

WEB PAPER

Improving residents' teaching skills: A program evaluation of residents as teachers course

MICHAEL OSTAPCHUK, PRADIP D. PATEL, KAREN HUGHES MILLER, CRAIG H. ZIEGLER,
RUTH B. GREENBERG & GAIL HAYNES

University of Louisville School of Medicine, USA

Abstract

Background: The role of residents as teachers is recognized as an important part of medical education. However, residents may not possess the practical skills needed to teach medical students effectively.

Aim: In response to a Liaison Committee on Medical Education citation concerning surgery residents' teaching skills, the University of Louisville School of Medicine instituted a campus-wide residents as teachers program based on the bringing education and service together curriculum.

Methods: This evaluation plan is grounded on Kirkpatrick's four levels model. Levels 1 and 2 data included post-session learner questionnaires (2007 and 2008) and open-ended facilitator questionnaires (2008). Levels 3 and 4 data included third year medical students' responses to CourseEval® questions on residents as teachers (2005–2006 and 2007–2008) and data from third year medical student focus groups (2008).

Results: Levels 1 and 2 data analysis showed statistically significant improvements from session to session in Year I and significant improvements between Years I and II. Levels 3 and 4 data analysis showed third year students' perceptions of most residents as teachers remained high and improved significantly in the surgery clerkship.

Conclusion: Short-term and long-term measures show this curriculum to be successful for an interdisciplinary group of residents.

Introduction

Resident physicians' unique and vital role in the education of junior residents and medical students has been well documented in medical education literature. Medical students report that they value and gain significantly from their educational encounters with residents. They also report that up to one-third of their education is provided by resident physicians (Barrow 1966; Brown 1970; Bing-You & Sproul 1992; Busari et al. 2000). Along with their many other duties, medical residents report spending up to 25% of their time teaching medical students (Brown 1970; Sheets 1991). Residents recognize that they have a responsibility to teach and most report that they enjoy teaching (Apter et al. 1988; Sheets 1991; Busari et al. 2000). Residents are uniquely positioned to be effective teachers in the clinical setting because they can emphasize the practical aspects of patient care and also understand the needs of students (Busari et al. 2000; Wilson 2001). When asked their opinion, attending physicians think that resident teaching is integral to the training of junior residents and medical students (Bing-You & Sproul 1992; Busari et al. 2003). Teaching responsibilities begin early in medical education, but the most dramatic shift from learner to teacher occurs during the transition from internship to residency (Bensinger et al. 2005).

Requirements from both the Liaison Committee on Medical Education (LCME) and Accreditation Council for Graduate Medical Education (ACGME) address the importance of the

Practice points

- Up to 25% of medical residents' time is dedicated to teaching medical students.
- Many medical residents have not been trained in the practical skills in adult education.
- The BEST curriculum can be adapted for teaching an interdisciplinary group of medical residents.
- A two-year evaluation of the RAT's program showed significant improvement in student perceptions of residents teaching skills.
- The success of the residents as teachers training program promoted a cultural change in the institution.

resident's role as a teacher. The LCME requires that institutions provide resources, such as workshops and written materials to enhance the teaching and evaluation skills of residents. The LCME also requires formal assessment of the teaching and evaluation skills of the residents (Liaison Committee on Medical Education 2008). The ACGME's *Program Director Guide to Common Program Requirements* requires that residents develop skills and habits to be able to participate in the education of patients, families, students, residents, and other health professionals. Programs must describe the structured learning activities that support the development of these teaching skills (Accreditation Council for Graduate Medical Education 2007).

Correspondence: Michael Ostapchuk, Department of Family and Geriatric Medicine, 201 Abraham Flexner Way, Suite 690, Louisville, KY, 40202, USA. Tel: 1 502-8525499; fax: 1 502-8524944 email: michael.ostapchuk@louisville.edu

Although residents are considered teachers, there are impediments to the teaching task, including lack of time, lack of confidence, and insufficient role-models (Apter et al. 1988; Busari et al. 2002; Bensinger et al. 2005). There may also be limited awareness of service-specific learning objectives for clinical clerks (Wilson 2001). Finally, there may be little formal instruction in the principles of adult education or effective teaching methods (Apter et al. 1988; Wilson 2001; Bensinger et al. 2005).

Efforts to correct these impediments became more widespread in the 1980s and 1990s, as residency programs began to experiment with resident-as-teacher programs. These programs usually focused on one specialty area or on specific combinations of programs in primary care specialties (Jewett et al. 1982; Greenberg et al. 1984; Edwards 1988; Bing-You et al. 1997; Dunnington & DaRosa 1998; Busari et al. 2002; Minor 2002; Morrison et al. 2003, 2004; Farrell et al. 2006; Jain & Jain 2007). These programs have been shown to improve resident self-assessed teaching behaviors, self-reported resident knowledge (including clinical and intellectual skills), and self-confidence as teachers; they have also been shown to result in higher learner evaluations of the residents (Sheets 1991; Weiss & Needlman 1998; Wipf et al. 1999; Busari 2004; Wamsley et al. 2004). In 2001, approximately 50% of the family medicine, pediatric, obstetric/gynecology, psychiatric, and general surgery residencies surveyed had resident as teacher curricula (Morrison et al. 2001). In this same survey, 35% of graduate medical education (GME) offices reported sponsorship of resident as teacher curricula (Morrison et al. 2001). Between the 1980s and 2001, the focus seems to have changed from the *need* to train residents to teach to *how best to train* residents to teach.

The UC BEST model

One program designed to teach primary care residents to teach – bringing education and service together (BEST) – was developed at the University of California, Irvine (Morrison et al. 2003, 2004). Residents from family medicine, internal medicine, and pediatrics participated in the 13 h curriculum given over ten sessions. The first session was a ‘mini-retreat’ that focused on the microskills of teaching and giving feedback to a colleague. This was followed by nine other sessions: leadership skills, orienting learners, giving feedback, teaching procedures, bedside teaching, teaching charting, work rounds, and giving lectures (given in two sessions). Residents randomly assigned to the curriculum showed improved teaching skills as judged by medical student raters when compared to residents randomly assigned to the control group (Morrison et al. 2004). In a one year post-curriculum survey, participating residents reported enthusiasm for teaching (current and future) and increased self-knowledge about teaching (Morrison et al. 2004; Shapiro et al. 2005). The BEST model has also been used to improve teaching skills in an OB/GYN residency (Gaba et al. 2007). The results of this randomized controlled trial support effectiveness in improving residents’ teaching skills similar to that found in the original generalist resident programs (Gaba et al. 2007).

The U of L case study

In spring 2007, we began a campus-wide resident as teachers’ curriculum based on the BEST model. Based on 2007 participant and faculty evaluations, the curriculum was revised and offered again in spring 2008. The original program intent was to address an LCME concern that one of our residency programs was deficient in teaching, but we soon realized that all residency programs could potentially benefit from the residents as teachers (RATs) workshops.

Sessions took place in a spacious, attractive hotel located close to the medical campus. Interns were given the day off (not counted against vacation), were excused from call the night prior to their assigned workshop, and allowed to answer only personal emergency calls during the day. All interns were required to attend and were assigned a specific session. Breakfast, lunch, and refreshments were supplied during the day, and certificates of completion were awarded at the end of the workshop. The learning environment was designed to emulate the comfortable continuing medical education (CME) sessions learners will encounter in their professional lives.

Aim of this program evaluation

As the BEST curriculum had already been validated with residents in family medicine, internal medicine, pediatrics, and OB/GYN, we focused this evaluation on the modified curriculum and delivery system that integrated residents from all medical specialties (Morrison et al. 2004; Morrison et al. 2005; Shapiro et al. 2005; Gaba et al. 2007). The population were all first year medical residents (interns) (2007 $N=405$; and 2008 $N=413$). Residents worked in small mixed groups and the two facilitators at each group table were also selected to represent a mix of medical specialties and areas of medical education.

The evaluation plan was to investigate *reaction and learning* (Kirkpatrick’s evaluation levels 1 and 2), and *transfer and results* (Kirkpatrick’s evaluation levels 3 and 4) (Kirkpatrick 2007). Kirkpatrick’s ‘four levels’ approach reminds us to evaluate both short-term and long-term instructional outcomes. Levels 1 and 2 evaluation questions were (a) how did learners rate the specific parts of the learning modules; (b) how did learners rate the learning experience in general; (c) were there any statistically significant changes between Years I and II; and (d) how did volunteer faculty facilitators perceive the learning event. Questions for Kirkpatrick’s evaluation levels 3 and 4 were (a) were there any statistically significant changes in the perceptions of third year medical students about the teaching skills of the residents between 2005–2006 and 2007–2008 (as measured by four specific CourseEval® questions about residents and teaching); (b) how did third year medical students perceive the role of residents as teachers; and (c) were there any other organizational indicators of success or need for change in RATs.

Methods

Workshops were conducted in the spring prior to interns becoming second year residents. Residents were assigned to

one of five daylong workshops and assigned to one specific table to insure a mix of specialties in each small group. Each small group included seven to nine participants along with two facilitators (faculty and staff from several departments who had volunteered to work in this program). Facilitators had been instructed in the BEST model prior to the workshops by the Assistant Dean for Graduate Medical Education.

We chose to use six of the BEST curriculum's nine components: microskills of teaching, orienting learners, giving feedback, teaching procedures, bedside teaching, and giving lectures. The rationale for using these six was that the charting and work rounds components were easily incorporated into orienting learners and the leadership skills component would be more appropriately suited for senior residents. Reducing the curriculum to six modules, allowed us to present the material in a 1 day session. The six components used were well suited for the format of mini-lectures followed by small group discussions and practice with standardized patients (SPs) trained to represent standardized learners (SLs). The SLs were trained in two scenarios for all components except 'giving lectures.' As in the BEST model, at the end of the mini-lecture for each topic, SLs were assigned to each small group to role-play as medical students as one of the interns practiced his or her new teaching skills. Other interns and facilitators observed and took notes for a peer critique. Peer critiques were guided by checklists and all comments (both praise and correction) were given in an upbeat and supportive way.

Sources of data included (a) post-session learner questionnaires from 2007 and 2008; (b) open-ended facilitator questionnaires (2008); (c) data from third year medical students on four specific CourseEval® questions related to residents as teachers (2005–2006 and 2007–2008); (d) data from third year medical student focus groups on residents as teachers (2008); and (e) anecdotal information about the perception of the RATs program at the U of L SOM. The protocol and all instruments were approved in advance by U of L's IRB.

Post-session learner questionnaires

The post-session questionnaire included 11 quantitative questions measured on a 7-point Likert's style agreement scale and three open-ended comment questions. Survey results were highly reliable for the combined 2007 and 2008 sample with a Cronbach's alpha of 0.94. Qualitative replies showed consistency, were logically written, and in many cases learners used language found specifically in the curriculum (e.g., I see how I can use the 'feedback sandwich' model). Echoing specific language is often a positive indicator of learner engagement (Schaefer 1980).

Open-ended facilitator questionnaires

The open-ended e-mail questionnaire for volunteer faculty facilitators was sent in 2008 after the workshops were completed. The e-mails were sent by the project director and replies were not anonymous. The open-ended questions asked about course strengths and areas for further

improvements; those who volunteered in both 2007 and 2008 were asked if they had observed any changes related to the 2008 revisions.

Third year medical students CourseEval® questions

Data from four specific questions related to residents as teachers from CourseEval® were analyzed. We selected third year students' comments because the structure of third year clerkships is more consistent than in the fourth year where several electives are offered. Student scores on four specific questions from 2005 to 2006 were used as a baseline (pre-RATs) and compared to 2007–2008 when approximately 50% of residents were RATs trained. Surgery scores were presented separately from 'other clerkships' because of the previously mentioned LCME citation.

Third year medical student focus groups

The levels 3–4 evaluation also included focus groups for third year medical students. Three groups of six or seven students met on 3 days and were asked to use flip charts to 'blog' on four general topics (a) describe a positive learning experience while working with residents in a rotation, (b) describe a negative learning experience while working with residents in a rotation, (c) if you could change two things about how residents teach, what would they be, and (d) what would you want to learn to prepare yourself for your teaching role during your residency. All open-ended data were analyzed using variations on Glaser and Strauss' constant comparison (Tavakol 2006).

Statistical analysis

A planned trend analysis across all sessions for 2007 was performed. The Mann–Whitney U test compared the items between 2007 and 2008. For the CourseEval® questions related to residents as teachers a 2 × 2-randomized-group multivariate analysis of variance (MANOVA) was performed on outcomes. Independent variables were two clerkship groups (a) surgery, (b) all other clerkships; and year classes were taught (a) 2005–2006, and (b) 2007–2008. The p -values ≤ 0.05 were deemed as statistically significant and all analyses were performed in SPSS®.

Results

Post-session learner questionnaires

Improvement in post-session evaluation scores from 2007 to 2008 was indicated in two ways (a) the 2007 data showed a linear trend of scores improving from session 1 through session 5 with statistical significance ($p \leq 0.05$) on four of the 11 items (Table 1); and (b) consistently higher score on all 11 items between 2007 and 2008, with a statistically significant increase on seven of the 11 items ($p \leq 0.05$) (Table 2).

Responses to the open-ended questions on the survey revealed consistent and positive learner reactions in both 2007 and 2008 with an emphasis on (a) appreciating the nice venue

Table 1. U of L SOM post-session questionnaire scores 2007 All RATs sessions.

Questions	Session 1		Session 2		Session 3		Session 4		Session 5		p-value ^a Linear Trend
	Mean	(SD)									
Practicing microskills	4.64	(1.18)	5.06	(0.94)	4.76	(1.22)	5.30	(0.86)	5.26	(1.05)	0.05*
Microskills module	4.91	(1.11)	5.17	(0.86)	4.95	(0.97)	5.40	(0.75)	5.53	(0.90)	0.03*
Practicing orienting learners	4.91	(1.44)	5.11	(1.13)	4.81	(1.40)	5.25	(0.64)	5.37	(1.07)	0.21
Orienting learners module	5.32	(1.25)	5.28	(1.23)	5.14	(1.01)	5.45	(0.69)	5.63	(0.96)	0.28
Practicing feedback	5.05	(1.13)	5.28	(0.96)	4.86	(1.28)	5.30	(1.08)	5.42	(0.96)	0.32
Feedback module	5.45	(1.10)	5.56	(0.70)	5.05	(1.02)	5.45	(1.00)	5.74	(0.87)	0.50
Practicing procedures	4.57	(1.40)	4.94	(1.16)	4.52	(1.21)	5.15	(0.93)	5.68	(1.11)	0.01**
Procedures module	4.90	(1.17)	5.00	(1.19)	5.00	(1.00)	5.35	(1.04)	5.63	(1.07)	0.02*
Practicing bedside teaching	4.77	(1.27)	4.50	(1.04)	4.76	(1.18)	5.30	(0.92)	5.00	(0.88)	0.10
Bedside teaching module	5.00	(1.07)	4.61	(1.04)	4.90	(1.00)	5.15	(0.99)	5.11	(0.94)	0.29
Giving lecture module	4.73	(0.94)	5.28	(0.96)	4.81	(1.21)	5.40	(0.99)	5.17	(1.10)	0.18

Notes: ^aTest for linear trend.
* $p \leq 0.05$, ** $p \leq 0.01$.

Table 2. U of L SOM post-session questionnaire scores comparing RATs 2007 to 2008.

Questions		Least favorable 2 3 4 5 6 Most favorable							Mean	(SD)	p-value ^a
		Freq.	Freq.	Freq.	Freq.	Freq.	Freq.	Freq.			
Practicing microskills	2007	0	3	6	20	33	36	2	4.99	(1.08)	0.01**
	2008	0	1	0	10	44	45	5	5.40	(0.80)	
Microskills module	2007	0	2	1	18	39	36	4	5.18	(0.95)	0.05*
	2008	0	1	1	8	43	46	6	5.43	(0.83)	
Practicing orienting learners	2007	0	5	4	16	35	33	7	5.08	(1.18)	0.06
	2008	0	2	0	7	45	38	8	5.41	(0.89)	
Orienting learners module	2007	0	2	3	11	35	39	10	5.36	(1.04)	0.51
	2008	0	2	0	5	44	45	8	5.48	(0.86)	
Practicing feedback	2007	0	4	1	17	38	32	8	5.17	(1.09)	0.01**
	2008	0	3	1	7	35	48	11	5.50	(1.00)	
Feedback module	2007	0	2	1	10	34	44	9	5.44	(0.97)	0.63
	2008	0	1	1	7	38	49	9	5.52	(0.86)	
Practicing procedures	2007	0	4	8	19	34	25	9	4.96	(1.23)	0.05*
	2008	0	2	2	13	36	31	10	5.30	(1.05)	
Procedures module	2007	0	1	5	22	27	34	9	5.17	(1.10)	0.12
	2008	0	2	2	12	30	34	13	5.41	(1.09)	
Practicing bedside teaching	2007	0	4	4	26	37	25	4	4.87	(1.09)	0.01**
	2008	0	2	3	11	39	31	8	5.26	(1.03)	
Bedside teaching module	2007	0	2	6	19	43	27	3	4.96	(1.00)	0.01*
	2008	0	0	4	13	33	33	10	5.34	(0.99)	
Giving lecture module	2007	0	2	4	21	38	27	7	5.06	(1.06)	0.05*
	2008	0	0	1	14	35	34	8	5.37	(0.89)	

Notes: ^aMann-Whitney U test.
* $p \leq 0.05$, ** $p \leq 0.01$.

(i.e., they felt 'valued'); (b) gaining awareness of teaching as a discipline; and (c) acquiring practical teaching tools they could apply immediately in their residencies.

Open-ended facilitator questionnaires

We found the volunteer facilitator comments ($N=11$) both useful and consistent. Key themes were (a) the venue and professional atmosphere greatly enhanced the event, (b) practice cases and SL (SP) training could be refined even more, and (c) more explanation and context should be given to the module on teaching procedures. Several facilitators who participated in both 2007 and 2008 also commented that the

'streamlined schedule' and 'revised cases' improved the learning event.

Third year medical student CourseEval[®] questions

Long-term learner evaluation is always more prone to error than short-term evaluation due to intervening variables such as 'skills improving with practice.' One logical indicator of success after Year II was residents' ability to apply their knowledge of adult education to improve third year medical students' experiences during their clinical rotations. Four specific CourseEval[®] questions related to residents as teachers were analyzed. Data from 2005 to 2006 (pre-RATs) were used as a baseline; data from 2007 to 2008 were used as a measure

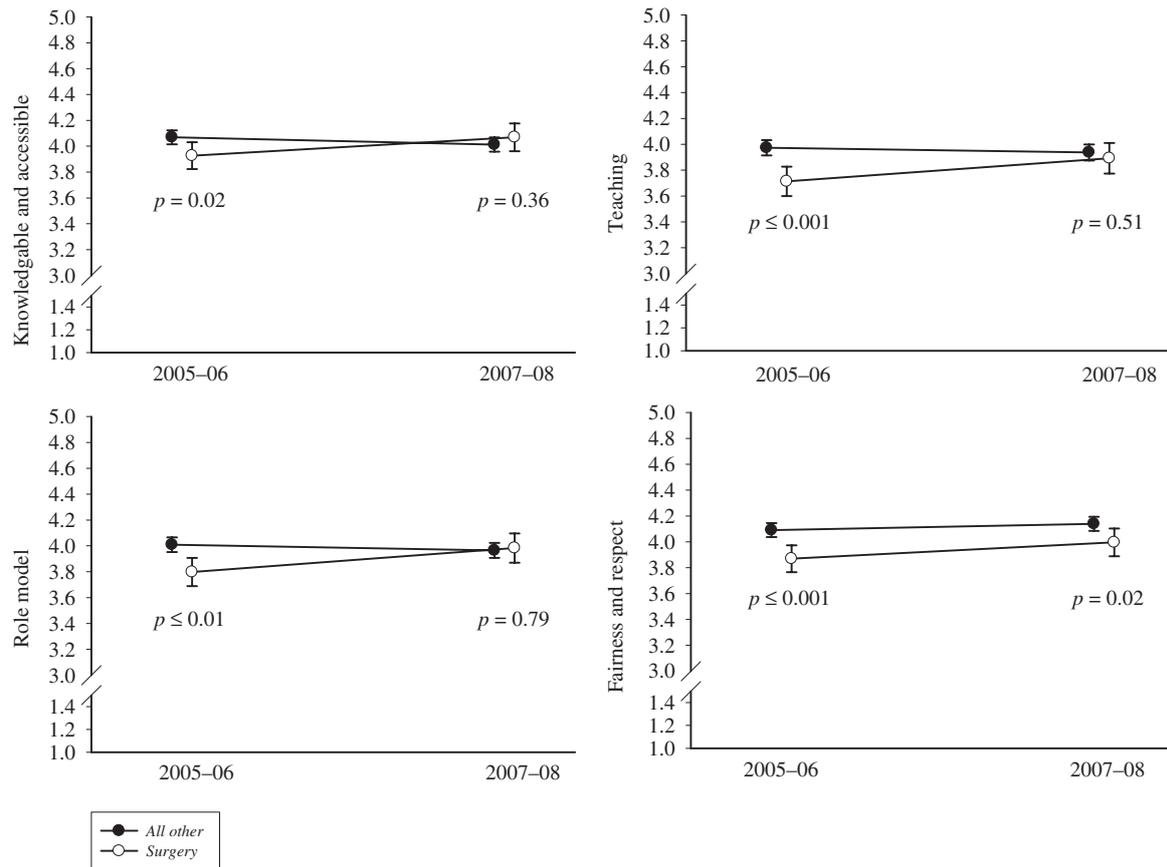


Figure 1. U of L SOM Third year students' evaluation of residents as teachers as a function of year and clerkship. Note: Error bars represent 95% CIs.

of success. Figure 1 plots the means and the 95% confidence intervals (CIs) on each outcome for all combinations of clerkships and year. Our results demonstrated the hoped-for finding that scores reflecting third year students' perceptions of surgery residents increased significantly between the baseline year and 2007–2008. Because surgery accounted for so much of the increase between the baseline year and 2007–2008, we were not surprised to see either no increase or a non-significant decrease in *all other* clerkship scores.

Analysis of the impact of the clerkship by year interaction on each outcome showed an interaction existed for all outcome variables except for *fairness and respect*. For the *knowledge and accessible*, *overall teaching* and the *role model* items, *surgery* was statistically different from *all other* clerkships groups in the 2005–2006 year. However, no statistical difference was found in 2007–2008 for *surgery* with *all other* clerkships (Figure 1).

Third year medical student focus groups

The findings from the third year medical student focus groups (Table 3) were specific, articulate, and showed a high level of consistency among the three groups.

The four open-ended discussion questions asked for descriptions of positive and negative teaching events during clerkships, two things third year students would change about

teachers as residents, and what they themselves would like to learn to prepare to be better teachers.

Anecdotal information about the perception of the RATs program

Anecdotal information about perceptions of the RATs program included the increased number of faculty willing to serve as volunteer faculty facilitators in 2008 and looking ahead to 2009; the mention of RATs training as a recruitment tool for U of L's residency programs; and reports on the program being accepted for presentation at one national, one regional, and one institution-wide conference to date.

Conclusions

This investigation confirms previous findings that resident teaching skills improved when a formal content-specific resident as teacher program was used. The limitations of this study are the inherent limitations of Kirkpatrick's level 4, where many intervening variables can have an impact on the long-term outcomes of adult learning. The solution to this limitation is typically to collect and analyze data from as many sources related to the instructional program as possible rather than consider program evaluation as an 'experimental model' where all variables must be identified. Additional limitations

Table 3. U of L SOM third year medical students' focus groups on residents as teachers.

Question	Describe a <i>positive</i> learning experience with residents in a rotation*	Describe a <i>negative</i> learning experience while working with residents in a rotation	If you could <i>change two things</i> about how residents teach, what would they be?	What do you want to learn to prepare yourself for your teaching role during your residency?
Theme				
Planned and/or organized teaching activities	Spot teaching, quizzing, reviewing, modeling, and deconstructing (i.e., breaking things down – task analysis), one hour talks, and informal or brief talks (e.g., over lunch)	Not setting aside time to teach, missing opportunities to teach, refusing to teach, and teaching at an inappropriate level	Break things down and teach at the appropriate level, provide smaller doses of information	How to 'boil down' a topic, how to assess a student's current level of knowledge and teach to that level
Teaching strategies	Listening, showing respect, involving students in procedures, responding to students' thoughts, finding time to teach. Link cases to associated medical complications	'Pimping' (e.g., probing to see what students know), 'scuttling' (e.g., assigning boring repetitive tasks), lack of respect for students, asking students to read but then not following up	More practice (e.g., suturing, physical exams); set aside time for teaching; teaching out loud (e.g., talking through a procedure)	How to see clinical problems from a student's point of view, how to teach disease process rather than detail
Organizational issues	Patient/family education-how to approach patients	Lack of orientation and unclear expectations (i.e., 'Don't follow me around!')	Better orientation – let students know what is expected of them; introduce students as part of the team	Observe a resident's teaching then provide a critique, have upper level residents model good teaching
Specific content			How to write a good note; focus on things that are hard to learn from a textbook (e.g., ventilators or blood gases)	How to put together good lectures; what types of visual tools are helpful (e.g., how to use PowerPoint®, how to create charts)

include the evaluation was conducted at a single institution and conducted over 2 years.

Levels 1 and 2 findings

All sessions and modules of the RATs program were valued highly; however, the majority of residents rated the mini-lectures higher than the small group discussions. This may be due to the ease with which learners can listen and participate in an open discussion with one voice at a time, as opposed to the multiple conversations being carried in the same room. The use of standardized patients as standardized learners also seemed to lower the scores for the small group discussions. A few residents felt the SLs were not totally believable as medical students (i.e., they believed they could have role played students themselves since they were all students in the not too distant past).

The residents have enjoyed the RATs sessions over the past 2 years. They appreciated being treated as professionals with an emphasis on having designated time to participate in the session, participating with peers from other medical specialties, and the attractive venue. Participants also seemed to gain awareness of 'adult education' as a discipline. They appreciated acquiring some 'practical teaching tools' they could apply immediately in their busy daily schedules.

We believe the consistent increase in learner evaluation scores is explained by improvements made in the activities and case studies being used, and faculty facilitators' increasing skill in working with learners during the practice sessions. There may also have been a more positive mindset of learners in

2008 because they heard informally from 2007 participants that it was 'a good day' and they 'were treated very well.'

Comments conveyed by the volunteer faculty facilitators were helpful to the program coordinators. Most of the 2007 faculty returned to participate in 2008, and we believe they did for the following reasons (a) their feedback about the program in 2007 was valued by program coordinators, (b) improvements in the activities and case studies in 2008 were direct reflections of the feedback made in 2007, and (c) some of the faculty facilitators were encouraged to present mini-lectures of content to the workshop group as a whole.

Levels 3 and 4 findings

The use of third year students' CourseEval® survey data on four questions regarding residents and teaching was a more abstract measure than post-session surveys, but the element of abstraction is always a limitation when looking at instructional outcomes at the application level (i.e., we can rarely isolate a single reason for change in adult learners over time). Nevertheless, the strong similarities of these data to third year student focus group findings help reduce the abstraction. We were pleased to see relatively high baseline scores (2005–2006) for *all others*, and not surprised to find lower baseline scores for surgery residents since that had been the focus of LCME review comments. The lack of significant change over time for *all others* was not surprising because those scores began high and because the aggregate change in scores was accounted for by *surgery*. The significant improvement in

surgery was a desirable finding since that group was the original concern cited in the LCME review.

Positive and negative issues identified by the third year medical student focus groups reflected several of the principles taught to the residents during the RATs sessions. For example, they felt that a positive learning experience with residents occurs when residents (a) show respect, (b) find time to teach, (c) listen, and (d) link teaching to current clinical cases. All of these are covered in the RATs curriculum. Negative learning experiences occur when residents (a) 'pimp,' (b) assign 'scut' work (see Table 3 for definitions), (c) show a lack of respect for students, and (d) do not provide an orientation of clear expectations during the rotation. Again, tips for avoiding these problems are part of the RATs curriculum.

A comparison of third year student focus group outcomes to the specifics of the RATs curriculum indicated a need for more instruction in task analysis (content deconstruction) and in teaching skills. Time spent on student orientation (a major component of RATs) seems to be time well spent since orientation is a major component of helping medical students to feel productive as learners in their clerkships.

The organizational indicators of the success of the RATs program are approval of the Education Policy Committee (EPC) to increase the number of questions on third year students' CourseEval[®] relating to residents' teaching in clerkships; the use of the RATs program as a recruiting tool for attracting residents to our program; and the RATs teaching team being invited by several departments to present portions of the curriculum to their faculty.

RATs is a replicable model grounded in best practice. We attribute the program's success to a validated core curriculum (BEST), a structured evaluation and improvement system, and the enthusiasm and dedication of faculty volunteers. Having adequate resources from the Department of Graduate Medical Education has also made the journey easier.

This evaluation process will continue to measure content retention by residents and the impact of their instruction on medical students. The next steps in this project will be to continue to revise the RATs curriculum based on evaluation findings, to measure post-session learner outcomes (spring 2009), to add several new questions related to residents as teachers to the third year medical students' CourseEval[®], and to analyze CourseEval[®] data at a more discreet level by looking at specific departmental outcomes. We are also aware of several other medical schools' success providing similar workshop content online, and are considering the addition of an online support component to provide continuing support for residents in their roles as teachers.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

Notes on contributors

MICHAEL OSTAPCHUK, MS Ed, MD, is an Assistant Dean for Graduate Medical Education, Associate Professor, and Residency Program Director of

Family and Geriatric Medicine at the University of Louisville School of Medicine, Louisville, KY, USA.

PRADIP D. PATEL, MD, is an Associate Professor and Associate Vice Chair for Medical Education, Department of Pediatrics, University of Louisville School of Medicine, Louisville, KY, USA.

KAREN H. MILLER, MEd, PhD, is Director for Evaluation and Assessment, Office of Medical Education, University of Louisville School of Medicine, Louisville, KY, USA.

CRAIG H. ZIEGLER, MS, is the Biostatistician, Office of Medical Education University of Louisville School of Medicine, Louisville, KY, USA.

RUTH B. GREENBERG, PhD, is an Associate Dean for Medical Education, Office of Medical Education, University of Louisville School of Medicine, Louisville, KY, USA.

GAIL HAYNES, MEd, is Director of Academic Support, Office of Student Affairs, University of Louisville School of Medicine, Louisville, KY, USA.

References

- Accreditation Council for Graduate Medical Education. 2007. Common Program Requirements. Available from: www.acgme.org/acWebsite/dutyHours/dh_dutyhoursCommonPR07012007.pdf (Accessed August 21, 2008).
- Apter A, Metzger R, Glassroth J. 1988. Residents' perceptions of their role as teachers. *J Med Educ* 63(12):900-905.
- Barrow MV. 1966. Medical student opinions of the house officer as a medical educator. *J Med Educ* 41:807-810.
- Bensinger LD, Meah YS, Smith LG, Bensinger LD, Meah YS, Smith LG. 2005. Resident as teacher: The Mount Sinai experience and a review of the literature. *Mt Sinai J Med* 72(5):307-311.
- Bing-You RG, Greenberg LW, Wiederman BL, Smith C.S. 1997. A randomized multicenter trial to improve resident teaching with written feedback. *Teach Learn Med* 9(1):10-13.
- Bing-You RG, Sproul MS. 1992. Medical students' perceptions of themselves and residents as teachers [see comment]. *Med Teach* 14(2-3):133-138.
- Brown RS. 1970. House staff attitudes toward teaching. *J Med Educ* 45(3):156-159.
- Busari JO, Scherpbier AJJA. 2004. Why residents should teach: A literature review. *JPGM* 50(3):205-210.
- Busari JO, Prince KJ, Scherpbier AJ, van der Vleuten CP, Essed GG. 2002. How residents perceive their teaching role in the clinical setting: A qualitative study. *Med Teach* 24(1):57-61.
- Busari JO, Scherpbier AJJA, van der Vleuten CPM, Essed GE. 2000. Residents' perception of their role in teaching undergraduate students in the clinical setting. *Med Teach* 22(4):348-353.
- Busari JO, Scherpbier AJ, van der Vleuten CP, Essed GG. 2003. The perceptions of attending doctors of the role of residents as teachers of undergraduate clinical students. *Med Educ* 37(3):241-247.
- Dunnington GL, DaRosa D. 1998. A prospective randomized trial of a residents-as-teachers training program. *Acad Med* 73(6):696-700.
- Edwards JC, Kissling GE, Brannan JR, Plauche WC, Marier R. 1988. Study of teaching residents how to teach. *J Med Educ* 63:603-610.
- Farrell SE, Pacella C, Egan D, Hogan V, Wang E, Bhatia K, Hobgood CD. 2006. Resident-as-teacher: A suggested curriculum for emergency medicine. *Acad Emerg Med* 13(6):677-679.
- Gaba ND, Blatt B, Macri CJ, Greenberg L. 2007. Improving teaching skills in obstetrics and gynecology residents: Evaluation of a residents-as-teachers program. *Am J Obstet Gynecol* 196(1):e81-e87.
- Greenberg LW, Goldberg RM, Jewett LS. 1984. Teaching in the clinical setting: Factors influencing residents' perceptions, confidence and behaviour. *Med Educ* 18(5):360-365.
- Jain S, Jain S. 2007. Training residents to be office-based teachers of family medicine [see comment]. *Fam Med* 39(10):700-702.
- Jewett LS, Greenberg LW, Goldberg RM. 1982. Teaching residents how to teach: A one-year study. *J Med Educ* 57(5):361-366.
- Kirkpatrick DL. 2007. Implementing the four levels: A practical guide for effective evaluation of training programs. San Francisco: Berrett-Koehler.

- Liaison Committee on Medical Education. 2008. Functions and structure of a medical school. Available from: <http://www.lcme.org/functions/2008jun.pdf> (Retrieved August 20, 2008).
- Minor S, Poenaru D. 2002. The in-house education of clinical clerks in surgery and the role of housestaff. *Am J Surg* 184:471–475.
- Morrison EH, Friedland JA, Boker J, Rucker L, Hollingshead J, Murata P. 2001. Residents-as-teachers training in U.S. residency programs and offices of graduate medical education. *Acad Med* 76(10 Suppl.): S1–S4.
- Morrison EH, Hitchcock MA, Harthill M, Boker JR, Masunaga H. 2005. The on-line clinical teaching perception inventory: A 'snapshot' of medical teachers. *Fam Med* 37(1):48–53.
- Morrison EH, Rucker L, Boker JR, Gabbert CC, Hubbell FA, Hitchcock MA, Prislin MD. 2004. The effect of a 13-hour curriculum to improve residents' teaching skills: A randomized trial. *Ann Intern Med* 141(4):257–263.
- Morrison EH, Rucker L, Boker JR, Hollingshead J, Hitchcock MA, Prislin MD, et al. 2003. A pilot randomized, controlled trial of a longitudinal residents-as-teachers curriculum. *Acad Med* 78(7):722–729.
- Schaefer BA, Bavelas J, Bavelas A. 1980. Using echo technique to construct student-generated faculty evaluation questionnaires. *Teach Psychol* 7(2):83–86.
- Sheets KJ, Hankin FM, Schwenk T. 1991. Preparing surgery house officers for their teaching role. *Am J Surg* 161:443–449.
- Tavakol M, Torabi S, Zeinaloo AA. 2006. Grounded Theory in Medical Education Research [Electronic Version]. *Med Educ Online*. Available from: <http://www.med-ed-online.org> (Retrieved August 20, 2008).
- Wamsley MA, Julian KA, Wipf JE, Wamsley MA, Julian KA, Wipf JE. 2004. A literature review of 'resident-as-teacher' curricula: Do teaching courses make a difference? *J Gen Inter Med* 19(5 Part 2):574–581.
- Weiss V, Needlman R. 1998. To teach is to learn twice. Resident teachers learn more. *Arch Pediatr Adolesc Med* 152(2):190–192.
- Wilson FC. 2001. Residents as teachers [reprint in 2007]. *Clin Orthop Relat Res.* 454:247–250; PMID: 17091017]. *J Bone Joint Surg: Am* 83-A(9): 1441–1443.
- Wipf JE, Orlander JD, Anderson JJ. 1999. The effect of a teaching skills course on interns' and students' evaluations of their resident-teachers. *Acad Med* 74(8):938–942.