

Intern Orthopedic Rotation Versus Emergency Medicine Procedure Month: Which one Derives More Opportunity?

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ABSTRACT

INTRODUCTION: The American College of Graduate Medical Education (ACGME) defines 18 “key procedures” as requirements in emergency medicine (EM) residency programs. The post-graduate year-1 (PGY-1) curriculum provides an early foundation for EM trainees to gain procedural experience, but traditional PGY-1 rotations may not provide robust procedural opportunities. Our objective was to replace a traditional orthopedic rotation with a 4-week rotation that emphasized EM procedure acquisition and comprehension. Although all residents met ACGME procedural requirements before the curricular modification, the purpose of this month was to increase overall procedure numbers. The block contained dedicated procedure shifts in the emergency department as well as an asynchronous, self-directed learning course. We sought to compare the number of procedures performed by PGY-1 residents during their orthopedic rotation (the year before implementation), to the number of procedures performed during their procedure rotation (the year after implementation).

METHODS: The total number of procedures performed and logged by PGY-1 residents during the traditional orthopedic rotation (during the year prior to implementation of the new procedure rotation) were compared to the total number of procedures by the first class to undergo the new procedure rotation the following year. Thirty resident logs were reviewed (15 per class). Data were analyzed using SAS NPAR1WAY; $Z < 0.05$ was considered significant.

RESULTS: When compared to the orthopedic rotation, the procedure rotation had statistically significant higher numbers of procedures per resident (22, standard deviation [SD] 12, vs 11.4, SD 7.6; $Z = 0.0177$). A wide variety of nonorthopedic procedures accounted for the increased numbers, (13.6, SD 10.3, vs 0.9, SD 0.9; $Z < 0.001$). While the average number of orthopedic procedures was slightly less on the procedure rotation, there was no statistical difference (orthopedic rotation 10.13, procedure rotation 8.26; $Z = 0.4605$). Notably, fewer procedures were performed when 2 residents were on the procedure rotation at the same time (21 vs 10.1).

CONCLUSION: This analysis demonstrated a larger number and a wider variety of procedures performed by PGY-1 residents during a dedicated procedure rotation compared to a traditional orthopedic rotation. Furthermore, exposure to orthopedic procedures did not decline significantly. Limitations of the study include a modest number of subjects. Data may be limited by the consistency of procedure logging by individual residents. Further studies may assess procedural competency after PGY-1 year of training.

KEYWORDS: emergency medicine, education, medical, graduate, rotation, procedures, orthopedic procedures

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Introduction

An emergency medicine (EM) physician must be prepared to perform a wide variety of medical procedures. These range from simple procedures, to complex, life-saving interventions. The American College of Graduate Medical Education (ACGME) defines 18 “key procedures” as requirements in EM residency training.^{1,2} The first post-graduate year-1 (PGY-1) curriculum provides an early foundation for EM trainees to gain procedural experience, but traditional PGY-1 rotations may not provide robust procedural opportunities. As of writing in 2021, there are 269 EM residency programs in the United States, so there is a potential for variability in procedural exposure and training.³ Variability in procedural experience exists in medical school as well. Some PGY-1 EM residents have been shown to lack procedural competence in performing a lumbar puncture, due to inadequate training in

medical school.⁴ Studies that survey large cohorts of EM PGY-1 residents have revealed similar findings for other procedures.⁵ Therefore, in a landscape of inconsistent medical school preparation before residency, training programs must be prepared to provide ample procedural training opportunities to help residents achieve procedural competency.

Previously, PGY-1 residents rotated through orthopedic surgery as part of their first-year training to facilitate exposure to orthopedic procedures. This was consistent with many other well-known EM programs in the United States who utilize orthopedic surgery as a month-long rotation during the first year of training.^{6–8}

Our intervention consisted of replacing the orthopedic rotation with a 4-week “emergency interventions” (EI) procedure rotation. Although all residents met ACGME procedural requirements before the curricular modification, the purpose



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of this month was to increase overall procedure numbers. The new block emphasized EM procedures, with dedicated procedure shifts in the emergency department (ED) as well as an asynchronous, self-directed learning course. The curricular change implemented at the study institution aimed to increase the breadth and frequency of procedural training opportunities for PGY-1 EM residents. Although graduates met ACGME procedural requirements, some expressed interest in acquiring additional procedural experience during residency. The EI rotation aimed to increase overall procedural exposure and experience by allowing the rotating PGY-1 learner to participate in procedures conducted by the EM team and those performed by consultants in the ED. These procedures included all common and advanced orthopedic procedures, as well as a host of other procedures that would not have been included in the traditional orthopedic rotation. The number of procedures performed by PGY-1 residents during the orthopedic rotation and the EI rotation was monitored and compared.

Methods

This observational study was conducted as part of an educational, quality assurance effort at a 3-year EM residency training program within a large, university-based hospital. Since each intern was required to complete the EI rotation as part of their assigned clinical curriculum, Institutional Review Board approval was not pursued and consent was not obtained. The study cohort included 2 PGY-1 intern classes, each containing 15 residents, and the study time period extended over the course of 2 years. Each intern was required to complete the orthopedic and EI rotation as part of their assigned clinical curriculum. The composition of each residency class consisted of an average of 30% female, with 96% Caucasian background. Both intern classes contained residents from various parts of the country.

The study team reviewed all procedures logged by residents on Medhub®, an online residency management software program.

All resident names were first blinded by an administrative assistant. Procedures were analyzed by class. The class of 2020 was the last resident class to rotate on the orthopedic rotation and comprised the preintervention cohort. Per routine, EM interns were assigned to the orthopedic consult team, working 12-h shifts and assisting the orthopedic team with ED and floor consults. Common procedures that EM residents were expected to perform included arthrocentesis, dislocation reduction, and complex wound management. All these procedures are required by the ACGME.² These procedures were overseen by an orthopedic chief resident. Orthopedic chief residents manage the consult service with much autonomy; however, they are supervised by the on-call orthopedic attending physician and all cases are discussed with the attending. Another procedure that was common on the orthopedics rotation was assisting with procedural sedation during consultations

in the ED. This procedure was supervised by the treating EM attending. For statistical analysis, these 4 procedures (arthrocentesis, dislocation reduction, complex wound management, and procedural sedation) were considered “orthopedic” related procedures, while all others were designated as “non-orthopedic” procedures.

The following year, members of the class of 2021 were assigned to the EI rotation. PGY-1 residents worked 8 and 10 h shifts in the ED. Here, they performed various procedures under the direct supervision of supervising EM faculty or consultant senior resident if a specialty consult team was involved. Upper-level EM residents and attending physicians working in the ED decided whether the procedure was appropriate for the PGY-1 resident’s level of training. Each PGY-1 was instructed to log their completed procedures in their Medhub® account.

Thirty resident logs were reviewed, 15 per class. The total number of procedures performed and logged by PGY-1 residents during the traditional orthopedic rotation and the EI rotation were examined and recorded. Only ACGME-required procedures were recorded for the study. The total number of procedures by type and by class were registered using Microsoft Excel.

The total number of procedures performed in both the orthopedic rotation and the EI rotation were compared.

The number of procedures performed in each rotation was not assumed to be normally distributed. Therefore, due to this distribution of the difference between the data points, a nonparametric statistical test was utilized. Data were analyzed using SAS NPAR1WAY, a Wilcoxon signed-rank test. $Z < 0.05$ was considered significant.

Results

When compared to the orthopedic rotation, the EI rotation had statistically significant higher numbers of ACGME-required procedures per resident (22, standard deviation [SD] 12, vs 11.4, SD 7.6; $Z = 0.0177$) (Table 1). A wide variety of non-orthopedic procedures accounted for the increased numbers (13.6, SD 10.3, vs 0.9, SD 0.9; $Z < 0.001$).

While the average number of orthopedic procedures was slightly less on the EI rotation, there was no statistical difference (orthopedic rotation 10.13 ± 6.4 , EI rotation 8.26 ± 5.8 ; $Z = 0.4605$) (Table 1). Notably, fewer procedures were performed when 2 residents were on the EI rotation at the same time (21 vs 10.1).

Discussion

Our analysis demonstrated a larger number and a wider variety of procedures performed by PGY-1 residents during the EI rotation compared to an orthopedic rotation. Furthermore, exposure to orthopedic procedures did not decline significantly.

For years, many EM programs have attempted to improve the resident clinical education by enhancing experiences on rotations. Although other curriculum refinements (eg, a decrease in internal

Table 1. Comparison of procedures logged, orthopedics rotation versus procedure rotation.

PROCEDURE	EI ROTATION (MEAN ± SD)	EI ROTATION (MEDIAN)	ORTHOPEDECS ROTATION (MEAN + SD)	ORTHOPEDECS ROTATION (MEDIAN)	WILCOXON SIGNED-RANK TEST
Complex wound repair	4.3 ± 3.7	4	1.5 ± 2.0	1	
Arthrocentesis	1.0 ± 1.2	1	2.6 ± 2.2	2	
Joint reduction	1.6 ± 1.5	2	5.4 ± 3.3	6	
Procedural sedation	1.3 ± 1.5	2	0.5 ± 1.3	0	
<i>Orthopedics related procedures</i>	8.3 ± 5.8	8	10.1 ± 6.4	10	Z = 0.4605
Paracentesis	0.8 ± 1.1	1	0	0	
Arterial line	1.6 ± 1.6	2	0.2 ± 0.4	0	
Intubation	1.5 ± 1.5	1	0.7 ± 0.3	0	
Central line	1.0 ± 1.1	1	0.2 ± 0.4	0	
Chest tube	0.8 ± 0.9	1	0.2 ± 0.5	0	
Lumbar puncture	1.8 ± 1.4	2	0.6 ± 0.2	0	
Thoracentesis	0.1 ± 0.3	0	0	0	
Ultrasound	5.6 ± 9.2	0	0.1 ± 0.4	0	
Cardiac pacing	0.2 ± 0.4	0	0	0	
Pericardiocentesis	0.1 ± 0.3	0	0	0	
<i>Nonorthopedics related procedures</i>	13.6 ± 10.3	11	0.9 ± 0.9	1	Z < 0.001
<i>Total of orthopedics and nonorthopedics related procedures</i>	22.0 ± 12	20	11.4 ± 7.6	11	Z = 0.0177

Abbreviations: EI, emergency intervention; SD, standard deviation.

medicine rotations and an increase in ultrasound and toxicology rotations) have occurred over the past 3 decades, orthopedic rotations have held consistent with over 70% of residencies maintaining them in their curricula.⁹ This should be of no immediate surprise as 20% of ED patients present with musculoskeletal (MSK) chief complaints and conditions.¹⁰ Ideally, an orthopedic rotation should increase MSK knowledge as well as foster procedural experience and confidence.¹¹ However, over 40% of residency graduates across multiple programs felt only “somewhat prepared” upon graduation to handle common fracture reductions.¹² Some of this could be due to the less standardized teaching and direct feedback from orthopedic attendings, while other rotations may emphasize more observation of procedures rather than actual hands-on practice.¹³

The PGY-1 year traditionally contains the most off-service rotations, allowing PGY-1 residents to become familiar with other specialties and their practices, build interdepartmental camaraderie, and learn unique approaches to common procedures in that particular field. Residencies must balance the number of off-service rotations by providing opportunities for procedural competency. Many studies have surveyed residents on their time spent during different rotations.¹⁴ As one can

imagine, resident opinions of non-EM rotations vary by institution and specialty. One study demonstrated EM residents spent 42% of their time on an internal medicine rotation with documentation, leaving less time for patient care and procedures.¹⁵ Another study showed faculty teaching varied greatly among specialties, with surgical rotations providing much less faculty-directed teaching (18% of a total 166 h at work).¹⁶

The new rotation was also developed to minimize the non-physician task burden on rotating interns, expose interns to more orthopedic procedures (those performed by the ED team and those performed by orthopedic consultants in the ED), provide additional nonorthopedic procedural experience, and deliver a standardized educational experience (asynchronously) around procedural interventions.

Procedural training in medicine has evolved from the classic approach of “see one, do one, teach one” into more wholistic models that encompass knowledge, experience, technical skill development, and competency evaluation.¹⁷ Unfortunately, the pace of a consulting service such as orthopedic surgery affords limited opportunities to promote this form of learning, ie the ability to step back and spend time training, or even documenting, procedures.¹⁸ Attendings and chief residents are often

primarily involved in surgical interventions, leaving a minimal opportunity for feedback and dedicated teaching to residents. In contrast, an ED-dedicated procedural rotation capitalizes on direct supervision in the ED, allowing milestone-based procedure competency assessment tool reviews to occur for procedures performed. This echoes what Sawyer et al¹⁹ propose in their procedural pedagogical framework, by “providing a structured environment within which a learner can reliably receive a formative assessment of procedural skills.” The article states this structured environment is best achieved through a dedicated procedural rotation, where supervision “is best provided by an attending physician or other expert providers, as opposed to one of the trainee’s peers.”¹⁹ For the resident, a procedure rotation offers protected space to fully engage with training materials in a practical manner, as well as in the documenting of procedures.

One unmeasurable advantage the EI rotation has over the orthopedic rotation is the close interaction of PGY-1s being present in the ED with their classmates, upper-level residents, attendings, and nurses. Instead of exclusively being with the orthopedic team for 1 month, the PGY-1s interact daily with members of their ED team, building strong working relationships and learning practice patterns from senior-level physicians and attendings. Indeed, the goal of many training programs is to have their PGY-1 residents work in the ED space as much as possible, forming relationships with their ED colleagues, consultants, and nursing staff is a critical development, one that is immeasurable but valued.

Procedures were not necessarily transferred from upper-level EM residents to PGY-1 residents which could arguably decrease procedural experience for EM residents across 3 years of training. Instead, having additional physicians on-hand to complete time-consuming procedures may have resulted in more procedures being completed by the ED team, rather than a consultation to a specialty service.

One limitation of this study is the lack of accurate measurement of procedural competence and skill retention. Procedural competence remains difficult to quantify, and a proper method to assess resident procedural competency has been a focus of medical education research for years. Variability in assessment likely exists among programs and residents, and there is no agreed-upon standard of completion or complication rate.^{20,21} While the evaluation of performance on this new EI rotation would be useful information to have, it is beyond the scope of the study. Our project was not designed to evaluate performance or competence.

There are other limitations to this study. It was a single-center, observational exercise based on a curricular change, involving single classes of residents in 1 specialty. Since the intervention (ie, new EI rotation) was a required clinical assignment, interns were not randomized into control and intervention groups. A relatively low number of subjects was involved which may have rendered the study underpowered to detect significant differences. Furthermore, data collection was dependent on resident diligence in recording completed

procedures. Ultimately, it was the responsibility of the individual resident to track their completed procedures.

Although our study did not demonstrate a significant decline in orthopedic procedures being performed, other institutions may be different in many regards. Before considering the implementation of an EI rotation, one should address the importance of making a similar change and collaborate with on-site orthopedics services to optimize resident education for all.

A common and widely used method to assess competency is procedure logs.¹⁸ This method relies on the premise that procedural repetition and experience contribute to procedural competence. It is a model reflected in the ACGME-required procedure list, which requires a minimum number of procedures to graduate (eg, 35 intubations, 15 lumbar punctures, and 10 vaginal deliveries).²

However, the number of procedures performed and logged by a resident does not necessarily denote procedural competence. The advent of ACGME milestones emphasized the importance of longitudinal assessments of procedural competence over a training continuum. Further studies should assess procedural competency after PGY-1 year of training, as well as skills retention after the EI rotation.

As medical education continues to evolve in the digital age, there have been increased efforts to measure competency outside patient care. Various residencies have implemented simulation cases, cadaver labs, and there has even been increasing popularity with simulation fellowships to train faculty in this niche.²²⁻²⁴ Future studies should be aimed at implementing a more simulation-centered curriculum in graduate education.

A training environment in which competency assessment and clinical care standards are aligned continues to be a worthy goal, but medical education must continue to evolve to meet the ever-changing demands of the digital age we inhabit.


Conclusion

Procedural training is a major component of EM residency education and optimizing procedural opportunities is a goal for many programs. PGY-1 residents can complete more procedures on the EI rotation compared to a traditional orthopedic rotation, without a significant decrease in orthopedic procedure exposure.

Author Contributions

Blake Briggs, David Cline, Kendall Stewardson, Jordan Kugler, and Cedric Lefebvre all contributed to the design and implementation of the research, to the analysis of the results, and to the writing of the manuscript.

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