

A Comparison of National Pediatric Procedures Training Guidelines With Actual Clinical Practice in Ohio

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ABSTRACT

Background The Accreditation Council for Graduate Medical Education (ACGME) and Pediatrics Review Committee (RC) recommends the clinical procedures residents should master during their training. These guidelines may be partially based on consensus opinion or tradition rather than actual need. The literature defining which procedures general pediatricians actually perform in practice is limited.

Objective Our objective was to determine how often general pediatricians perform procedures recommended by accreditation bodies, how well prepared they feel to perform them, and how important the procedures are to their practice.

Methods We categorized recommended procedures as emergent, urgent, or office-based, then developed and administered a survey in 2017 based on these classes. We randomly sampled and polled 439 general pediatricians from urban, suburban, or rural regions across central Ohio. Responses were compared using the Welch ANOVA, Mann Whitney U, and post-hoc tests.

Results The response rate was 60% (265 of 439). Pediatricians almost never performed 11 of 13 recommended procedures, yet felt well prepared to perform them all and believed that all were important. Rural pediatricians performed significantly more emergent and office-based procedures and rated them as more important. Commonly performed non-ACGME/RC procedures were circumcision, wart removal, cerumen removal, umbilical cauterization, and suture removal.

Conclusions Findings suggest that pediatricians rarely perform most of the recommended procedures, but think they are important. There are several office-based non-ACGME recommended procedures that pediatricians commonly perform. Regional differences suggest the need for customized training based on future practice plans.

Introduction

What procedures do today's general pediatricians routinely perform in their daily practice? Considering the time and resources pediatrics residency programs invest in preparing pediatricians for practice, this is an important question.¹ Even though the current general pediatrician workforce spends approximately 80% of their clinical time in the outpatient setting,² the types of procedures they perform vary widely based on practice type, location, and patient population.^{3–5} Further complicating an answer to this question are the rapidly evolving models of health care delivery with advances in technology, the introduction of procedural technicians and advanced practice providers, as well as the availability of and parental preference for medical specialists at tertiary care children's hospitals.^{6–10}

General pediatricians receive their primary training for the procedures they are expected to perform in practice during residency. The Accreditation Council for Graduate Medical Education (ACGME) establishes requirements and educational guidelines for all residency programs with the intent to standardize curriculum content and graduation requirements across institutions.^{11,12} Review Committees (RCs) are charged with evaluating and accrediting residencies within each specialty.¹² The Pediatrics RC is comprised of 10 voting members representing 3 affiliate professional organizations: the American Academy of Pediatrics, the American Board of Pediatrics, and the American Medical Association. Every 5 years, the RC reviews and revises program requirements and solicits feedback from other stakeholders, including the Association of Pediatric Program Directors, the Ambulatory Pediatric Association, and the Association of Medical School Pediatric Department Chairs.^{12–14} Current program requirements were published in 2013 and include 13 clinical procedures for which every

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Editor's Note: The online version of this article contains the survey instrument used in the study.

pediatrics resident must demonstrate competence prior to graduation.¹¹

The current guidelines are detailed and founded on the representative opinions of the groups outlined above, as well as program directors and trainees.^{1,15–19} However, they need to be regularly updated because graduate medical education is a rapidly changing field. Accordingly, there may be gaps between the current procedural guidelines and those procedures general pediatricians actually perform in practice, suggesting that the voices of practicing pediatricians also need to be considered. Our literature search yielded very little information regarding the procedures that pediatricians actually perform as a routine part of their practice,^{20,21} but this information could contribute to designing more pertinent procedural training.

The purpose of this study was to determine how often practicing general pediatricians across central Ohio perform the 13 ACGME/RC recommended procedures, whether they believe they were well-prepared to perform them, and whether they believe these procedures are important in their daily practice.

Methods

Setting and Participants

We defined our population as general pediatricians from counties in central Ohio who refer patients to, or have an affiliation with, Nationwide Children's Hospital. We identified 629 pediatricians practicing in this region, verified board certification in pediatrics, and called each practice to update their contact information. The resulting population was 543 board-certified pediatricians, representing 145 practices.

Sampling Methods

General pediatricians were organized into 3 groups: urban, suburban, and rural based on regional population, proximity to the study institution (Level 1 pediatric trauma center), and proximity to another Level 1 or 2 pediatric trauma or major medical center (FIGURE). Within each group, we stratified physicians by practice size to prevent overrepresentation of larger practices. We estimated that we could attain a 95% confidence interval, with $\pm 3\%$ sampling error, and maximum variation in survey responses through stratified random sampling of 81% of the total valid population.²¹ Our final sample was 439 of the 543 pediatricians (81%).

Survey Development and Dissemination

To answer our 3 research questions we developed a survey focusing on the 13 ACGME procedures

What was known and gap

The Accreditation Council for Graduate Medical Education recommends procedures pediatric residents should master during training, yet there is little data on which procedures practicing general pediatricians actually perform.

What is new

A survey to determine how often general pediatricians perform procedures recommended by accreditation bodies, how well prepared they think they are to perform them, and how important the procedures are to their practice.

Limitations

Survey was administered in one region of one state, which may limit generalizability. Data collected were based on recall and not verified.

Bottom line

Pediatricians rarely perform most of the recommended procedures, but think they are important, and commonly perform procedures not included in current guidelines.

(provided as online supplemental material). We also asked demographic questions about the pediatricians' training background and practice setting. We made further adjustments to the survey after piloting it among 20 academic general pediatricians outside of Ohio.

We administered the survey in 2017, using Dillman's total design survey method as a guide to give advance notice of the survey's purpose, coordinate dissemination in paper and electronic formats, and send weekly reminders by postcard, e-mail, and telephone.²¹ This process took 8 weeks. The electronic survey was distributed through Research Electronic Data Capture (REDCap).²²

The Institutional Review Board at Nationwide Children's Hospital deemed this study exempt.

Statistical Analyses

We used descriptive statistics to profile survey respondents and chi-square statistics to evaluate their representativeness of the total population. To prevent inflation of the nominal "alpha" value (typically $\alpha = .05$) adopted for statistical significance, we employed a 3-pronged approach to inferential statistical analyses.

First, we reduced the potential for type 1 error by aggregating items into 3 categories: (1) emergent (immediate procedures used for saving life or limb); (2) urgent (nonemergent procedures used for conditions that potentially can become emergent); and (3) office-based for each item set (frequency, preparation, and importance) and by creating raw scores by summing across items within categories and converting them into percentages. Next, we used the Bonferroni correction to adopt a nominal alpha based on the number of planned analyses.²³ For preliminary

**FIGURE****Geographic Regions Representing Comparison Groups**

Note: Region 1 (dark gray): urban, high population density, closest to study institution; region 2 (light gray): suburban, moderate population density (> 94000), close to a level 1 or 2 pediatric trauma center or major medical center; and region 3 (medium gray): rural, low population density.

global tests, only *P* values less than .006 would be considered statistically significant.

We selected the Welch's ANOVA for comparing regional groups. This statistic best addressed the conditions of heterogeneity of variance and unbalanced group size we observed in our data.^{24,25} We further analyzed statistically significant differences between groups with Games-Howell post-hoc tests. Finally, we used the Mann-Whitney *U* test for comparing general pediatricians who entered practice before and after published procedural guidelines were

implemented. We performed all analyses using SPSS 22 (IBM Corp, Armonk, NY).

Results

Respondents

Our response rate was 60% (265 of 439). More than half (61%, 162 of 265) of respondents had some affiliation with the study institution. Most worked in an outpatient setting (78%, 209 of 265). The average time in practice was 16.6 years (SD = 11.2). Slightly more than half (53%, 141 of 265)

TABLE 1

Frequencies and Percentages of Pediatrician Responses to Demographic Questions

Demographic Characteristic	Yes, n (%)
Employed by the study institution	107 (40)
Is your practice affiliated with the study hospital?	162 (61)
Do you have hospital admitting privileges?	140 (53)
Do you work full-time?	199 (75)
Did you complete a medicine-pediatrics residency?	36 (14)
Did you complete subspecialty training (ie, a fellowship)?	23 (9)
Are there various provider types (MD, DO, NP, PA, etc) in your practice?	240 (91)
Residency in the same state as study institution	181 (68)
Practiced longer than 15 years	125 (47)
Practice in more than 1 type of setting	64 (24)
Practice Setting	Yes, n (%)
Clinic or private practice	207 (78)
Urgent care or emergency department	44 (17)
Hospital medical center	73 (28)

completed residency training at the study institution itself (TABLE 1).

Bias Analysis

We used chi-square statistics to evaluate representation of our respondents to the total sample (TABLE 2). We found slight overrepresentation of urban physicians, including those employed by the study institution, and underrepresentation of suburban and rural physicians.

TABLE 2

Demographic Characteristics of Pediatricians Surveyed About Clinical Procedures^a

Demographic Characteristic	Respondents, No. (% of 265)	Nonrespondents, No. (% of 174)	Total, No. (% of 439)
Gender			
Female	169 (64)	106 (61)	275 (63)
Male	96 (36)	68 (39)	164 (37)
$\chi^2 = 0.37$, $df = 1$, $P = .55$			
Regional comparison groups			
1: Urban	169 (64)	88 (51)	257 (59)
2: Suburban	47 (18)	42 (24)	89 (20)
3: Rural	49 (19)	44 (25)	93 (21)
$\chi^2 = 7.5$, $df = 2$, $P \leq .05$			
Total	265 (60)	174 (40)	439 (100)

^a The columns display the numbers and percentages of 265 survey respondents and 174 nonrespondents on gender and region. Chi-square tests of proportion were used to evaluate whether the sample obtained was representative of the population at large.

Survey Results

TABLE 3 presents the modal response to the performance frequency, preparedness, and importance of the 13 procedures. Despite respondents reporting that they “almost never” performed 11 of the 13 procedures, they believed they were well prepared to perform most procedures (8 of 13) and only unprepared to perform one (peripheral intravenous catheter placement). Additionally, participants regarded most procedures as important.

Grouped Comparison Results

TABLE 4 shows comparisons between the 3 regional groups with regard to procedure performance frequency, preparedness, and importance. Welch’s ANOVA with Games-Howell post-hoc testing revealed that urban physicians performed both emergent (Welch’s $F = 13.3$; $P \leq .001$; $es = 0.85$) and office-based (Welch’s $F = 8.63$; $P \leq .001$; $es = 0.73$) procedures significantly less often than suburban and rural pediatricians. Effect sizes (es) related to these differences were large.^{26,27} No differences were observed between groups in how often they performed urgent procedures. All pediatricians felt well prepared to perform all 3 classes of procedures. However, rural pediatricians rated both emergent (Welch’s $F = 17.1$; $P \leq .001$; $es = 0.83$) and office-based (Welch’s $F = 5.4$; $P = .006$; $es = 0.53$) procedures as more important to their practice than did their urban and suburban counterparts.

In addition, general pediatricians who had been practicing before 2005, compared to those who entered practice after, were significantly more likely to consider office-based procedures important ($U = 6151$, $P \leq .01$). There was no difference between these groups with regards to importance of emergent and

TABLE 3Respondent Ratings on Frequency, Preparedness, and Importance of 13 ACGME/RC Procedures^a

Procedures	Frequency ^b	Preparedness ^c	Importance ^d
Emergent procedures			
Bag-valve mask ventilation	Almost never 220 (83)	Well prepared 241 (91)	Critical 157 (59)
Neonatal endotracheal intubation	Almost never 238 (90)	Well prepared 183 (69)	Moderately 74 (28)
Umbilical catheter placement	Almost never 250 (94)	Well prepared 162 (61)	Minimally 75 (28)
Urgent procedures			
Lumbar puncture	Almost never 224 (85)	Well prepared 234 (88)	Considerably 80 (30)
Simple laceration repair	Almost never 186 (70)	Well prepared 138 (52)	Considerably 99 (37)
Incision and drainage of abscess	Occasionally 118 (45)	Well prepared 147 (56)	Considerably 134 (51)
Reduction of a dislocation	Almost never 152 (57)	Somewhat prepared 101 (38)	Considerably 100 (38)
Temporary splinting of a fracture	Almost never 161 (61)	Somewhat prepared 115 (43)	Considerable 95 (36)
Office-based procedures			
Giving immunizations	Almost never 189 (71)	Somewhat prepared 105 (40)	Minimally/Moderately 142 (54)
Bladder catheterization	Almost never 194 (73)	Somewhat prepared 100 (38)	Moderately 87 (33)
Peripheral intravenous catheter placement	Almost never 241 (91)	Unprepared 93 (35)	Moderately 78 (29)
Venipuncture	Almost never 227 (86)	Well prepared 130 (49)	Moderately 84 (32)
Removal of a foreign body	Occasionally 138 (52)	Well prepared 157 (59)	Considerably 129 (49)

^a In each cell is the term associated with the most common (modal) rating, and the number and percentage of respondents who selected that choice.^b Frequency with which procedures are performed was rated on a 5-point scale. The numbers next to each label offer guidance in estimating times per year: 1, almost never (< 3); 2, occasionally (4–11); 3, monthly (12–26); 4, almost weekly (27–50); 5, almost daily (> 50).^c Preparation to perform procedures was rated on a 3-point scale along with an opt out or not sure category (1, unprepared; 2, somewhat prepared; 3, well prepared). Not sure was not scored.^d Importance of teaching the procedural skills to pediatricians was rated on a 5-point scale (1, not at all; 2, minimally; 3, moderately; 4, considerably; 5, very important, critical).

urgent procedures ($U = 7473.5$, $P = .12$ and $U = 8056.5$, $P = .57$, respectively).

Other Procedures

Nearly half of respondents (130 of 265) listed 32 additional procedures they commonly perform, 30 of which were not part of the current ACGME guidelines. Urban pediatricians suggested more than two-thirds of these additional procedures (71%, 92 of 130), while suburban pediatricians suggested 14% (18 of 130), and rural pediatricians 15% (20 of 130). The most commonly performed other procedures were circumcision ($n = 50$), wart removal ($n = 36$), cerumen removal ($n = 27$), umbilical cauterization ($n = 23$), and suture removal ($n = 21$). Based on prior definitions, 7 procedures were emergent (patient

restraint, newborn delivery management, arterial puncture, administering breathing treatments, tracheostomy and gastrostomy tube changes, and nasal cautery); 7 urgent (fluorescein staining, umbilical cauterization, ingrown toenail repair, joint aspiration, subungual hematoma trephination, digital blocks, and sedations); and the rest office-based (birth control, cerumen removal, circumcision, digital block, ear piercing, fluoride treatment, frenotomy, joint injections, medication injections, osteopathic manipulation, pap smears/pelvic examinations, penile adhesion reduction, suture removal, throat cultures, tympanometry, and wart removal). Few respondents ($n = 62$) sought additional procedural training beyond residency. Additional training was most common for circumcision ($n = 10$), frenulectomy ($n = 9$), long-

TABLE 4

Welch Statistic and Adjusted Alpha Value for Comparisons Among Groups With Unequal Variances by Frequency, Preparation, and Importance of Procedures

Frequency	Region	N	Mean	SD	Welch Statistic	df	P	es ^a
Emergent procedures	Urban	169	20.7	2.26	13.26	2/64	≤ .001 ^b	0.852
	Suburban	47	25.5	10.05				
	Rural	49	27.5	11.76				
Urgent procedures	Urban	169	29.8	10.70	2.63	2/104	.07	N/A
	Suburban	47	32.9	8.01				
	Rural	49	31.6	8.33				
Office-based procedures	Urban	169	28.4	7.93	8.63	2/81	≤ .001 ^c	0.731
	Suburban	47	31.9	9.31				
	Rural	49	34.9	11.63				
Preparation	Region	N	Mean	SD	Welch Statistic	df	P	es ^a
Emergent procedures	Urban	168	88.43	12.91	3.92	2/94	.023 ^c	0.412
	Suburban	47	89.60	13.19				
	Rural	47	93.38	10.01				
Urgent procedures	Urban	169	76.94	13.78	4.10	2/95	.020 ^d	0.426
	Suburban	47	76.17	12.57				
	Rural	49	82.45	12.45				
Office-based procedures	Urban	169	73.25	16.22	3.40	2/88	.038 ^e	0.531
	Suburban	47	69.50	16.61				
	Rural	49	78.64	17.79				
Importance	Region	N	Mean	SD	Welch Statistic	df	P	es ^a
Emergent procedures	Urban	169	67.42	18.19	17.05	2/89	≤ .001 ^d	0.831
	Suburban	47	69.22	21.65				
	Rural	48	83.19	16.10				
Urgent procedures	Urban	169	71.13	15.82	3.17	2/94	.047	N/A
	Suburban	47	70.72	12.79				
	Rural	48	77.42	16.16				
Office-based procedures	Urban	169	65.27	16.06	5.36	2/93	.006 ^d	0.526
	Suburban	47	65.87	14.56				
	Rural	49	73.71	16.06				

^a Cohen's d effect size for paired comparisons of the significantly different groups using weighted means and pooled standard deviations when needed.

^b Games-Howell post-hoc tests indicate that the urban group's mean is significantly lower than the means of both the suburban and rural groups.

^c Games-Howell post-hoc tests indicate that the urban group's mean is significantly lower than the mean of the rural group only.

^d Games-Howell post-hoc tests indicate that the urban and suburban groups' means is significantly lower than the mean of the rural group.

^e Games-Howell post-hoc tests indicate that the suburban group mean is significantly lower than the mean of the rural group only.

Abbreviations: es, effect size; N/A, not available.

acting contraception placement (n = 7), and neonatal resuscitation (n = 6).

Discussion

General pediatricians from central Ohio reported that they almost never perform most of the 13 ACGME recommended procedures. Yet, they believe them to be important to their practice and believe they are well prepared to perform them. We found differences between regional groups. Rural pediatricians, who

practice 30 miles or more from major medical facilities, performed emergent and office-based procedures more often and rated these procedures as more important. We explain this finding to be related to the distance these pediatricians are from specialists. We found little to no differences among regional groups involving the frequency, preparedness for, or importance of urgent procedures.

Our results generally build on the current body of literature regarding which procedures general pediatricians actually perform in their daily practice and

which they find important. Oliver and colleagues found that general pediatricians believed only 24 of 101 (23%) commonly taught procedures were important to their daily practice.²⁸ Our respondents said that all recommended procedures were important. Like Ben-Isaac and colleagues, we found that emergent procedures are rarely performed by general pediatricians, yet they feel well-prepared to perform them.²⁰ And finally, we found that the procedures general pediatricians most commonly perform may depend on their practice location and distance from a major medical center.⁴ While seemingly odd that physicians rate procedures they almost never perform as important, prior studies showed that physicians consider procedures important based on what was emphasized during their residency training.^{1,16,28} Pediatricians who graduated prior to the establishment of procedural guidelines in 2005¹ and their peers who graduated under the auspices of guidelines, ascribed similar levels of importance to emergent and urgent procedures. However, these 2 groups differed on their opinions about the importance of office-based procedures, with the former considering office-based procedures to be more important, suggesting that these results may be influenced by the evolving health care landscape.

Are such procedural guidelines necessary? While the purpose of accreditation bodies such as the ACGME is to standardize residency curricula, our findings suggest that there is room for improvement. While standardization does give pediatricians the procedural skills necessary to decrease specialist or tertiary care medical center referrals and the ability to practice as primary providers in a variety of settings,²⁹ our research shows that in today's rapidly changing practice environment, the frequency of performing RC recommended procedures is low. Since procedural practice depends on practice location and setting, access to specialized care, and staffing models, a practical solution would be to customize procedural training to meet future practice needs of individual trainees. Such customization recognizes that the needs of pediatricians entering hospital-based practice are different from those of pediatricians practicing in the office, thus allowing for more flexibility and time for other educational activities in the pediatric residency curriculum.^{30–32}

What procedures should be taught? While our findings suggest that general pediatricians believe almost all of the procedures are important, additional procedures listed suggest that residency education should include commonly performed procedures for which pediatricians seek additional postresidency training, such as circumcisions. Future studies should document the most common procedures pediatricians

perform and ascertain how best to teach them during residency and maintain procedural competency throughout their career.³³

Not surprisingly, we received significantly more surveys from physicians closest to and employed by the study institution compared to those from more rural communities. While this may suggest sponsor bias, we believe that the difference in returns between groups accurately reflects the proportions of those groups in the population; thus, it did not heavily impact our results. However, since we only administered the survey to pediatricians practicing in Ohio, generalizability to other states and regions is limited. We only stratified physicians based on proximity to major medical or pediatric centers and not by distance from urgent cares. This too may have affected our interpretation of results for urgent procedures since we found no differences between regional groups within this category. Additionally, data collected regarding how often procedures are performed were based on pediatricians' recall and has not yet been verified through other estimation methods.

Conclusion

General pediatricians rarely perform the current ACGME recommended procedures, but think that these skills are important. General pediatrician voices should be emphasized when creating future guidelines, particularly when recommending procedures.

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