Residency Education

The University of Missouri Integrated Residency: Evaluating a 4-year Curriculum

Erika Ringdahl, MD; Robin L. Kruse, PhD, MSPH; Erik J. Lindbloom, MD, MSPH; Steven C. Zweig, MD, MSPH

Background and Objectives: *Several approaches to merging residency training and medical school education have been attempted over the past 20 years. This study describes and evaluates an integrated family medicine residency program—a 4-year program that overlaps with the final year of medical school.* Methods: *We retrospectively analyzed multiple data sources, including In-Training Examination scores, patient visit profiles, resident demographics, and graduate surveys.* Results: *Integrated residents (IRs) perform significantly better than traditional residents on In-Training Examinations at each year of residency training, with the difference in mean scores decreasing over time (67.8, 39.6, and 33.0 points better in the first, second, and third residency years). No evidence of increased patient continuity or panel size was noted. A higher proportion of IRs serve as chief residents, rate their residency experience as "excellent," and remain with the program through graduation. Practice characteristics immediately after residency do not significantly differ. Financial benefits are evident for the IRs as well as the hosting department.* Conclusions: *This integrated program offers several benefits for both the medical student and the residency program, and it is a potential model for academic residencies aiming to recruit and retain a higher percentage of their own schools' students.*

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During the past decade, there has been a decline in American medical students' interest in entering family medicine residency programs.[1] In response to a similar decline in student interest during the late 1980s, the American Board of Family Practice approved the first "accelerated residency program" at the University of Kentucky in 1989.[2] Medical students in this program combined their fourth year of medical school with their first year of residency training, completing medical school and residency in 6 years instead of 7. Evaluation of this program and other subsequent accelerated programs found better standardized test performance, equal or better clinical performance, and a higher percentage of participants becoming chief residents compared to traditional residents.[3,4] Taking a different approach to combining medical school and residency training, the University of Nebraska began a 4-year primary care program in 1989 that evolved into a 4-year rural training program.[5,6]

In 1992, the Department of Family and Community Medicine at the University of Missouri (MU) created a 4-year Integrated Residency Program. Its goal was to recruit outstanding MU medical students who had completed the third year of medical school into a fully integrated 4-year program that would result in eligibility for board certification in family medicine. The goal of this program was not to shorten the course of residency training but rather, to better use the fourth year of medical school for students who were interested in family medicine and committed to staying at MU. These students enroll in the National Residency Match Program (NRMP) and still complete 3 years of residency training after medical school graduation, but they are ranked at the top of MU's Match list assuming they achieve satisfactory performance during their fourth year of medical school.

Although this program is viewed locally as advantageous for both students and the residency program, a rigorous evaluation of the program had not been

From the Department of Family and Community Medicine, University of Missouri.

completed. As part of its inclusion in the Preparing the Personal Physician for Practice (P4) Initiative, the department planned both a retrospective and prospective analysis of the Integrated Residency Program.[7] The retrospective study of resident profiles, practice characteristics, and standardized test performance is described in this report.

Methods

Participants and Setting

Students who are confident of their desire for a career in family medicine, and who know they wish to stay at MU for residency training, are encouraged to apply to the Integrated Residency Program in the spring of their third year of medical school. Applicants submit their curriculum vitae, scores on Step 1 of the United States Medical Licensing Examination (USMLE), personal statement, and a transcript release prior to their interviews. Approximately 90% of applicants are accepted, and two to seven students have enrolled in the program annually since 1992. Residency class size at MU is 12 per year.

Curriculum Design

Integrated Residents (IRs) begin their fourth year of medical school by participating in residency orientation with the incoming traditional first-year residents and subsequently attend the weekly family medicine grand rounds conferences and 1 half day per week of resident seminars. They also spend 1 or 2 half days per week in one of our four family medicine centers during the fourth year of medical school. During the first 6 months, IRs see patients with a faculty member who models patient-centered care in a medical home. In the second 6 months, an IR is paired with a third-year resident, with the intent of assuming care for that graduating resident's patients. The IRs receive medical school credit for this longitudinal clinical experience.

During the fourth year of medical school, they also may fill a first-year resident position on the family medicine inpatient service, family medicine maternity care service, pediatric inpatient service, and emergency medicine rotation. Their prescriptions, orders, and notes must be cosigned by a second- or third-year resident. By incorporating many of the experiences of first-year family medicine residents into the fourth year of medical school, the rigors of the "intern" year are decompressed over 2 years, and IRs can use their extra elective time to tailor their training to their individual needs.

The program provides financial support to each IR, approximating the cost of the fourth year of medical school tuition. This support was initially split between University of Missouri Healthcare and the Department of Family and Community Medicine. However, as student interest has waned in family medicine across the country, the department has significantly increased its financial stake in the program to allow for growth in the number of IRs filling our residency slots.

Data Collection and Analysis

This study was approved by the University of Missouri Institutional Review Board. We performed three comparisons of In-Training Examination scores—across years within each group (IRs or traditional residents), between IRs and traditional residents in the same year of residency training (excluding the integrated year) and between IRs and traditional residents in the same year of exposure to the residency curriculum (for example, IRs in the fourth year of medical school versus traditional residents in the first year of residency). We also compared USMLE Step-1 scores to assess standardized test performance prior to enrollment in the residency. All test result data were normally distributed, and we used *t* tests for independent means for these comparisons.

We obtained data on the average monthly number of ambulatory patient visits for each resident in our program as of March 2008, as well as the number of patients seen by the same resident for three or more visits. These measures were compared between IRs and traditional residents using *t* tests for independent means. We also used ambulatory visit data from fiscal year 2008 to estimate the financial value each resident contributes to the department.

Our residency graduates are surveyed every 3 years regarding perception of their residency experience and practice demographics. Because the first class of IRs graduated in 1996, surveys from 1998, 2001, 2004, and 2007 were included in the analysis. For residency perceptions and practice patterns, we used data from the earliest survey available for each resident. We used exit interview documentation and past Program Information Forms to collect data on first practice locations and resident attrition rates. Using SAS for Windows (Version 9.1), we compared demographic characteristics of IRs and traditional residents with chi-square analysis. For any contingency tables that contained any cells with expected counts less than five, we used Fisher's Exact Test.

Results

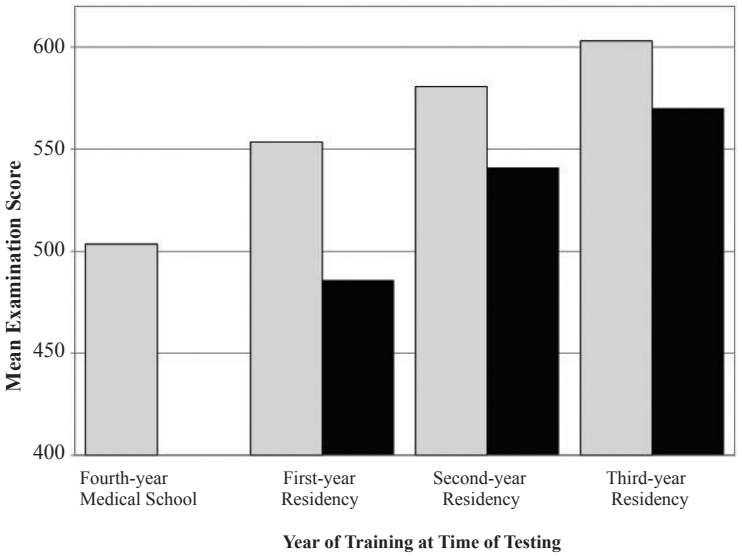
A total of 168 residents graduated from 1996 to 2008 or anticipate graduating in 2009 or 2010. Of this total, 40 have been IRs.

In-training Exam Scores

Figure 1 depicts the mean In-training Exam scores. Scores for IRs are significantly higher than traditional residents at each year of postgraduate training, with differences decreasing over time. In the first year of residency training after medical school graduation, the mean IR score was 67.8 points higher (553.6 versus

Figure 1

In-training Examination Scores, University of Missouri Residency Classes Graduating 1996–2010



Gray = Integrated residents
Black = Traditional residents
P<.05 for mean difference in first, second, and third years of residency.

485.8, *P*<.001). Over the next 2 years, the difference was 39.6 points (*P*=.02), and 33.0 points (*P*=.04). Although not statistically significant, the IRs also scored slightly higher than traditional residents in the same year of enrollment (that is, fourth-year medical student IR versus first-year traditional resident, first-year postgraduate IR versus second-year traditional resident, etc). Mean USMLE Step-1 scores were slightly higher for IRs, but this difference was not statistically significant either (224.7 versus 216.3, *P*=.15).

Practice Continuity and Panel Size

As a measure of practice continuity and panel size, Table 1 shows the total visits per resident month as well as the total number of patients seen more than three times. Although traditional residents had slightly higher total visits per month of residency (47.95) compared with IRs (44.52), the difference was not statistically significant (*t* test, *P*=.50). For each month in residency, IRs had more patients they had seen for three or more visits (2.71) compared with traditional residents (2.22). This difference was also not statistically significant (*t* test, *P*=.29).

Chief Resident Positions

IRs assume leadership positions at a higher rate than traditional residents. Twenty of 40 IRs have been elected as chief residents by residents and faculty, compared with 32 of 128 traditional residents (50% versus 25%, *P*=.005).

Attrition

To date, only one of our IRs has left the program, and this was due to family reasons. In contrast, our attrition rate for traditional residents over the same period of time was 12%, with 17 leaving for various reasons.

Match Rates

The IRs not only contribute to a lower attrition rate but a higher success rate in the residency Match. Both of these factors are associated with a financial benefit for the department. Since the IR program started 17 years ago, our program has not filled in the NRMP seven times. Six of those 7 years, we had two or fewer IRs. Every year when we had four IRs or more, we filled our residency slots.

Table 1

Comparison of Integrated Residents With Traditional Residents, Total Visits, and Patients Seen for Three or More Visits

Integrated Resident	*Number*	*Measure*	*Mean*	*Median*	*SD*
No	21	Total visits per residency-month	47.95	47.67	11.82
Yes	10		44.52	47.38	15.48
No	21	Patients seen 3 or more visits per residency-month	2.22	1.94	1.07
Yes	10		2.71	3.05	1.46

SD—standard deviation

Clinical Productivity

In fiscal year 2008, our residents in our outpatient teaching clinics generated an average of 767.5 relative value units (RVUs) per resident. Multiplying a 3-year average of 2,302 RVUs by $45.69 (last year's amount available for salary support per RVU after overhead) yields $105,197 in income to the department; this calculation does not include the costs of supervision by attending physicians.

Alumni Survey Results

Table 2 reviews the alumni survey results. At least one alumni survey was received from 98 graduates (58.3%). Response rate did not differ significantly by curriculum (55.0% of IRs, 59.4% of traditional residents, chi-square *P*=.62). Half of the IRs are men and half are women, and this does not differ from the traditional track (*P*=.6). IRs were more likely to rate their residency experience as "excellent," although this difference was not statistically significant (89% versus 54%, *P*=.07). Table 2 also highlights key responses that demonstrate no significant differences in first practice characteristics between IR graduates and traditional graduates. Apart from this information from graduate surveys, exit interviews reveal that the geographic locations of first practices differ between groups. Twenty-four of 30 (80%) IRs versus 67 of 118 (58%) traditional residents stayed in Missouri for their first practice (*P*=.03).

Discussion

The differences in examination results we found were similar to those reported in previous studies of "accelerated residencies" that condensed the medical school and residency timeframe, probably attributable to a more focused medical school experience and earlier interest in family medicine.[3,4,8] It is possible that IRs are academically stronger prior to enrollment in the program, but the difference in mean USMLE Step 1 scores was not statistically significant, and the magnitude of the difference was much smaller than the yearly differences in mean In-training Exam scores. Our higher representation of IRs among our chief residents is also consistent with a prior study.[4] Because our chief resi-

Table 2

Comparison of Integrated Residents to Residents in the Traditional Curriculum From the First Alumni Survey Completed Following Residency Graduation

	Number of Surveys	***Number Choosing Response/ Number Who Responded (%)***		
Variable	*(# missing)**	*Traditional*	*Integrated*	*P Value*
Expressed need for more training				
Adult inpatient	76 (0)	2/61 (3.3)	2/15 (13.3)	.17
Procedural skills	76 (0)	12/61 (19.7)	1/15 (6.7)	.44
Not well prepared				
Adult inpatient	47 (7)	3/32 (9.4)	0/8 (0.0)	1.0
Adult outpatient	47 (1)	0/36 (0.0)	1/10 (10.0)	.2
Routine inpatient obstetrics	47 (9)	3/30 (10.0)	1/8 (12.5)	1.0
Rated residency training as excellent†	47 (1)	20/37 (54.0)	8/9 (88.9)	.07
Located >30 miles to metropolitan area	70 (0)	19/54 (35.2)	4/16 (25.0)	.44
Any obstetrics since residency	98 (0)	29/76 (38.2)	5/22 (22.7)	.18
Currently doing obstetrics	98 (0)	25/76 (32.9)	4/22 (18.2)	.18
Other practice characteristics				
See nursing home patients	98 (0)	30/76 (39.5)	8/22 (36.4)	.79
Academic practice	98 (0)	6/76 (7.9)	1/22 (4.6)	1.0
Within a health professional shortage area	98 (0)	3/76 (4.0)	2/22 (9.1)	.31
Rural	98 (0)	19/76 (25.0)	5/22 (22.7)	.83
Care for hospital inpatients	98 (0)	42/76 (55.3)	12/22 (54.6)	.95
Teach medical students	98 (0)	41/76 (54.0)	12/22 (54.6)	.96
Teach residents	98 (0)	24/76 (31.6)	6/22 (27.3)	.70
Perform colposcopy	98 (0)	12/76 (15.8)	7/22 (31.8)	.12

* Number of surveys differs because not all surveys contained the same items.
† Compared to good

dents are elected by residents and faculty, this was not a particularly surprising finding given the increased visibility and experience that the extra year provides.

Regarding satisfaction with the residency experience, there was a trend for IRs to more favorably rate their training (P=.07). We were pleased to learn that increasing the duration of time with the program was associated with positive perceptions of their experience since IRs occasionally express some early frustration. They are definitely aware of working harder than most of their fourth-year peers in medical school and experience occasional role confusion between "IR" rotations and "medical school" rotations. Although they function as residents in many respects, they also must have all of their orders cosigned by senior residents before they become licensed physicians. These relatively minor concerns of the first year are apparently outweighed by the numerous benefits.

We found no difference regarding practice characteristics, apart from a higher propensity for IRs to remain in Missouri. This was not surprising because the intent of the program was not to create a different type of physician but rather to retain a higher percentage of our own medical students and to create a richer and more flexible training experience. Although retention of physicians in Missouri was not an original goal of the program, this is certainly consistent with the University of Missouri's primary mission to serve the state.

Financial benefits exist for the IRs, in the form of the fourth-year stipend and lessened interview expenses, and for the department, in the form of a more reliable clinical revenue stream from a filled 3-year residency slot. Although the stipend is a welcome benefit for them, 21 of our current 23 IRs (with assurances that their identities would be withheld from the residency director and department chair) report that they would have applied to the program even if the stipend did not exist.

Strengths of our study include the duration of time our program has been in existence and the number of residents in the program. To the best of our knowledge, this is the only study of an integrated program that does not shorten duration of training. Weaknesses of the study include its retrospective nature, some missing data, and a lack of similar programs for comparison. Students who apply to the IR program may be different than those who do not, in terms of their baseline academic ability, their level of dedication to family medicine, or their attitude toward family medicine residency training. Whether the program enhances these differences or merely attracts those individuals with such desirable characteristics, the results are still potentially relevant and reproducible at other institutions if similar training programs are developed.

Given these findings and limitations, a prospective study is being planned as part of the P4 Initiative. Focus groups of IRs and traditional residents will explore advantages and disadvantages of the program, and P4 "practice diaries" will give more immediate feedback and allow some comparison to other P4 sites. Implementation of an upgraded electronic health record will allow comparison of care quality indicators and better measures of continuity. Finally, new graduate surveys will allow more detailed practice comparisons.

What does this mean for the future of family medicine residency training? Accelerated residency programs have largely been discontinued. Some have discussed the possibility of 4 years of residency training in family medicine after graduation from medical school, in part because of the varied roles and clinical experiences of family physicians in the United States.[9,10] Our approach to a 4-year training curriculum does not lengthen overall training time. Medical students in our IR may have less elective flexibility than their classmates during their fourth year of school, but in return they have more flexibility later in residency training, when they are more knowledgeable about their future practice characteristics. We are confident that this training option gives selected students a valuable, individualized experience while simultaneously strengthening and stabilizing the residency as a whole. Given the continuing need to build student interest in family medicine and the range of practice opportunities available to graduates, this program and other types of innovative programs will be required to confront the anticipated shortage of family physicians.

Corresponding Author: Address correspondence to Dr Ringdahl, University of Missouri, Department of Family and Community Medicine, One Hospital Drive, DC032.00, Columbia, MO 65212. 573-882-9099. Fax: 573-884-4122. ringdahle@health.missouri.edu.

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