

Redesigning Residency Education in Internal Medicine: A Position Paper from the Association of Program Directors in Internal Medicine

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There has been considerable change in the practice of internal medicine in the past quarter century, including the rise of specialization, increasing time pressure, the hospitalist movement, and the rapidly changing responsibilities of internists in inpatient and outpatient settings. Training programs have not adequately responded

to these trends, and there is a consensus that the residency education system urgently needs redesign.

Ann Intern Med. 2006;144:920-926.
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The Association of Program Directors in Internal Medicine (APDIM) Council has developed a strategy for redesigning residency training. The Council's recommendations were reviewed and approved by the APDIM membership and form the basis of this official position paper. The Association of Program Directors in Internal Medicine comprises more than 400 internal medicine training programs throughout the United States and Canada.

The redesign process will require substantial changes to the educational environment, oversight, curriculum, faculty reward system, and funding of graduate medical education in internal medicine. The Association of Program Directors in Internal Medicine proposes immediate, short-term, and long-term solutions.

There is a growing consensus that residency education in internal medicine urgently needs redesign. The education system has failed to respond to dramatic changes in medical practice and health care delivery: It is not patient-centered and is not adequately linked with efforts to improve patient safety (1-10). Medical residents are not sufficiently exposed to internal medicine career options, leading them to make uninformed career choices. Finally, interest among U.S. medical school graduates in internal medicine careers is declining, especially in ambulatory general internal medicine (11-13).

The Association of Program Directors in Internal Medicine (APDIM) has begun to reexamine internal medicine residency education. The Association believes that core principles, not criticism, should be the foundation for change. As such, the APDIM Education Committee developed principles for redesigning residency education, emphasizing quality improvement and a renewed commitment to patient-centered care (Table). These guiding principles were used as the foundation of an APDIM Council Retreat to consider options for redesign. Two conclusions were reached: 1) High-quality education and patient care must be inseparably linked within training programs, and 2) redesign will require changes to the educational environment, oversight, curriculum, faculty reward system, and funding of graduate medical education in internal medicine.

Following the retreat, a writing subcommittee was created to develop a position paper. Drafts were shared with

the Council, which made recommendations for revisions to the document. In April 2005 at the APDIM national meeting in San Francisco, breakout sessions of the membership discussed the draft and provided feedback. After recommended changes from the membership were reviewed, the position paper was revised to its present version. It has been unanimously approved by the APDIM Council.

EDUCATIONAL ENVIRONMENT

Changes in internal medicine practice have rendered inadequate the century-old, inpatient-based education model. This system was developed with the assumption that internists would care for the sickest and most challenging patients, often as inpatient consultants. Today the internist often serves as a primary care physician (14). Internal medicine and its subspecialties have expanded into new areas, such as outpatient chronic disease management; complex acute care; and hospital, addiction, and HIV medicine. This expanded scope has led some organizations to consider recommending that internal medicine training be lengthened to 4 years (15).

Financial pressure on teaching hospitals has intensified, encouraging the pursuit of clinical and grant revenue at the expense of resident education (16, 17). The number of full-time clinical faculty has grown nearly 10-fold in the past 4 decades, not for educational purposes, but principally to provide clinical service (16). Many institutions have also expanded their residency programs to meet increasing service demands, including rapid movement of patients through the medical system (18).

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Inpatient rotations have traditionally been the centerpiece of internal medicine education. In the past, virtually every patient admitted to the medical service of a teaching hospital was cared for by a resident team. The patients' illnesses varied widely in terms of acuity, severity, and complexity. Patients stayed in the hospital longer, allowing residents and faculty more time to collaborate on data collection and interpretation and to discuss plans for diagnosis and management. Longer hospitalizations also allowed residents to develop relationships with patients and their families. As length of hospital stay has decreased and as the locus of care for many clinical problems has shifted to the outpatient setting, the diversity of patient care experiences and time for reflection have diminished. Inpatients are sicker and less representative of internal medicine as a whole (19). Residents generally do not follow patients to the outpatient setting and thus see only a fraction of an illness.

Long overdue regulations limiting resident duty hours and patient load have had the unintended consequence of worsening this situation. Many teaching hospitals have responded by hiring nurse practitioners, physician assistants, and hospitalists to care for patients who can no longer be accommodated by teaching services. As a result, teaching service tends to be composed of the sickest patients, many with multiple acute and chronic medical problems and complex, frustrating discharge-planning issues (20).

Outpatient clinics have assumed an increasing burden of postacute care and complex chronic disease management. Most internal medicine residency programs still rely heavily on hospital-based clinics as the primary resident experience in ambulatory general medicine. These clinics often have an inadequate number of personnel and inadequate physical resources and can be frustrating, chaotic places to practice. Patients returning to outpatient clinics frequently see unfamiliar physicians or seek alternate sites of care for acute problems because their resident physicians are unavailable. Many clinics have a commitment to underserved populations, which carry a heavy burden of chronic illness and social challenges.

The inability to provide patient-centered care because of inadequate resources and poor continuity also drives away patients with less complex conditions, narrowing residents' breadth of experience. Limiting continuity experiences to settings in which multidisciplinary, efficient care is not possible may be yet another factor turning residents and students away from primary care careers (21).

Solutions

As residency education is redesigned, the following principles and practices should be emphasized in all rotations: 1) focus on education; 2) quality, patient safety, and systems-based practice; and 3) graded supervision of residents.

Table. Principles for Redesigning the Educational Continuum

Recognize that medical education is centered on patient care and meeting the needs of patients; emphasize that the primary responsibility of medical education is to teach the next generation of physicians, not to fulfill the service obligations of institutions.

Define and assess the core skills, knowledge, and attitudes that all internists—regardless of their eventual focus—must master as a foundation in internal medicine; recognize that the foundation will change as medical practice evolves; respond to scientific and societal change with a process of continual curricular renewal; and instill physicians-in-training with values and skills that will strengthen their effectiveness and promote career satisfaction. These values and skills include compassion, professionalism, lifelong learning, data-driven quality improvement, patient-centered focus, team building, and leadership.

Develop, refine, and evaluate standards of competency in internal medicine; ensure that the educational continuum is marked by competency-based milestones.

Recognize that the complexity of the health care system imposes limitations on the learning environment; encourage innovation and development of new models for teaching internal medicine to the next generation of physicians; use these new models to improve patient care and medical education; guarantee that the educational continuum in internal medicine—particularly the foundation—adheres to valid concepts of learning theory, especially as this theory applies to adult learners.

Address the importance of faculty educators and mentors to physicians-in-training; provide opportunities for faculty to enhance their teaching skills; ensure faculty have adequately supported time for their responsibilities of mentorship, feedback, and evaluation; advocate for faculty recognition and promotion.

Ensure that the educational continuum in internal medicine affords graduated responsibility to physicians-in-training while ensuring patient safety by providing necessary support and guidance to students, residents, and fellows.

Provide learning environments that promote the rich diversity of career pathways available to internists, including options for specialty focus (generalists, hospitalists, geriatricians, and subspecialists) and duality of purpose (clinician-educators, physician-scientists, and clinician-administrators); provide options that remain flexible throughout the duration of internists' careers.

Offer venues, experiences, and support for physicians-in-training to develop and maintain the skills and integrity necessary for independent critical thinking, including reflection, self-assessment, unbiased analysis, critical appraisal of medical literature, scholarship, and research.

Guarantee that graduate medical education in internal medicine promotes heterogeneity among training programs, recognizes the value of diverse physicians-in-training, reflects community needs, and balances regulatory requirements with the necessity of protecting flexibility and diversity among training programs.

Recognize that quality patient care and quality resident education are tightly linked; demonstrate high-quality patient care through measurement and improvement in the clinical settings where medical education occurs.

Focus on Education

During the past 3 decades, the environment of internal medicine residency programs has been increasingly driven by service needs and financial pressures of teaching institutions (18). Unless the paradigm of education over service is established, few improvements will be possible. The decision to assign residents to clinical rotations must

be based on educational needs rather than those of the hospital and medical faculty. Residency programs must also provide lectures, workshops, directed readings, and study modules to ensure that residents are exposed to the depth and breadth of internal medicine. Programs must commit to continual evaluation of the effectiveness of their educational curriculum and embrace innovations, such as patient simulators, that may improve patient safety. Observed simulated clinical evaluations and clinical examination exercises are other useful assessment tools (22, 23).

Quality, Patient Safety, and Systems-Based Practice

Residency education must be inseparably linked to high-quality patient care. Such care begins with an understanding of the unique needs of each patient and progresses to evidence-based diagnosis and management. To learn quality improvement, residents and supervising faculty must be actively engaged in analyzing errors and near-misses to improve their personal practices and systems of care (24). A blame-free process of error reporting and review must be part of every residency program (25, 26). Residents must learn to practice effective, high-quality care as part of a multidisciplinary team. Teams should employ quality improvement models and understand local and national health care systems. Residents must be given opportunities to learn team leadership, reflective practice, and systems management.

Advances in information technology are increasingly affecting health care delivery. Computer-based order entry, bar coding, and electronic medical records are innovations that have been shown to improve quality and prevent errors (27–29). Residency programs must embrace these new technologies and ensure that residents become familiar with them.

Graded Supervision of Residents

Residency education must be jointly focused on the learner and the patient. The primary activity of residents, in close collaboration with faculty mentors, should be caring for patients. Patient care and leadership responsibilities of residents should be gradually increased over the duration of the program. Although patient care activities must be supervised by faculty, increasing autonomy and independence commensurate with a resident's demonstrated level of competency is essential to his or her growth and development of confidence. This is the cardinal educational principle underlying graduate medical education (18). Teaching and supervision of less experienced residents, students, and other health professionals are essential components of a senior resident's professional development.

Inpatient Rotations

The educational value of inpatient teaching services can be recaptured only if services are reconfigured to ensure that residents have adequate patient diversity and time for reflection. Departments of internal medicine must work

collaboratively with hospital administrators to develop systems that are less dependent on residents. Residents should lead multidisciplinary teams composed of teaching faculty, midlevel practitioners, advanced practice nurses, social workers, and clerical support personnel. In such a model, noneducational activities that currently fall to residents (for example, discharge planning) could be shared among team members, allowing residents to learn from a broader spectrum of patients. Midlevel practitioners would consult the residents for advice and assistance about sicker patients who might have otherwise required resident coverage.

Hospitalists can serve as teaching faculty, functioning as educators and role models for inpatient care (30, 31). They are uniquely positioned to lead inpatient quality improvement and patient safety programs in conjunction with residents. They may also staff a nonteaching service, independently or in conjunction with midlevel practitioners, thus reducing service obligations of the residency program.

Ambulatory Experiences

Improving ambulatory education requires a commitment to redesigning hospital-based continuity practices. Like inpatient rotations, ambulatory care experiences must provide adequate patient diversity, sufficient numbers of patients, and time for residents to care for and reflect on their patients. Nurse practitioners, physician assistants, advanced practice nurses, and clinical pharmacists can provide interim care or other ambulatory services (for example, prescription refills). Programs should explore community-based practices as alternative or complementary ambulatory sites. Ambulatory block rotations allow residents to focus on the ambulatory population without the distraction of inpatient responsibilities. Residents can learn quality-improvement principles in clinic through systematic efforts to assess and improve their own care (32).

OVERSIGHT OF GRADUATE MEDICAL EDUCATION IN INTERNAL MEDICINE

The Accreditation Council for Graduate Medical Education sets explicit requirements for programs, including mechanisms for ensuring compliance, through its 27 Residency Review Committees. Historically, the program requirements have emphasized process rather than outcomes. In many respects, the lengthy program requirements have defined the residency curriculum and severely limited experimentation because program directors must expend a tremendous amount of effort to comply with the requirements (33–35). We recommend that the requirements be reevaluated to allow more flexibility and encourage innovation.

The Accreditation Council for Graduate Medical Education has begun to shift its focus from process to outcomes through the establishment of core competencies and the Outcome Project (36). In response, the Residency Review Committee for Internal Medicine has instituted the

Educational Innovations Project, which allows selected programs to develop novel educational methods and assessment tools by removing many of the process-oriented program requirements (37). Sufficient incentives must be built into this project to ensure broad participation and to foster rapid dissemination of results. Although this initiative has the potential to facilitate many of the ideas discussed here, we do not recommend that programs wait for these results before beginning the redesign process.

CURRICULUM

The American Board of Internal Medicine sets educational standards through its certification and recertification process, but there is debate about what constitutes the core knowledge, skills, and attitudes of the internist (38). Internal medicine leaders disagree on the optimal duration of residency. Some propose shortening core training to 2 years, followed immediately by fellowship training for future subspecialists or by 1 or more additional years for future primary care internists or hospitalists (39–41). These recommendations presume that the length of time required to become an internal medicine subspecialist discourages students from choosing internal medicine and that programs do not make effective use of all 3 years of training. In fact, third-year experiences are often a repeat of second-year rotations, including many subspecialty electives during which residents have few patient care decision-making or leadership responsibilities. In contrast, others have advocated for a 4-year curriculum (15, 42).

The core curriculum should be developed by using information on current medical practice patterns across the internal medicine disciplines. Leaders from key stakeholder groups have recently convened a task force on educational redesign to develop the core content. These stakeholders include the Alliance for Academic Internal Medicine (which includes APDIM, the Association of Professors of Medicine, the Association of Specialty Professors, the Clerkship Directors in Internal Medicine, and the Administrators of Internal Medicine), the American Board of Internal Medicine, the American College of Physicians, and specialty societies.

Maintenance of the 3-year curriculum is necessary to ensure broad competency for internists. It is difficult to envision a shorter residency in light of expanding medical knowledge, new required competencies, and duty-hour limitations (that is, the 80-hour workweek). Because many residents are unsure of their ultimate career goals, shortening the core training may deprive them of sufficient experience and time to make informed decisions. We applaud recent initiatives to delay the subspecialty fellowship application process, giving residents more time to consider their options (43).

The 3-year curriculum should be redesigned with specific educational goals for each year. The internship must include a balance of closely supervised ambulatory and in-

patient experiences. Interns must be exposed to various internal medicine career pathways, including ambulatory general medicine, inpatient general medicine, and inpatient and ambulatory subspecialties. The second year must introduce supervision and independent decision making as the resident takes on leadership and teaching responsibilities and functions more autonomously in ambulatory continuity practice.

The third year of training should be redesigned and tailored to match the resident's career plans. The curriculum can emphasize hospital, ambulatory, or specialty experiences or a combination of these elements, depending on the resident's goals. The third year should focus on building leadership skills and understanding how to provide safe, efficient, and cost-effective care in an increasingly complex practice environment. Residents, in collaboration with attending physicians, should become leaders of multidisciplinary teams that include less experienced residents; students; and other health care professionals, such as nurse practitioners and physician assistants.

Although measuring the success of educational reform and curricular innovation is inherently difficult, the effectiveness of changes in the core curriculum must be evaluated over time to ensure that residents gain the requisite knowledge, skills, and attitudes of an internist.

FACULTY ISSUES

Faculty face pressures to increase clinical productivity, compete for external funding, and publish in peer-reviewed journals. Furthermore, as resident duty hours decrease, clinical responsibilities of supervising faculty often increase. Such pressures discourage faculty members from assuming teaching activities and educational leadership roles.

Responsibilities of program leadership have expanded to include oversight of most departmental teaching activities. Residency program directors and key teaching faculty should pursue innovation and seek continuous improvement in their programs. Faculty teaching quality should be monitored by using standardized assessment methods, such as resident feedback and direct observation by experienced clinician-educators (44, 45). Faculty development programs must be provided, particularly for faculty members who do not meet performance expectations. Program directors and other faculty must be available to meet regularly with each resident to discuss academic progress, career planning, and programmatic issues.

Meeting such challenges will require changes to the faculty promotion and reward system and a renewed commitment to teaching by departments of medicine and their faculty (46). Talented, creative faculty must be identified to lead educational programs, to teach effectively, and to mentor residents and junior teaching faculty. Such individuals must receive salary support and job security that are comparable to those of other academic track faculty. Medical schools and teaching hospitals must provide the re-

sources for faculty development programs for clinician-educators.

Promotion criteria for clinician-educators should be as rigorous as criteria in other academic tracks but must embrace a broader definition of scholarship that includes quality-improvement projects, curriculum development, teaching portfolios, and educational workshops and presentations (47). New metrics should be developed to evaluate academic success and the impact of educational programs (48). Faculty must be rewarded for innovation and continuous improvement of their teaching programs. Well-designed educational projects enhance the local learning environment and provide evidence of scholarship, and they may be disseminated to other institutions.

FUNDING OF GRADUATE MEDICAL EDUCATION

Although funding of graduate medical education is linked to patient care services provided by residents, federal funds do not flow directly to training programs. Instead, the affiliated teaching hospital receives and distributes the money to each training program. This system places an emphasis on inpatient clinical service rather than the quality of education, regardless of where the teaching occurs. Hospital administrators, reacting to fiscal pressures, have used the resident workforce to accomplish tasks that could be performed just as well by other health care practitioners (49). Hospitals have also expanded residency programs to meet increasing service demands without considering the untoward effects on resident education (19).

The allocation of graduate medical education funding should be transparent, with a portion specifically designated for direct support of residency training programs. Program directors should work with hospital leadership to ensure that residents' time is well utilized from an educational perspective. For instance, being part of multidisciplinary teams may allow residents to focus on tasks that require their unique abilities and hence may contribute to their education. Development of innovative nonteaching services may improve education and be cost-effective (50).

Teaching hospitals must demonstrate institutional competence, which includes appropriate distribution of educational funds, mechanisms to resolve the conflicts between service and educational needs, and a commitment to supporting efforts to enhance the learning environment.

OTHER IMPORTANT ISSUES

Although redesigning educational programs is critical, additional steps are necessary to address the declining attractiveness of internal medicine. Medical students have large debts at graduation and emphasize lifestyle and income in choosing a career path (51, 52). They recognize that primary care physicians earn less, have lower job satisfaction rates, and provide care that the current system does not value (53–61). Residents and students on internal medicine rotations are exposed to dysfunctional systems in

which underinsured or uninsured patients disproportionately receive care as inpatients or in emergency departments rather than in the ambulatory environment. Thus, the impact of educational redesign will be muted without fundamental improvements to the health care system. Methods of attracting students to general internal medicine include narrowing the reimbursement gap between cognitive and procedural specialties; enhancing loan repayment programs for primary care physicians; increasing student exposure to generalist clinician-educators; and emphasizing flexible career options, such as hospitalist tracks (61–63).

Redesign may result in untoward financial, administrative, educational, and health care consequences. Costs may increase with the addition of hospitalists and midlevel practitioners. Many internal medicine departments will recruit and manage these individuals to maintain quality and clinical revenue, complicating the job of program director. If costs exceed revenues, departments may need additional financial support. Programs will need to promote the nonfinancial benefits of resident education to their institutions. Administering a training program that advances residents on the basis of skill acquisition, rather than time spent, will be daunting, especially with unpredictable numbers of residents on various services. Hiring practitioners to replace residents during evening and weekend hours will be difficult.

Cultivating residents' autonomy in a system that does not "depend" on them may be challenging because such a system functions perfectly well without learners and thus may relegate residents to observers. Some institutions may even question their commitment to having a residency program at all. Although nonresident practitioners may allow residents to focus on medical decision making, residents trained in such "ideal" environments may be unable or unwilling to adapt to system failures, a key aspect of systems-based practice. Finally, teaching hospitals that have traditionally provided safety-net care to the poor may close their doors to these patients in an attempt to further limit costs.

RECOMMENDATIONS

Internal medicine must retain 3 years of training to allow each resident to experience the major internal medicine disciplines, achieve clinical competency, and mature as a clinician and team leader. Educational goals and objectives must take precedence over clinical service needs to ensure that residents have adequate time for learning and reflection. Unless this paradigm is clearly established, meaningful redesign will not be possible. In addition, we recommend the following immediate, short-term, and long-term steps.

Immediate

Programs should provide multidisciplinary team leadership experiences in the third year, along with meaningful

experiences in systems-based practice, clinical quality improvement, and patient safety.

Short-Term

Over 1 to 2 years, programs should define the core content of knowledge, skills, and attitudes required for all internists independent of their career plans. The curriculum should be individualized, especially in the third year, to meet each resident's evolving career plans. Programs should tailor the choice of rotations and proportion of time spent in inpatient and outpatient settings to a resident's career goals and should improve ambulatory care experiences by providing adequate facilities and support staff. Faculty development programs should be created to maintain and improve teaching quality and to prepare faculty to assess competence effectively. Nonresident personnel should perform noneducational activities. Finally, programs should experiment with new approaches that achieve the desired educational goals.

Long-Term

Over 2 to 5 years, programs should change the faculty promotion and reward system for clinician-educators by providing salary support and job security that are comparable to those of traditional academic-track faculty. Funding for graduate medical education should be explicitly defined and separated from other institutional funding. Teaching hospitals should receive appropriate financial support for the unique services they provide their communities.

CONCLUSION

Internal medicine training has lagged behind major changes in the health care delivery system and needs to be redesigned. Residency programs must be transformed into environments in which high-quality residency education and patient care are inseparably linked. The Association of Program Directors in Internal Medicine hopes leaders and educators in internal medicine will work together to bring internal medicine training into the 21st century.

From the Association of Program Directors in Internal Medicine, Washington, DC.

Grant Support: Dr. Henderson receives grant support from the U.S. Department of Health and Human Services, Health Resources and Services Administration (D58HP05139).

Potential Financial Conflicts of Interest: None disclosed.

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References

- Schroeder SA, Showstack JA, Gerbert B. Residency training in internal medicine: time for a change? *Ann Intern Med.* 1986;104:554-61. [PMID: 3954280]
- Greganti MA, Fletcher SW. Residency training in the inpatient setting: a new dilemma for internal medicine. *J Gen Intern Med.* 1989;4:136-8. [PMID: 2709172]
- Fallon HJ. Residency reform: a perspective from the Association of Professors of Medicine. *Ann Intern Med.* 1992;116:1041. [PMID: 1350186]
- Nolan JP, Inui TS. Tinkering or real reform? The choice is ours. *Ann Intern Med.* 1992;116:1042-5. [PMID: 1350187]
- Cantor JC, Baker LC, Hughes RG. Preparedness for practice. Young physicians' views of their professional education. *JAMA.* 1993;270:1035-40. [PMID: 8350444]
- Cohen JJ. Honoring the "E" in GME. *Acad Med.* 1999;74:108-13. [PMID: 10065051]
- The Commonwealth Fund Task Force on Academic Health Centers. *Training Tomorrow's Doctors: The Medical Education Mission of Academic Health Centers.* New York: The Commonwealth Fund; 2002.
- Whitcomb ME. Putting patients first: the need to reform graduate medical education [Editorial]. *Acad Med.* 2003;78:851-2. [PMID: 14507609]
- Donabedian A. *The Definition of Quality and Approaches to Its Assessment.* Ann Arbor, MI: Health Administration Pr; 1980.
- Holmboe ES, Bowen JL, Green M, Gregg J, DiFrancesco L, Reynolds E, et al. Reforming internal medicine residency training. A report from the Society of General Internal Medicine's task force for residency reform. *J Gen Intern Med.* 2005;20:1165-72. [PMID: 16423110]
- Association of American Medical Colleges. *AAMC Data Book 2004.* Washington, DC: Association of American Medical Colleges; 2004.
- National Resident Matching Program. *Results and Data 1975-2005.* Washington, DC: National Resident Matching Program; 2005.
- Garibaldi RA, Popkave C, Bylsma W. Career plans for trainees in internal medicine residency programs. *Acad Med.* 2005;80:507-12. [PMID: 15851467]
- Huddle TS, Centor R, Heudebert GR. American internal medicine in the 21st century: can an Oslerian generalism survive? *J Gen Intern Med.* 2003;18:764-7. [PMID: 12950486]
- Larson EB. Health care system chaos should spur innovation: summary of a report of the Society of General Internal Medicine Task Force on the Domain of General Internal Medicine. *Ann Intern Med.* 2004;140:639-43. [PMID: 15096335]
- Association of American Medical Colleges. *The Handbook of Academic Medicine: How Medical Schools and Teaching Hospitals Work.* Washington, DC: Association of American Medical Colleges; 2004.
- Henderson MC, Meyers FJ, Ibrahim T, Tierney LM Jr. *Confronting the brutal facts in health care* [Editorial]. *Am J Med.* 2005;118:1061-3. [PMID: 16194632]
- Ludmerer KM. *Time to Heal: American Medical Education from the Turn of the Century to the Era of Managed Care.* New York: Oxford University Pr; 1999.
- Ludmerer KM, Johns MM. Reforming graduate medical education. *JAMA.* 2005;294:1083-7. [PMID: 16145029]
- Boex JR, Leahy PJ. Understanding residents' work: moving beyond counting hours to assessing educational value. *Acad Med.* 2003;78:939-44. [PMID: 14507629]
- Whitcomb ME, Cohen JJ. The future of primary care medicine. *N Engl J Med.* 2004;351:710-2. [PMID: 15306674]
- Holmboe ES, Huot S, Chung J, Norcini J, Hawkins RE. Construct validity of the miniclinical evaluation exercise (miniCEX). *Acad Med.* 2003;78:826-30. [PMID: 12915378]
- Holmboe ES, Yepes M, Williams F, Huot SJ. Feedback and the mini clinical evaluation exercise. *J Gen Intern Med.* 2004;19:558-61. [PMID: 15109324]
- Plews-Ogan ML, Nadkarni MM, Forren S, Leon D, White D, Marineau D, et al. Patient safety in the ambulatory setting. A clinician-based approach. *J Gen Intern Med.* 2004;19:719-25. [PMID: 15209584]
- Odwazny R, Hasler S, Abrams R, McNutt R. Organizational and cultural changes for providing safe patient care. *Qual Manag Health Care.* 2005;14:132-43. [PMID: 16027591]
- Wild D, Bradley EH. The gap between nurses and residents in a community hospital's error-reporting system. *Jt Comm J Qual Patient Saf.* 2005;31:13-20. [PMID: 15691206]
- Kuperman GJ, Gibson RF. Computer physician order entry: benefits, costs,

and issues. *Ann Intern Med.* 2003;139:31-9. [PMID: 12834316]

28. Hillestad R, Bigelow J, Bower A, Girosi F, Meili R, Scoville R, et al. Can electronic medical record systems transform health care? Potential health benefits, savings, and costs. The adoption of interoperable EMR systems could produce efficiency and safety savings of \$142-\$371 billion. *Health Aff (Millwood).* 2005; 24:1103-17. [PMID: 16162551]
29. Bates DW, Cohen M, Leape LL, Overhage JM, Shabot MM, Sheridan T. Reducing the frequency of errors in medicine using information technology. *J Am Med Inform Assoc.* 2001;8:299-308. [PMID: 11418536]
30. Kulaga ME, Charney P, O'Mahony SP, Cleary JP, McClung TM, Schildkamp DE, et al. The positive impact of initiation of hospitalist clinician educators. *J Gen Intern Med.* 2004;19:293-301. [PMID: 15061737]
31. Hauer KE, Wachter RM, McCulloch CE, Woo GA, Auerbach AD. Effects of hospitalist attending physicians on trainee satisfaction with teaching and with internal medicine rotations. *Arch Intern Med.* 2004;164:1866-71. [PMID: 15451761]
32. Holmboe ES, Prince L, Green M. Teaching and improving quality of care in a primary care internal medicine residency clinic. *Acad Med.* 2005;80:571-7. [PMID: 15917362]
33. Charap MH, Levin RI, Pearlman RE, Blaser MJ. Internal medicine residency training in the 21st century: aligning requirements with professional needs. *Am J Med.* 2005;118:1042-6. [PMID: 16164893]
34. Accreditation Council for Graduate Medical Education. Program Requirements for Internal Medicine. Chicago, IL: Accreditation Council for Graduate Medical Education; 2003.
35. Goroll AH, Sirio C, Duffy FD, LeBlond RF, Alguire P, Blackwell TA, et al. A new model for accreditation of residency programs in internal medicine. *Ann Intern Med.* 2004;140:902-9. [PMID: 15172905]
36. Accreditation Council for Graduate Medical Education. Outcome Project: General Competencies. Accessed at www.acgme.org/outcome/comp/compFull.asp on 24 April 2004.
37. Bush RW. Educational innovations project for core internal medicine programs update. Presented at 2005 Association of Program Directors in Internal Medicine Spring Meeting, San Francisco, California, 12 April 2005.
38. American Board of Internal Medicine. Crossing the Quality Chasm: Shared Vision on Quality and Leadership for Training in Internal Medicine. Accessed at www.abimfoundation.org/FoundationReport2004/index.htm on 12 October 2005.
39. Hirshfeld J Jr, Fye WB. Summary of Task Force recommendations to address the growing shortage of cardiologists. *J Am Coll Cardiol.* 2004;44:272-5. [PMID: 15261918]
40. Blackwell TA, Powell DW. Internal medicine reformation. *Am J Med.* 2004;117:107-8. [PMID: 15234646]
41. Goldman L. Modernizing the paths to certification in internal medicine and its subspecialties [Editorial]. *Am J Med.* 2004;117:133-6. [PMID: 15234652]
42. Stein JH. Grand cru versus generic: different approaches to altering the ratio of general internists to subspecialists. *Ann Intern Med.* 1991;114:79-82. [PMID: 1983939]
43. Clayton CP, Battinelli DL, Ladenson PW. Halfway toward healing a broken system: fellowship recruitment in internal medicine. *Am J Med.* 2004;117:69-71. [PMID: 15210396]
44. Holmboe ES, Hawkins RE, Huot SJ. Effects of training in direct observation

of medical residents' clinical competence: a randomized trial. *Ann Intern Med.* 2004;140:874-81. [PMID: 15172901]

45. Holmboe ES. Faculty and the observation of trainees' clinical skills: problems and opportunities. *Acad Med.* 2004;79:16-22. [PMID: 14690992]
46. Ludmerer KM. Learner-centered medical education. *N Engl J Med.* 2004; 351:1163-4. [PMID: 15371570]
47. Fleming VM, Schindler N, Martin GJ, DaRosa DA. Separate and equitable promotion tracks for clinician-educators. *JAMA.* 2005;294:1101-4. [PMID: 16145031]
48. Levinson W, Rubenstein A. Mission critical—integrating clinician-educators into academic medical centers. *N Engl J Med.* 1999;341:840-3. [PMID: 10477784]
49. Grover A. Medicare GME: past, present, and future. Presented at Academic Internal Medicine Week, Nashville, Tennessee, 16 October 2004.
50. Nishimura RA, Linderbaum JA, Naessens JM, Spurrier B, Koch MB, Gaines KA. A nonresident cardiovascular inpatient service improves residents' experiences in an academic medical center: a new model to meet the challenges of the new millennium. *Acad Med.* 2004;79:426-31. [PMID: 15107281]
51. Jolly P. Medical School Tuition and Young Physician Indebtedness. Washington, DC: Association of American Medical Colleges; 2004.
52. Dorsey ER, Jarjoura D, Rutecki GW. Influence of controllable lifestyle on recent trends in specialty choice by US medical students. *JAMA.* 2003;290:1173-8. [PMID: 12952999]
53. Association of American Medical Colleges. AAMC Faculty Salary Survey Reports. Accessed at https://services.aamc.org/fssreports/general/table11-03.cfm?current_survey_year=2003 on 25 May 2004.
54. Allied Physicians. Physician salaries—physician salary surveys. Accessed at www.allied-physicians.com/salary_surveys/physician-salaries.htm on 9 May 2004.
55. Leigh JP, Kravitz RL, Schembri M, Samuels SJ, Mobley S. Physician career satisfaction across specialties. *Arch Intern Med.* 2002;162:1577-84. [PMID: 12123400]
56. Zuger A. Dissatisfaction with medical practice. *N Engl J Med.* 2004;350:69-75. [PMID: 14702431]
57. Petrozzi MC, Rosman HS, Nerenz DR, Young MJ. Clinical activities and satisfaction of general internists, cardiologists, and ophthalmologists. *J Gen Intern Med.* 1992;7:363-5. [PMID: 1613618]
58. American College of Physicians. 2003 Member Survey. Philadelphia, PA: American College of Physicians; 2003.
59. Pham HH, Simonson L, Elnicki DM, Fried LP, Goroll AH, Bass EB. Training U.S. medical students to care for the chronically ill. *Acad Med.* 2004; 79:32-40. [PMID: 14690995]
60. Humphrey HJ. Attracting, keeping, and funding the best and the brightest in internal medicine. Presented at 2004 Association of Professors of Medicine Winter Meeting, Sarasota, Florida, 28 February 2004.
61. Ibrahim T. The case for invigorating internal medicine. *Am J Med.* 2004; 117:365-9. [PMID: 15336591]
62. Schwartz MD, Basco WT Jr, Grey MR, Elmore JG, Rubenstein A. Rekindling student interest in generalist careers. *Ann Intern Med.* 2005;142:715-24. [PMID: 15838091]
63. Henderson RC, Hunt DK, Williams JW Jr. General internists influence students to choose primary care careers: the power of role modeling. *Am J Med.* 1996;101:648-53. [PMID: 9003113]

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