

## Influence of Residency Training on Procedures Performed by South Carolina Family Medicine Graduates

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**Background and Objectives:** Guidelines regarding procedure training in family medicine residencies are nonspecific. This study describes procedure practices of South Carolina family medicine residency graduates. **Methods:** Of 1,416 surveys mailed to graduates of South Carolina Area Health Education Consortium (SC AHEC) family medicine residency programs, 144 were undeliverable. A total of 717 respondents (response rate 56.4%) were stratified by community size and year of graduation. Percentage performing 18 procedures (from a list developed by SC AHEC program directors) and stating lack of training affected their procedural practice was compared using chi square tests. Logistic regressions evaluating procedure performance included year of graduation, community size, region of country, and gender as independent variables. **Results:** Joint aspiration/injection (81%), skin biopsy (81%), and Intensive Care Unit (ICU) care (48%) were the most common procedures. Physicians in smaller communities were more likely to perform joint aspiration/injection, skin biopsy, ICU care, and respirator management while recent graduates were more likely to perform exercise stress testing, ICU care, and respirator management. Lack of training was a common reason not to perform esophagogastroduodenoscopy, colonoscopy, nasopharyngoscopy, and vasectomy. **Conclusions:** Increasing performance of exercise stress testing and ICU care by recent graduates and reported lack of training for several outpatient procedures may reflect evolving roles for family physicians. New residency training modalities may improve training for these roles.

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Medical procedures are an integral part of the practice of family medicine, since they may make up a significant portion of physicians' practice, both in the office and in the hospital setting.<sup>1</sup> The performance of procedures may be influenced by a variety of factors, such as practice guidelines, procedural training gained during residency, and a physician's practice setting.<sup>1-3</sup> Consequently, there has been ongoing debate and research focusing on exactly which procedures should be taught by family medicine residency programs,<sup>1,4,5</sup> and variability exists in the procedural training provided by residency programs. For instance, although 93% of US family medicine residency programs offer colposcopy training, only 32% offer esophagogastroduodenoscopy

(EGD) training, 52% offer flexible sigmoidoscopy training, and 48% offer colonoscopy training.<sup>6-9</sup>

Guidelines regarding procedure training during formal residency training are not specific. For instance, the Accreditation Council for Graduate Medical Education (ACGME) defines competency as performing "those procedural skills that are within the scope of family practice." Due to these uncertainties, the American Academy of Family Physicians (AAFP) established a Task Force on Procedures to better define this issue. Unfortunately, their official policy statement gives little specific guidance about the procedures that family medicine residents should learn to perform. The AAFP's 1993 Task Force on Procedures stated: "While family practice residents cannot be expected to learn all the procedures within the scope of family practice, they [programs] should, at a minimum, teach all residents those procedures done by a substantial number of practicing family physicians or taught in a substan-

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tial number of family practice residencies.” Since this policy was issued, multiple studies have attempted to delineate exactly which procedures should be taught in a family medicine residency.<sup>1,4,5,10</sup> These results have been based largely on surveys of residency program directors as to what procedures they feel are taught in their programs and thus do not reflect residents’ experiences during or after training.

The current practice of residency-trained family physicians is dynamic and influenced by numerous variables, such as practice location, current practice guidelines, and training during residency. As such, residency curricula will need to be reviewed and updated to accommodate for the changes in practice. To assist with the revision of procedural training, program directors may benefit from more information regarding the current practice pattern of family physicians regarding the types of procedures they perform, as well as the influence of training on procedural practice. The aims of this study are to examine the specific procedures currently being performed by family physicians in our state and to identify factors that affect the practice of these procedures.

## Methods

Data from the 2004 South Carolina Area Health Education Consortium (SC AHEC) Family Medicine Graduate Survey were analyzed. This survey questionnaire was modeled after previous surveys of this population and was reviewed by several family physician educators and SC AHEC members for appropriateness. A list of graduates was obtained from each SC AHEC-affiliated family medicine residency program. The questionnaire was mailed to each graduate with a cover letter explaining the purpose of the study and inviting the graduate to participate. Completed questionnaires were returned in an accompanying self-addressed stamped envelope. A second mailing was sent to nonrespondents 6 weeks after the initial mailing with the same cover letter. The responses of completed questionnaires were recorded in a computerized database for analysis. Descriptive statistics were used to characterize and summarize the data obtained. The study protocol was approved by the Internal Review Board of the Medical University of South Carolina.

The survey queried graduates about many details of their current practice. Participants were questioned regarding their practice of 18 common procedures (selected by all eight program directors of the SC AHEC based on their expert opinion). Participants who did not currently perform a procedure were asked if this was due to lack of training, opportunity, need, and/or personal desire. More than one answer was possible. Current practice of residency-trained physicians was determined by examining the percentage of respondents who were currently performing a procedure.

Responses from participants who never performed a procedure were analyzed by graduation date and by size of practice location to determine the percentage who stated that lack of training affected their ability to perform that procedure. These results were also stratified by community size of practice location (using categories of <10,000, 10,000–100,000, and >100,000 population size) and by year of graduation categorized into three graduation date groups (pre-1990, 1990–1999, and post-1999). These categories were selected to ensure adequate sample size for analysis in each of the groups. Chi square tests were used for all comparisons of percentages. A *P* value <.05 was considered significant.

Region of the country where a graduate was practicing was characterized as Northeast (Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island), Mid-Atlantic (New York, New Jersey, Pennsylvania, Delaware, Washington, DC, and Maryland), South (Virginia, West Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Arkansas, Louisiana), Midwest (Ohio, Michigan, Indiana, Wisconsin, Illinois, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Kansas, Nebraska), Southwest (Texas, Oklahoma, New Mexico, Arizona, and Nevada), West (Colorado, Wyoming, Montana, Utah, California, Idaho, Oregon, Washington, Alaska, and Hawaii). Separate logistic regressions evaluating the likelihood of performing each procedure were computed. Year of graduation, community size of practice location, region of country, and gender were included as independent variables in these regressions, since these factors have been previously associated with procedural practice.<sup>1</sup> Due to small sample size (eg, not enough respondents in a region performing the procedure), region of country could not be included in regressions for certain procedures.

## Results

Based on the information obtained from the individual family medicine residency programs, we mailed out 1,416 surveys; 144 were undeliverable to the address provided. Of the 717 surveys returned to us (response rate 56.4%), 20 came from graduates who were no longer practicing or did not provide information about the frequency of performing specified services, yielding 697 surveys for our analyses.

A majority of respondents were male (75.6%) and identified themselves as white, non-Hispanic (93.2%). Mean age of the subjects was 45.2 years, with a range of 29 to 66 years. Most of the graduates worked in communities with a population of 10,000–100,000 (46.0%), with 20.0% working in communities of less than 10,000 and 34.0% working in communities of greater than 100,000. The majority of the graduates worked in the South (75.5%), while 20.9% worked

elsewhere in the United States: 1.2% in New England, 3.9% in the Mid-Atlantic, 6.6% in the Midwest, 3.4% in the Southwest, and 5.9% in the far West. Graduates working overseas accounted for 1.0%, and graduates who did not give a work location accounted for 2.6%. Two graduates (0.3%) self-identified as currently working as hospitalists.

Of the procedures queried (Table 1), the most commonly performed were skin biopsy, joint aspiration/injection, intensive care unit (ICU) care, short arm or leg casts, respirator management, and exercise stress testing. The least common were colonoscopy, vasectomy, EGD, cesarean section, and Swan-Ganz catheter insertion. Physicians in smaller communities were more likely to be performing skin biopsy, joint aspiration/injection, ICU care, respirator management, exercise stress testing, and surgical assistance.

Examining the differences in procedure performance over the three graduation year groupings revealed significant differences for seven procedures (Table 2). Procedures that were more frequently being performed included ICU care, respirator management, exercise stress testing, colonoscopy, and EGD. Procedures that were being performed less frequently included flexible sigmoidoscopy and Swan-Ganz catheter insertion.

The percentages of graduates who listed lack of training as a reason for not performing a procedure were compared by year of graduation. Seven procedures revealed a significant trend in either increasing or decreasing frequency of performance. For each procedure, the lack of training was increasingly cited as a reason for nonperformance (Table 3). There were no significant differences in the graduates who listed lack of training as a reason for not doing a procedure when compared by community size of practice location or region of country where practicing (results not shown).

Results from eight logistic regressions where community size or year of graduation were significant are presented (Table 4). These regressions demonstrate that physicians in smaller communities are more likely to perform skin biopsy, joint aspiration/injection, ICU care, and respirator management. Graduates post-1990 are more likely to perform colonoscopy, EGD, exercise stress testing, and ICU care but less likely to perform flexible sigmoidoscopy. Finally, female graduates are less likely to perform most procedures, including joint aspiration/injection, ICU care, exercise stress testing, flexible sigmoidoscopy, colonoscopy, central line placement, paracentesis, chest tube placement, thoracentesis, vasectomy, and casting (results

Table 1

Percent of Respondents Currently Performing a Procedure by Community Size of Practice Setting (n=697)

Procedure	Total n (%)	Community Size			$\chi^2$ P=
		< 10,000	10,000–100,000	>100,000	
<b>Outpatient</b>					
Skin biopsy	564 (80.9%)	92.2%	90.6%	72.4%	<.01
Joint aspiration/injection	562 (80.6%)	89.6%	88.3%	75.0%	<.01
Short arm or leg casts	246 (35.3%)	39.1%	38.5%	31.6%	.25
Exercise stress testing	143 (20.5%)	27.8%	25.3%	15.8%	.02
Flexible sigmoidoscopy	143 (20.5%)	15.7%	24.9%	21.4%	.13
Paracentesis	82 (11.7%)	14.8%	10.9%	13.8%	.50
Thoracentesis	79 (11.4%)	13.9%	11.3%	11.7%	.77
Nasopharyngoscopy	52 (7.5%)	5.2%	7.9%	9.1%	.45
Vasectomy	29 (4.2%)	5.2%	4.9%	4.1%	.88
Colonoscopy	28 (4.1%)	6.1%	6.4%	2.0%	.08
Esophagogastroduodenoscopy	24 (3.4%)	6.1%	4.9%	1.5%	.08
<b>Inpatient</b>					
Intensive Care Unit care	337 (48.4%)	55.6%	56.6%	38.9%	<.01
Respirator management	217 (31.2%)	40.0%	36.9%	20.4%	<.01
Central line placement	74 (10.6%)	10.4%	10.9%	11.7%	.93
Chest tube placement	56 (8.1%)	9.6%	6.4%	9.7%	.37
Surgical assistant	51 (7.3%)	13.0%	6.8%	5.1%	.03
Cesarean section	15 (2.1%)	1.7%	1.1%	2.0%	.73
Swan-Ganz catheter	13 (1.9%)	1.7%	1.5%	3.1%	.50

Table 2

Procedures With Significant Differences in Performance by Year of Graduation (n=697)

Procedure	Percent of Respondents Performing Procedure			P Value
	Pre-1990 Graduates	1990-1999 Graduates	Post-1999 Graduates	
Outpatient				
Flexible sigmoidoscopy	27.0	16.2	12.1	<.01
Exercise stress testing	16.6	22.4	34.1	<.01
Colonoscopy	3.9	2.5	9.0	.02
EGD	3.4	1.7	8.0	.01
Inpatient				
ICU care	45.5	51.9	60.9	.02
Respirator management	28.1	34.8	39.9	.04
Swan-Gantz catheter insertion	3.4	0.8	0.0	.03

EGD—esophagogastroduodenoscopy  
ICU—Intensive Care Unit

not shown). Physicians in the South were more likely to perform joint aspiration/injection than those in the Northeast/Mid-Atlantic.

### Discussion

As noted by the results of this study, graduates of the SC AHEC-affiliated family medicine residency programs provide a wide range of procedural care for their patients. The South Carolina family physicians surveyed in this study were fairly similar to family physicians nationally, as noted in the May 2005 American Academy of Family Physicians Practice Profile Survey with respect to their procedural practice.<sup>11</sup> For outpatient skills such as skin biopsy, joint injection/aspiration, and casting, these results confirm the importance of continued training in these traditionally common procedures. In addition, these results indicate that inpatient procedures not previously felt to be an important aspect of formal family medicine residency training (eg, ICU care and respirator management) were also commonly performed. Findings from this statewide study can provide a foundation for the development of a procedure curriculum for South Carolina family medicine residency programs and suggest the

Table 3

Percent of Respondents Who Report Lack of Training as Reason for Never Doing a Procedure by Graduation Date

Procedure (n= number of respondents not performing procedure)	Overall	Pre-1990 Graduates	1990-1999 Graduates	Post-1999 Graduates	$\chi^2$ P=
Outpatient					
Esophagogastroduodenoscopy (n=673)	38.2	37.0	38.0	43.5	.52
Colonoscopy (n=669)	37.2	37.0	36.6	39.6	.88
Nasopharyngoscopy (n=645)	33.3	30.6	34.2	40.2	.20
Vasectomy (n=668)	32.1	28.5	32.8	43.3	.02
Exercise stress testing (n=554)	24.0	25.7	22.5	21.2	.61
Short arm or leg casts (n=451)	15.6	11.4	17.4	25.0	.02
Flexible sigmoidoscopy (n=554)	13.8	11.2	15.8	17.1	.23
Joint aspiration/injection (n=135)	13.7	8.1	15.6	40.0	.02
Thoracentesis (n=618)	13.7	8.9	13.9	29.7	<.01
Paracentesis (n=615)	13.7	10.0	12.2	30.0	<.01
Skin biopsy (n=133)	8.6	4.5	13.2	18.2	.15
Inpatient					
Cesarean section (n=682)	31.6	29.8	29.9	41.8	.06
Swan-Gantz catheter placement (n=684)	25.7	21.0	25.1	43.0	<.01
Chest tube placement (n=641)	20.7	16.0	19.6	39.0	<.01
Central line placement (n=623)	15.8	13.7	17.4	19.3	.32
Surgical assistant (n=646)	12.0	10.6	12.3	16.1	.34
Respirator management (n=480)	10.8	11.4	10.2	10.0	.91
Intensive Care Unit care (n=360)	7.2	5.7	9.5	7.7	.46

importance of conducting a national graduate survey that can evaluate the need for curricular change on a national level. Further studies are needed to evaluate whether these findings also reflect national trends.

Specific variables were noted to be associated with the types and frequency of procedures performed. In particular, year of residency graduation, population size of the community being served, and gender of the physician was significantly associated with procedure performance. Region of country was not significant for most procedures, but this may be due to the small percentage of graduates not working in the South. Of particular note, the results revealed significant trends in the performance of certain procedures based on year of graduation from residency training. Most notably,

the performance of exercise stress testing, ICU care, and respirator management increased in frequency. This increase may reflect an increasing role for family physicians providing more-acute inpatient care, especially in smaller-sized communities. In contrast, flexible sigmoidoscopy had a significant decrease in the frequency of performance, whereas colonoscopy saw a significant increase. This finding likely reflects a change in practice due to an emerging preference for colonoscopy over sigmoidoscopy for colon cancer screening.<sup>12</sup>

Theoretically, trends in training should parallel trends in current practice, such that training for frequently performed procedures is sufficient. This study presents opportunities to improve education.

Table 4

Relative Likelihood of Performing a Procedure by Gender, Community Size, Region of Country, and Year of Graduation (n=697)

		<i>Colonoscopy</i>	<i>EGD</i>	<i>Exercise Stress Testing</i>	<i>Flexible Sigmoidoscopy</i>	<i>Joint Aspiration/Injection</i>	<i>Skin Biopsy</i>	<i>ICU Care</i>	<i>Respirator Management</i>
	<i>Dependent Variable</i>	<i>OR (95% CI)</i>	<i>OR (95% CI)</i>	<i>OR (95% CI)</i>	<i>OR (95% CI)</i>	<i>OR (95% CI)</i>	<i>OR (95% CI)</i>	<i>OR (95% CI)</i>	<i>OR (95% CI)</i>
Region of Country*	South	—	—	1	1	1	1	1	1
	Northeast and Mid-Atlantic	—	—	0.33 (0.10–1.14)	1.34 (0.56–3.22)	0.40 (0.18–0.90)	0.53 (0.22–1.30)	1.38 (0.65–2.93)	0.53 (0.22–1.30)
	Midwest, Southwest, and West	—	—	0.81 (0.45–1.46)	1.33 (0.76–2.35)	0.83 (0.46–1.49)	2.20 (1.00–4.66)	1.35 (0.84–2.16)	1.00 (0.61–1.64)
	Other (overseas, unknown)	—	—	1.15 (0.31–4.23)	1.05 (0.28–3.84)	0.23 (0.06–0.90)	0.39 (0.10–1.45)	0.70 (0.23–2.18)	0.46 (0.12–1.79)
Year of Graduation	Pre-1990	0.35 (0.14–0.86)	0.34 (0.13–0.88)	0.32 (0.18–0.55)	2.87 (1.35–6.10)	0.65 (0.29–1.48)	0.65 (0.29–1.43)	0.53 (0.32–0.90)	0.72 (0.42–1.21)
	1990–1999	0.32 (0.11–0.97)	0.24 (0.07–0.87)	0.57 (0.32–1.01)	1.82 (0.82–4.04)	0.61 (0.26–1.42)	0.82 (0.35–1.92)	0.69 (0.40–1.19)	1.01 (0.59–1.73)
	Post-1999	1	1	1	1	1	1	1	1
Community Size	<10,000	2.55 (0.72–9.01)	3.39 (0.85–13.55)	1.77 (0.98–3.21)	0.59 (0.30–1.15)	2.87 (1.41–5.82)	5.13 (2.27–11.62)	2.03 (1.25–3.31)	2.70 (1.59–4.58)
	10,000–100,000	2.65 (0.85–8.29)	2.61 (0.70–9.69)	1.54 (0.93–2.53)	1.27 (0.78–2.05)	2.35 (1.40–3.92)	4.16 (2.41–7.19)	2.05 (1.38–3.04)	2.21 (1.41–3.45)
	>100,000	1	1	1	1	1	1	1	1
Gender	Female	0.11 (0.01–0.79)	0.14 (0.02–1.03)	0.38 (0.21–0.67)	0.37 (0.20–0.68)	0.56 (0.33–0.93)	0.90 (0.52–1.56)	0.60 (0.40–0.91)	0.66 (0.41–1.05)
	Male	1	1	1	1	1	1	1	1

\* Not included in regression if sample size of respondents performing procedure too small for analysis in any region

EGD—esophagogastroduodenoscopy

ICU—Intensive Care Unit

For instance, 13.7% of all graduates not performing joint aspiration/injection stated it was due to lack of training. Looking specifically at post-1990 graduates, 40% of them listed lack of training as a reason they do not perform this procedure. Thus, an increased need for emphasis on this procedure is suggested. A similar percentage of post-1990 graduates (39.0%–43.5%) reported not performing cesarean section, colonoscopy, EGD, nasopharyngoscopy, or vasectomy due to lack of training and also increasingly noted lack of training as a reason not to perform certain invasive procedures, such as chest tube placement, thoracentesis, and paracentesis. Since these procedures are performed by less than 12% of family physicians, increasing training for these procedures may be useful for a small number of residents who perform these procedures in the future but may not be necessary for all residents.

Results from this survey can assist in the development of a resident procedure training curriculum, concentrating education on commonly performed procedures and minimizing or omitting exposure to procedures not commonly performed by family physicians. Increases in performance of ICU care and respirator management, and outpatient procedures such as EGD and colonoscopy, reveal evolving roles for family physicians providing acute inpatient care and a variety of outpatient procedures. New modalities of residency training, such as developing “tracks” within residency programs (eg, for residents interested in endoscopy, hospital medicine, or rural medicine), regional training centers, or a fourth year of residency devoted to advanced procedural skills should be evaluated for their ability to meet these evolving training needs.

### Limitations

This study was done using only data from family physicians trained in South Carolina, and it evaluates procedures from a list based on opinions of SC AHEC program directors. Thus, all procedures performed by family physicians were not evaluated. Although data on procedural practice from this study is similar to that from a national AAFP survey, the findings may not be generalizable to physicians nationally.

Another limitation is the use of the graduate’s self response to identify lack of training as a reason for not performing a procedure, since that may not correlate with the amount of training received during residency. However, respondent self response is appropriate for this study, since even if the respondents did receive training, if they felt it was inadequate a need for improved training is necessary.

Finally, the response rate for this survey was only just over 50%. However, we were able to obtain information from graduates over several decades in a variety of practice settings.

### Conclusions

Findings from this study demonstrate increasing performance of exercise stress testing and ICU care by recent graduates from South Carolina residency programs and a reported lack of training for several outpatient procedures. Further studies are needed to evaluate whether these findings also reflect national trends and to suggest which new residency training modalities may improve training.

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