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Increased Academic Productivity of Orthopaedic Surgery Residents Following 2011 Duty Hour Reform

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BACKGROUND: In 2003 and again in 2011, the Accreditation Council for Graduate Medical Education (ACGME) mandated increasingly stringent resident duty hour restrictions. With less time required at the hospital, residents theoretically have more time for other academic activities, such as research. Our study seeks to examine whether the number of research publications by orthopaedic residents increased following implementation of the 2011 ACGME duty hour restrictions.

DESIGN: Pubmed was queried using publicly available alumni lists from programs across the United States. The years 2008 to 2011 were included to assess pre-2011 productivity. The years 2012 to 2015 were included in the post 2011 group. Paired *t* tests were used to assess differences between groups. Statistical significance was set to $p < 0.05$ a priori.

SETTING: A total of 10 orthopedic surgery residency programs across the United States.

PARTICIPANTS: The study group was composed of 5 of the 2015 top 20 National Institutes of Health (NIH) funded programs and 5 programs without NIH funding.

RESULTS: When corrected for number of residents per year, there were 0.290 publications per resident/year from 2008 to 2011 increasing to 0.528 publications per resident/year from 2012 to 2015 following implementation of the 2011 work hour restrictions ($p = 0.033$). When corrected for number of residents per year, there remained no difference in publications per resident from 2008 to 2011 ($p = 0.81$) or from 2012 to 2015 ($p = 0.10$) between NIH and non-NIH funded programs.

CONCLUSION: There has been little data to support the theory that resident work hour restrictions have improved education or patient care in any meaningful way. In our study, there was a statistically significant increase in publications after 2011; however, the number of publications between NIH funded and non-NIH funded programs did not differ. Our study is the first to demonstrate that with increasing duty hour restrictions, orthopaedic surgery residents may be using more of their free time to conduct research. (J Surg Ed ▮:▮▮▮-▮▮▮. © 2017 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: duty hours, orthopedics, academic productivity

COMPETENCIES: Patient Care, Medical Knowledge, Practice Based Learning and Improvement, Systems Based Practice, Professionalism, Interpersonal Skills and Communication

INTRODUCTION

In 2003 and 2011, the Accreditation Council for Graduate Medical Education (ACGME) mandated increasingly stringent resident duty hour restrictions, which govern the amount of time residents can spend in patient care settings, mandate breaks between shifts of patient care, and require adherence to the "80-hour work week." These changes were implemented in an effort to minimize adverse patient events; however, studies have not demonstrated an improvement in outcomes since the initiation of duty hour restrictions.[1] Given the decreased time allotted for residents in the hospital setting, orthopaedic surgery residency program directors have implemented several strategies to manage resident duty hours and education on both local and national levels.[2] Some of these strategies include dedicated time outside the operating room for practicing surgical skills, increasing the number of midlevel providers to decrease the clerical load of residents, and the use of surgical simulators.[2-4]

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Although patient outcomes have not changed, data show that resident education has been compromised.[5] With less time required at the hospital, however, residents, in theory, have more time for academic activities such as research. In 2009, Jagannathan et al. examined the educational and academic productivity of neurosurgical trainees following the implementation of the 2003 work hour restrictions. They found that academic productivity, measured by resident abstract submissions, and American Board of Neurological Surgery scores declined.[6]

Similarly, the repercussions of duty hour reform have been investigated with regard to the academic productivity of general surgery faculty members.[7] Klingensmith et al. surveyed general surgery faculty members after the implementation of the 2003 duty hour restrictions. Of those surveyed, 83% felt academic productivity had suffered following resident work hour restrictions, 60% of the respondents believed that this was in part owing to the need for general surgery attendings to perform clinical tasks that had previously been done by residents.[7]

Our primary objective in this study was to examine whether resident academic productivity, has increased following implementation of the 2011 ACGME duty hour restrictions. Given the increased restrictions on the number of hours allowed for resident clinical education, we hypothesize that orthopaedic trainee' academic productivity increased after the 2011 duty hour restrictions were implemented.

METHODS

Selection of Programs

Per institutional policy, no institutional review board (IRB) approval was required for this project. A total of 10 orthopaedic surgery residency programs were selected based on geographic location, amount of National Institutes of Health (NIH) funding, and accessibility of resident information (Appendix). NIH funding was used to gauge the "academic" potential of the residency program. Five of the 2015 top 20 NIH funded orthopaedic residency programs were selected. Each program represented a different geographic area of the country to ensure sample diversity. For comparison, 5 orthopaedic residency programs without NIH funding were also included, all of which were matched to a geographic region with the NIH funded programs. Programs were selected based upon geographic location, and the availability of resident rosters online, or those that were able to be provided by email.

Selection of Publications

We compared publications from 2008 to 2011 (prework hour restriction group) and 2011 to 2015 (postwork hour restriction group). Although the new regulations were put in place on July 1, 2011, all of 2011 was included in the prerestriction data to account for any publication lag following manuscript acceptance.

Each of the 10 orthopaedic residency programs was then evaluated individually, by year from 2008 to 2015. For each year, the program was broken up by class into groups ranging from postgraduate year-1 to postgraduate year-5, to allow for efficient data collection. Each member of a class was entered into a PubMed author search that was restricted to a time period of 1 year. All publications with the resident listed as an author were recorded. Publications were screened to ensure that the work was performed while the resident was in training at the program credited on the manuscript. In cases where authorship on a publication included more than 1 resident in a particular program, the publication was only counted once, with credit given to the resident listed earliest in the order of authors. The type of publication, level of evidence, author number, and funding were all recorded, and type of funding were noted for all publications. The data were then analyzed with Paired *t* tests to assess the differences between groups. Statistical significance was set to $p < 0.05$ a priori.

RESULTS

Total Publications

A total of 286 papers were published among residents at all 10 orthopaedic surgery residency programs from 2008 to 2011 for an average of 71.5 publications per year. From 2012 to 2015, 512 papers were published for an average of 128 publications per year ($p = 0.021$). When corrected for number of residents per year, there were 0.290 publications per resident/year from 2008 to 2011, and there were 0.528 publications per resident/year from 2012 to 2015 ($p = 0.033$) (Fig. 1). A posthoc power analysis demonstrated that our study was 95% powered to detect a 20% difference in publications per resident/year. From 2008 to 2011, NIH funded programs published on average 8.2 publications per year, whereas non-NIH funded programs published 7.6 publications per year ($p = 0.13$). From 2012 to 2015, NIH funded programs published 16 publications per year, whereas non-NIH funded programs

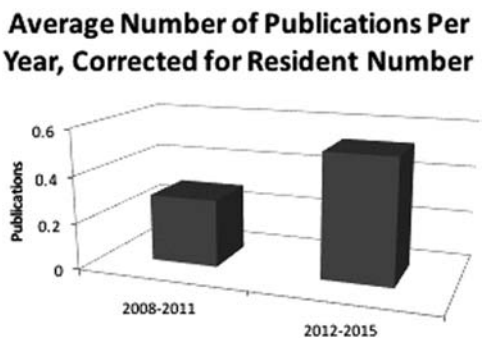

FIGURE 1. Number of publications per resident/year before and after 2011 duty hour restrictions.