The Resident-Run Minor Surgery Clinic: A Pilot Study to Safely Increase Operative Autonomy

Brandon M. Wojcik, MD, Zhi Ven Fong, MD, Madhukar S. Patel, MD, MBA, ScM, David C. Chang, MPH, MBA, PhD, Emil Petrusa, PhD, John T. Mullen, MD and Roy Phitayakorn, MD, MHPE

Department of Surgery, Massachusetts General Hospital, Boston, Massachusetts

OBJECTIVE: General surgery training has evolved to align with changes in work hour restrictions, supervision regulations, and reimbursement practices. This has culminated in a lack of operative autonomy, leaving residents feeling inadequately prepared to perform surgery independently when beginning fellowship or practice. A resident-run minor surgery clinic increases junior resident autonomy, but its effects on patient outcomes have not been formally established. This pilot study evaluated the safety of implementing a resident-run minor surgery clinic within a university-based general surgery training program.

DESIGN: Single institution case-control pilot study of a resident-run minor surgery clinic from 9/2014 to 6/2015. Rotating third-year residents staffed the clinic once weekly. Residents performed operations independently in their own procedure room. A supervising attending surgeon staffed each case prior to residents performing the procedure and viewed the surgical site before wound closure. Postprocedure patient complications and admissions to the hospital because of a complication were analyzed and compared with an attending control cohort.

SETTING: Massachusetts General Hospital General in Boston, MA; an academic tertiary care general surgery residency program.

PARTICIPANTS: Ten third-year general surgery residents.

RESULTS: Overall, 341 patients underwent a total of 399 procedures (110 in the resident clinic vs. 289 in the attending clinic). Minor surgeries included soft tissue mass excision ($n = 275$), abscess incision and drainage ($n = 66$), skin lesion excision ($n = 37$), skin tag removal ($n = 15$), and lymph node excision ($n = 6$). There was no significant difference in the overall rate of patients developing a postprocedure complication within 30 days (3.6% resident vs. 2.8% attending; $p = 0.65$); which persisted on multivariate analysis. Similar findings were observed for the rate of hospital admission resulting from a complication. Resident evaluations overwhelmingly supported the rotation, citing increased operative autonomy as the greatest strength.

CONCLUSIONS: Implementation of a resident-run minor surgery clinic is a safe and effective method to increase trainee operative autonomy. The rotation is well suited for mid-level residents, as it provides an opportunity for realistic self-evaluation and focused learning that may enhance their operative experience during senior level rotations. (J Surg Ed 73:e142-e149. © 2016 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: graduate medical education, autonomy, patient outcomes, resident clinic, deliberate practice model, minor surgery

COMPETENCIES: Patient Care, Medical Knowledge, Practice-Based Learning and Improvement, Systems-Based Practice

INTRODUCTION

General surgery residency training has evolved to align with changes in work-hour restrictions, supervision regulations, reimbursement practices, and the increase in surgical subspecialization. These changes have culminated in the nationwide phenomenon of graduating residents feeling inadequately prepared to operate when beginning fellowship or independent practice.[1,2] In a recent survey of fellowship directors in the United States, 66% felt that incoming fellows could not perform 30 minutes of a major operation unsupervised.[3] This lack of confidence has led to the creation of a "Transition to Practice Program in General Surgery" by the American College of Surgeons and almost

Correspondence: Inquiries to Roy Phitayakorn, MD, MHPE, Department of Surgery, Massachusetts General Hospital, WACC 460 15 Parkman St., Boston, MA 02114; e-mail: rphitayakorn@mgh.harvard.edu

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certainly contributes to why 75% to 80% of graduating residents feel they would require additional training.[2,4] Although this paradox in surgical education is multifactorial, a major contributing factor is the decrease in resident autonomy over the past 30 years.[1,5-8]

In an effort to better prepare residents as they transition to more complex operations, there has been a national initiative to increase the operative experience and introduction of appropriate autonomy during the junior resident years.[9] Examples of such initiatives include the American Board of Surgery (ABS) mandating that residents log 250 cases by the end of their second postgraduate year (PGY),[10] the General Surgery Milestone Project,[11] use of simulation technology, and the adoption of deliberate practice models.[9,12,13]

A resident-run minor surgery clinic, historically referred to as a "lumps and bumps clinic," offers junior residents a unique setting for early operative autonomy.[14] The procedures encountered in a "lumps and bumps clinic" are relatively low-risk, require skills that residents develop with supervision during their intern year, and are considered to be core general surgery procedures and educational objectives by the ABS and Surgical Council on Resident Education.[10,15,16] However, a survey of the Accreditation Council for Graduate Medical Education National Resident Report Case Logs revealed that during the 2014 to 2015 academic year, the average number of subcutaneous small tumor excisions logged by residents as surgeon chief and surgeon junior was only 0.2 and 3.3, respectively.[17]

Our university-based general surgery training program felt implementation of such a resident-run minor surgery clinic was feasible and conducted a 10-month pilot program. This study was designed to evaluate patient outcomes by comparing resident clinic patients with an attending control group during the pilot. Our hypothesis was that there would be no significant difference in the rate of postprocedure complications between these groups.

MATERIALS AND METHODS

Clinic structure

The clinic was piloted from 9/2014 to 6/2015 and run by rotating PGY-3 residents during a general surgery rotation. An established single attending minor surgery clinic was restructured to allow half of the patients during 1 clinic day each week to be seen in the resident clinic. The attending clinic otherwise saw patients 2 full days per week. New referrals to the attending clinic were given the opportunity of being seen in the resident clinic when making appointments. Soft tissue mass excisions were preferentially scheduled in the resident clinic, as this procedure was felt to allow honing of more complex procedural skills. The resident was required to observe the attending perform the procedure once before they were able to operate on patients seen in the resident-run minor surgery clinic.

For daily workflow, a medical assistant seated patients took vital signs and prepared the procedure room. The resident conducted a history and physical examination, reviewed previously obtained laboratory studies/imaging, and performed a bedside ultrasound if indicated. Their treatment plan was discussed with the attending surgeon who met the patient before any procedure was performed. In most cases, further diagnostic work-up was not required. If a procedure was indicated, it was performed during the same visit, unless the patient deferred. The patient was offered the option of declining resident involvement in performing their procedure.

The resident operated alone in their own procedure room and was responsible for all aspects of obtaining consent, field block anesthesia, performing the surgery, discussing postprocedure wound care, and reviewing concerning symptoms that should prompt a follow-up office visit. The attending surgeon was immediately available during the procedure and entered the room after being notified that the resident had reached the critical portion of the case. The critical portion of the procedures encountered in the clinic was determined by the attending surgeon to be inspection of the surgical site just before closure to ensure hemostasis and adequate excision or drainage. Residents received feedback after each procedure and a more comprehensive debriefing session at the end of each clinic day. Residents completed a standard rotation evaluation as part of the greater general surgery service.

Patients were not routinely seen in follow-up unless a complication arose. On completion of their procedure, concerning symptoms that should prompt an office or emergency department visit were discussed with the patient and provided in a standardized written form. This form contained the contact information of the attending surgeon including office number and cell phone number. To further ensure that complications were detected, the resident and attending each contacted their respective patients by telephone 7 to 10 days after the procedure to discuss pathology results and query their recovery. If any symptoms concerning for a postprocedure complication were detected, a follow-up visit was immediately scheduled. All resident patients were also evaluated by the attending surgeon during this visit.

The Centers for Medicare and Medicaid Services Manual System states that for a teaching physician to bill for a surgical procedure they must be responsible for the preoperative, operative, and postprocedure care of the beneficiary, present for the critical portion of the procedure, and immediately available throughout the remainder of the procedure.[18] In our clinic, this criteria was met as previously discussed and all procedures were billed under the attending surgeon's name.

TABLE 1. Patient Demographics

Demographic[†]	Resident (n = 110), n (%)	Attending (n = 289), n (%)	p-value
Age (years)	52.3 ± 16.0	51.0 ± 16.3	0.23
Female	48 (43.6)	138 (47.8)	0.46
Race			0.58
White	85 (78.0)	226 (80.0)	
Black	4 (3.7)	17 (6.0)	
Hispanic	2 (1.8)	7 (2.5)	
Asian	9 (8.3)	14 (5)	
Other	9 (8.3)	18 (6.4)	
BMI (kg/m^2)	28.4 ± 6.6	27.3 ± 6.9	0.09
Comorbidity Severity			0.03
Moderate-Severe (CCI ≥3)	56 (50.9)	112 (38.8)	

BMI = Body mass index; *CCI* = Charlson Comorbidity Index
[†]Categorical data represented as number (%) and continuous data as the mean ± standard deviation

Study design

A case-control study was performed on patients seen from September 2014 to June 2015. All patients who had a procedure performed in the resident clinic were included in the study group. The control group was selected from a single attending's private clinic in which there was no resident participation. Patients who had similar procedures to those performed in the resident clinic during the same time period were included. This study was approved by the Institutional Review Board of the Massachusetts General Hospital (2015P001836).

Data collection and analysis

Data were extracted from an electronic institutional data registry and key outcome measures were confirmed by manual chart review. Multiple procedures performed on the same patient (i.e., excision of a scalp cyst and an extremity lipoma) were analyzed independently. Body mass index (BMI) was calculated by averaging the recorded heights and weights 1 year before and up to 1 year after the procedure. The severity of preprocedure comorbid disease was scored and analyzed using the Charlson Comorbidity Index (CCI).[19] Patients were divided into 2 groups to indicate mild (CCI $<$ 3) vs. moderate-severe (CCI $\geq$ 3) comorbid disease.

The primary outcome was 30-day postprocedure complications. These complications included superficial wound infection requiring antibiotics only, deep wound infection requiring antibiotics and drainage, seroma requiring drainage, hematoma requiring drainage, and wound dehiscence/debridement. Secondary outcomes included 30-day inpatient admissions related to a complication of the procedure and 6-month soft tissue mass recurrence, regardless of whether the patient opted for re-excision.

Unadjusted comparison was made using chi-squared test for categorical data and student's *t*-test for continuous data. Multivariable analysis was performed to adjust for resident participation, age, sex, race, CCI, BMI, and procedure. Statistical analysis was conducted using STATA/se version 13.1.

RESULTS

Ten residents managed the resident minor surgery clinic during the study period. Overall, 341 patients underwent a total of 399 procedures (110 in the resident clinic vs. 289 in the attending clinic). A comparison of patient demographics is displayed in Table 1. There were no significant differences in age, sex, race, or BMI between patients seen in the resident vs. the attending's minor surgery clinic. The resident clinic patients had a higher severity of comorbidities, as indicated by a CCI $\geq$ 3, when compared with the attending clinic patients (50.9% vs. 38.8%, p = 0.03).

A variety of minor surgeries were performed in the resident clinic (Table 2). Excision of a soft tissue mass (i.e., lipoma, pilar cyst, or epidermal inclusion cyst) was the most commonly performed procedure in both clinics (n = 86 resident vs. n = 189 attending), but constituted a significantly larger portion of the resident practice (78.2% vs. 65.4%, p = 0.01). The remainder of the procedures performed in the resident clinic occurred at a much lower frequency and included incision and drainage of an abscess (n = 11), skin lesion excision (n = 8), skin tag removal (n = 4), and lymph node excision (n = 1).

The primary outcome, 30-day postprocedure complications, were compared between the resident and attending clinic patients (Table 3). Complications that patients developed in the resident clinic included deep surgical site infection (2.7%, n = 3) and a wound dehiscence/debridement (0.9%, n = 1). There were no cases of superficial wound infection, seroma, or hematoma in the resident clinic, although there was at least one of each complication in the attending clinic. Univariate analysis showed no

TABLE 2. Minor Surgery Clinic Procedures

Procedure	Resident (n = 110), n (%)	Attending (n = 289), n (%)	p-value
Soft Tissue Mass Excision	86 (78.2)	189 (65.4)	0.01
Abscess Incision & Drainage	11 (10)	55 (19.0)	0.03
Skin Lesion Excision	8 (7.3)	29 (10.0)	0.40
Skin Tag Removal	4 (3.6)	11 (3.8)	0.94
Lymph Node Excision	1 (0.9)	5 (1.7)	0.55

significant difference in the rate of individual postprocedure complications (Table 2). There was no significant difference in the overall unadjusted rate of patients developing a postprocedure complication within 30 days (3.6% resident vs. 2.8% attending, p = 0.65). This nonsignificance persisted on adjusted multivariable analysis as displayed in Table 4 (odds ratio = 1.62; 95% CI: 0.45-5.84; p = 0.45).

Among patients with complications, 1 from each group was admitted to the hospital within 30 days for treatment of the complication. Both patients had a deep surgical site infection that required drainage and a short course of intravenous antibiotics before discharge on oral antibiotics. There was no significant difference in the rate of inpatient admissions between groups (resident 0.9% vs. attending 0.4%, p = 0.48). Furthermore, there was no difference in 6-month recurrence of soft tissue masses between groups (4.8% resident vs. 7.7% attending, p = 0.66).

To assess resident feedback, standard residency program evaluations were reviewed. Comments specifically directed toward the resident clinic regarded operative autonomy as the major strength of the experience. A representative comment was that "the lumps and bumps clinic encourages autonomy and critical thinking, especially where small things such as positioning really make a difference."

DISCUSSION

Anecdotal accounts suggest that resident minor surgery clinics used to be a common part of a general surgery residency program. However, a thorough literature review yielded virtually nothing on this topic. It is possible that many of these procedures were lost to other medical specialties such as dermatological surgery and plastic surgery.[20] This study describes the re-establishment of a resident-run lumps and bumps clinic that fosters resident autonomy, while assuring patient safety. A deliberate practice instructional model was incorporated to enhance the educational experience. Deliberate practice was originally described by Ericsson,[13] and it involves immediate feedback, time for problem-solving and evaluation, and opportunities for repeated performance to hone a specific set of skills.[12] Residents received immediate critical corrections from the attending surgeon after each procedure and formative feedback at the end of each clinic day, which allowed for self-reflection and improvement with each subsequent procedure. Importantly, the clinic focused on a subset of skills that have been deemed by the ABS and Surgical Council on Resident Education as core procedures or competencies of general surgery residents.[10,11,15,16]

The concern for patient safety has been the largest driving factor for decreasing resident autonomy across all of graduate medical education.[7,21-24] Within the context of general surgery, Teman et al. found an increased focus on patient outcomes to be the largest barrier to attending surgeons granting increased autonomy to residents in the operating room.[25] Although work-hour and supervision regulations have been adopted over the past few decades to prevent compromise of care, many studies, including the landmark Flexibility in Duty Hour Requirements for Surgical Trainees (FIRST) trial, are now finding that these interventions have not led to improved patient outcomes.[26-28] These restrictions may, however, negatively affect future patient outcomes by compromising the education that current residents receive.

To address this tension between resident autonomy and patient safety, the Council of Review Committee Residents (CRCR), an expert panel of residents and fellows spanning

TABLE 3. Unadjusted Complications

Complication	Resident (n = 110), n (%)	Attending (n = 289), n (%)	p-value
30-Day Postprocedure Complication	4 (3.6)	8 (2.8)	0.65
Superficial Infection	0 (0)	2 (0.7)	0.38
Deep Infection	3 (2.7)	3 (1.0)	0.22
Wound Dehiscence/Debridement	1 (0.9)	1 (0.4)	0.48
Seroma	0 (0)	1 (0.4)	0.54
Hematoma	0 (0)	1 (0.4)	0.54
30-Day Inpatient Admission for Complication	1 (0.9)	1 (0.4)	0.48
6-Month Soft Tissue Mass Recurrence[†]	1 (4.8)	3 (7.7)	0.66

[†]Soft tissue mass recurrence frequency includes only patients that underwent soft tissue mass excision

TABLE 4. Adjusted 30-Day Postprocedure Complication

Variable	Odds Ratio	95% CI	p-value
Clinic			
Attending	Reference	Reference	Reference
Resident	1.62	0.45-5.84	0.45
Age (years)			
< 30	Reference	Reference	Reference
30-50	0.28	0.04-1.97	0.20
51-75	0.25	0.03-1.76	0.16
>75	0.60	0.07-4.95	0.64
Gender			
Male	Reference	Reference	Reference
Female	1.75	0.52-5.96	0.37
Race			
White	Reference	Reference	Reference
Black/Hispanic/Asian/Other	0.24	0.03-2.19	0.21
BMI (kg/m^2)	1.08	0.98-1.19	0.11
Charlson Comborbidity Index			
Mild (CCI <3)	Reference	Reference	Reference
Moderate-Severe (CCI ≥3)	1.01	0.28-3.59	0.99
Procedure			
Soft Tissue Mass Excision	Reference	Reference	Reference
Other Procedures	2.07	0.61-6.98	0.24

BMI = Body mass index; *CCI* = Charlson Comorbidity Index

multiple specialties, recently held structured discussions to develop recommendations on how to return progressive independence to graduate medical education. They recommended that any model of progressive autonomy should "include ongoing measurements of patient safety and outcomes data that would inform the degree of resident involvement."[21] Our analysis of patient outcomes is consistent with the CRCR recommendation in that the degree of resident involvement is clearly defined. Importantly, our outcomes reflect a very high level of autonomy, within the context of minor surgery procedures. We found no significant difference in the rate of 30-day postprocedure complications for patients operated on by a resident compared with attending controls. Additionally, there was no difference in the rate of complication-related hospital admissions or incomplete excision of a soft tissue mass leading to its recurrence.

A review of the literature regarding patient outcomes when residents are involved in an operation paints a clouded picture. Although a number of studies are consistent with our results,[29,30] many who analyze the American College of Surgeons National Surgical Quality Improvement Program Database have shown an increase in complications, most commonly, superficial surgical site infections.[31-35] Unfortunately, these studies typically do not define the degree of resident autonomy. Tsigonis et al. have come the closest in their single center retrospective study of 1107 patients undergoing breast cancer surgery in which they they found no change in perioperative outcomes when a resident self-reported completing more than 50% of the case.[36] As residents progress toward autonomy, it is imperative that our patient safety data is reflective of the level of independence that a resident is given. Standardized resident assessment instruments such as the Zwisch scale are needed on a national basis.[37] The Zwisch scale is a 4-stage scale that tracks the degree of resident operative autonomy.[37-39] Greater use of this system would allow national databases to link the degree of resident autonomy with specific operations, which would strengthen future studies.

Knowledge of patient outcomes with increased resident operative autonomy may aid in preoperative patient conversations. Kempenich et al. found that the public is more receptive to residents performing routine operations than faculty perceive and this number increased to 94% if they were assured that the surgical outcome would be the same or better.[8] We found similar anecdotal results in our study with few patients requesting that the attending surgeon perform the procedure. A common "risk factor" for loss of resident autonomy was if the patient's primary care physician told the patient that they should only see the attending. Thus, enhancement of resident autonomy also requires "buy-in" from referring physicians.

Finally, with patient acceptance, this study demonstrates that resident physicians can be given very high levels of independent decision-making. In our minor surgery clinic model, the standard was that residents would be granted a high level of autonomy after observing the attending perform single procedure. This rapid progression of autonomy was possible by acknowledging the surgical skills that all residents in our program acquire during their first 2 years of training. The autonomy was protected by allowing the trainee to perform these tasks unsupervised, but with an attending surgeon immediately available. The critical portion of the procedure was determined to be inspection of the wound after tissue dissection and excision or drainage had been performed, but before wound closure. This

promoted resident independence by allowing the trainee to perform the majority of the procedure without assistance, but protected patient safety by having the attending surgeon inspect the wound to ensure hemostasis and adequate exicision or drainage. For more complex operations, hybrid models which provide adequate oversight, but safeguard autonomy should be implemented. In urology, for example, integrated endourology suites provide audio and visual communication for attendings to remotely monitor urology residents as they perform procedures alone.[40] Using this model, residents reported positively on increased autonomy without compromising safety, clinical decision-making, or education quality.[40]

This research has several limitations that must be taken into consideration when interpreting the results. As this was designed as a pilot study, its primary limitation is that it is a 1-year experience at a single institution. Thus, we have a limited number of patients in our analysis, but enrollment to date has been encouraging. Our institution has approved continuing the clinic for the foreseeable future and we will continue to update and analyze our patient outcomes. Additionally, although the clinic was designed to increase junior resident confidence and hone operative skills with deliberate practice, this was not measured during the pilot year. This study was designed to analyze patient outcomes. Having demonstrated patient safety, which has led to the continuation of the clinic, this will be assessed and reported in future studies. We have already incorporated a quantitative measurement tool of these outcomes for residents participating during the current and future academic years.

Despite these limitations, there are several important strengths that should be considered by surgical educators. First, our resident-run minor surgery clinic is not a novel concept, rather, it is the revival of what may have been a standard component of general surgery training. Therefore, our faculty members were very receptive to the model, which eased in its implementation. It was incorporated into an existing general surgery rotation to augment, rather than replace, our current educational experience. Although our institution found it to work most readily as a part of our PGY-3 year, we believe it would have equal benefit in the PGY-2 year. Finally, it allows for continuity of care by allowing the resident that completes the initial work-up to perform the procedure. This is, to the best of our knowledge, the first description of a general surgery resident-run minor surgery clinic in the literature. We hope that in sharing our early experience, other institutions will implement similar resident clinics into their curriculum. With greater adoption, we hope to organize and report a multicenter experience.

CONCLUSIONS

The implementation of a resident-run minor surgery clinic is an effective strategy at allowing junior residents to operate independently without compromising patient care. The incorporation of a deliberate practice model enhances the educational experience and promotes mastery of a subset of surgical skills. This experience provides junior residents with an opportunity for realistic self-evaluation and focused learning that may ultimately enhance their operative experience during senior level rotations.

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