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Title

Applied Mathematics to Predict the Progression of Emergency Medicine Resident Productivity

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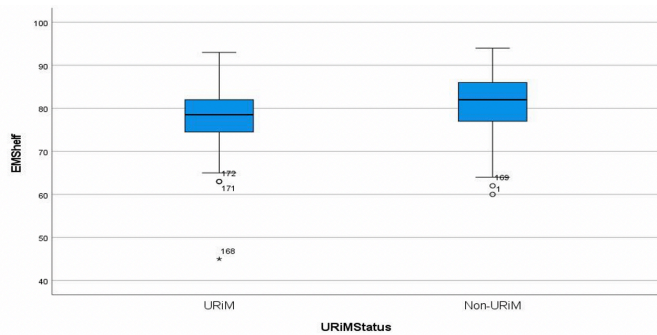**Authors**

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Figure 2. Combined (GY22 and GY21) EM Shelf score versus URiM status.

Conclusions: There was a statistically significant difference with respect to EM NBME Subject Exam score, which showed that URiM students performed lower than non-URiM; however, there was no statistically significant difference in clinical performance. Clerkship grade differences are mediated by the difference in exam score and raise questions on how to mediate equity concerns around standardized tests in clerkship grade decisions.

6 Applied Mathematics to Predict the Progression of Emergency Medicine Resident Productivity

Matthew Singh, J. Adam Oostema

Background: Throughout training, an emergency medicine (EM) resident is required to expand efficiency and productivity to ensure safe practice after graduation. Multitasking is one of the 22 ACGME EM milestones and is often measured through evaluations and observation. Providing quantitative patient per hour (PPH) data and efficiency projections to both residents and residency administration could improve a resident experience and training in many ways.

Objectives: Our study was designed to analyze various throughput metrics and productivity trends utilizing applied mathematics and a robust data set. The goals of our study were to define the curve of resident PPH over time, adjust for relevant confounders, and analyze additional efficiency metrics related to throughput.

Methods: This analysis used a retrospective, observational design in a single, urban, tertiary care center ED that sees approximately 110,000 adult patients per year from July 1st, 2019 to December 31st, 2021. A total of 49 residents from an ACGME accredited 3-year residency were included in the analysis. Patients under the age 18 were excluded. Data was collected using a secure data vendor and an exponential regression model was created to assess resident PPH data. Additional models were created

accounting for patient covariates such as triage acuity and geriatric populations.

Results: A total of 79,232 patients were analyzed over 30 months. Using an exponential equation and adjusting for patient covariants, median PPH starts at 0.898 and ends at 1.425 PPH. The median PPH by PGY year were 1.14 for PGY1, 1.38 for PGY2 and 1.41 for PGY3. Additional models were created to analyze a resident's progression in other efficiency metrics such as door to decision time.

Conclusion: Productivity metrics such as PPH data are an essential part of working in an emergency department. Our study shows that residents improve with PPH over three years but tend to plateau in the second year.

Table 1. Median PPH by PGY year.

Residents	49
Months	30
Median PPH	
PGY1	1.14
PGY2	1.38
PGY3	1.41

7 Are First-Year Emergency Medicine Residents Still Behind on Level 1 Care-Based Milestones?

Julie Cueva, Lindsay MacCoaghy, Madeleine Alexeeva, Peter Moffett, Nathan Stuempfig

Background: According to the ACGME, Level 1 is described as what is "expected of an incoming resident." A previous study in 2015 was published showing that less than 75% of PGY-1 residents had achieved Level 1 on care-based milestones in the ED. With Milestones 2.0 introduced in 2021 and the impact of the COVID pandemic on UME unknown, we chose to revisit these milestone assessments.

Objectives: To determine what percentage of incoming PGY1 residents have achieved a level 1 as assessed by faculty and themselves for patient care- based milestones (PC 1-7) and to see if there has been an improvement when compared to this previous study.

Methods: Incoming PGY1 residents from 5 collaborating EM residency programs across the United States were assessed by faculty and themselves while on shift during the first month of residency. All were asked to determine whether the resident consistently demonstrated level 1 skills for 9 ED patient care-based sub-competencies. Data were then de-identified and combined between programs. Data were analyzed to determine what