OPEN

PRS GLOBAL OPEN

SPECIAL TOPIC

Progressive Surgical Autonomy in a Plastic Surgery Resident Clinic

Kristopher M. Day, MD
Jillian K. Scott, BS
Lani Gao, PhD
Tara M. Lee, MPH
Jimmy L. Waldrop, MD
Larry A. Sargent, MD, FACS, FAAP
J. Woody Kennedy, MD
Jason P. Rehm, MD
Mark A. Brzezienski, MS, MD, FACS

Background: Resident clinics are thought to catalyze educational milestone achievement through opportunities for progressively autonomous surgical care, but studies are lacking for general plastic surgery resident clinics (PSRCs). We demonstrate the achievement of increased surgical autonomy and continuity of care in a PSRC.
Methods: A retrospective review of all patients seen in a PSRC from October 1, 2010, to October 1, 2015, was conducted. Our PSRC is supervised by faculty plastic surgery attendings, though primarily run by chief residents in an accredited independent plastic surgery training program. Surgical autonomy was scored on a 5-point scale based on dictated operative reports. Graduated chief residents were additionally surveyed by anonymous online survey.
Results: Thousand one hundred forty-four patients were seen in 3,390 clinic visits. Six hundred fifty-three operations were performed by 23 total residents, including 10 graduating chiefs. Senior resident autonomy averaged 3.5/5 (SD = 1.5), 3.6/5 (SD = 1.5), to 3.8/5 (SD = 1.3) in postgraduate years 6, 7, and 8, respectively. A linear mixed model analysis demonstrated that training level had a significant impact on operative autonomy when comparing postgraduate years 6 and 8 ($P = 0.026$). Graduated residents' survey responses (N = 10; 100% response rate) regarded PSRC as valuable for surgical experience (4.1/5), operative autonomy (4.4/5), medical knowledge development (4.7/5), and the practice of Accreditation Council of Graduate Medical Education core competencies (4.3/5). Preoperative or postoperative continuity of care was maintained in 93.5% of cases.
Conclusion: The achievement of progressive surgical autonomy may be demonstrated within a PSRC model. *(Plast Reconstr Surg Glob Open 2017;5:e1318; doi: 10.1097/GOX.0000000000001318; Published online 4 May 2017.)*

INTRODUCTION

Over a century after the Flexner Report, the Accreditation Council of Graduate Medical Education (ACGME) continues to develop standards for resident progression during clinical training.[1–3] Many authors have voiced concern that achieving traditionally time-based competency in surgical autonomy is threatened by present day duty hour restrictions.[4–8] This has caused a paradigm shift toward competency-based training, which requires documentation of progressive educational achievement.[9–12] Resident clinics represent another recent development in plastic surgery curriculums, intended to enhance opportunities for residents to provide autonomous surgical care.[13–20] We investigate the value of a plastic surgery resident clinic (PSRC) for tracking progressive surgical autonomy.

In an effort to describe competency-based training goals, the American Board of Plastic Surgery and the ACGME undertook a joint initiative to set these goals, called The Plastic Surgery Milestone Project (PSMP).[2,3,21] The PSMP describes the "knowledge, skills, attitudes, and other attributes for each of the ACGME core competencies," which are intended to "define training outcomes … as a trainee progresses" in plastic surgery.[21] Examples of such milestones include "independently performs routine procedures" and "independently performs complex procedures."[21] Despite such laudable efforts to define surgical autonomy in plastic surgery, recent studies have sought to further define such competency-based criteria in anticipation of ACGME Next Accreditation System.[9–12,22–24]

From the Department of Plastic Surgery, University of Tennessee College of Medicine, Chattanooga, Tenn.
Received for publication February 7, 2017; accepted March 7, 2017.
Presented at the American Council of Academic Plastic Surgeons Spring Retreat, May 19, 2016, New York, N.Y.

DOI: 10.1097/GOX.0000000000001318

Disclosure: *The authors have no financial interest to declare in relation to the content of this article. The Article Processing Charge was paid for by the authors.*

Resident clinics, employed widely in plastic surgery training programs for cosmetic surgery, are thought to augment physician education while delivering quality medical care.[13–20] They provide "the opportunity for a surgeon to gain independent experience while offering cost-effective benefits to patients," aim to allow residents to become primary care providers, build patient relationships, and follow through with plans of care.[19] Cosmetic resident clinics are thereby thought to catalyze the achievement of patient care competencies by providing greater liberty for operative autonomy and continuity of care. However, similar reports are lacking for PSRCs, which may be more relevant to graduating plastic surgeons with competency in common general plastic surgery clinical scenarios.

Our program incorporates a half-day PSRC into the weekly training curriculum that predominantly features general plastic surgery patients with a focus on trauma and other largely emergency referral care. These PSRCs allow residents to make clinical decisions under the supervision of a board-certified plastic surgery faculty member. The general philosophy is that residents should approach PSRC patients as their primary providers with assistance from attending physicians provided to a degree commensurate with the trainee's demonstrated level of competency and independence. Attending physicians ultimately take responsibility for all care delivered but provide significant autonomy to residents both in the clinic consultation and during any operative intervention.

Our aim was to show the progressive achievement of competencies in patient care regarding operative autonomy and continuity of care in a PSRC model, thus providing a method by which to observe and document this progress. We believe this to be the first such study to provide verification of competency-based plastic surgery achievement in a PSRC model. These findings establish an evidence-based method for training programs to document their residents' progress in surgical autonomy and continuity components of patient care in accordance with the tenants of the PSMP.[2,3,9–12,23]

METHODS

Following approval by the University of Tennessee Institutional Review Board, a retrospective review of all patients seen in a PSRC from October 1, 2010, to October 1, 2015 was conducted.

Clinic Design

A weekly half-day PSRC supervised by board-certified University of Tennessee College of Medicine Department of Plastic Surgery faculty members, though primarily run by chief residents in an ACGME-accredited independent plastic surgery training program. Residents are required to be American Board of Surgery exam eligible general surgeons before admission into the plastic surgery training program at the University of Tennessee. One junior and one senior resident, of 5 total residents, typically attend PSRC in conjunction with 1 of 5 rotating attending surgeons. Attendings are present and oversee clinic but are not usually in direct contact with patients unless requested by the patient or resident personnel. All underinsured resident consult patients are referred to PSRC. Services administered exclusively by residents are not billed. Eligible uninsured patients additionally have the opportunity to participate in Project Access, a county-based healthcare outreach program.[25] Residents' clinic participation is evaluated through continual daily clinically oriented feedback and quarterly structured written evaluations.

Virtually all aspects of patient care are executed by residents and administrated by the supervising chief resident, including obtaining history and physical exam information, interpretation of radiographic imaging, clinical care decision-making, patient consent, written and dictated clinical documentation, financial coding, scheduling, and associated administrative tasks. Communication and decision-making regarding PSRC patients' management between clinics is also accomplished by residents with judicious involvement of attendings, as needed. Operations scheduled from PSRC are performed by 1 or more residents, often the junior and senior resident team that interacted with that patient in PSRC. The operative attending of record's presence in the hospital is a requirement that is strictly adhered to, though varying levels of operative autonomy may be given pursuant to Table 1. The intention is for the resident to act as the primary surgeon with graduated autonomy granted as deemed appropriate by the attending plastic surgeon for each individual clinical scenario.

Chart Review

Investigators conducted a 5-year retrospective review of all PSRC patients seen from October 1, 2010, to October 1, 2015. Patient data were collected from the charts within the Erlanger Medical Center printed and electronic medical and financial records. Data collection is largely summarized in Tables 1–4, which included patient demographics, referral source, diagnosis (International Classification of Disease, ninth edition, codes),[26] procedure (Current Procedural Terminology codes),[27] number of preoperative and postoperative PSRC visits, total time period followed in PSRC, name of resident(s) interacting on case, name

Table 1. Dictated Resident Autonomy Scores

Autonomy Score	Dictated Phrase for Attending's Role	Clinical Significance of Attending Involvement
5	"Available"	Highest resident autonomy, case discussed before and after procedure with attending
4	"Present for critical portions"	Attending not present for the majority of the procedure, present and advises during key steps
3	"Scrubbed for critical portions"	Attending not present for portions of the procedure, scrubbed for and directs key steps
2	"Present for entire"	Attending advises entire operation, scrubbed for a portion of the operation
1	"Scrubbed for entire"	Lowest resident autonomy, attending is scrubbed and directs entire operation

of supervising faculty member(s), insurance status, costs acquired, and payments. The ascending 5-point scale for autonomy was based on dictated phrases found in the resident operative reports and is outlined in Table 1 with "1" representing minimal to no autonomy and "5" indicating indirect supervision only. "Critical portions" of a given operation are defined as only those technical steps that the involved surgeons considered only the most technically challenging portion of the procedure. These steps, by definition, always occurred after incision or other manipulation of tissue and before closure of the surgical site or final tissue manipulation, though never included the entirety of the operation. Clinicians were unaware of this study at the time of each operative dictation.

Table 2. Clinic Patient Descriptive Statistics

Demographics	Average	SD	Range
Age (y)	32.8	14.3	<1–77
Sex (%)			
Male	74		
Female	26		
Race (%)			
White	75.8		
Black	19.7		
Other	4.6		
Insurance status (%)			
Un/underinsured	84.3		
State-sponsored	34.4		
Commercial	2.2		
Clinic encounters	**Average**	**SD**	**Range**
Clinic visits (operative patients)	3.9	2.6	1–29
Preoperative	1.3	1.2	0–22
Postoperative	2.7	2.6	0–20
Duration followed (wk)	14.1	26.5	1–251
Clinic visits (all patients)	3.0	2.7	1–29
Distribution of care			
Total patients	1,144		
Patients per clinic	11.9		
New patients per clinic	33.6% (4.0)		
New patients from ED	60% (2.4)		

ED, emergency department.

Table 3. Linear Mixed Model Analysis of Autonomy Score by Training Level

PGY Training Level	Mean	SD	CI	% of Total Operations	*P*
6	3.5	1.5	3.4–3.6	25.0	Base value
7	3.6	1.5	3.5–3.7	44.8	0.37
8	3.8	1.3	3.8–4.0	30.1	0.026

Statistical Analysis

After data collection, the above data points were analyzed with various tools to determine statistical significance. The mean, SD, and range were determined for all numerical demographic and clinic encounter data points. A linear mixed model analysis was performed to compare the mean autonomy score at each postgraduate year (PGY) training level. The fixed effect is PGY level, and the resident autonomy score is the random effect. A between-subjects analysis of variance with Tukey post hoc analysis and Bonferroni correction was used to compare the 10 most commonly performed procedures' average autonomy scores with *P* values provided for comparison to the base autonomy score procedure (pedicled tissue flap). The percentage of continuity of care events was generated by comparing the names of all included patients' recorded providers in the operative and preoperative or postoperative clinic setting.

Survey

An 18-question elective survey was sent through SurveyMonkey (SurveyMonkey, San Mateo, Calif.)[28] to assess graduated chief residents' perception of the educational value of PSRC. A solicitation e-mail was sent requesting a response from each graduate from our program in the last 5 years. Responses were then compiled anonymously by a research assistant, blinding all other study personnel.

The survey content was based on previously published survey data by Neaman et al.[16] Two questions assessed the quantity and diversity of procedural exposure, 5 questions referred to knowledge-based educational usefulness, 6 questions discussed each of the ACGME core competencies, 2 referred to feedback, and 3 addressed opportunities for autonomy through the PSRC experiences. All responses were quantified on a 5-point Likert scale with the following score significance: 1 = "strongly disagree," 2 = "disagree," 3 = "neutral," 4 = "agree," and 5 "strongly agree."

Tabulation of Procedures

The International Classification of Disease, ninth edition, code was recorded to document each patient's diagnosis, and the Current Procedural Terminology code was recorded for each surgical intervention. The surgeries reported in this study include only those arranged from the PSRC not those executed in the emergency department or other facility before referral. The frequency of each

Table 4. Most Common Procedures from Clinic

Procedure	N	Average Autonomy	SD	*P*
Open reduction of mandible fracture	96	3.5	1.3	0.0003
Closed reduction of mandible fracture	85	4.4	1.1	<0.001
Open reduction of zygomaticomaxillary complex	73	3.5	1.5	0.0003
Tissue debridement	51	3.4	1.6	0.0062
Lesion excision	45	4.4	1.4	<0.001
Skin graft	41	3.4	1.5	0.016
Pedicled tissue flap	37	2.3	2.3	Base value
Closed reduction of nasal bone fracture	39	4.0	1.5	<0.001
Open reduction of orbital fracture	36	4.1	1.1	<0.001
Complex laceration repair	23	3.5	1.8	0.045

procedure were then pooled, when sufficiently related, to generate the list of most common procedures displayed in Table 4.

RESULTS

Overall Clinic Statistics

A total of 1,144 patients were seen in 3,390 total clinic visits, including an average of 11.9 patients per half-day PSRC each week. This included 4.0 patients new to PSRC weekly (33.6%), of which 2.4 (60.0%) were direct emergency room referrals. The remaining patients new to PSRC (40.0%) were seen after previous inpatient consultation, outpatient plastic surgical care, or outpatient physician referral. Patient demographics are summarized in Table 2. Six hundred fifty-three operations were performed by 23 total residents, including 10 graduating chiefs. Procedures from PSRC were conducted by 25.0% PGY6, 44.8% PGY7, and 30.1% PGY8 residents. Approximately 147.4 patient encounters and 56.8 operations per year were conducted annually per resident, approximately half as the surgeon-in-charge.

Operative Autonomy

Overall resident autonomy averaged 3.6 (SD = 1.5). Resident autonomy averaged 3.5/5 [SD = 1.6; confidence interval (CI), 3.39–3.58], 3.6/5 (SD = 1.5; CI, 3.52–3.72), to 3.9/5 (SD = 1.3; CI, 3.75–3.95) in PGYs 6, 7, and 8, respectively. The linear mixed model analysis demonstrated a significant association between training level and documented operative autonomy between PGYs 6 and 8 ($P = 0.026$). There was no significant difference between PGYs 6 and 7 or 7 and 8. These results are summarized in Table 3 (Fig. 1).

Continuity of Care

A resident involved in the operation saw their patient in the clinic at least once (either pre- or postoperatively) 93.5% of the time. There was no significant difference between the rate of these interactions with operative patients in the pre- or postoperative clinic setting as compared with attendings staffing the clinic, except for the preoperative and operative setting, in which attendings and residents saw the operative patient 83.9% and 78.8% of the time preoperatively, respectively ($P = 0.017$). Operative patients were followed an average of 14.1 (SD = 26.5; range, 1–248) weeks and had a mean of 3.9 (SD = 2.6; range, 1–29) clinic encounters.

Resident Survey

All 10 graduated chief residents responded to the online survey, resulting in a 100% response rate. The average score for resident satisfaction with the quantity and variation of operative case exposure from PSRC was 4.1/5 (SD = 1.0). Residents' impression of the autonomy they were granted in the pre-, intra-, and postoperative averaged 4.5/5 (SD = 0.5), 4.4/5 (SD = 0.5), and 4.4/5 (SD = 0.5), respectively. Graduated chief residents scored PSRCs contribution to their medical knowledge averaging of 4.7/5 (SD = 0.5). The practice of ACGME core competencies in PSRC received an average score of 4.3/5 (SD = 0.8) by graduated residents.

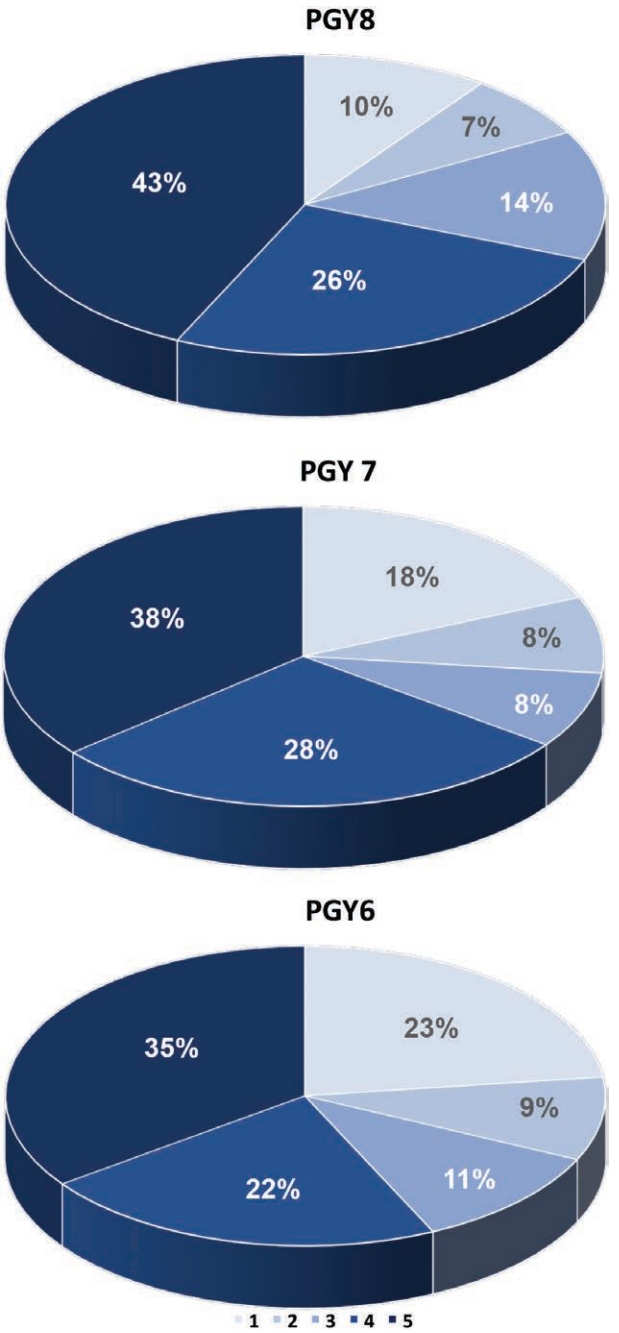

Fig. 1. Resident autonomy progression. A progressive increase in operative autonomy throughout training is demonstrated. Lower percentages of lower autonomy scores and greater percentages of higher autonomy scores are displayed in each successive postgraduate training year.

Common Procedures

Mandible fracture repair, by either open (N = 96) or closed (N = 85) reduction, represented the most common procedures performed from PSRC with average operative

autonomy scores of 3.5/5 (SD = 1.3) and 4.4/5 (SD = 1.1), respectively. The analysis of variance demonstrated a significant difference between average autonomy scores [$F(9, 525) = 6.64$; $P < 0.001$]. Tukey honest significant difference post hoc analysis showed statistically significant higher average operative autonomy scores (mean = 3.4–4.4; P<0.001–0.045) for all procedures compared with pedicled tissue flap (2.3/5; SD = 2.3), which displayed the lowest average operative autonomy score. The 10 most common procedures from PSRC are summarized in Table 4.

DISCUSSION

Competency-based Education Implications

It has been said that all surgeons are responsible for the safety of their patients, but training institutions incur the additional responsibility of the safety of future patients who will be cared for by their trainees.[29] We report a 5-year experience in progressive operative autonomy and continuity of care in a PSRC composed of 653 operations and 3,390 clinical appointments. Resident autonomy was observed to progress at a statistically significant rate between PGYs 6 and 8 (Table 3; $P = 0.026$), suggesting that PSRC contributed to the development of progressive surgical autonomy and a forum in which to observe it. Additionally, because statistically significant progression in operative autonomy was not seen between consecutive PGY 6 and 7 or 7 and 8, these results suggest that 3 years may be required to demonstrate such progression in an independent training model.

There are some elements of our training model that may differ from other centers, such as an independent training model, the size of the training program, and delivery of care to a predominantly underinsured population. Although training environments remain heterogeneous within plastic surgery, the PSRC may be instituted within various training environments, so its educational value remains relevant to other centers of care. Furthermore, given the prior completion of general surgical training in our curriculum, the observation of progressive surgical autonomy despite a relatively high presumed starting point suggests that even greater rates of progression could be observed in integrated training models.

Levels of Supervision

The ACGME defines supervision of residents as either "direct," "indirect," or in "oversight."[30] All levels of operative autonomy in this report would be characterized as direct or indirect supervision, as surgical care was provided with the operative surgeon in the hospital and with the ability to provide immediate direct supervision as needed. As reflected in a number of studies of the value of cosmetic resident clinics, this greater liberty for autonomous clinical decision-making and technical performance is thought to confer educational value to the training of safe future plastic surgeons.[13–20,31,32]

Study Limitations

There are a number of limitations in this study's design that must be considered when drawing conclusions. Perhaps the most notable is the lack of a comparison group. Although the change in autonomy over time within the same residents is significant, it would be optimal to have a reference for this rate of change in a non-PSRC setting to determine if this progression is attributable to the clinic or the training experience as a whole. Such a comparison was not possible, as the dictated operative phrases recorded (Table 1) are unique to resident operative dictations. We did observe remarkable fidelity between dictations for these phrases. It is possible, however, to imagine a scenario in which the attending is scrubbed throughout a procedure though not actively directing the surgical decision-making and technical performance, which would meet common definitions for operative autonomy.[31,32] Alternatively, an attending present but not scrubbed could potentially direct the entire operation without significant resident decision-making. The complexity of this concept has led to the development of novel measurements for operative proficiency.[33–36] Although we provide self-reported data, resident surgeons were blind to this study at the time of their dictation and report predominantly objective facts (presence or absence and scrubbed status of attendings). Our approach also differs from those that employ a third party or surgeon's assessment in that we report the actual official medical record documentation. We believe this increases the validity of the above results for increased surgical autonomy over time.

Continuity of Care

Resident continuity of care is an aspect of patient care believed by Okie and others to have been threatened by duty hour restrictions.[4–8] We observed maintenance of resident continuity of care with at least 1 clinic consultation by the same resident in 93.5% of operations performed on PSRC patients, which we believe to be superior to most current training opportunities. Compared with PSRC attendings, there was no difference in resident continuity except in the pre- and intraoperative setting (83.9% versus 78.8%; $P = 0.017$). This must also be interpreted in the context of institutional requirements to schedule operations under the name of attending surgeons with surgical privileges. Despite our relatively high observation of interaction by the same resident in the operative room and *either* the preoperative or postoperative setting, we struggle with some of the challenges that plague many centers in preserving continuity throughout the cycle of care from start to finish.[16,36,37] We maintain optimism that further development of PSRC systems of care will enable more comprehensive resident care, benefiting not only resident education but potentially also costs and quality of patient care.[16,17]

Chief Resident Survey

Our graduated chief residents' survey indicated that past trainees regarded the experiences gained through PSRC as valuable for surgical experience (4.1/5), operative autonomy (4.4/5), medical knowledge development (4.7/5), and the practice of ACGME core competencies (4.3/5). This perspective has been previously reported in the context of cosmetic resident clinics by D'Souza and

Gosman[13] but not in the setting of a PSRC. Combined with the aforementioned demonstration of progressive operative autonomy and preservation of continuity of care, this favorable trainees' perspective provides further evidence of the value of the PSRC for resident education. This merit proves even more significant, given that it also serves patients with less access to care.

Future Directions

It is important, in the PSMP era of plastic surgical education, for training programs to examine the achievement of milestones by their residents.[9–12,38,39] Modern surgical education is clearly trending toward greater documentation of residents' competency-based progression throughout training, given that the Next Accreditation System requirements are imminent.[2,23,30] The current challenge to medical educators across healthcare fields is to examine their pedagogies and develop models in which to demonstrate competency achievement.[40–46] Some innovative studies on techniques used to assess resident operative performance have been conducted recently.[33–36,47] However, due to the novelty of quantifying resident operative competence, extensive research is yet to be conducted in plastic surgery.

This PSRC model can be used to identify opportunities for improvement in specific procedures or by particular trainees with resident-specific outcomes. Further studies, such as prospective comparisons of the PSRC to other attending-centered systems of care, will be required to confirm these results and determine their best fit into the larger framework of the PSMP. Although studies in multiple other centers have shown the adequacy of resident-delivered care in related venues, further investigations will also be necessary to demonstrate the quality and safety of care delivered through PSRCs.[13,14,31,48–51] Increased definition of the tools used to measure operative autonomy will likely herald greater safe trainee skill progression and increase the ability of plastic surgery educators to communicate expectations.

One might infer from Table 4 that higher average autonomy score cases are more amenable to junior resident performance and lower average autonomy score procedures should be reserved for more senior trainees, though future studies would be necessary to refine the assessment of "junior" and "senior" operations with further subgroup analyses. Follow-up studies will hopefully display greater complexity of procedures executed by resident trainees as systems of resident care and its documentation proliferate. For the purposes of this report, the observed increase in the operative autonomy observed despite a likely increase in the complexity of procedures conducted by residents in later years of training is encouraging.

CONCLUSIONS

Opportunities to practice autonomous plastic surgical care, continuity, and observe progressive surgical autonomy may be provided by PSRCs. We believe that PSRCs can be valuable for the development of independent surgical decision-making and operative proficiency, though further studies are needed to further define their role in competency-based educational curriculums. The PSRC model also enables programs to document operative proficiency by their trainees and identify opportunities for both individual and systems-based improvements.

Kristopher M. Day, MD
979 East Third Street
Suite 901
Chattanooga, TN 37403
E-mail: krisophermday@gmail.com

ACKNOWLEDGMENTS

Multiple individuals made indispensable contributions to this study, including S. Renee Ferguson, plastic surgery clinic coordinator, W. Caleb White, MBA, MSHI, information technologist, and Michael Lee, CPA, healthcare data analyst.

REFERENCES

1. Cooke M, Irby DM, Sullivan W, et al. American medical education 100 years after the Flexner report. *N Engl J Med.* 2006;355:1339–1344.
2. Accreditation Council for Graduate Medical Education. Milestones. Available at https://www.acgme.org/acgmeweb/tabid/430/ProgramandInstitutionalAccreditation/NextAccreditationSystem/Milestones.aspx. Accessed May 25, 2016.
3. Accreditation Council for Graduate Medical Education. Plastic surgery. Available at https://www.acgme.org/acgmeweb/tabid/145/ProgramandInstitutionalAccreditation/SurgicalSpecialties/PlasticSurgery.aspx. Accessed May 25, 2016.
4. Ahmed N, Devitt KS, Keshet I, et al. A systematic review of the effects of resident duty hour restrictions in surgery: impact on resident wellness, training, and patient outcomes. *Ann Surg.* 2014;259:1041–1053.
5. Basu CB, Chen LM, Hollier LH Jr, et al. The effect of the Accreditation Council for Graduate Medical Education Duty Hours Policy on plastic surgery resident education and patient care: an outcomes study. *Plast Reconstr Surg.* 2004;114:1878–1886.
6. Durkin ET, McDonald R, Munoz A, et al. The impact of work hour restrictions on surgical resident education. *J Surg Educ.* 2008;65:54–60.
7. Okie S. An elusive balance—residents' work hours and the continuity of care. *N Engl J Med.* 2007;356:2665–2667.
8. Simien C, Holt KD, Richter TH, et al. Resident operative experience in general surgery, plastic surgery, and urology 5 years after implementation of the ACGME duty hour policy. *Ann Surg.* 2010;252:383–389.
9. Bancroft GN, Basu CB, Leong M, et al. Outcome-based residency education: teaching and evaluating the core competencies in plastic surgery. *Plast Reconstr Surg.* 2008;121:441e–448e.
10. Johnson SP, Chung KC, Waljee JF. Evidence-based education in plastic surgery. *Plast Reconstr Surg.* 2015;136:258e–266e.
11. Knox AD, Gilardino MS, Kasten SJ, et al. Competency-based medical education for plastic surgery: where do we begin? *Plast Reconstr Surg.* 2014;133:702e–710e.
12. Lutz K, Yazdani A, Ross D. From time-based to competency-based standards: core transitional competencies in plastic surgery. *J Surg Educ.* 2015;72:228–234.
13. D'Souza GF, Gosman A. Evaluation of an Academic Resident Aesthetic Clinic from perspective of patient and resident. *Plast Reconstr Surg.* 2015;136(4 Suppl):122–123.
14. Freiberg A, Giguère D, Ross DC, et al. Are patients satisfied with results from residents performing aesthetic surgery? *Plast Reconstr Surg.* 1997;100:1824–31; discussion 1832.

15. Hultman CS, Wu C, Bentz ML, et al. Identification of best practices for resident aesthetic clinics in plastic surgery training: the ACAPS national survey. *Plast Reconstr Surg Glob Open*. 2015;3:e370.
16. Neaman KC, Hill BC, Ebner B, et al. Plastic surgery chief resident clinics: the current state of affairs. *Plast Reconstr Surg*. 2010;126:626–633.
17. Nguyen AT, Janis JE. Discussion: plastic surgery chief resident clinics: the current state of affairs. *Plast Reconstr Surg*. 2010;126:634–635.
18. Pu LL, Thornton BP, Vasconez HC. The educational value of a resident aesthetic surgery clinic: a 10-year review. *Aesthet Surg J*. 2006;26:41–44.
19. Pyle JW, Angobaldo JO, Bryant AK, et al. Outcomes analysis of a resident cosmetic clinic: safety and feasibility after 7 years. *Ann Plast Surg*. 2010;64:270–274.
20. Zweifler M, Glasberg SB. An outcome-based study of aesthetic surgery in a clinic setting. *Ann Plast Surg*. 2000;44:355–360.
21. McGrath MH. The plastic surgery milestone project. *J Grad Med Educ*. 2014;6(1 Suppl 1):222–224.
22. Cooney CM, Redett RJ 3rd, Dorafshar AH, et al. Integrating the NAS milestones and handheld technology to improve residency training and assessment. *J Surg Educ*. 2014;71:39–42.
23. Sillah NM, Ibrahim AM, Lau FH, et al. The new accreditation council for graduate medical education next accreditation system milestones evaluation system: what is expected and how are plastic surgery residency programs preparing? *Plast Reconstr Surg*. 2015;136:181–187.
24. Wanzel KR, Fish JS. Residency training in plastic surgery: a survey of educational goals. *Plast Reconstr Surg*. 2003;112:723–9; discussion 730.
25. Project Access, a Community Health Partnership of the Chattanooga and Hamilton County Medical Society. Available at http://www.chattmedsoc.org/project-access. Accessed June 26, 2016.
26. The International Classification of Diseases, 9th Revision, Clinical Modification" (ICD-9-CM), Sixth Edition, issued for use beginning October 1, 2008 for federal fiscal year 2009 (FY09). Available at http://www.cdc.gov/nchs/icd9.htm. Accessed June 12, 2016.
27. Current Procedural Terminology (CPT®), a product of the American Medical Association. Available at http://www.ama-assn.org/ama/pub/physician-resources/solutions-managing-your-practice/coding-billing-insurance/cpt.shtml. Accessed June 12, 2016.
28. SurveyMonkey®, Inc. Palo Alto, Calif. www.SurveyMonkey.com. Accessed August 15, 2015.
29. Ludmerer KM. *Let Me Heal: The Opportunity to Provide Excellence in American Medicine*. New York, N.Y.: Oxford University Press; 2015.
30. Common program requirements of the Accreditation Council of Graduate Medical Education, effective July 1, 2015. Available at http://www.acgme.org/What-We-Do/Accreditation/Common-Program-Requirements. Accessed June 12, 2016.
31. Kennedy TJ, Regehr G, Baker GR, et al. Progressive independence in clinical training: a tradition worth defending? *Acad Med*. 2005;80(10 Suppl):S106–S111.
32. Kotsis SV, Chung KC. Application of the "see one, do one, teach one" concept in surgical training. *Plast Reconstr Surg*. 2013;131:1194–1201.
33. Bohnen JD, George BC, Williams RG, et al.; Procedural Learning and Safety Collaborative (PLSC). The feasibility of real-time intraoperative performance assessment with SIMPL (System for Improving and Measuring Procedural Learning): early experience from a multi-institutional trial. *J Surg Educ*. 2016;73:e118–e130.
34. George BC, Teitelbaum EN, Meyerson SL, et al. Reliability, validity, and feasibility of the Zwisch scale for the assessment of intraoperative performance. *J Surg Educ*. 2014;71:e90–e96.
35. Glarner CE, McDonald RJ, Smith AB, et al. Utilizing a novel tool for the comprehensive assessment of resident operative performance. *J Surg Educ*. 2013;70:813–820.
36. Wagner JP, Chen DC, Donahue TR, et al. Assessment of resident operative performance using a real-time mobile Web system: preparing for the milestone age. *J Surg Educ*. 2014;71:e41–e46.
37. Freiberg A. Challenges in developing resident training in aesthetic surgery. *Ann Plast Surg*. 1989;22:184–187.
38. Bingham HG. Training in esthetic surgery: some problems encountered in a university program. *Plast Reconstr Surg*. 1980;65:227–228.
39. Philibert I, Nasca T, Brigham T, et al. Duty-hour limits and patient care and resident outcomes: can high-quality studies offer insight into complex relationships? *Annu Rev Med*. 2013;64:467–483.
40. Borman KR, Augustine R, Leibrandt T, et al. Initial performance of a modified milestones global evaluation tool for semiannual evaluation of residents by faculty. *J Surg Educ*. 2013;70:739–749.
41. Bradley KE, Andolsek KM. A pilot study of orthopaedic resident self-assessment using a milestones' survey just prior to milestones implementation. *Int J Med Educ*. 2016;7:11–18.
42. Friedman KA, Balwan S, Cacace F, et al. Impact on house staff evaluation scores when changing from a Dreyfus- to a milestone-based evaluation model: one internal medicine residency program's findings. *Med Educ Online*. 2014;19:25185.
43. Goldflam K, Bod J, Della-Giustina D, et al. Emergency medicine residents consistently rate themselves higher than attending assessments on ACGME milestones. *West J Emerg Med*. 2015;16:931–935.
44. Naritoku WY, Alexander CB, Bennett BD, et al. The pathology milestones and the next accreditation system. *Arch Pathol Lab Med*. 2014;138:307–315.
45. Schumacher DJ, Spector ND, Calaman S, et al. Putting the pediatrics milestones into practice: a consensus roadmap and resource analysis. *Pediatrics*. 2014;133:898–906.
46. Schartel SA, Kuhn C, Culley DJ, et al. Development of the anesthesiology educational milestones. *J Grad Med Educ*. 2014;6(1 Suppl 1):12–14.
47. Meyerson SL, Teitelbaum EN, George BC, et al. Defining the autonomy gap: when expectations do not meet reality in the operating room. *J Surg Educ*. 2014;71:e64–e72.
48. Hauer KE, Ten Cate O, Boscardin C, et al. Understanding trust as an essential element of trainee supervision and learning in the workplace. *Adv Health Sci Educ Theory Pract*. 2014;19:435–456.
49. Novick RJ, Lingard L, Cristancho SM. The call, the save, and the threat: understanding expert help-seeking behavior during non-routine operative scenarios. *J Surg Educ*. 2015;72:302–309.
50. Sterkenburg A, Barach P, Kalkman C, et al. When do supervising physicians decide to entrust residents with unsupervised tasks? *Acad Med*. 2010;85:1408–1417.
51. van der Leeuw RM, Lombarts KM, Arah OA, et al. A systematic review of the effects of residency training on patient outcomes. *BMC Med*. 2012;10:65.