

Residency Education

Integrative Medicine in Residency: Assessing Curricular Needs in Eight Programs

Rita Benn, PhD; Victoria Maizes, MD; Mary Guerrero, MD;
Victor Sierpina, MD; Paula Cook; Patricia Lebensohn, MD

Background and Objectives: *Integrative medicine in residency (IMR) is a competency-based online program designed to incorporate a core curriculum in integrative medicine (IM) into established residency training in family medicine. Results of a needs assessment survey developed to guide this curriculum design are presented and discussed. **Methods:** Faculty and residents from eight self-selected family medicine programs that agreed to pilot the IMR were invited to complete an online needs assessment survey. The survey included a mix of structured and open-ended questions. **Results:** A total of 222 respondents completed the survey, yielding a 60% response rate. Sixty-seven percent of faculty and residents preferred that IM be woven throughout all curriculum areas. The highest rated content topics were nutrition and supplements and physician wellness. Chronic illness, behavioral health, and outpatient medicine were the three top curricular areas seen to need enhancement with IM. Qualitative analysis revealed that 84% of respondents viewed IM as central to family medicine training, the care of patients, and the field of family medicine. Top challenges to implementation included limitations in time, resources, and acceptance. **Conclusions:** The findings from the needs assessment serve as a resource for addressing curriculum design and potential challenges in implementation.*

(Fam Med 2009;41(10):708-14.)

In the past 15 years, studies consistently report that more than one third of patients use complementary and alternative therapies,^{1,2} and a large proportion do not inform their physicians of this use.³ To ensure patient safety, the Institute of Medicine (IOM) Academy of Science Committee on the use of complementary and alternative medicine (CAM) recently recommended that “health professional schools (eg, school of medicine, nursing, pharmacy, and allied health) incorporate sufficient information about CAM into the standard curriculum at the undergraduate, graduate, and postgraduate levels to enable licensed professionals to competently advise their patients about CAM.”⁴ Despite this call, research investigating the training and cur-

ricular needs of IM in academic family medicine has been limited.⁵

Integrative medicine has been defined by leading academic health centers^{6,7} as an approach to care that shares much of the same philosophical principles of family medicine. It includes a strong bio-psycho-socio-spiritual underpinning, a belief in the healing power of the body, and a practice style that is patient centered, emphasizing prevention and less invasive therapies first. Providing training about conventional and complementary practices within this framework will optimize clinical care and prepare future family physicians with the necessary skills and competencies to consider use of all appropriate treatment options, including lifestyle modification, nutrition supplementation, stress management, and other therapies.

Integrative Medicine in Residency (IMR) is a 200-hour online competency-based curriculum development project conceived to meet the need for comprehensive family medicine training in integrative medicine. It emerged from a previous model⁸ developed by the University of Arizona, and subsequently

From the University of Michigan (Dr Benn); the Center for Integrative Medicine, University of Arizona (Dr Benn, Dr Maizes, Ms Cook, and Dr Lebensohn); University of Connecticut (Dr Guerrero); and Department of Family Medicine, University of Texas Medical Branch (Dr Sierpina).

implemented elsewhere, to provide a 4-year residency track in integrative family medicine (IFM). The objective of the IMR is to create a flexible, adaptable, and scaleable model for training residents using Web-based content, program-specific experiential exercises, and group process-oriented activities woven into each of the 3 years of residency education. This paper reports on the results of a needs assessment survey conducted with eight family medicine residencies to inform the scope and direction of the content as well as teaching methodologies of the proposed curriculum.

Methods

Sample

The sample consisted of all faculty and residents from eight family medicine programs that agreed to pilot the IMR program in their curriculum. Three residency programs are IFM sites, one of which has also received an earlier National Center for Complementary and Alternative Medicine (NCCAM) R25 grant to implement CAM into medical education.⁹ Two other IMR sites also had been previous NCCAM R25 grantees. The study sites represented a mix of community- (n=3) and university-affiliated/university-based residencies (n=5), spanning the Northeast (4), Midwest (1), Southeast (1), and Southwestern US regions (2).

Procedure

Faculty and residents responded to an invitation to complete an online needs assessment designed for this study. The study was approved by the University of Arizona Institutional Review Board.

Survey Instrument

The needs assessment was designed to investigate faculty and resident attitudes toward IM content incorporation into the curriculum and preferences for curriculum content, format, and program length. The survey included demographic questions as well as structured and open-ended questions. Two structured questions used a 4-point Likert scale to rate the extent to which participants believed specific IM content areas would enhance the curriculum as well as which required areas of family medicine curriculum would benefit most. Included IM content areas were based on the categorical NCCAM framework (mind-body therapies, biological-based therapies [nutrition, supplements and botanicals], manual medicine, whole systems, and energy medicine) and other areas (eg, patient-centered care, physician wellness) previously identified as IM competencies for the family medicine residents.^{8,10} Two structured questions asked respondents to check the number of hours and format desired for IM content inclusion. The open-ended questions probed respondents' opinion of inclusion of IM training in residency and perceptions of the challenges to integration of this required curriculum.

Data Analysis

Descriptive frequency statistics were calculated on responses to each of the structured question items. Chi-square (or Fisher's Exact Test) analysis was performed to determine any association between selected demographics (gender, age), respondent role status (faculty, resident), previous site experience with IM (ie, IFM and/or NCCAM R25), and survey items. Rated scale responses were grouped into two categories to not violate small-frequency cell assumptions of chi-square analysis. For each open-ended question, responses were content coded by the first and last author and a list of themes generated. The first and last authors agreed on the themes to list. Responses were then recoded by the first author using revised themes and subsequently verified by the last author. Discrepancies in coded responses were discussed and reconciled. Chi-square analyses were also performed to investigate the association between qualitative themes and sample and site characteristics.

Results

Survey Response Rate

A total of 222 respondents completed the survey, yielding an overall response return rate of 60.2%. Response completion was independent of faculty and resident roles status but was significantly associated with different residency programs (Pearson chi-square=26.29, df=7, $P<.0009$), with survey return rates varying across sites from a low of 43.9% to a high of 82.9%. Previous history of site experience with IM did not appear to influence site survey return rate when both residents and faculty were included in calculated analysis. With separate analyses of resident and faculty data, a significant relationship was observed for residents only ($P=.009$). Residents were much more likely to return their surveys if their program had current or previous exposure to IM curriculum.

Respondent Characteristics

Descriptive data of sample respondent characteristics are presented in Table 1. No significant association was observed between respondent role status and gender. Role status was related to respondents' age in the expected direction (Pearson chi-square=1.175, df=2, $P<.0001$). Gender was significantly related to both respondent age and IM site experience. More females (61%) than males (44%) were likely to fall in the younger age range, and more males (36%) than females (21.3 %) were found in the over-45 age range (Pearson chi-square=10.603, df=2, $P<.005$). Respondents from residency sites with no previous IM exposure were significantly more likely to be female (63.5 %), in contrast to sites with previous IM experience ($P=.05$).

Table 1
Survey Respondent Characteristics

	Faculty	Residents	Total
n	99	123	222
Gender			
Male	49 (49.5%)	51 (41.5%)	100 (45.0%)
Female	50 (50.5%)	72 (58.5%)	122 (55.0%)
Age			
<30	—	56 (45.5%)	56 (25.2%)
30–35	14 (14.1%)	49 (39.8%)	63 (28.4%)
36–44	28 (28.3%)	13 (10.6%)	41 (18.5%)
45–54	39 (39.4%)	5 (4.1%)	44 (19.8%)
55 and over	18 (18.2%)	—	18 (8.1%)
PGY			
1	—	66 (53.7%)	—
2	—	31 (25.2%)	—
3+	—	26 (21.1%)	—
Faculty experience			
< 2 years	25 (25.3%)	—	—
3–5 years	20 (20.2%)	—	—
6–10 years	16 (16.2%)	—	—
> 10	38 (38.4%)	—	—
Site experience with IM			
IM exposure (IFM/R25)	56 (56.6%)	81 (65.9%)	137 (61.7%)
No formal IM exposure	43 (43.4%)	42 (34.1%)	85 (38.3%)

IM—integrative medicine

Curriculum Integration of IM Format and Hours

Analysis of respondents' preferences regarding the format of curriculum integration of IM revealed two significant associations. Faculty were significantly more likely to select the response that IM needs to be fully integrated into all areas of the curriculum in contrast to the other choices (ie, IM as an elective or as a subspecialty track) made more frequently by residents (Pearson chi-square=10.594, $df=2$, $P<.005$). Female respondents were also significantly more likely to prefer that IM be woven into the curriculum than the males (Pearson chi-square=12.642, $df=2$, $P<.002$).

Respondent preference for time allocation in the curriculum revealed no significant differences with respondent demographics, role status, or IM site exposure. Fifty-two percent preferred that IM curriculum time occur for less than 100 IM hours, 19% for 100–150 hours, and 29% more than 150 hours.

Family Medicine Curriculum Areas and IM Content

Table 2 lists the frequency of respondents' perceptions of IM content areas that might enhance the existing family medicine curriculum. More than 60% of respondents perceived two IM content areas to have a substantial influence: nutrition and supplements and physician wellness, with no differential response by resident and faculty subgroups. A significant association was observed only for age of respondent and the botanical content area. Respondents older than 35 were more likely to perceive that botanical medicine would substantially enhance the curriculum in contrast to younger age respondents (Pearson chi-square=6.622, $df=2$, $P<.04$). Respondents from sites with a history of IM experience were significantly more likely to perceive that content in physician wellness (67%) and manual medicine (74.1%) would add value and were significantly less likely (31%) to see the benefit for spirituality-related content ($P=.032$, $P=.0009$, and $P=.016$, respectively).

Faculty and residents prioritized the areas in the family medicine curriculum where they believed IM content would best fit. The majority (74%) ranked the area of chronic illness as the highest need area for inclusion of IM content in family medicine, followed by behavioral health (57%), adult medicine (53%), and women's health (45.6%). Significantly fewer respondents (29%) from sites with previous IM experience agreed on the need to include IM content into the behavioral health area in contrast to respondents from sites with no IM exposure ($P=.013$).

Curriculum Integration: Qualitative Themes

Respondents articulated their opinions regarding adding IM content to the curriculum. They described their perspective in terms of a curricular focus or value to the profession. While a small proportion (16%) perceived that IM should have a limited role in a family medicine residency curriculum, the remainder desired that IM have a prominent, vital role in the curriculum (41%), provide tools and information to improve patient care and their professional competency as a physician (32.5%), and to enhance the field of family medicine (10.5%). Representative comments that relate to each of these four themes are presented in Table 3. The history of site experience with IM was significantly associated with the themes emerging from respondents' opinions (Pearson chi-square=11.52, $df=3$, $P<.009$). Respondents from sites with a history of IM experience were more likely to write about the value of IM in enhancing their competency as a physician (74.5%) and propose a central role for IM (62.5%) within a family medicine curriculum.

Table 2

Agreement of Curriculum Enhancement From Integrative Medicine (IM) Content Areas

	Role Status				Total		Site IM Exposure			
	Faculty		Residents				IM Exposed		Non IM Exposed	
	n=99	%	n=123	%	n=222	%	n=137	%	n=85	%
Nutrition and supplements	68	68.7	76	61.8	144	64.9	83	60.6	61	71.8
Physician wellness*	68	68.7	68	55.3	136	61.3	91	66.4	45	52.9
Mind-body medicine	56	56.6	58	47.2	114	51.4	65	47.4	49	57.6
Physical activity	50	50.5	64	52.0	114	51.4	68	49.6	46	54.1
Patient-centered Care	49	49.5	62	50.4	111	50.0	70	51.1	41	48.2
Botanicals	54	54.5	57	46.3	111	50.0	66	48.2	45	52.9
Manual medicine**	46	46.5	62	50.4	108	48.6	80	58.4	28	32.9
Whole systems	42	42.4	57	46.3	99	44.6	58	42.3	41	48.2
Energy medicine	36	36.4	46	37.4	82	36.9	46	33.6	36	42.4
Spirituality***	39	39.4	42	34.1	81	36.5	42	30.7	39	45.9

* Significant between sites at $P < .03$

** Significant between sites at $P < .0009$

*** Significant between sites at $P < .016$

Challenges to Curriculum Integration

All respondents listed three major challenges to incorporating IM into the curriculum. Table 4 presents the eight themes that emerged from the qualitative analysis of this data, along with representative comments. Finding time in the curriculum to implement IM, followed by a lack of resources (insufficient number of trained staff and/or faculty) and lack of acceptance by the larger medical system were the three greatest challenges identified. There was no association between respondent or site characteristics and the identified challenges.

Discussion

Analysis of the qualitative and quantitative data supports the interest of the educators and residents from these eight self-selected family medicine programs in including IM training in residency education. The majority of those surveyed indicated that IM content should be woven into all areas of the family medicine residency curriculum. More than 80% of open-ended responses included comments that affirmed IM as integral to family medicine training, adding value to the care of patients and the physician's professional competence. Respondents from residency sites with prior curriculum experience with IM expressed these open-ended comments more frequently than respondents from residencies with no history of IM exposure.

It is interesting that female respondents were more likely to prefer that IM content be woven into the curriculum than males. This finding occurred irrespective of the history of site exposure to IM and supports the gender-based interest and usage in holistic health de-

scribed in studies with medical trainees¹¹⁻¹² and various adult populations.^{1,13-14}

More than 60% of the residents and faculty identified two key content areas for inclusion in the IMR program: (1) nutrition and dietary supplements and (2) physician wellness. With the flood of dietary supplement products on the market, the issue of safe and appropriate use by patients is a major public health concern. An extensive body of literature substantiates the use of dietary supplements for prevention and alleviation of a variety of diseases¹⁵⁻¹⁷ as well as the potential for nutritional changes to reduce inflammatory disease processes and improve health.¹⁸⁻²⁰ Because faculty and residents have typically received little formal training in nutritional science or dietary supplements, IMR content in this area will greatly enhance current family medicine residency education.

We were not surprised that respondents selected physician wellness as their second most commonly chosen topic for curricular enhancement. Teaching wellness strategies is important to protect against high levels of resident burnout and depression.²¹⁻²⁴ The inherent physical, psychological, and time demands of residency training make self-care a challenging issue to address. Self-care for physicians is a core competency of IM education,^{7,10} and as such, respondents from sites with experience with prior IM initiatives were even more likely to recognize this need. Self-care strategies and wellness guidelines will be emphasized early in the IMR curriculum to exemplify its importance and encourage its personal application.

Table 3
Representative Comments Related to Integrative Medicine Curriculum Inclusion

<i>Theme: Centrality of Curricular Focus (57%)</i>	
<i>Integral (41%)</i>	<i>Limited (16%)</i>
<ul style="list-style-type: none"> • An important and key area that should be brought into family medicine training. • Essential and under-utilized in most training programs and in allopathic Western medicine. • Should be included in core curriculum • Valuable resource. Needs to be made into a routine part of patient care/ precepting process to make a lasting impact. • I think it is essential for physicians to know about integrative medicine. • A much needed addition to allopathic medicine... Traditional Western medicine is beginning to open its eyes to integrative medicine, and it is timely that we are integrating this training into family medicine residency training 	<ul style="list-style-type: none"> • It is a reasonable area to provide training in and to involve in the care of my own patients. • Fine as an elective, and everyone needs a basic intro on how to find information, but I don't think it should be part of core curriculum in any detail. • There is a definite role for research-supported integrative med as an adjuvant to allopathic medicine. • A cursory overview of various modalities is helpful for providers to understand what is out there. More than that, unless it is evidence-based, should not be required of all residents. • I think it is important for residents to have a basic understanding of integrative medicine practice.
<i>Theme: Value to the Profession (43%)</i>	
<i>Enhanced Physician Competency (32.5%)</i>	<i>Family Medicine Field (10.5%)</i>
<ul style="list-style-type: none"> • Family medicine looks at the patient in a broad context; it is only appropriate to learn more about IM to have broader information to offer patients to find a good fit for them individually. • Important for us to have understanding because many of our patients will be using different modalities with or without us • It is a very important piece of residency experience because my patients care about it. • The ability to integrate Eastern and Western medicine would be an invaluable tool for us family doctors. • I think it has an important role, and several of my patients would benefit from me learning more about it. 	<ul style="list-style-type: none"> • Part of the foundation of family medicine as it is evolving today. • I feel it is yet another area where family medicine is taking a lead. • I think family doctors are best suited to bring together the best of allopathic and the best of complementary and alternative medicine. • We need more opportunities to train physicians in integrative medicine approaches • Family medicine and integrative medicine are not separate entities to our patients, so it only makes sense that we too view family medicine through these lenses.

IM—integrative medicine

The survey results demonstrate a high level of concordance between residents and faculty on the areas where IM is most needed. These areas include chronic illness, behavioral health, and adult outpatient care. Integrative medicine has much to offer in the context of primary and secondary preventive services and of motivating lifestyle behavior changes that affect health. Improved nutrition, physical activity, and use of mind-body practices are known to significantly influence outcomes for patients with many chronic illnesses.²⁵⁻²⁷ The IMR will use diverse case scenarios that simulate family medicine patient populations in the outpatient setting to facilitate clinical translation of these content areas.

As is true of any new curriculum effort, faculty and residents acknowledged a number of concerns. The issue of time permeated survey respondents' comments and likely influenced the preference by 52% of faculty and residents for less than 100 hours of IM content. It is noteworthy that neither history of site exposure to IM nor the perceived challenges related to time or absence of faculty or fiscal resources deterred respondents from wanting to weave IM throughout family medicine training. In developing our IMR content, we plan to

be sensitive to resource issues. Faculty will have open access to the IMR curriculum. With increased opportunity to deepen their learning, faculty resources for teaching IM will be augmented. We intend to revise our units should the modules take too long for our learners to complete.

Limitations

The results of this needs assessment are specific to the family medicine sites included in our study. Sampling bias limits generalization of survey findings, since the residencies were self-selected, and there was substantial variation in survey response return rates among sites. Several programs had seasoned IM faculty with a previous history of IM curriculum implementation resulting from IFM and NCCAM R25 program participation. Data analyses demonstrated the influence of IM site experience on survey return rates for residents and surveyed items.

Conclusions

The faculty and resident responses provided by the variety of eight family medicine residencies informed us of key areas to be targeted for IMR education. The

Table 4

Themes and Representative Comments Related to Challenges to Integrative Medicine Curriculum Integration

<i>Challenges</i>	<i># (%) of Comments (n=822)</i>	<i>Sample Representative Comments</i>
1. Time	126 (20.6)	"Time needed for study," "Finding the appropriate time/space in the curriculum because it is a time crunch as it is," "Faculty time allocation"
2. Resources	122 (19.9)	"Federal insurance, reimbursement for services, and training requirements that inhibit addition of this curriculum," "Cost to patients, most of our patients do not have the money to pay unless covered by Medicaid," "Have trained faculty to teach residents"
3. Medical system acceptance	97 (15.8)	"Overcoming closed-minded attitude about this type of medicine," "Acceptance from other medical specialties," "Resistance from patients who might be skeptical about this concept"
4. Competing curriculum needs and demands	63 (10.3)	"Already extensive and sometimes overwhelming broad base of information residents are expected to learn," "Competing responsibilities of residents," "Too many other areas, which are much more central to allopathic or osteopathic medicine"
5. Curriculum implementation	64 (10.5)	"Not knowing how to integrate into curriculum," "Figuring out where Web-based learning can substitute some of our core content," "Getting residents to think integratively in all patient encounters"
6. Resident/faculty acceptance	63 (10.3)	"Hesitance by some faculty and some specialties," "Resistance from attendings who do not believe in other modalities of care," "Having all residents agreeing on its importance; buy-in by residents"
7. Evidence base	41 (6.7)	"The current research paradigm and the difficulty of integrative medicine to fit nicely into an EBM model," "Quality resources may be lacking, must ensure that content is evidence based/guided," "Convincing its efficacy on patient care"
8. Breadth and specificity	36 (5.9)	"Being able to comprehend and remember all the essential information in this area," "Integrative medicine spectrum is too wide," "Lack of prepared curriculum"

data from the sites made us more sensitive to perceived challenges in curriculum integration and allowed us to proactively address potential problematic issues related to curriculum implementation. By developing modular instruction units that can be flexibly integrated in diverse ways into family medicine training, we expect to maximize scalability and likelihood of widespread adoption. The IMR serves as an innovative example for residency redesign and demonstrates how a small group of family medicine educators are responding to the call to action set forth by the Future of Family Medicine to create a "new model" of comprehensive patient-centered care.^{28,29}

Acknowledgments: This study was previously presented as "Developing a Learning Community Among Residencies: The Integrative Medicine in Residency Project." Eight residencies across the United States are creating a learning community by developing a common Web-based curriculum in integrative medicine. The curriculum has been created following the Accreditation Council for Graduate Medical Education Outcome Project guidelines and includes a needs assessment and specific content and evaluation methodologies. Presented as a seminar at the 2008 Society of Teachers of Family Medicine Annual Spring Conference in Baltimore.

The authors are grateful for the contributions of Emily Sherbrooke, IMR Program Coordinator, and all IMR faculty coordinators who were not listed in the authorship byline. These include Craig Schneider, Maine Medical Center, Portland, Me; Selma Sroka, Hennepin County, Minneapolis; Ben Kligler and Raymond Teets, Beth Israel, New York; Dale Waxman, Carolinas Medical Center, Charlotte, NC; and John Woytowicz, Maine-Dartmouth,

Augusta, Me. The authors thank the faculty and residents from these respective residency sites for completing the survey.

This study was supported with funding provided from the Weil Foundation, Lovell Foundation, Joan Diamond Trust, and several generous individual donors.

Corresponding Author: Address correspondence to Dr Lebensohn, 520-626-9390. Fax: 520-626-6484. plebenso@email.arizona.edu.

REFERENCES

1. Barnes PM, Bloom B, Nahin R. CDC National Health Statistics Report #12. Complementary and alternative medicine use among adults and children: United States, 2007. Atlanta: Centers for Disease Control and Prevention, December 2008.
2. Robinson A, McGrail MR. Disclosure of CAM use to medical practitioners: a review of qualitative and quantitative studies. *Complement Ther Med* 2004;12(2-3):90-8.
3. Eisenberg DM, Davis RB, Etner SL, et al. Trends in alternative medicine use in the United States, 1990-1997: results of a follow-up survey. *JAMA* 1998;280:1569-75.
4. Institute of Medicine. Committee on the Use of Complementary and Alternative Medicine by the American Public. *Complementary and alternative medicine in the United States*. Washington, DC: National Academies Press, 2005.
5. Prajapati SH, Kahn RF, Stecker T, Pulley L. Curriculum planning: a needs assessment for complementary and alternative medicine education in residency. *Fam Med* 2007;39(3):190-4.
6. Maizes V, Schneider C, Bell I, Weil A. Integrative medical education: development and implementation of a comprehensive curriculum at the University of Arizona. *Acad Med* 2002;77(9):851-60.

7. Consortium for Academic Health Centers. Consortium of Academic Health Centers for Integrative Medicine. www.imconsortium.org. Accessed January 18, 2009.
8. Maizes V, Silverman H, Lebensohn P, et al. The Integrative Family Medicine Program: an innovation in residency education. *Acad Med* 2006;81:583-9.
9. National Center for Complementary and Alternative Medicine. Request for Proposals for CAM Education Grants. Bethesda, Md: National Institutes of Health, December 13, 1999.
10. Kligler B, Koithan M, Maizes V, et al. Competency-based evaluation tools for integrative medicine training in family medicine residency: a pilot study. *BMC Med Educ* 2007;7:7. DOI:10.1186/1472-6920-7-7.
11. Astin J, Sierpina V, Forsys K, Clarridge B. Integration of the biopsychosocial model: perspectives of medical students and residents. *Acad Med* 2008;83(1):20-7.
12. Sierpina V, Levine R, Astin J, Tan A. Use of mind therapies in psychiatry and family medicine faculty and residents: attitudes, barriers, and gender differences. *EXPLORE: Journal of Science and Healing* 2007;3(2):129-35.
13. Boon HS, Olatunde F, Zick SM. Trends in complementary/alternative medicine use by breast cancer survivors: comparing survey data from 1998 and 2005. *BMC Women's Health* 2007;7:4.
14. Smith BW, Dalen J, Wiggins KT, Christopher PJ, Bernard JF, Shelley BM. Who is willing to use complementary and alternative medicine? *Explore (NY)* 2008;4(6):359-67.
15. Halberstein RA. Medicinal plants: historical and cross-cultural usage patterns. *Ann Epidemiol* 2005;15:686-99.
16. Lee JH, O'Keefe JH, Bell D, Hensrud DD, Holick MF. Vitamin D deficiency: an important, common, and easily treatable cardiovascular risk factor? *J Am Coll Cardiol* 2008;52(24):1949-56.
17. Lappe JM, Travers-Gustafson D, Davies KM, Recker RR, Heaney RP. Vitamin D and calcium supplementation reduces cancer risk: results of a randomized trial. *Am J Clin Nutr* 2007;85:1586-91.
18. Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med* 2002;346(6):393-403.
19. Salas-Salvado J, Fernandez-Ballart J, Ros E, et al. Effect of a Mediterranean diet supplemented with nuts on metabolic syndrome status. *Arch Intern Med* 2008;168(22):2449-58.
20. Griffin BA. How relevant is the ratio of dietary n-6 to n-3 polyunsaturated fatty acids to cardiovascular disease risk? Evidence from the OPTILIP Study. *Curr Opin Lipidol* 2008;19:57-62.
21. Prins JT, Gazendam-Donofrio SM, Tubben BJ, van der Heijden FMMA, van de Wiel HBM, Hoekstra-Weebers JEHM. Burnout in medical residents: a review. *Med Educ* 2007;41:788-800.
22. Martini S, Arfken C, Churchill A, Balon R. Burnout comparison among residents in different medical specialties. *Acad Psychiatr* 2004;28:240-2.
23. Purdy RR, Lemkau JP, Rafferty JP, Rudisill JR. Resident physicians in family practice: who's burned out and who knows? *Fam Med* 1987;19:203-8.
24. Thomas NK. Resident burnout. *JAMA* 2004;292:2880-9.
25. Friedenreich CM, Gregory J, Kopciuk KA, Mackey JR, Courneya KS. Prospective cohort study of lifetime physical activity and breast cancer survival. *Int J Cancer* 2009;Apr 15;124(8):1954-62.
26. Meyerhardt JA, Niedzwiecki D, Hollis D, et al. Association of dietary patterns with cancer recurrence and survival in patients with stage III colon cancer. *JAMA* 2007;298(7):754-64.
27. Morris MC, Evans DA, Tangney CC, Bienias JL, Wilson RS. Associations of vegetable and fruit consumption with age-related cognitive change. *Neurology* 2006;67:1370-6.
28. Green LA, Pugno P, Fetter G, Jones SM. Preparing the personal physician for practice (P4): a national program testing innovations in family medicine residencies. *J Am Board Fam Med* 2007;20(4):329.
29. TransforMED. Preparing the Personal Physician for Practice (P4). www.transformed.com/p4.cfm. Accessed January 18, 2009.