



Family Medicine Residency Program Director Expectations of Procedural Skills of Medical School Graduates

Gretchen M. Dickson, MD, MBA; Amy K. Chesser, PhD; Nikki Keene Woods, PhD, MPH; Nathan R. Krug, MD; Rick D. Kellerman, MD

BACKGROUND AND OBJECTIVES: Mismatch between program directors' expectations of medical school graduates and the experience of students in medical school has important implications for patient safety and medical education. We sought to define family medicine residency program directors' expectations of medical school graduates to independently perform various procedural skills and medical school graduates' self-reported competence to perform those skills at residency outset.

METHODS: In July of 2011, a paper-based survey was distributed nationwide by mail to 441 family medicine residency program directors and 3,287 medical school graduates enrolled as post-graduate year 1 (PGY-1) residents in family medicine residency programs. Program director expectation of independent performance and recent medical school graduate self-reported ability to independently perform each of 40 procedures was assessed.

RESULTS: Surveys were completed and returned from 186 program directors (response rate 42%) and 681 medical school graduates (response rate 21%). At least 66% of program directors expected interns to enter residency able to independently perform 15 of 40 procedures. More than 80% of new interns reported they were able to independently perform five of the 15 procedures expected by program directors.

CONCLUSIONS: Incongruity exists between program director expectations and intern self-reported ability to perform common procedures. Both patient safety and medical education may be jeopardized by a mismatch of expectation and experience. Assessment of medical students prior to medical school graduation or at the start of residency training may help detect procedural skill gaps and protect patient safety.

(Fam Med 2013;45(6):392-9.)

Ideally, throughout medical school, residency training, and ongoing continuing medical education courses, learners progressively develop and refine procedural skills. Such a continuum requires alignment of

the procedural skill competencies achieved in medical school with the expectations program directors hold for medical school graduates. Mismatch between program director expectations and medical school

graduate ability to independently perform procedures could significantly jeopardize patient safety. Little is known about current program director expectations of medical school graduates or medical student experience with procedural skills.

Several efforts have been made to define a national procedures competency list for graduates of all US allopathic medical schools. In 1998, the Medical School Objectives Project of the Association of American Medical Colleges (AAMC) identified the ability to perform venipuncture, IV line insertion, arterial puncture, thoracentesis, lumbar puncture, nasogastric tube insertion, Foley catheter insertion and laceration repair as key competencies of graduates.¹ A majority of medical schools surveyed in 2004 expected graduates to be able to perform venipuncture, IV placement, suturing, bladder catheterization and arterial puncture.² Further, a national task force in 2008 identified venipuncture, interpreting an electrocardiogram, and correctly performing wet mount and KOH studies as key preclinical competencies.³

From the Department of Family and Community Medicine (Drs Dickson, Chesser, Woods, and Kellerman) and Wichita Family Medicine Residency Program at Wesley Medical Center (Dr Krug), University of Kansas School of Medicine-Wichita, Wichita KS.

Despite these efforts, the 2005 report of the AAMC Task Force on the Clinical Skills Education of Medical Students made no recommendation for universal competencies acknowledging significant variation among medical schools regarding the specific procedural skills graduates will have acquired.⁴ A lack of universal agreement on the procedures that medical students will be competent to perform by the time of graduation results in residents who have widely varied skills. In family medicine residency programs, such variation may be further exacerbated by the high proportion of international and osteopathic medical school graduates who may have acquired different procedural skills than their allopathic peers.

Limited time and resources may curtail medical student attainment of competencies during medical school. Forty seven of 60 responding medical schools (78%) in a 1998 survey reported no formal training for clinical procedures other than an introduction to phlebotomy.⁵ Some medical schools have implemented intensive internship preparation experiences within the fourth year of medical school, longitudinal clinical skills curricula, or simulation exercises to address concerns that medical students have insufficient experience on clerkships alone to attain independence in performing procedures.^{2,6-15} Although such interventions have proven successful for individual medical schools, the cumulative effect of these curricular changes on medical student procedural competency nationally is unknown.

Little is known about family medicine residency program director expectations of medical school graduates with respect to procedural skills. A majority of respondents in a study of 39 program directors representing multiple specialties believed that trainees at the start of residency should be competent to perform venipuncture (80%), insertion of a peripheral intravenous line (69%), insertion of a Foley catheter

(64%), insertion of a nasogastric tube (64%), interpretation of an arterial blood gas (64%), EKG interpretation (54%), and X-ray interpretation (51%).¹⁶ However, generalists, such as family physicians, may place greater emphasis on procedural training in medical school and residency than subspecialists.¹⁷⁻²⁰ Research on procedural training during family medicine residency has primarily focused on developing consensus about residency procedural curricula and optimizing instructional methods.²¹⁻²⁴ A knowledge gap exists regarding family medicine residency program director expectations of medical school graduates as well as the degree to which current graduates meet these expectations.

Understanding program director expectations of as well as medical school graduate reported ability to perform procedures is critical to inform both medical school and residency curricula. To appropriately assign resident responsibilities and faculty supervision, program directors must understand the experiences of graduating medical students. Medical school curricula may need modification if the skills acquired by medical students are not expected by residency programs and those deemed critical by residency programs have not been attained by medical school graduates. Limitations on time for didactic education and clinical experience in residency may limit the number of procedures that can be learned if students do not enter residency training proficient in basic skills.

We sought to define both current expectations of family medicine residency program directors and medical school graduate self-reported competence to independently perform common procedural skills at residency outset.

Methods

These assessments were completed July 1–September 30, 2011, and this project was approved by the University Institutional Review Board.

A list of current Accreditation Council of Graduate Medical Education (ACGME)-accredited family medicine residency programs and the number of postgraduate year 1 (PGY-1) positions in those programs was generated using the American Academy of Family Physicians (AAFP) website and the American Medical Association's Fellowship and Residency Electronic Interactive Database Access System (FREIDA). A packet was mailed to each family medicine residency program director containing a description of the study and separate surveys for each PGY-1 resident (class of 2014) in the program and the program director. Survey completion implied consent to participate. Residents returned surveys in individual self-addressed stamped envelopes to maintain confidentiality of responses.

Each program director completed only one survey, even if serving as director of more than one family medicine residency program (ie, central program with a rural training track). A total of 3,287 PGY-1 resident surveys and 441 program director surveys were distributed in our initial mailing.

The procedures included in the survey instrument were identified through literature review as well as review of the requirements of the ACGME Review Committee for Family Medicine Programs and the Liaison Committee for Medical Education (LCME) for medical schools.^{20,23,24} The initial list was refined to 40 final procedures included on the survey with input from the research team and three current family medicine residency program directors.

The survey asked program directors to evaluate whether or not a medical student should be able to independently perform a procedure at the time of medical school graduation. Independently perform was defined on the survey as "the ability to recognize the need for a procedure, provide informed consent to the patient through a discussion of the risks, benefits, and alternatives

and perform the procedure without prompting or coaching from a faculty member or other supervisor.” Program directors were specifically asked to ignore billing, liability, or institutional policies that determine who must be present when a procedure is performed.

The medical school graduate survey was similar to the program director survey in that each PGY-1 resident was asked to reflect on their medical school experience and evaluate his/her ability to independently perform each of the 40 included procedures at the start of internship. The residents were provided with the same definition of “independently perform” and were also asked to ignore billing, liability, and institutional policies when responding. Several demographic items were included on the medical school graduate and program director surveys.

The principal outcomes of interest were proportion of program directors who reported expecting interns to be competent to perform each procedure and the proportion of medical school

graduates who self-reported competence to perform each procedure. Using a modified Anghoff procedure, a group of faculty with experience in medical student and resident education determined educationally relevant cutoffs for analysis of the responses. It was determined that at least 66% of family medicine residency program directors would need to report that they expected a medical school graduate to be able to independently perform a procedure to classify the procedure as an expected competency. The same group determined that at least 80% of medical school graduates would need to be able to perform a procedure at the time of medical school graduation in order to classify the procedure as attained in medical school.

Results

One hundred and eighty six (186) of 441 program directors (42%) and 681 of 3,287 PGY-1 residents (21%) returned completed surveys. Tables 1 and 2 summarize the demographic characteristics of respondents as

well as include information about the population demographics of family medicine residency program directors and PGY-1 family medicine residents in July 2011.

Table 3 summarizes the proportion of program directors who responded that a medical student should be able to perform each procedure at the time of medical school graduation. The Expected Procedures that at least 66% of program directors thought an intern should be able to independently perform at the beginning of residency are highlighted in bold font in Table 3. Expected Procedures included two office based, five diagnostic, two maternity care, and six inpatient medicine procedures.

The proportion of residents who self-reported the ability to independently perform the procedure at the time of medical school graduation is also included in Table 3. Of the 15 Expected Procedures, more than 80% of residents reported that they were able to independently perform five of the procedures. These Attained

Table 1. Demographic Characteristics of Family Medicine Program Director Respondents*

		Respondents	National Demographics (July 2011)**
Gender	Male	76% (140)	73%
	Female	24% (44)	27%
Census region of residency program	Northeast	24% (45)	18%
	Midwest	32% (58)	30%
	South	25% (46)	32%
	West	19% (35)	20%
Years as program director	0–5 years	40% (74)	Unknown
	6–10 years	28% (52)	Unknown
	11–15 years	19% (35)	Unknown
	16–20 years	7% (13)	Unknown
	21+ years	5% (10)	Unknown
Age	21–30 years	0% (0)	Unknown
	31–40 years	13% (24)	Unknown
	41–50 years	32% (60)	Unknown
	51–60 years	41% (76)	Unknown
	61–70 years	14% (25)	Unknown

*n=186

** Calculated from the information provided in the American Academy of Family Physicians Family Medicine Residency Program Directory at www.aafp.org/online/en/home/membership/directories/residencyprograms.html.

Table 2: Demographic Characteristics of Medical School Graduate Respondents*

		Respondents	National Demographics of Graduates Entering Family Medicine Residency Programs July 2011
Gender	Male	45% (311)	46%
	Female	54% (368)	54%
	Unknown	0.3% (2)	N/A
Census region of residency program	Northeast	15% (99)	14%
	Midwest	32% (216)	29%
	South	25% (169)	33%
	West	20% (133)	24%
	Unknown	9% (64)	N/A
Census region of medical school	Northeast	13% (87)	11%**
	Midwest	25% (170)	17%**
	South	17% (118)	19%**
	West	11% (77)	9%**
	International	28% (190)	36%
	Unknown	6% (39)	N/A
Type of medical school	Allopathic	49% (335)	46%
	Osteopathic	17% (117)	18%
	International	28% (190)	36%
	Unknown	6% (39)	N/A

* n=681

** Determined by combining reported allopathic and osteopathic graduates matching into family medicine from each census region.³⁰ Determined by total positions reported by state by the NRMP²⁹

Procedures included one office based, one inpatient medicine, and three diagnostic procedures.

Expected office-based procedures included simple laceration repair (79%) and cerumen removal (72%). Eighty-five percent (85%) of residents reported that they were able to perform simple laceration repair at the beginning of residency. Only 65% of residents felt confident to independently perform cerumen removal.

At least 66% of program directors expected new interns to be competent to independently perform five diagnostic procedures, including throat culture (98%), urine dipstick (96%), wet mount/KOH studies (89%), use of a glucometer (79%), and urine microscopy (66%). Attained Procedures included an ability to perform throat culture (92%), urine dipstick (89%), and glucose testing with a glucometer (87%). Only 66% of residents reported an ability to perform wet

mount and KOH analysis, and only 23% could perform urine microscopy.

Expected maternity care procedures included performing a cervical examination for dilation (72%) and effacement (68%). However, the majority of residents reported they were unable to perform these skills, with only 42% of residents able to independently perform a cervical examination for dilation and only 35% able to perform a cervical examination for effacement.

Six inpatient medicine procedures were expected by program directors, namely performing a complete history and physical examination (100%), obtaining blood using phlebotomy (91%), starting an IV (88%), catheterizing a bladder (86%), reading an EKG (81%), and placing a nasogastric tube (71%). Only performing a complete history and physical examination of a patient was an Attained Procedure (99%). Less than 80% of

residents reported the ability to independently catheterize a bladder (79%), read an EKG (76%), perform phlebotomy (72%), start an IV (66%), and place a nasogastric tube (62%).

Conclusions

Our results suggest considerable disconnect between the expectations of family medicine residency program directors regarding procedural competence that medical school graduates will possess upon entry into residency and the experience of recent medical school graduates. Such disconnect has important implications for medical education and patient safety. Although program directors expect residents to enter residency training competent to independently perform 15 of 40 procedures, residents self-report the ability to perform only five of these 15 procedures.

Table 3: Proportion of Program Directors Expecting Independent Performance and Proportion of Residents Able to Independently Perform Each Procedure

Procedures	Program Directors Expectations*	Residents Self-Reports**
Office-based procedures		
Repair a simple laceration	79%	85%
Remove cerumen	72%	65%
Perform a fluorescein eye exam	56%	34%
Incision and drainage of abscess	44%	60%
Perform a digital block for anesthesia	39%	41%
Apply a short arm cast	28%	30%
Place anterior packing for epistaxis	25%	33%
Perform an excisional skin biopsy	16%	41%
Remove a foreign body from the eye	11%	15%
Remove a sebaceous cyst	6%	28%
Circumcise a newborn	4%	17%
Diagnostic procedures		
Perform a throat culture	98%	92%
Perform a urine dipstick	96%	89%
Perform wet mount and KOH studies	89%	66%
Obtain a blood glucose using a glucometer	79%	87%
Perform urine microscopy	66%	23%
Interpret spirometry report	61%	39%
Interpret peripheral blood smear using microscopy	45%	28%
Perform colonoscopy	0%	5%
Maternity care procedures		
Assess cervical dilation	72%	42%
Assess cervical effacement	68%	35%
Assess fetal station on cervical examination	63%	30%
Interpret electronic fetal monitoring	60%	67%
Perform a spontaneous vaginal delivery	51%	51%
Determine fetal position by Leopold's maneuver	50%	42%
Perform amniotomy	27%	12%
Place fetal scalp electrode	16%	9%
Place intrauterine pressure catheter	10%	9%
Repair second degree perineal laceration	9%	13%
Perform a vacuum assisted vaginal delivery	1%	5%
Perform a caesarean section	0%	4%
Inpatient medicine procedures		
Perform complete history and physical examination	100%	99%
Obtain blood using phlebotomy	91%	72%
Start an IV	88%	66%
Catheterize a bladder	86%	79%
Read an EKG	81%	76%
Place nasogastric tube	71%	62%
Perform an arterial blood gas	57%	39%
Perform endotracheal intubation	18%	36%
Place a central line	4%	13%

* Bolded procedures are Expected Procedures (More than 66% of program directors expected new PGY-1s to be able to independently perform)

** Bolded procedures are Attained Procedures (More than 80% of residents self-reported the ability to independently perform)

Office-based Procedures

While more than 80% of new interns are able to independently repair a simple laceration, only 65% are able to remove cerumen. As cerumen removal is often performed by medical team members other than the physician, the student may not attain sufficient experience with this task.

Alternatively, cerumen removal may not be deemed an important skill to include in medical school curricula, such that students may become competent only if they happen to encounter patients requiring this treatment.

Diagnostic Procedures

The ability to perform diagnostic procedures is a critical skill to ensure that patients receive appropriate and timely treatment for common ailments. While three of five Expected Procedures were Attained Procedures, only 66% of residents were able to independently perform wet mount/KOH studies, and only 23% could perform urine microscopy. Wet mount studies are commonly indicated in routine family medicine practice, and residents are likely to encounter the need for this skill. Faculty who assume that a resident attained competence in performing wet mount/ KOH studies during medical school may be less likely to provide detailed instruction, closely observe performance of the procedure, or confirm resident interpretation of these studies.

Further, only 23% of residents self-report the ability to independently perform urine microscopy. With the ease of accessing laboratory results at the point of care using computers and other technology, perhaps the need for the clinician to perform urine microscopy is no longer necessary. As a result, this skill may have fallen out of favor in medical school curricula, leading to few medical school graduates possessing competence in urine microscopy. Dedicated curriculum, rather than reliance on encountering these skills during clinical rotations, may

be needed if medical schools or residency programs feel urine microscopy is an essential skill.

Maternity Care Procedures

Mismatch between program director expectations of new interns and resident self-report of competence may be particularly dangerous for maternity care patients. Program directors expected new interns to be able to independently perform a cervical examination for dilation and effacement, while less than half of residents self-reported the ability to perform either of these skills.

If competence in basic maternity care skills, such as assessing cervical dilation and effacement, is expected by program directors, residency programs may need to provide dedicated teaching of these skills prior to expecting interns to begin patient care on the maternity floor. Otherwise, a resident may learn “on the job” through trial and error. In this hit and miss educational model, a resident who fears embarrassment of being labeled as inadequately prepared for residency may hide their incompetence and jeopardize patient safety. Guessing at a cervical examination can have serious consequences for the patient. Further, their own lack of competence may lead a resident to shy away from attempting to teach these skills to medical students. Medical students training on service with a resident who is remediating a medical school competency may have their own experience curtailed. As such, the next generation of learners may also start residency without having competence in this area.

Inpatient Procedures

Of the six inpatient Expected Procedures, only the completion of a history and physical examination was self-reported as an ability of more than 80% of residents. Less than half of residents reported the ability to independently place a nasogastric tube, start an IV, obtain blood using phlebotomy, read an EKG, or

catheterize a bladder. The assumption that these inpatient skills were acquired in medical school may result in less residency instruction than is needed to safely and adequately perform the task. If medical schools include these skills as competencies for their graduates, our results would suggest that medical students are not attaining sufficient experience either to achieve competence or to acquire sufficient confidence in their competence.

Limitations

Our study included only family medicine residency program directors and thus results may not be generalizable to other specialties. Likewise, the medical school experience may differ for a student planning a career in family medicine as opposed to other specialties. As results reflect an aggregate response, the competence of any one individual or the training obtained in any particular medical school may or may not be congruent with our findings.

Medical school graduate attained ability to independently perform procedures was assessed through self-report data, wherein new PGY-1 residents may overestimate or underestimate their abilities. The self-reported competence of new residents was not assessed with direct observation. A myriad of factors may influence a resident’s ability to accurately self-assess and report their procedural competence. The medical school graduate sample included all individuals who were starting internship in a family medicine residency in July of 2011, including those who may have had previous training in another specialty, prior practice experience, or graduated prior to 2011. Further, the initial mailing underestimated the number of PGY-1 residents starting family medicine residency by 171 when compared with the final analysis of the 2011 National Resident Matching Program.²⁵ The residents who were unintentionally excluded, as well as those program directors and

residents who received the survey and chose not to respond, may have opinions that differ from those reflected in our results. Our response rates of 42% from program directors and 21% from residents may further limit the generalizability of our findings.

Implications for Medical Education and Patient Safety

Program directors may be best suited to define which skills are necessary prerequisites to be successful in residency training. If program director expectations determine the standard of what should be taught in medical school, our results would suggest that there are areas where medical schools fall short in preparing graduates. Re-examining which procedures are taught and how competence is assessed may be key to ensuring that medical school graduation is synonymous with competence in specific areas.

Perhaps, though, the purpose of medical school is to provide a foundation of knowledge about a variety of procedures rather than for students to attain competence to independently perform any specific procedure. For instance, a recent consensus building project to identify core geriatric competencies included knowledge of indications, contraindications, and risks associated with the placement of a Foley catheter as a critical skill rather than the manual skill of placing the catheter.²⁶ The diversity of medical school graduate self-reported ability to perform procedures experience reflected in our results may highlight this broad exposure to procedures. However, this also implies that residency programs receive a slightly different product in each medical school graduate. Performing an assessment of resident procedural competence at the outset of residency would allow program directors to detect potential knowledge gaps, especially as written tests alone cannot predict performance with procedural skills.²⁷ The Accreditation Council for Graduate

Medical Education (ACGME) implemented standards in July of 2011 that call for program directors to evaluate each resident's abilities using pre-defined criteria to determine level of supervision needed. Our results would suggest that direct observation of skills will be needed as variation in self-reported ability to perform even basic skills exists among medical school graduates.

Residents who select one program over another may do so because of variation in areas of emphasis of procedural training in residency programs and may prepare for residency by choosing electives and experiences in medical school that influence their competence to perform procedures. Similarly, program director expectation of new interns may be influenced by the area of emphasis for the residency program. As such, any specific program director may recruit residents with the skills expected for that program irrespective of other trends in medical school education.

The disconnect between program director expectations and medical student experience not only has important implications for medical education but also for patient safety. A study of first-year residents in the first months of residency found that skills such as interpreting an EKG were often performed without involvement of an attending physician.²⁸ Given our findings that 24% of medical school graduates report being unable to independently read an EKG, if they do not have attending physician involvement or the involvement of a competent senior resident, a patient safety concern exists. Inadequate experience in basic skills may also delay acquisition of more advanced skills required in residency. Assuming a learner is competent to perform a task that is not substantiated by an assessment at either the medical school or residency level could lead to a resident being assigned responsibilities they are unable or unsafe to perform.

As we move toward competency-based curricula at both the medical student and resident level, the ability to determine that a student has mastered a competency and to individualize their responsibilities to mirror the competencies that they possess will be critical. Rather than a seniority-based delineation of responsibilities, competency evaluation of residents may determine who performs which tasks and the degree of supervision required.

CORRESPONDING AUTHOR: Address correspondence to Dr Dickson, University of Kansas School of Medicine-Wichita, Department of Family and Community Medicine, 1010 N. Kansas, Wichita, KS 67214. 316-293-2607. Fax: 316-293-2696. gdickson@kumc.edu.

ACKNOWLEDGMENTS: This study was supported by a research grant from the US Department of Health and Human Services, Health Resources and Services Administration (HRSA-10-235-Residency Training in Primary Care).

Portions of this study were presented at the University of Kansas School of Medicine-Wichita Annual Research Forum, Wichita KS, April 12, 2012. Also, this data was used to inform a discussion of procedure training in medical school that was held at the American Academy of Family Physicians Workshop for Program Directors, Kansas City, KS, June 2012.

References

1. Medical School Objectives Program Writing Group. Learning objectives for medical school education—guidelines for medical schools: Report 1 of the Medical Schools Objective Project. *Acad Med* 1999;74:13-8.
2. Sanders CW, Edwards JC, Burdinski TK. A survey of basic technical skills of medical students. *Acad Med* 2004;79:873-5.
3. The AAMC Task Force on the Clinical Skills Education of Medical Students. Recommendations for preclerkship clinical skills curricula for undergraduate medical education. Washington, DC: Association of American Medical Colleges, 2008.
4. The AAMC Task Force on the Clinical Skills Education of Medical Students. Recommendations for clinical skills curricula for undergraduate medical education. Washington, DC: Association of American Medical Colleges, 2005.
5. Nelson MS, Traub S. Clinical skills training in US medical students. *Acad Med* 1993;68(12):926-8.
6. Dare A, Fancourt N, Robinson E, Wilkinson T, Bagg W. Training the intern: the value of a pre-intern year in preparing students for practice. *Med Teach* 2009;31(8):e345-50.
7. Kowlowitz V, Curtis P, Solane PD. The procedural skills for medical students: expectations and experiences. *Acad Med* 1990;65:656-8.

8. Goodfellow PB, Claydon P. Students sitting medical finals—ready to be house officers? *Journal of the Royal Society of Medicine* 2001; 94:516-20.
9. Remmen R, Scherpbier A, Derese A, et al. Unsatisfactory basic skills performance by students in traditional medical curricula. *Med Teach* 1998;20:579-82.
10. Remmen R, Derese A, Scherpbier A, et al. Can medical schools rely on clerkships to train medical students in basic clinical skills? *Med Educ* 1999;33:600-5.
11. Teo AR, Harleman E, Sullivan PS, Maa J. The key role of a transition course in preparing medical students for internship. *Acad Med* 2011;86(7):860-5.
12. Lyss-Lerman P, Teherani A, Aagaard E, Loeser H, Cooke M, Harper GM. What training is needed in the fourth year of medical school? Views of residency program directors. *Acad Med* 2009;84(7):823-9.
13. Dent JA, Angell-Preece HM, Ball HM, Ker JS. Using the ambulatory care teaching centre to develop opportunities for integrated learning. *Med Teach* 2001;23:171-5.
14. Marcus E, White R, Rubin RH. Early clinical skills training. *Acad Med* 1994;69:415.
15. Remmen R, Scherpbier A, Van Der Vleuten C, et al. Effectiveness of basic clinical skills training programmes: a cross sectional comparison of four medical schools. *Med Educ* 2001;35(2): 121-8.
16. Langdale LA, Schaad D, Wipf J, Marshall S, Vontver L, Scott CS. Preparing graduates for the first year of residency: are medical schools meeting the need? *Acad Med* 2003;78(1):39-44
17. Tape T, Wigton R, Blank L. Procedural skills of practicing pulmonologists. A national survey of 1,000 members of the American College of Physicians. *Am J Respir Crit Care Med* 1995; 151:282-7.
18. Tape T, Wigton R, Blank L, Nicolas J. Procedural skills of practicing nephrologists. A national survey of 700 members of the American College of Physicians. *Ann Intern Med* 1990; 113:392-7.
19. Wigton R, Blank L, Monsour H, Nicolas J. Procedural skills of practicing gastroenterologists. A national survey of 700 members of the American College of Physicians. *Ann Intern Med* 1990;113:540-6.
20. Crutcher R, Szafran O, Woloschuk W, et al. Where Canadian family physicians learn procedural skills. *Fam Med* 2005;37:491-5.
21. Norris T, Felmar E, Tolleson G. Which procedures should be taught in family practice residency programs? *Fam Med* 1997;29:99-104.
22. Tenore J, Sharp L, Lipsky M. A national survey of procedural skill requirements in family practice residency programs. *Fam Med* 2001; 33:28-39.
23. Kelly B, Sicilia J, Forman S, Ellert W, Nothnagle M. Advanced procedural training in family medicine: a group consensus statement. *Fam Med* 2009;41:398-404.
24. Sharp L, Wang R, Lipsky M. Perception of competency to perform procedures and future practice intent: a national survey of family practice residents. *Acad Med* 2003;78:926-32.
25. Biggs WS, Bieck AD, Pugno PA, Crosley PW. Results of the 2011 National Resident Matching Program: family medicine. *Fam Med* 2011; 43(9):619-24.
26. Leipzig R, Granville L, Simpson D, Anderson MB, Sauvigne K, Soriano RP. Keeping granny safe on July 1: a consensus on minimum geriatrics competencies for graduating medical students. *Acad Med* 2009;84(5):604-10.
27. Remmen R, Scherpbier A, Denekens J, et al. Correlation of a written test of skills and a performance-based test: a study in two traditional medical schools. *Med Teach* 2001;23(1): 29-32.
28. Raymond MR, Mee J, King A, Haist SA, Winward ML. What new residents do during their initial months of training. *Acad Med* 2011; 86(10 Suppl):S59-S62.
29. 2011 NRMP main residency Match: Match rates by specialty and state. www.nrmp.org/data/resultsbystate2011.pdf. Accessed April 20, 2012.
30. Articles about the National Residency Matching Program. Available at www.stfm.org/fammed_match.cfm. Accessed April 20, 2012.