

Teaching-skills training programs for family medicine residents

Systematic review of formats, content, and effects of existing programs

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ABSTRACT

OBJECTIVE To review the literature on teaching-skills training programs for family medicine residents and to identify formats and content of these programs and their effects.

DATA SOURCES Ovid MEDLINE (1950 to mid-July 2008) and the Education Resources Information Center database (pre-1966 to mid-July 2008) were searched using and combining the MeSH terms *teaching, internship and residency, and family practice*; and *teaching, graduate medical education, and family practice*.

STUDY SELECTION The initial MEDLINE and Education Resources Information Center database searches identified 362 and 33 references, respectively. Titles and abstracts were reviewed and studies were included if they described the format or content of a teaching-skills program or if they were primary studies of the effects of a teaching-skills program for family medicine residents or family medicine and other specialty trainees. The bibliographies of those articles were reviewed for unidentified studies. A total of 8 articles were identified for systematic review. Selection was limited to articles published in English.

SYNTHESIS Teaching-skills training programs for family medicine residents vary from half-day curricula to a few months of training. Their content includes leadership skills, effective clinical teaching skills, technical teaching skills, as well as feedback and evaluation skills. Evaluations mainly assessed the programs' effects on teaching behaviour, which was generally found to improve following participation in the programs. Evaluations of learner reactions and learning outcomes also suggested that the programs have positive effects.

CONCLUSION Family medicine residency training programs differ from all other residency training programs in their shorter duration, usually 2 years, and the broader scope of learning within those 2 years. Few studies on teaching-skills training, however, were designed specifically for family medicine residents. Further studies assessing the effects of teaching-skills training in family medicine residents are needed to stimulate development of adapted programs for the discipline. Future research should also assess how residents' teaching-skills training can affect their learners' clinical training and eventually patient care.

EDITOR'S KEY POINTS

- This review focused on teaching-skills training programs designed for or including family medicine residents. It reviews the format and content and appraises the effects of such programs.
- Teaching-skills programs for family medicine residents exist in many formats.
- Few data are available on the effects of teaching-skills curricula for family medicine residents specifically.

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Programme de formation en enseignement pour les résidents en médecine familiale

Synthèse critique des formes, du contenu et des effets des programmes actuels

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RÉSUMÉ

OBJECTIF Passer en revue les ouvrages spécialisés portant sur les programmes de formation en enseignement à l'intention des résidents en médecine familiale, et cerner les formes, le contenu et les effets de ces programmes.

SOURCES DES DONNÉES On a fait une recension dans Ovid MEDLINE (de 1950 à mi-juillet 2008) et la base de données de l'Education Resources Information Center (d'avant 1966 à mi-juillet 2008), en utilisant et en combinant les termes MeSH *teaching, internship, residency et family practice*; ainsi que *teaching, graduate medical education et family practice*.

CHOIX DES ÉTUDES Les recherches initiales dans MEDLINE et la base de données de l'Education Resources Information Center ont cerné respectivement 362 et 33 références. On a examiné les titres et les résumés et on a tenu compte des études lorsqu'elles décrivaient la forme ou le contenu du programme en art de l'enseignement, ou étaient les premières études des effets d'un programme de formation en enseignement à l'intention des résidents en médecine familiale ou de stagiaires en médecine familiale ou d'autres spécialités. On a ensuite passé en revue les bibliographies de ces articles pour trouver des études non identifiées dans la recension initiale. Au total, 8 articles ont été choisis pour faire l'objet de la synthèse critique. La sélection s'est limitée aux articles publiés en anglais.

SYNTHÈSE La durée des programmes de formation en enseignement pour les résidents en médecine familiale varie d'une demi-journée à quelques mois. Leur contenu porte sur les habiletés en leadership, en enseignement clinique efficace, en enseignement technique, ainsi qu'en rétroaction et en évaluation. Les évaluations mesuraient principalement les effets du programme sur le comportement pédagogique, qui était généralement jugé meilleur après la participation au programme. Les évaluations des réactions des apprenants et des résultats de l'apprentissage font aussi valoir que les programmes ont eu des répercussions positives.

CONCLUSION Les programmes de résidence en médecine familiale se distinguent de tous les autres programmes de formation postdoctorale par leur plus courte durée, habituellement 2 ans, et par le champ plus vaste d'apprentissage durant ces 2 années. Par ailleurs, peu d'études sur la formation en enseignement ont été conçues spécifiquement pour les résidents en médecine familiale. Il faut faire d'autres études évaluant les effets de la formation en enseignement pour stimuler l'élaboration de programmes adaptés à la discipline. Les recherches futures pourraient aussi évaluer l'influence de la formation des résidents en enseignement sur la formation clinique des apprenants et, éventuellement, les soins aux patients.

POINTS DE REPÈRE DU RÉDACTEUR

- Cette synthèse porte sur les programmes de formation en enseignement conçus pour les résidents, incluant ceux en médecine familiale. Elle examine la forme et le contenu de ces programmes ainsi que leurs effets.
- Il existe plusieurs formes de programmes de formation en enseignement pour les résidents en médecine familiale.
- Il y a peu de données portant sur les effets des programmes de formation en enseignement spécifiquement sur les résidents en médecine familiale.

*Le texte intégral est accessible en anglais à www.cfp.ca.

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Medical residents are often involved in teaching undergraduate medical students or junior residents, in addition to teaching and caring for patients, during their postgraduate training period. Many medical schools and residency training programs offer teaching-skills training sessions to prepare residents to be better teachers. The format, content, and duration of these teaching programs, however, vary widely. Wamsley et al published a literature review of “resident-as-teacher” curricula, which included residents from different specialties. This review identified various formats of such courses and found that participants improved self-assessed teaching behaviour and teaching confidence, in addition to receiving improved evaluations from their students.¹

Residents need to find balance between their own learning, patient care, and teaching. They also have to balance their needs for learning clinical knowledge with their needs for teaching-skills training.²⁻⁴ These barriers are especially obvious in family medicine residency.

Family medicine residency training programs differ from all other training programs in their shorter duration (usually 2 or 3 years in North America) and their broader scope of learning within this period. Teaching-skills training, however, is considered mandatory,⁵⁻⁸ as family medicine residents, and residents in other disciplines, are often expected to provide a considerable amount of formal and informal teaching to junior trainees. Most of them will also receive trainees when they begin practice. Family physicians are primary providers and are often the only providers of patient education and public education, which further stresses the importance of teaching-skills training for family medicine residents.

The College of Family Physicians of Canada's *Standards for Accreditation of Residency Training Programs* states the following: “Residents must be given opportunities to develop effective teaching skills through organized activities focused on teaching techniques.”⁵ The *CanMEDS Physician Competency Framework* also states that physicians should be scholars, “able to facilitate the learning of patients, families, students, residents, other health professionals, the public, and others, as appropriate, and to contribute to the creation, dissemination, application, and translation of new medical knowledge and practices.”⁸ According to the Accreditation Council for Graduate Medical Education's *Common Program Requirements* for practice-based learning and improvement, “residents/fellows are expected to develop skills and habits to be able to participate in the education of patients, families, students, residents and other health professionals, as documented by evaluations of a resident's teaching abilities by faculty and/or learners.”⁶ Moreover, the Liaison Committee on Medical Education's *Standards for Accreditation of Medical Education Programs Leading to the M.D. Degree* states that “[r]esidents who supervise or teach medical

students, as well as graduate students and postdoctoral fellows in the biomedical sciences who serve as teachers or teaching assistants, must be familiar with the educational objectives of the course or clerkship and be prepared for their roles in teaching and evaluation.”⁷ As prescribed by these organizations, teaching is not only a possibility, but also a responsibility for physicians in training.

Residents consider teaching medical students to be one of their primary responsibilities and they learn themselves in the process of teaching.⁴ Most learners feel that resident teachers, who are close to their own training level, facilitate their learning and have a good understanding of how they should be taught.⁹ Teaching also seems to enhance the teacher's own knowledge acquisition.¹⁰ A literature review concluded that teaching also improved teachers' perceived professional competency: physicians seen as competent were those who taught effectively and possessed a basic understanding of teaching and learning.¹¹

This systematic review aims to evaluate the formats used and the content usually taught in existing teaching-skills training programs for family medicine residents, and will appraise the reported effects of such programs.

DATA SOURCES

We searched Ovid MEDLINE (1950 to mid-July 2008) and the Education Resources Information Center (ERIC) database, which indexes education journals, (pre-1966 to mid-July 2008) using and combining the MeSH terms *teaching*, *internship and residency*, and *family practice* (MEDLINE) and *teaching*, *graduate medical education*, and *family practice (medicine)* (ERIC), and reviewed the bibliographies of identified articles. This search was specific to family medicine training. To make sure that we did not miss any relevant articles published since Wamsley and colleagues' review,¹ we also conducted a search using only the terms they used (*internship and residency* and *teaching*) for articles published after their review time frame (ie, June 2003 until mid-July 2008).

Study selection

The initial MEDLINE and ERIC searches identified 362 and 33 references, respectively. Titles and abstracts were reviewed to identify the articles relevant to our analysis. References were included if they described the format or the content of a teaching-skills program or if they presented the results of primary studies of the effects of a teaching-skills program for family medicine residents or which included residents in family medicine among other specialty trainees. Only articles published in English were selected. Three references were identified as relevant to this review. The bibliographies of

these articles were reviewed, and 4 additional relevant articles were identified. The broader search extending Wamsley and colleagues' review¹ found 907 references, from which 1 additional article was identified. Therefore, we included a total of 8 articles in our systematic review.

SYNTHESIS

Format and content of teaching-skills training

Teaching-skills training programs in which family medicine residents are involved have various formats: 1-hour weekly sessions over a few months,¹²⁻¹⁵ half-day courses,^{13,14,16} 1-day intensive workshops,¹⁷ and on-line modules.¹⁸

Various teaching strategies are used, such as lectures,¹⁵ interactive discussions,¹³⁻¹⁵ role playing or simulated teaching activities,^{13-15,17} discussion of sample cases,^{15,17} videotaped vignettes,¹⁵ on-line teaching resources,^{15,18} one-on-one mentoring,¹⁵ and guidance by faculty supervisors.¹⁵

The content taught in teaching-skills curricula included the following skills.

Leadership skills. Program content covered leadership and role modeling,^{13,14} motivation,¹⁶ and directing attention.¹⁶

Effective clinical teaching skills. Specific areas of focus included general principles of clinical teaching and adult learning^{15,18}; orienting learners^{13,14,17}; objectives and planning^{12,16,17}; the "teachable moment" concept^{13,14}; delivery methods¹²; group teaching and inpatient work rounds^{13,14}; discussion and questioning^{12,18}; tips for effective teaching,¹⁵ such as the "five-step microskills" model of clinical teaching^{13,14,17}; bedside teaching^{13,14}; and audiovisual and presentation skills.^{12-14,18,19}

Technical teaching skills. These included demonstration techniques,¹² teaching with high-fidelity patient simulation,¹⁸ teaching procedures,^{13,14,16,18} and teaching charting.^{13,14}

Feedback and evaluation skills. Residents learned to give feedback¹³⁻¹⁸ and to evaluate¹⁶⁻¹⁷ learners.

The description of format and content for each program is summarized in **Table 1**.¹²⁻²⁰

Effects of teaching-skills programs

According to Kirkpatrick,²⁰ 4 levels of evaluation can be assessed: reactions, learning, behaviour, and results. His model for evaluating educational outcomes was modified by Freeth et al²¹ and was adopted by the Best Evidence in Medical Education Collaboration. This model was further adapted by Steinert et al²² to include students, residents, and colleagues (instead of patients).

The results of studies on the effects of teaching-skills programs retrieved by this review are presented in **Table 1**¹²⁻²⁰ in terms of those 4 levels.

The evaluation of most programs was very positive in terms of curriculum appreciation (*reactions*),^{14,17} *learning* outcomes^{14,17} and teaching *behaviour*.^{12-14,16,17,19} None of the retrieved studies assessed the outcome on learners (*results*).

DISCUSSION

This review demonstrates that teaching-skills programs for family medicine residents exist in many formats and shows what content is usually discussed. Specific data on the effects of teaching-skills curricula for family medicine residents are, however, lacking. Most studies involved "primary care residents," which usually included family medicine, internal medicine, and pediatrics residents.

When compared with studies aimed at various specialty programs, few data are available for family medicine residents on curriculum appreciation²³⁻³¹ or learning outcomes of teaching-skills curricula.^{23,27,29,32} As for most studies involving residents from other programs,^{23-25,28,29,32-38} most studies for family medicine residents have assessed the effects of this training on residents' teaching behaviour. Considerable gains were noted on several teaching skills in the various studies.

Not surprisingly, there are no data analyzing the highest evaluation level, which is outcome on learners (*results*). Such data are limited even when residents from all specialties are considered.²⁴

The findings on primary care residents from Aiyer et al are of interest for family medicine training programs.¹⁷ When compared with non-primary care residents, primary care residents showed a greater increase in confidence in their teaching ability and in some teaching skills (improved perceptions of encouraging bedside teaching and providing daily feedback to their learners). This suggests a great potential for teaching in these residents.

After reviewing literature in 1990 on training residents as teachers, Chamberland and Boulé proposed 4 recommendations that still seem to be accurate and particularly relevant to family medicine residents: 1) because of residents' time constraints, short (2 to 3 hours), periodic sessions are preferred to curricula presented over a few days in a row; 2) course content should be practical and relevant to the residents' practices and should integrate basic education principles rather than teaching in a theoretical way; 3) educational strategies should encourage an active role for residents (workshops, role playing, videotapes, etc); and 4) teaching-skills training should be included in residency programs to establish and valorize residents' teaching role and ensure evaluation of their teaching skills.³⁹

Limitations

This review has some limitations. Publication bias is an important limitation, and some unpublished studies might have given a different view. Also, most articles that were retrieved targeted primary care residents, not specifically family medicine residents. This might have an effect because duration of training in internal medicine and pediatrics is longer than for family medicine.

Furthermore, applicability of these findings still needs to be carefully assessed, as the 8 studies that were included in this review were not conducted in Canadian settings. Most of the family medicine programs examined in the retrieved articles are 3 years in length, leaving more time

for teaching-skills training. Canadian family medicine residency programs are very different from those of the other specialties owing to their 2-year duration. There is a paucity of papers on teaching skills for family medicine residents. This review is based on published literature and thus most of the papers on which the review is based have 3-year programs. Some of the findings, however, can be extrapolated to family medicine residents and should be considered during the development of teaching-skills curricula in the context of our shorter programs.

Conclusion

Teaching-skills training programs for family medicine

Table 1. Summary of format, content, and effects of teaching-skills training programs involving family medicine residents

STUDY	PARTICIPANTS	TEACHING-SKILLS CURRICULUM			EVALUATION (ACCORDING TO KIRKPATRICK'S LEVELS OF EVALUATION ²⁰)			FM FINDINGS
		FORMAT	CONTENT	MEASUREMENT TOOL	REACTIONS (APPRECIATION)	LEARNING	BEHAVIOUR (TEACHING BEHAVIOUR)	
Lawson and Harvill, ¹² 1980	FM and internal medicine residents	13 1-hour weekly sessions	Objectives and planning; delivery methods; discussion and questioning; demonstration techniques (audiovisual and lecturing)	Videotaped teaching performances and written questionnaire	NA	NA	Significant ($P < .001$) gains in teaching performance (eg, delivery, organization, explanation, use of audiovisuals) and in attitude toward participating in a teaching-skills program	Not mentioned
Edwards et al, ¹⁶ 1988	First-year residents in medicine, FM, obstetrics, and gynecology	1 half-day course	Communicating objectives; motivating; directing attention; teaching procedures; feedback; evaluation	Randomized controlled trial; trained raters' evaluation of videotapes, residents' self-rating, and students' ratings	NA	NA	Higher scores on evaluation of teaching skills in the experimental group compared with the control group	Before instruction, FM and medicine residents were rated significantly higher on formulating differential diagnoses; no other differences between specialties were statistically significant
Swanson et al, ¹⁹ 1992	FM residents	Not specified	Presentation skills	Randomized controlled time series design; presentations were evaluated using a standardized format	NA	NA	Educational intervention can improve FM residents' presentation skills; education coupled with repeated opportunities for presentation produces greater improvement than repeated presentations alone	Not mentioned
Morrison et al, ¹³ 2003	Generalist residents (FM, internal medicine, pediatrics)	Longitudinal curriculum: 3-hour mini-retreat and 10 1-hour noon conference sessions in which interdisciplinary groups of ≤ 10 residents reviewed homework, brainstormed about teaching skills, and for ≥ 30 minutes actively practised the module's skills in pairs or groups (with "standardized learners") and mutually provided feedback	"Teachable moment" concept; "five-step microskills" model of clinical teaching Teaching skills: leadership and role modeling; orienting learners; giving feedback; bedside teaching; teaching procedures; group teaching, inpatient work rounds; teaching charting; giving mini-lectures	Randomized controlled trial; 3.5-hour, 8-station OSTE designed specifically to test clinical teaching skills of primary care residents; CTPI, a 28-item O-sort instrument that measures comfort with clinical teaching	NA	NA	Intervention group improved their mean overall OSTE scores by 22.3% (more than 2 SD) from pretest to posttest	Not mentioned

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Table 1. *continued*
from page 903.e3

Morrison et al, ¹⁴ 2004	Generalist residents (FM, internal medicine, pediatrics)	Longitudinal curriculum: 3-hour mini-retreat and 10 1-hour noon conference sessions in which interdisciplinary groups of ≤10 residents reviewed homework, brainstormed about teaching skills, and for ≥30 minutes actively practised the module's skills in pairs or groups (with "standardized learners") and mutually provided feedback	"Teachable moment" concept; "five-step microskills" model of clinical teaching Teaching skills: leadership and role modeling; orienting learners; giving feedback; bedside teaching; teaching procedures; group teaching, inpatient work rounds; teaching charting; giving mini-lectures	Randomized, controlled trial; 3.5-hour, 8-station OSTE for generalist resident teachers; semistructured interviews 1 year after the curriculum for some participants	If the curriculum were shortened, participants recommended that the modules on teaching charting and bedside teaching be eliminated	1 year after the program, residents in the intervention group had a richer, more elaborate understanding of teaching principles and skills	Mean overall posttest score for residents in the intervention group improved by 28.5%; control residents did not improve significantly on the overall posttest (2.7%) or on any station; 1 year after the program, intervention residents had greater enthusiasm for teaching during and after residency, had greater learner-centred approaches, and most planned to teach after residency (most control residents did not)	Not mentioned
Farrell et al, ¹⁸ 2006	Program aimed at emergency medicine residents	6 on-line modules	General principles of clinical teaching; effective feedback; teaching procedures; teaching with high-fidelity patient simulation; effective discussion-leading and lecturing	NA	NA	NA	NA	NA
Jain, ¹⁵ 2007	Third-year FM residents	10–12 1-hour weekly sessions: lectures, interactive discussions, video vignettes, role-playing sessions; residents referred to multiple resources (eg, websites); guidance from faculty supervisors	Qualities of adult learners; assessment of knowledge, attitude, and skills; tips for effective teaching; provision of effective and useful feedback	NA	NA	NA	NA	NA
Aiyer et al, ¹⁷ 2008	First-year residents in various specialties (emergency medicine, FM, internal medicine, pediatrics, neurology, neurosurgery, obstetrics, gynecology, radiology, surgery)	1-day mandatory intensive workshop, repeated 3 times a year so that all first-year residents could attend; concludes with an OSTE followed by a discussion	Orienting the learner, which included discussion of the individual clerkship goals and objectives; using clinical teaching microskills; giving feedback to learners; and evaluating student learners	Pre-post self-assessment surveys	Residents felt more prepared, enthusiastic, and confident about their ability to teach; increased understanding of what was expected of them as teachers; lower anxiety level regarding teaching; unchanged perception of teaching by positive example	Increased understanding of the difference between feedback and evaluation; no difference in understanding of the differences between giving someone feedback and a compliment or criticism	Residents more inclined to explain their role to team members, solicit learning goals from team members, and plan to meet each learner's personal learning objectives; increased willingness to use the clinical teaching microskills and to make learners aware of the extent to which they give feedback, provide daily feedback, and provide feedback that is descriptive in nature; no increased willingness to admit "I don't know," to teach by positive example, or to wait at least 3 seconds for a response after asking a question	No specific analysis for FM residents; primary care residents noted a greater increase in their confidence in teaching ability and in assuming team control compared with non-primary care residents; primary care residents' self-ratings of their willingness to encourage bedside teaching and provide daily feedback to their learners showed a much greater increase compared with non-primary care residents

CTPI—Clinical Teaching Perception Inventory, FM—family medicine, NA—not applicable or not assessed, OSTE—objective structured teaching evaluation.

*None of the studies assessed results (patient or learner outcomes), Kirkpatrick's fourth level of evaluation.

Residents use many teaching strategies in curricula presented over a half-day to a few months. Their content includes leadership skills, effective clinical teaching skills, technical teaching skills, as well as feedback and evaluation skills. Program evaluation mainly targeted the effects of the programs on teaching behaviour, which was generally found to improve after completion of these programs.

Because family medicine training covers a broad scope of clinical content in the context of a short duration of training, further studies assessing the effects of teaching-skills training for family medicine residents are needed. Educators should, however, develop programs based on the available knowledge that would benefit family medicine residents in Canada and evaluate the effects of these programs. Future research should also concentrate on the learners' outcomes to assess how residents' teaching-skills training can affect their learners' clinical training and eventually patient care. ✍

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Contributors

Dr Lacasse developed the concept and design of the study, conducted the literature review, selected and analyzed the studies, interpreted the analysis, and prepared the manuscript for submission. **Dr Ratnapalan** provided support for the development of the concept and design of the study and participated in the interpretation of the analysis and preparation of the manuscript for submission.

Competing interests

None declared

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References

- Wamsley MA, Julian KA, Wipf JE. A literature review of "resident-as-teacher" curricula: do teaching courses make a difference? *J Gen Intern Med* 2004;19(5 Pt 2):574-81.
- Yedidia MJ, Schwartz MD, Hirschhorn C, Lipkin M Jr. Learners as teachers: the conflicting roles of medical residents. *J Gen Intern Med* 1995;10(11):615-23.
- Morrison EH, Hollingshead J, Hubbell FA, Hitchcock MA, Rucker L, Prislis MD. Reach out and teach someone: generalist residents' needs for teaching skills development. *Fam Med* 2002;34(6):445-50.
- Busari JO, Prince KJ, Scherpier AJ, van der Vleuten CP, Essed GG. How residents perceive their teaching role in the clinical setting: a qualitative study. *Med Teach* 2002;24(1):57-61.
- College of Family Physicians of Canada. *Standards for accreditation of residency training programs*. Mississauga, ON: College of Family Physicians of Canada; 2006. Available from: www.cfpc.ca/local/files/Education/Red%20Book%20Sept.%202006%20English.pdf. Accessed 2009 Jul 17.
- Accreditation Council for Graduate Medical Education. *Common program requirements*. Chicago, IL: Accreditation Council for Graduate Medical Education; 2007.
- Liaison Committee on Medical Education of the Association of American Medical Colleges. *Standards for accreditation of medical education programs leading to the M.D. degree*. Washington, DC: Association of American Medical Colleges; 2007.
- Frank JR, editor. *The CanMEDS 2005 physician competency framework*. Ottawa, ON: Royal College of Physicians and Surgeons of Canada; 2005.
- Morrison EH, Boker JR, Hollingshead J, Prislis MD, Hitchcock MA, Litzelman DK. Reliability and validity of an objective structured teaching examination for generalist resident teachers. *Acad Med* 2002;77(10 Suppl):S29-32.
- Weiss V, Needelman R. To teach is to learn twice. Resident teachers learn more. *Arch Pediatr Adolesc Med* 1998;152(2):190-2.
- Busari JO, Scherpier AJ. Why residents should teach: a literature review. *J Postgrad Med* 2004;50(3):205-10.
- Lawson BK, Harvill LM. The evaluation of a training program for improving residents' teaching skills. *J Med Educ* 1980;55(12):1000-5.
- Morrison EH, Rucker L, Boker JR, Hollingshead J, Hitchcock MA, Prislis MD, et al. A pilot randomized, controlled trial of a longitudinal residents-as-teachers curriculum. *Acad Med* 2003;78(7):722-9.
- Morrison EH, Rucker L, Boker JR, Gabbert CC, Hubbell FA, Hitchcock MA, et al. The effect of a 13-hour curriculum to improve residents' teaching skills: a randomized trial. *Ann Intern Med* 2004;141(4):257-63.
- Jain S. Training residents to be office-based teachers of family medicine. *Fam Med* 2007;39(10):700-2.
- Edwards JC, Kissling GE, Brannan JR, Plauche WC, Marier RL. Study of teaching residents how to teach. *J Med Educ* 1988;63(8):603-10.
- Aiyer M, Woods G, Lombard G, Meyer L, Vanka A. Change in residents' perceptions of teaching: following a one day "Residents as Teachers" (RasT) workshop. *South Med J* 2008;101(5):495-502.
- Farrell SE, Pacella C, Egan D, Hogan V, Wang E, Bhatia K, et al. Resident-as-teacher: a suggested curriculum for emergency medicine. *Acad Emerg Med* 2006;13(6):677-9.
- Swanson RW, Spooner HJ, Reeder BA, Haight KR, Senthilselvan A. Improving presentation skills of family medicine residents: a randomized controlled study. *Med Educ* 1992;26(3):241-7.
- Kirkpatrick DL. *Evaluating training programs: the four levels*. San Francisco, CA: Berrett-Koehler Publishers; 1994.
- Freeth D, Hammick M, Koppel I, Reeves S, Barr H. *A critical review of evaluations of interprofessional education*. London, Engl: Higher Education Academy Learning and Teaching Support Network for Health Sciences and Practice; 2003. Available from: www.health.heacademy.ac.uk/publications/occasionalpaper/occasionalpaper02.pdf. Accessed 2009 Jul 17.
- Steinert Y, Mann K, Centeno A, Dolmans D, Spencer J, Gelula M, et al. A systematic review of faculty development initiatives designed to improve teaching effectiveness in medical education: BEME guide no. 8. *Med Teach* 2006;28(6):497-526.
- Edwards JC, Kissling GE, Plauche WC, Marier RL. Long-term evaluation of training residents in clinical teaching skills. *J Med Educ* 1986;61(12):967-70.
- Furney SL, Orsini AN, Orsetti KE, Stern DT, Gruppen LD, Irby DM. Teaching the one-minute preceptor. A randomized controlled trial. *J Gen Intern Med* 2001;16(9):620-4.
- Gaba ND, Blatt B, Macri CJ, Greenberg L. Improving teaching skills in obstetrics and gynecology residents: evaluation of a residents-as-teachers program. *Am J Obstet Gynecol* 2007;196(1):87.e1-7.
- Haber RJ, Bardach NS, Vedanthan R, Gillum LA, Haber LA, Dhaliwal GS. Preparing fourth-year medical students to teach during internship. *J Gen Intern Med* 2006;21(5):518-20.
- Pasquale SJ, Cukor J. Collaboration of junior students and residents in a teacher course for senior medical students. *Med Teach* 2007 Sep 29;1-5. Epub ahead of print.
- Pristach CA, Donoghue GD, Sarkin R, Wargula C, Doerr R, Opila D, et al. A multidisciplinary program to improve the teaching skills of incoming housestaff. *Acad Med* 1991;66(3):172-4.
- Roberts KB, DeWitt TG, Goldberg RL, Scheiner AP. A program to develop residents as teachers. *Arch Pediatr Adolesc Med* 1994;148(4):405-10.
- Rockey P, Dunnington G, DaRosa DA. A multidisciplinary approach to teaching residents to teach. *Acad Med* 2000;75(5):545-6.
- Weissman MA, Bensinger L, Koestler JL. Resident as teacher: educating the educators. *Mt Sinai J Med* 2006;73(8):1165-9.
- Spickard A 3rd, Corbett EC Jr, Schorling JB. Improving residents' teaching skills and attitudes toward teaching. *J Gen Intern Med* 1996;11(8):475-80.
- Bharel M, Jain S. A longitudinal curriculum to improve resident teaching skills. *Med Teach* 2005;27(6):564-6.
- Busari JO, Scherpier AJ, van der Vleuten CP, Essed GG. A two-day teacher-training programme for medical residents: investigating the impact on teaching ability. *Adv Health Sci Educ Theory Pract* 2006;11(2):133-44.
- Edwards JC, Kissling GE, Plauche WC, Marier RL. Evaluation of a teaching skills improvement programme for residents. *Med Educ* 1988;22(6):514-7.
- Litzelman DK, Stratos GA, Skeff KM. The effect of a clinical teaching retreat on residents' teaching skills. *Acad Med* 1994;69(5):433-4.
- White CB, Bassali RW, Heery LB. Teaching residents to teach. An instructional program for training pediatric residents to precept third-year medical students in the ambulatory clinic. *Arch Pediatr Adolesc Med* 1997;151(7):730-5.
- Wipf JE, Orlander JD, Anderson JJ. The effect of a teaching skills course on interns' and students' evaluations of their resident-teachers. *Acad Med* 1999;74(8):938-42.
- Chamberland M, Boulé R. Residents and the teaching role: review of the literature [article in French]. *CMAJ* 1990;143(8):725-30.