

Title: Acute Care Surgery Demonstrates Higher Faculty-Resident Entrustment Compared to Elective Surgery

Short title: Acute Care Surgery Demonstrates Higher Faculty-Resident Entrustment

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Gurjit Sandhu created the *OpTrust* tool used for all data collection, developed training for observers, helped conceptualize the project, drafted and edited the manuscript, and approved the final manuscript as submitted.

Abstract

Background: Attaining appropriate faculty entrustment and resident entrustability is crucial for intraoperative learning during surgical residency. While intraoperative faculty entrustment and resident entrustability have been heavily evaluated for core elective surgical services, studies evaluating these interactions during acute care surgery (ACS) rotations remain lacking. The aim of this study was to compare intraoperative faculty-resident entrustment interactions during an ACS rotation with core elective general surgery services.

Methods: From May-September 2019, ACS operations were directly observed and evaluated for faculty entrustment and resident entrustability using *OpTrust*. This sample was compared to *OpTrust* data from elective cases in general surgery (November 2016 – June 2017). Linear mixed modeling was used to evaluate the relationship between service type and entrustment/entrustability scores, while accounting for faculty/resident correlation.

Results: Faculty entrustment (3.00 vs 2.52; $p=0.001$) and resident entrustability scores (3.02 vs 2.25; $p < 0.001$) were significantly higher for the ACS cohort compared to the elective group. Faculty familiarity with the resident, resident familiarity with the faculty, and the number of times the resident had performed the operation correlated with higher entrustment scores in the ACS group compared to elective general surgery. There were no differences in case difficulty and prior operative experience with the resident between groups.

Conclusion: Both faculty entrustment and resident entrustability were significantly higher in ACS cases compared to elective general surgery operations. Faculty and resident familiarity with each other and resident case volume may be associated with higher faculty entrustment and resident entrustability.

Introduction

Changes in surgical education, such as increased supervision requirements, patient acuity, and patient comorbidities, have raised concerns that surgical residents may not be prepared to practice independently after graduation.¹⁻⁵ In the current surgical environment, trainees are often not afforded opportunities to operate with appropriate supervised autonomy.^{6,7} Attaining autonomy for residents requires transitioning from complete dependence on faculty to supervised autonomy, which requires faculty to gradually entrust residents with appropriate tasks and decision. This process of entrustment has been correlated with resident autonomy.⁸ In recent years, strategies to promote faculty entrustment and resident entrustability have been successful in promoting competence.^{9,10} These intraoperative interactions between faculty and residents have been queried across several elective general surgery services.^{2,11-15} While innovations in surgical education and strategies to increase entrustment are emerging, they have been limited largely to clinic-based and elective operative environments.

Despite the importance of these interactions during elective operations, residents routinely participate in urgent and emergent operations while rotating through acute care surgery (ACS) services. The ACS operative environment shares similar patient pathologies and operations managed by other general surgery services (e.g. gall bladder disease, appendicitis, and pancreatitis).¹⁶ However, there are differences in the non-elective ACS operative environment that pose unique challenges for surgeons, including a limited preoperative assessment, unpredictable case timing, 24-hour in-house team coverage, and increased risk of perioperative complications due to tenuous patient health status or lack of reliable patient history.¹⁷ Surgical

residents may even operate on ACS for a total of 12 months during their 5-year clinical training, such as our institution. Despite the increased proportion of time residents spend performing urgent and emergent cases on ACS rotations, faculty-resident intraoperative entrustment and entrustability interactions in this setting have not been well characterized.

The aim of this study was to compare faculty-resident entrustment interactions during ACS operations with elective cases on other core general surgery services. We hypothesized that unique aspects of the ACS rotation design, which includes constant team interactions and similar, repetitive cases, will promote higher faculty entrustment and resident entrustability through faculty and resident familiarity with each other and resident familiarity with cases.

Methods

Study Design

This study was conducted under the approval of the University of Michigan Institutional Review Board. All faculty and residents were informed about the scope of the study and provided verbal consent before observations.

From May to September 2019, an observational pilot study was conducted with the ACS service at Michigan Medicine using the *OpTrust* tool.¹² *OpTrust* has previously been used to entrustment in elective surgeries on general, vascular, thoracic, and plastics surgery services.¹⁴ Two raters observed a convenience sample of ACS cases during the study period. All raters in ACS and previous *OpTrust* observations underwent standardized training to ensure intra-rater reliability.¹⁴

Measures

OpTrust, a validated tool for measuring entrustment, has been used to better understand entrustment during surgical training.^{8,13,18-20} The *OpTrust* tool scores faculty-resident intraoperative interactions across five domains (type of questions asked, operative plan, instruction, problem solving, and leadership by the surgical resident). Faculty and resident familiarity were measured using a four-point scale (1 = not at all familiar, 2 = slightly familiar, 3 = moderately familiar, 4 = extremely familiar). Familiarity was self-reported by both faculty and resident individually and was obtained by the observer for each case. Residents self-reported the number of times they had done a type of case, and the number of times they had done that type of case with the specific faculty member (including the observed operation, 1 time, 2-5, 6-10, or >10 times). Faculty also self-reported the number of times they had done an operation with the resident using the same scale for comparison. Case difficulty was assessed by faculty at the end of each case using a 3-point scale (1 = easy/straightforward, 2 = moderately difficult, 3 = very difficult). Faculty years of experience and resident post graduate year (PGY) were obtained from the Michigan Medicine Department of Surgery. Case observations occurred for at least one hour after incision, or less if the case was completed in a shorter time period. Duration of observation was based on previous validation showing that the majority of entrustment impressions are made during the first hour of cases and that continued observation does not impact entrustment.²⁰ Raters took notes characterizing behaviors, verbal and non-verbal communication, and other interactions during each case and completed the *OpTrust* evaluation once the observation was complete.

Participants

Case observations included a variety of ACS operations including emergent, urgent, and burn cases, and cases where the primary operative team requested ACS assistance. Measures collected in ACS observations were compared to prior observations obtained from November 2016 - June 2017 of elective cases on general surgery services at the same institution. Critical case sampling was used in the elective data set to provide variation in faculty, residents, operation type, and case difficulty.²¹

Statistical Analysis

Faculty entrustment and resident entrustability scores were calculated as a mean score of the five *OpTrust* domain questions (Type of Questions Asked, Operative Plan, Instruction, Problem Solving, Leadership by the Surgical Resident) obtained through observations. Each question rates the domain on a scale of 1 to 4, with 4 representing full entrustment/entrustability. Faculty and resident characteristics were compared by chi-square/Fisher's exact tests as appropriate. Case characteristics, faculty entrustment and resident entrustability compared by case type (ACS vs other) were analyzed by separate, single factor linear or ordered logistic regression mixed effects models as appropriate. Faculty and/or resident was included as a random intercept to account for faculty/resident clustering. All analyses were conducted with STATA 15 and significance was set at $p < 0.05$.

Results

A total of 10 faculty (20% female) and 16 residents (44% female) were included in the ACS cohort, while 22 faculty (23% female) and 40 residents (45% female) were included in the elective general surgery group (Table 1). In the ACS group, operations included cholecystectomies (24%, n=12, 9 laparoscopic), colorectal resections (20%, n=10), burn and

wound debridements (18%, n=9), small bowel resections (6%, n=3), hernia repairs (6%, n=3), laparoscopic appendectomies (4%, n=2), and others (20%, n=10). In the elective GS group common observed operations included colorectal resections (23%, n=21), soft tissue resections (20%, n=18), thyroid/parathyroidectomy (18%, n=17), gastrectomy (7%, n=6), hernia repair (7%, n=6), laparoscopic cholecystectomy (3%, n=3), small bowel resections (2%, n=2), among others (21%, n=19). There were no differences in faculty gender, race, and years of experience between groups. There were also no differences in resident gender, race, and PGY level. The number of operations performed per resident/faculty ranged between 1-11.

A total of 49 ACS operations were observed compared to 92 elective general surgery operations (Table 2). Faculty entrustment (3.00 vs 2.52; $p=0.001$) and resident entrustability (3.02 vs 2.25; $p<0.001$) scores were significantly higher for the ACS cohort compared to the elective general surgery group. Faculty entrustment scores correlated with increased faculty familiarity with residents ($p = 0.02$) in the ACS cohort compared to elective general surgery. However, there were no differences between faculty perception of the number of cases performed with each resident ($p = 0.071$), faculty perception of case difficulty ($p = 0.404$), or faculty experience level ($p = 0.12$ for midlevel faculty and $p = 0.63$ for senior faculty).

In contrast, there were several significant differences between resident perceptions and characteristics between groups. Increased resident entrustability correlated with increased resident perception of familiarity with faculty ($p < 0.001$) and increased operative experience with similar cases ($p = 0.001$). Only 11% (n=5) of ACS observations represented the first time a resident had done an operation compared to 25% (n=20) for elective general surgery cases. However, residents performing ACS operations reported conducting operations at a greater

frequency (75% vs. 44%) compared to elective general surgery cases with cases being performed 6 or more times. Although there were differences in PGY-level between groups, there were no differences in the specific number of cases a resident had performed with the faculty.

ACS cases also had a significantly higher numbers of senior residents that led other residents (PGY-3 or greater) through cases compared to elective general surgery cases (41% vs. 0%; $p < 0.001$). Faculty also did not scrub in a higher proportion of ACS cases compared to faculty in elective general surgery cases (44% vs. 0%; $p < 0.001$).

Discussion

In this study, we sought to evaluate faculty-resident entrustment and entrustability interactions for ACS operations compared to elective general surgery operations. We found that there was significantly higher faculty entrustment and resident entrustability on the ACS service compared to elective general surgery services (colorectal, endocrine, hepatobiliary, minimally invasive, and surgical oncology) regardless of case difficulty, faculty experience level, or prior operative experience with residents. However, we did find that increased faculty entrustment and resident entrustability in the ACS group correlated with faculty familiarity with the resident, resident familiarity with the faculty, and the number of times a resident has performed the operation. These findings build on prior work using *OpTrust* and contribute novel findings which help further promote intraoperative faculty entrustment and resident entrustability.

Achieving faculty entrustment and resident entrustability are crucial for creating the ideal intraoperative learning environment for surgical residents.¹² Faculty entrustment has been shown

to correlate with resident autonomy, which is needed to develop operative confidence and competence. In recent years, several studies demonstrate that alignment of personality with the faculty's operative personality is associated with increased intraoperative entrustment.¹⁹ Further, faculty familiarity with residents has also been shown to improve intraoperative entrustment.¹³ Our study confirms these prior findings. We found that faculty in the ACS cohort reported increased familiarity with residents, which correlated with increased faculty entrustment and resident entrustability, compared to the elective general surgery cases. Compared to elective general surgery rotations where surgical residents may sporadically operate with select faculty, ACS rotations generally involve a single faculty member being "on call" during each day during the entire week. This is typical across ACS services at other institutions and differs from other general surgery services where faculty may work with a particular resident once a week during their set operating time.¹⁶ We suspect this call schedule facilitates increased faculty familiarity with the same resident team, thereby facilitating increased entrustment, unlike the elective general surgery cohort.

We also had some interesting findings regarding resident perceptions and characteristics related to faculty entrustment and resident entrustability. At present, there is little data linking resident familiarity of the faculty to faculty entrustment and resident entrustability. In this study, we found that resident familiarity with faculty also correlated with increased faculty entrustment and resident entrustability in the ACS group compared to elective general surgery. Although this has not been previously demonstrated, we recognize that both faculty and residents must work collectively to create the ideal surgical training environment for residents to learn and gain autonomy, and for faculty to allow opportunities for entrustment and autonomy. We also found

that increased faculty entrustment and resident entrustability in the ACS group correlated with the number of times a resident performed a given case. The most common operations performed by acute care surgeons include laparoscopic cholecystectomy, laparoscopic appendectomy, and exploratory laparotomies, which are typical for ACS surgeons. These findings confirm other studies that demonstrate that surgical case volume is often related to increasing competence.²² As residents perform more cases, they may likely be more comfortable, confident, and have a higher degree of competence, which may be perceived as resident entrustability, leading to increased faculty entrustment.⁸ Similar to other studies, we found no association between gender and faculty entrustment and resident entrustability.¹⁸

As part of readiness to practice surgery after graduation, senior surgical residents are also required to gain experience as a “Teaching Assistant” during cases. These are requirements by the Accreditation Council for Graduate Medical Education (ACGME) and American Board of Surgery (ABS) for board eligibility in general surgery.²³ These requirements allow for chief residents to participate in the education of junior and mid-level residents and help prepare chief residents for future faculty positions. In this study, we also observed that ACS cases involved a higher proportion of senior residents teaching junior and mid-level residents through operative cases compared to elective general surgery services. We also found that faculty were less likely to scrub into cases during ACS cases compared to other elective surgery services, although they were immediately available. We are unsure if this is secondary to time constraints, service workload, or faculty “buy-in” regarding the need for entrustment in senior residents for readiness to practice independently. However, the decision not to scrub for a case demonstrates an attending’s commitment towards promoting high levels of entrustment and ensuring progression

towards supervised autonomy. Within the ACS team structure, chief residents are allowed to lead operations, perform peer-to-peer teaching, and manage the service as a whole. The increased ACS entrustment score may be representative of how the culture of ACS is different from all other observed services at this institution. Other work, including qualitative studies, are required to fully elucidate these findings.

Our study has several limitations. First, although this was a pilot study, the number of faculty and residents was sufficient to achieve statistical significance. Larger populations across multiple institutions are needed to further substantiate these findings. Second, these observations occurred at a single, academic center; therefore, results may not be generalizable to other institutions. Third, it remains unknown how resident participation in emergent cases affects clinical outcomes and further studies are required. Fourth, our convenience sample of cases may not have provided the complete breadth of cases and faculty-resident interactions in both ACS and elective general surgery cohorts. Fifth, although this study is the first to measure entrustment behaviors in the ACS operative environments, further study regarding how ACS faculty make entrustment decisions is required. It is also unclear how residents prepare differently for ACS given the acuity of cases compared to elective general surgery. Conducting qualitative interviews of faculty and residents would help identify and explain these processes. Overall, while further research is needed to identify specific factors promoting higher entrustment in ACS operations, this work is an important first step in characterizing ACS behaviors related to entrustment and entrustability.

Conclusions

This study demonstrates that faculty entrustment and resident entrustability were significantly higher in ACS operations compared to elective general surgery cases. We found that faculty familiarity with residents, resident familiarity with faculty, and the resident cases volume were associated with increased faculty entrustment and resident entrustability in the ACS operations. Interestingly, the ACS group also had higher proportions of residents operating together compared to elective general surgery. Identifying behaviors associated with increased entrustment during elective surgery has the potential to inform how entrustment evidence can be generated during emergent faculty-resident interactions in an effort to scale to supervised autonomy. Complementary qualitative research is needed to better understand faculty-resident entrustment behaviors and the learning environment within the ACS service.

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Table 1: Faculty and Resident Demographics.

Demographic	ACS Cases	Elective GS Cases	p value
Faculty number	10	22	
Faculty Gender n (% female)	2 (20%)	5 (23%)	1.000
Faculty Race			
Non-Hispanic white	6 (60%)	19 (86%)	0.09
Minority	4 (4%)	3 (14%)	0.09
Faculty Years of Experience			
Junior (<10 year)	4 (40%)	5 (23%)	0.17
Midlevel (10 to 20 years)	1 (10%)	8 (36%)	0.12
Senior (>20 years)	5 (50%)	9 (41%)	0.63
Resident number			
Resident number	16	40	
Resident Gender n (% female)	7 (44%)	18 (45%)	1.000
Resident Race			
Non-Hispanic white	13 (81%)	26 (65%)	0.23
Minority	3 (19%)	14 (35%)	0.23
Resident PGY Level			
PGY1	1 (6%)	11 (28%)	0.08
PGY2	2 (13%)	7 (18%)	0.64
PGY3	6 (38%)	10 (25%)	0.34
PGY4	5 (31%)	5 (13%)	0.09
PGY5	2 (13%)	6 (15%)	0.80
PGY6	0 (0%)	1 (3%)	0.52

Table 2: ACS and Elective General Surgery Entrustment and Entrustability Characteristics.

Category	ACS Cases (n=49)	Elective GS Cases (n=92)	p value
Resident Entrustability Score	3.02	2.25	<0.001
Faculty Entrustment Score	3.00	2.52	0.001
Case Difficulty			
Easy/Straightforward	17 (36%)	38 (43%)	0.404
Moderately Difficult	21 (45%)	29 (33%)	
Very Difficult	9 (19%)	21 (24%)	
Faculty Years of Experience			
Junior (<10 year)	8 (16%)	49 (53%)	<0.001
Midlevel (10 to 20 years)	25 (51%)	31 (34%)	
Senior (>20 years)	11 (22%)	12 (13%)	
Faculty Familiarity with Resident			
Not at all	1 (2%)	7 (8%)	0.23
Slightly	8 (17%)	26 (30%)	0.11
Familiar*	38 (80%)	54 (62%)	0.02
Number of times faculty has done this type of case with this resident			
1	16 (34%)	44 (50%)	0.071
2 to 5	21 (45%)	27 (31%)	
6 to 10	4 (9%)	13 (15%)	
>10	6 (13%)	4 (5%)	
Resident Familiarity with Faculty			
Not at all	0 (0%)	5 (6%)	0.11
Slightly	3 (6%)	28 (33%)	0.001
Familiar*	46 (94%)	51 (61%)	<0.001
Number of times resident has done this type of case			
1	5 (11%)	20 (25%)	0.001
2 to 5	7 (15%)	25 (31%)	
6 to 10	4 (9%)	12 (15%)	
>10	31 (66%)	23 (29%)	
Number of times resident has done this type of case with this faculty			
1	15 (32%)	43 (54%)	0.058
2 to 5	22 (47%)	25 (31%)	
6 to 10	4 (9%)	8 (10%)	
>10	6 (13%)	4 (5%)	
Resident PGY Level			
PGY 1	1 (2%)	17 (19%)	0.005
PGY 2	2 (4%)	9 (10%)	
PGY 3	21 (43%)	19 (21%)	
PGY 4	11 (22%)	16 (17%)	
PGY 5	14 (29%)	28 (30%)	
PGY 6	0 (0%)	3 (3%)	

*Familiar designates ratings of moderately and extremely familiar

Table 3: Operative Environment Comparison of Supervised Autonomy, Attending Observers, and Additional Learners in ACS Cases and Elective GS Cases.

Observation Characteristic		ACS Cases (n=49)	Elective GS Cases (n=92)	p value
Attending Not Scrubbed		18 (37%)	0	<0.001
Additional Learner Present[†]	None	7 (14%)	33 (36%)	0.007
	Medical Student	41 (84%)	57 (62%)	0.007
	Junior Resident (PGY1-2)	6 (12%)	8 (9%)	0.50
	Senior Resident (PGY ≥3)	20 (41%)	0 (0%)	<0.001

* For Supervised Attending Not Scrubbed, written notes capturing this information were only available for 44 Elective Cases. Because of missing data, no statistical comparison was calculated.

[†]For 24 (49%) ACS and 3 (3%) Elective GS cases there were 2 additional learners present.

References:

1. Scally CP, Sandhu G, Magas C, Gauger PG, Minter RM. Investigating the Impact of the 2011 ACGME Resident Duty Hour Regulations on Surgical Residency Programs: The Program Director Perspective. *Journal of the American College of Surgeons*. 2015;221(4):883-889.e881.
2. Sandhu G, Teman NR, Minter RM. Training Autonomous Surgeons: More Time or Faculty Development? *Annals of Surgery*. 2015;261(5):843-845.
3. Hashimoto DA, Bynum We 4th Fau - Lillemoe KD, Lillemoe Kd Fau - Sachdeva AK, Sachdeva AK. See More, Do More, Teach More: Surgical Resident Autonomy and the Transition to Independent Practice. (1938-808X (Electronic)).
4. Chen PW. Are Today's New Surgeons Unprepared? *The New York Times*. December 12, 2013, 2013.
5. Mattar SG, Alseidi AA, Jones DB, et al. General surgery residency inadequately prepares trainees for fellowship: results of a survey of fellowship program directors. *Annals of surgery*.258(3):440-449.
6. Napolitano LM, Savarise M, Paramo JC, et al. Are General Surgery Residents Ready to Practice? A Survey of the American College of Surgeons Board of Governors and Young Fellows Association. *Journal of the American College of Surgeons*. 2014;218(5):1063-1072.e1031.
7. Coleman JRT, Brett M, Stadel, Kathryn M, Chotai, Pranit, and Howard, Jeff. The autonomy crisis: A call to action for resident advocacy. In. Vol 2019. Bulletin of the American College of Surgeons2018.

8. Sandhu G, Thompson-Burdine J, Matusko N, et al. Bridging the gap: The intersection of entrustability and perceived autonomy for surgical residents in the OR. *The American Journal of Surgery*. 2019;217(2):276-280.
9. Wojcik BM, Fong ZV, Patel MS, et al. The Resident-Run Minor Surgery Clinic: A Pilot Study to Safely Increase Operative Autonomy. *Journal of Surgical Education*. 2016;73(6):e142-e149.
10. Wojcik BM, Fong ZV, Patel MS, et al. Structured Operative Autonomy: An Institutional Approach to Enhancing Surgical Resident Education Without Impacting Patient Outcomes. *Journal of the American College of Surgeons*. 2017;225(6):713-724.e712.
11. Torres MB, Quinones PM, Sudarshan M. Assessing resident autonomy: What tools are available? *Bulletin of the American College of Surgeons*. 2018.
12. Sandhu G, Thompson-Burdine J, Nikolian VC, et al. Association of Faculty Entrustment With Resident Autonomy in the Operating Room Association of Faculty Entrustment With Surgical Resident Entrustability Association of Faculty Entrustment With Surgical Resident Entrustability. *JAMA Surgery*. 2018;153(6):518-524.
13. Sandhu G, Thompson J, Matusko N, et al. Greater faculty familiarity with residents improves intraoperative entrustment. *The American Journal of Surgery*. 2019.
14. Sandhu G, Magas CP, Robinson AB, Scally CP, Minter RM. Progressive Entrustment to Achieve Resident Autonomy in the Operating Room: A National Qualitative Study With General Surgery Faculty and Residents. *Annals of Surgery*. 2017;265(6):1134-1140.
15. Hoops HE, Haley C, Cook MR, et al. Factors influencing amount of guidance in the operating room during laparoscopic cases. *The American Journal of Surgery*. 217(5):979-985.

16. Ball CG, Hameed SM, Brenneman FD. Acute care surgery: a new strategy for the general surgery patients left behind. *Can J Surg.* 2010;53(2):84-85.
17. Jurkovich GJ, Davis KA, Becher RD, et al. In brief. *Current Problems in Surgery.* 2017;54(7):358-360.
18. Thompson-Burdine J, Sutzko DC, Nikolian VC, et al. Impact of a resident's sex on intraoperative entrustment of surgery trainees. *Surgery.* 2018;164(3):583-588.
19. Sutzko DC, Boniakowski AE, Nikolian VC, et al. Alignment of Personality Is Associated With Increased Intraoperative Entrustment. *Annals of Surgery.* 9000;Publish Ahead of Print.
20. Nikolian VC, Sutzko DC, Georgoff PE, et al. Improving the feasibility and utility of OpTrust—A tool assessing intraoperative entrustment. *The American Journal of Surgery.* 2018;216(1):13-18.
21. Sandhu G, Thompson-Burdine J, Dombrowski J, et al. OpTrust: An Effective Educational Bundle for Enhancing Faculty-resident Intraoperative Entrustment. *Annals of Surgery.* 9000;Publish Ahead of Print.
22. Morche J, Mathes T, Pieper D. Relationship between surgeon volume and outcomes: a systematic review of systematic reviews. *Syst Rev.* 2016;5(1):204.
23. Surgery ARCF. Defined Category Minimum Numbers for General Surgery Residents and Credit Role. Accreditation Council for Graduate Medical Education.
<https://www.acgme.org/Portals/0/DefinedCategoryMinimumNumbersforGeneralSurgeryResidentsandCreditRole.pdf>. Accessed November 12, 2019.