to decrease. One inaccurate opinion regarding the question of whether physicians in rural areas have access to continuing medical education was not addressed in the course and was included as a control item. The pre- and post-course means on these five items are shown in Table 2, and the differences for all but the control question are significant and in the expected direction.

Table 3 shows the comparison of the pre and post-11 summation correct domain scores and the total summation score of all 44 items. The table indicates that students experienced a statistical significant increase in 10 domains, $P \leq .05$. Question 4 did not show a difference because most of the students knew this content well prior to the course, as shown in the pre-test answers.

The correct answers were those in the literature at the time as presented in the course, even as the correct

Table 1

Descriptive Statistics on Baseline Opinion Items ($n=36$)

<i>Physicians in Rural Areas:</i>	<i>Mean</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
Can make a positive difference in health	5.61	0.49	5	6
Have employment opportunities	5.47	0.70	3	6
Are involved in community activities	5.36	0.80	3	6
Are expected to be involved in the community	5.36	0.72	3	6
Are respected by their communities	5.33	0.59	4	6
Know most people in their communities	5.17	0.65	4	6
Are often contacted by patients after regular hours	5.06	0.63	4	6
Are often on-call	5.03	0.74	4	6
Have hospital privileges	5.03	0.74	3	6
Are responsible for helping with social problems	4.89	0.85	3	6
Have comfortable offices	4.81	0.75	3	6
Work more hours per week	4.78	0.76	3	6
See more patients daily	4.75	0.73	3	6
Have competent support staff	4.58	0.69	3	6
Have opportunities for professional interaction	4.58	0.73	2	6
Have access to continuing medical education	4.53	1.00	2	6
Have access to medical consultants	4.47	0.77	2	6
Have to do more paperwork	4.28	0.88	2	6
Earn incomes within the national average	4.22	1.12	1	6
Have access to advanced medical technology	4.08	1.00	1	6
Can easily schedule vacation time	3.28	0.85	1	5

SD—standard deviation

Table 2

Student Responses, Mean, and SD on the Opinion Items Before and After the Rural Medical Elective Course

<i>Physicians in Rural Areas:</i>		Very Unlikely						Very Likely		P Value*
		1	2	3	4	5	6	Mean	SD	
Q2. Earn incomes within the national average	Pre	1	0	2	8	10	2	4.39	1.08	.02
	Post	0	0	2	2	13	6	5.00	0.85	
Q12. Are often contacted by patients after regular hours	Pre	0	0	0	4	16	3	4.96	0.56	.02
	Post	0	0	3	11	5	4	4.43	0.95	
Q13. Are often on-call	Pre	0	0	0	9	10	4	4.78	0.74	.05
	Post	0	0	2	13	6	2	4.35	0.78	
Q14. Can easily schedule vacation time	Pre	0	2	10	9	2	0	3.48	0.79	.05
	Post	0	3	2	11	7	0	3.96	0.98	
Q15. Have access to continuing medical education	Pre	0	1	1	5	13	3	4.70	0.93	.56
	Post	0	0	2	10	8	3	4.52	0.85	

* P value based on Wilcoxon Signed Ranked Test comparing before and after responses.

answers changed year to year as state and federal policy and practice changed. Predictably, the pretest correct percentages were the lowest for items of practice management, and many traditional myths (eg, most emergency departments are staffed by emergency medicine board-certified physicians) were represented in these students' responses.

Comments on the students' evaluations included that they liked the relaxed atmosphere, "real world" discussions, and enthusiasm of the visiting professors. They did not like the evening time slot but expressed understanding that this allowed the rural physicians to attend while minimizing time away from practice. Several expressed interest in more rural field experiences.

Ultimately, the long-term outcome of interest is the decision for specialty and rural practice. Thirty-nine percent (25/65) of RME students from the Classes of 2003 through 2009 chose family medicine compared to 7.7% (85/1,103) of the entire ULSOM in the same period. Because of the 7–9 year delay before final practice site is known, the data set for this variable reported here is small, but 29% (7/24) of these RME students have chosen rural Kentucky practice, compared to 20% of the entire ULSOM during this time period.¹⁷ Because the RME could have just collected those already inclined to rural practice rather than positively affecting their choice, a historical comparison was made. Comparing time periods just before and after the RME was begun, the total ULSOM grads establishing rural practice in Kentucky increased from 19% to 21% while the other allopathic medical school in the state decreased from 33% to 28% during the same time periods.¹⁷ During the time period studied, former RME students represented 6% of all ULSOM graduates establishing practice.

Discussion

The affinity model would support that providing experiences for medical students from rural areas in pleasant rural areas with positive role models would have the most powerful effect on maintaining interest during urban medical school training. Given the packed schedules of preclinical students, these experiences are largely confined to summer activities. This elective is intended to keep the existing interest high and minimize urban disruption during the preclinical years.

Our initial results support that an elective experience like this can (1) assess student opinions about rural practice and correct inaccurate opinions among rural students attending an urban medical school and (2) provide knowledge about rural practice to these students that is stable for at least the 9 months across the academic year between the pre- and post-knowledge test measures. The data set is too small to prove our third hypothesis conclusively, that this elective can (3) maximize choice of rural practice and family medicine specialty choice in this group of students. The initial results do support this hypothesis though, within the limitations of our design.

The practicalities of medical education dictated some limitations on our ability to be more confident of our findings. An ideal arrangement would have been to randomize rural students with an interest in rural practice, stratified by important demographics, to either the RME or a control group, a study unlikely to occur. The lack of detailed demographics including just how "rural" these rural students were also limits our ability to do a multivariate analysis that might reveal the effects of all the important variables. As part of the larger Trover Campus multiple rural pathways

Table 3

Comparison of Pre-Count Versus Post-Count of Summation Correct Domain Scores and Overall Total Test Score (n=50)

		0	1	2	3	4*	Mean	SD	P Value‡
1. Which of the following are true concerning Medicare coverage?	Pre	0	4	11	25	10	2.82	0.85	<.001
	Post	0	0	1	12	37	3.72	0.50	
2. Which of the following are true concerning Medicaid coverage?	Pre	1	2	3	20	24	3.28	0.90	.004
	Post	0	0	2	10	38	3.72	0.54	
3. Which of the following are true concerning rural health clinics?	Pre	2	10	16	13	9	2.34	1.12	<.001
	Post	0	1	4	12	33	3.54	0.73	
4. Which of the following are true concerning residency training for rural practice?	Pre	0	1	1	10	38	3.70	0.61	<.819
	Post	0	1	2	9	38	3.68	0.65	
5. Which of the following are true concerning maternity care in rural practice?	Pre	9	8	17	12	4	1.88	1.21	.002
	Post	2	6	15	14	13	2.60	1.12	
6. Which of the following are services commonly provided by rural health departments?	Pre	5	0	15	8	22	2.84	1.28	<.001
	Post	0	0	0	4	46	3.92	0.27	
7. Which of the following are true concerning rural mental health?	Pre	5	1	8	14	22	2.94	1.27	.001
	Post	0	0	5	9	36	3.62	0.67	
8. Which of the following statements concerning physician extender practice in Kentucky are true?	Pre	1	6	8	26	9	2.72	0.97	.001
	Post	0	1	8	18	23	3.26	0.80	
9. Which statements are true concerning rural hospitals?	Pre	0	7	14	27	2	2.48	0.79	<.001
	Post	0	0	9	22	19	3.20	0.73	
10. Which statements are true concerning rural scholarships and loans?	Pre	7	11	19	11	2	1.80	1.07	<.001
	Post	2	1	13	21	13	2.84	0.98	
11. Which statements are true concerning emergency care in rural areas?	Pre	5	11	15	10	9	2.14	1.25	<.001
	Post	0	0	2	16	32	3.60	0.57	
Summation score of all 44 items**	Pre						28.94	4.52	<.001#
	Post						37.70	2.38	

* Scores ranges from 0 through 4 reflecting the number of items students got correct out of the 4 possible questions within each domain

** Score ranges from 0 through 44

‡ P value based on Wilcoxon Signed Ranked Exact test for all 11 domain summation scores

P value based on paired-sample t test

programs review, these detailed demographics are now being collected both retrospectively and prospectively, and this analysis will be done.

The practicalities of medical education also dictated the other primary limitation of our study, that of small sample size. One always must balance strict methods of correcting for multiple measures to avoid a type 1 error (finding a difference when none actually exists because of testing too many variables) against correcting so cleanly for multiple measures that one makes a type 2 error (missing a difference because of small sample size when one actually exists). For example, in Table 2 a strict methodologist could say that use of the Bonferroni correction is appropriate, meaning that the *P* value should be $.05/5 = .01$. Based on an average pre-score of 4 and post-score of 4.5 (the difference of 0.5 being chosen as a practically meaningful effect) we would need 28 cases to achieve 80% power based on alpha of 0.05. For an alpha of .01, we would have needed 42 cases.

We chose not to make that correction, risking type 1 error to avoid type 2 error because of the potential educational value of the elective and the fact that each question with at least a .05 significant difference reached the effect size we chose. The same argument could be made for Table 3, but even if a Bonferroni correction is placed on the alpha level, nine of the 10 domain questions remain statistically significant. This makes us more confident in our conclusions from Table 3.

The weakest part of our analysis is the effect on choice of rural practice and family medicine specialty because of the confounding of pre-selection bias, meaning that the students most likely to make these choices may have been simply attracted to the RME, and it was not the RME that made a difference. However, the historical control group did show that something happened during the time period that the RME was begun that resulted in more ULSOM students choosing rural practice at a time that the other allopathic medical

school in Kentucky showed a decrease. Further detailed data collection to illuminate what occurred during this period is underway now.

Also, the typical limitations of any such educational interventions apply here, including generalizability and stability of the findings. Replication at other medical schools is necessary, and the RME materials are packaged in such a way to be easily shared with other educators to allow this replication. Stability is perhaps best measured by rural practice choice and then retention in a rural practice. This cohort of students is now tracked annually to provide the long-term data needed, and other medical schools who have similar models can add to these data.

The dilemma for rural medical educators can be summarized in the often heard lament: "Rural docs see sicker, poorer patients, work more hours, and earn less."

Many publications dwell on these issues, often as a way to bring policy makers' attention to our needs.¹⁶ However, this may have a negative effect on our students' views of what is most needed to provide health care for rural people. The strategy of this elective was to acknowledge the partial truth of this statement and reframe reality as a challenge rather than as an assignment to mediocrity.

For instance, once the students heard that cost-based reimbursement applied in Rural Health Clinics and rural Federally Qualified Community Health Centers could actually minimize the negative financial effects on both doctor and patient, they were very interested to know the details. Once they heard that "more hours seeing patients" was about 3–4 per week¹⁸ and that their urban counterparts easily spent this much time commuting, one could watch the opinions change. And although the rural to suburban salary differences may actually be less than \$10,000 per year, it is still true, although the discrepancy is decreasing.¹⁸ This can easily be reframed by asking students to use their own experiences growing up in small towns versus what they are paying now to make the point that the cost of living difference may be as much as \$20,000 per year.

Our initial outcomes are encouraging, with evidence that an elective experience like this can make a difference. However, much more study is needed, and the Trover Rural Track provides a cohort of students who have been exposed to a series of focused, longitudinal, and comprehensive educational interventions intended to result in more rural physicians. With a matched control group from the remainder of the ULSOM class, a more careful analysis of the effect of each portion of the multi-step pathways process may guide policy makers to place resources where they can have the largest

effect. As primary care practice in underserved areas receives more policy attention than it has in the last 15 years, there is cause for optimism.

Acknowledgments: This effort would not have been successful without the assistance of the Kentucky Academy of Family Physicians and the time and enthusiasm of its rural members. Key representatives from state health offices also volunteered their time, and Ms Pam Carter managed all the multiple data collections. We sincerely appreciate the assistance of Diane Maxey of the Kentucky Medical Association data office in identifying graduates' practice sites.

Corresponding Author: Address correspondence to Dr Crump, ULSOM Trover Campus, 200 Clinic Drive, 3rd Center East, Madisonville, KY 42431. 270-824-3515. Fax: 270-824-3590. wcrump@trover.org.

References

1. Blackman JR. Predoctoral education for rural practice. In: Geyman JP, Norris TE, Hart LG, eds. Textbook of rural medicine. New York: McGraw-Hill, 2001:359-67.
2. Crandall LA, Dwyer JW, Duncan RP. Recruitment and retention of rural physicians: issues for the 1990s. *J Rural Health* 1990;6:19-38.
3. Geyman JP, Hart G, Norris TE, Coombs JB, Lishner DM. Educating generalist physicians for rural practice: how are we doing? *J Rural Health* 2000;16:56-80.
4. Elam CL, Rosenbaum ME, Johnson MMS. Geographic origin and its impact on practice location in Kentucky. *J Ky Med Assoc* 1996;94:446-50.
5. Looney SW, Blondell RD, Gagel JR, Pentecost MW. Which medical school applicants will become generalists or rural-based physicians? *J Ky Med Assoc* 1998;96:189-93.
6. Polk HC. Can AHES really influence the distribution of physicians? *J Med Educ* 1977;52:633-8.
7. Crump WJ, Barnett D, Fricker S. A sense of place: rural training at a regional medical school campus. *J Rural Health* 2004;20(1):80-4.
8. Crump W, McCall L, Phebus C, England L. The Rural Health Career Pipeline Program. Report of a pilot project, summer, 2000. *Ky Acad Fam Physician J* 2001;47:16-8.
9. Brooks B, Crump B, Martin D. Community assessment using the Key Informant Method: a snapshot of some rural communities from the perspective of community leaders. *J Ky Med Assoc* 2000;98:27-30.
10. Todini CR, Crump WJ. Building a regional clinical campus: experience with preclinical students. *Fam Med* 1999;31(1):6-7.
11. Crump WJ, Moore AC. Experience with a rural medicine elective for preclinical medical students at an urban medical school. *Journal of the Kentucky Academy of Family Physicians* 2004;50(1):9-14.
12. Hunt D, Norris T, Ballweg R. The University of Washington WWAMI Program: 25 years of experience with manpower shortages in rural areas. *Aust J Rural Health* 1995;3:152-8.
13. Stearns JA, Stearns MA, Glasser M, Londo RA. Illinois RMED: a comprehensive program to improve the supply of rural family physicians. *Fam Med* 2000;32(1):17-21.
14. Boulger JG. Family medicine education and rural health: a response to present and future needs. *J Rural Health* 1991;7:105-15.
15. Lynch DC, Willis SE. Can a 3-day preceptorship change first-year medical students' opinions about living and working in small towns? *Fam Med* 2000;32(6):495-500.
16. Geyman JP, Norris TE, Hart LG, eds. Textbook of rural medicine. New York: McGraw-Hill, 2001.
17. Kentucky Medical Association Data Management Office, provided March and April, 2010.
18. Weeks WB, Wallace AE. Rural-urban differences in primary care physicians' practice patterns, characteristics, and incomes. *J Rural Health* 2008;24:161-70.