



Practitioner Bias in the Interpretation of the Effects of Resident Work Hour Restrictions

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Background

In 2003, the Accreditation Council for Graduate Medical Education (ACGME) placed restrictions on the number and frequency of resident work hours.¹ The regulations were rooted in the 2001 New York State mandate that resulted from the death of Libby Zion.^{2,3,4} There is currently a large and growing body of literature which underscores the benefits and shortfalls of reduced resident work-hours on patient safety, resident morale, quality of life, education and operative experience.^{2,5-18}

Previously, we have performed a systematic review of the literature, and a cost analysis to assess the early effects of this mandate on patient safety as measured by mortality, provider errors and patient complications.^{19,20} The assessment of the effectiveness of work hour rules (WHR) is impaired by the occurrence of the effects of WHR subsequent to enactment of the rule.¹⁹ We hypothesized that when presented with the data from a meta-analysis¹⁹ without the benefit of a discussion or conclusion regarding the results, the interpretation of the study information would be different between practitioners from different specialties. We additionally hypothesized that attending physicians trained in internal medicine would interpret the data more in favor of WHR, compared to surgeons (orthopaedic and general). We also hypothesized that physicians trained before WHR would interpret the data less favorably in regards to WHR. Lastly, we hypothesized that physicians with a favorable or unfavorable view of WHR would interpret the data in line with their bias.

Methods

Institutional review board exemption was obtained, and power analysis determined that 168 responses would be needed to detect a medium sized difference. Assuming a response rate of 25%, we needed to sample 672 academic physicians to achieve our desired power.²¹ The survey included 10 questions and was delivered via email weblink to 700 academic physicians (526 medical, 123 surgical, 51 orthopaedic) within our tertiary level academic medical center. Data was collected over a two month

period, with a response rate of 30.5%. 66.5% of respondents (133/188) graduated residency prior to inception of the 80 hour work week, while the remaining 33.5% (55/188) had at least one year of exposure to the WHR as a resident. Overall, our survey had 188 total respondents, 95.7% filled out a full survey.

The major results our systematic review and meta-analysis of the available literature regarding WHR were paraphrased and presented to the survey takers.¹⁹ Questions were constructed around each major result of the study and survey takers were asked to draw from a list of conclusions regarding each data point. Descriptive statistics were generated, and statistical analysis consisted of Kruskal Wallis, Mann-Whitney U, Pearson's chi square, Fisher's exact tests where appropriate. Binary logistic regression was used to adjust odds of answering dichotomous questions for multiple variables. All statistics were calculated using SPSS version 16.0 (SPSS Inc. Chicago, IL).

Results

Personal Views of Study Group

Overall, 101 total respondents were "somewhat strongly" or "strongly" in favor of the WHR as set by the ACGME (53.7%). 58.6% of internal medicine trained physicians agreed with the ACGME rules as written, compared to 41.8% of surgeons (p value 0.002). 87.2% of all physicians surveyed felt that some level of restriction of work hours was warranted. This included 91.7% of internal medicine physicians and 76.4% of surgeons (p value 0.008).

Interpretation of systematic review data by personal bias regarding WHR as defined by ACGME

Only 30.4% of respondents who disagreed with the ACGME rules as written felt they improved patient mortality based on the data from the systematic review, compared to 58.2% of respondents who agreed with the ACGME rules (p value 0.012). In terms of medical errors/surgical complications, 16.5% of those who did not agree with the ACGME definition of WHR

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felt the results of the systematic review showed a decrease in errors/complications compared to 35.7% of those who agreed (p value 0.004). Only 10.1% of respondents who did not agree with the ACGME felt the data in the review warranted continuation of WHR compared to 35.7% who agreed (p value <0.001). Only 7.6% of respondents who did not agree with the ACGME rules felt that WHR were at least somewhat responsible for the decrease in observed mortality, compared to 22.4% of those who agreed (p value 0.007).

Multiple Regression Analysis

Binary logistic regression was used to determine if the answers to questions related to interpretation of data on the 80 hour work rule was conditional on discipline (medicine or surgery), date of graduation (before or after WHR inception) or pre-test attitude toward the ACGME work rule (support or disagree). We found that after adjustment, individuals with a positive attitude toward the WHR as defined by the ACGME were 3.1 times more likely (1.5, 6.4) to agree that the WHR were responsible for decreasing mortality based on the data presented compared to those who disagreed (p value 0.002). Similarly, physicians with a positive attitude towards the ACGME WHR were 3.4 times (1.2, 10.0) more likely to feel that the effects were symmetric across disciplines, 5.0 times more likely (2.1, 12.1) to feel that the data showed a decrease in medical errors/surgical complications, and 7.0 times more likely (2.8, 17.3) to feel that the data supported continuation of the WHR compared to those who did not hold a favorable view. Neither specialty nor personal exposure to WHR was a significant predictive factor after adjustment for multiple variables.

Discussion

Though prior studies have analyzed the influence of ACGME imposed WHR on patient outcomes, resident performance, education, and quality of life, this is the first investigation to determine variables that influence a physician's interpretation of this data. We demonstrate that a respondent's interpretation of data from a systematic review of mortality and medical errors pre- and post-WHR is most influenced by his/her pre-test attitude regarding WHR. Contrary to our hypotheses, personal exposure to WHR and medical or surgical specialty were not significantly related to attitudes toward the 80-hour work week.

We confirm that bias regarding WHR influences a respondent's interpretation of the data presented. As a result, when committees are created to investigate and discuss additions or revisions to the current WHR, we suggest a group that is equally represented in terms of medical specialty and baseline perceptions. Perhaps prior to creating a taskforce or committee on WHR, leaders should survey possible members regarding their perceptions of WHR in order to create a group that is diverse in both demographics and opinions. Our survey can be validated on a subsequent population then potentially used for this purpose.

Few studies have specifically investigated perceptions of WHR amongst practitioners of specific specialties. Nuthalapaty

et al evaluated the perceived impact of duty hour restrictions on the residency environment in a series of obstetrics and gynecology program directors and found that opposition to duty hour regulations and a preference for higher limits was associated with a higher prevalence of negative impressions regarding duty hour regulations.²² Dozois *et al* evaluated the perceived impact of WHR at a single-institution among nine surgical subspecialties and found that 15% of attending surgeons, 30% of residents who trained before WHR, and 67% of residents who trained after WHR believed patients were safer since the implementation of WHR.²³ Schlueter *et al* attempted to identify discrepancies of WHR interpretation within and between specialties, and determined that there was disagreement among program directors of different specialties on the interpretation of WHR.²⁴ It is likely that the baseline perceptions of physicians regarding WHR result from a conglomeration of variables of which baseline perception may be most significant.

Although only a little over half of physicians agreed with WHR as written, close to 90% agreed that some level of WHR is warranted. Despite this, only a very small minority believed that the effects of WHR were symmetric across disciplines. In fact, many more (almost 43%) respondents felt WHR should be changed to reflect the various needs of differing disciplines than felt that they should not (13%). For example, Yaghoubian *et al* sought to compare the outcomes of trauma surgery performed by surgical residents during daytime and evening hours versus those performed by residents working beyond 16 hours.²⁵ The authors determined that trauma surgery performed at night by residents who have worked longer than 16 hours have similar favorable outcomes compared with those performed during the day, and that instituting a 5-hour rest period at night is unlikely to improve outcomes of these commonly performed operations. In contrast, Gohar *et al* investigated internal medicine residents and concluded that a month of call rotations reduced overall sleep per night and working memory capacity was adversely affected.²⁶ As indicated by many of the respondents of our survey and by the variability in the literature, perhaps medical disciplines require different levels and types of WHR.

Our sample contained a nearly 3:1 medicine to surgery ratio, improving the external validity of our findings in keeping with the recommendations of the ACGME data resource book for primary medicine specialties, and primary surgery specialties.²⁷ Second, our response rate of 33% is comparable to recent studies which used an email or web-based strategy that showed an average response rate of 31%.²¹ However, since this is the first study of its type attempting to assess physician bias in the interpretation of data related to the ACGME WHR, our instrument could not be validated prior to its administration. As such, this study could be considered a pilot of this instrument.

We believe that this study raises interesting dilemmas when interpreting the medical literature as it is presented in our journals. The chosen journal of publication, audience of the journal, reviewer and editor bias, and author bias all dictate the way in which objective medical data is received, interpreted,

and disseminated. Perhaps understanding this interplay is as critical in obtaining and deciphering data from a study as the implementation and design of the study itself. As such, we urge restraint and consultation with this or any other contentious issue, as the best education of our future physicians and the best care of our patients cannot be left to chance.

References

1. **Accreditation Council on Graduate Medical Education.** Duty Hours: ACGME Standards. *Common program requirements* Chicago, IL: ACGME, 2010:1-19. [http://www.acgme.org/acgmeweb/Portals/0/PFAssets/ProgramResources/Common_Program_Requirements_07012011\[1\].pdf](http://www.acgme.org/acgmeweb/Portals/0/PFAssets/ProgramResources/Common_Program_Requirements_07012011[1].pdf)
2. **Browne JA, Cook C, Olson SA, et al.** Resident duty-hour reform associated with increased morbidity following hip fracture. *J Bone Joint Surg Am* 2009;91:2079-85.
3. **Friedlaender GE.** The 80-hour duty week: rationale, early attitudes, and future questions. *Clin Orthop Relat Res* 2006;449:138-42.
4. **Pelligrini VD Jr, Peabody T, Dinges DF, et al.** Symposium resident work-hour guidelines. A sentence or an opportunity for orthopaedic education? *J Bone Joint Surg Am* 2005;87:2576-86.
5. **Jones AM, Jones KB.** The 88-hour family: effects of the 80-hour work week on marriage and childbirth in a surgical residency. *Iowa Orthop J* 2007;27:128-33.
6. **Kusuma SK, Mehta S, Sirkin M, et al.** Measuring the attitudes and impact of the eighty-hour workweek rules on orthopaedic surgery residents. *J Bone Joint Surg Am* 2007;89:679-85.
7. **Niederee MJ, Knudtson JL, Byrnes MC, et al.** A survey of residents and faculty regarding work hour limitations in surgical training programs. *Arch Surg* 2003;138:663-9; discussion 669-71.
8. **Sargent MC, Sotile W, Sotile MO, et al.** Quality of life during orthopaedic training and academic practice. Part 1: orthopedic surgery residents and faculty. *J Bone Joint Surg Am* 2009;91:2395-405.
9. **Zuckerman JD, Kubiak EN, Immerman I, et al.** The early effects of code 405 work rules on attitudes of orthopaedic residents and attending surgeons. *J Bone Joint Surg Am* 2005;87:903-8.
10. **Nuckols TK, Bhattacharya J, Wolman DM, et al.** Cost implications of reduced work hours and workloads for resident physicians. *N Engl J Med* 2009;360:2202-15.
11. **Pappas AJ, Teague DC.** The impact of the accreditation council for graduate medical education work-hour regulations on the surgical experience of orthopedic surgery residents. *J Bone Joint Surg Am* 2007;89:904-9.
12. **Peabody T.** The effect of work hour restrictions on the education of orthopaedic surgery residents. *Clin Orthop Relat Res* 2006;449:128-33.
10. **Weatherby BA, Rudd JN, Ervin TB, et al.** The effect of resident work hour regulations on orthopaedic surgical education. *J Surg Orthop Adv* 2007;16:19-22.
14. **Baskies MA, Ruchelsman DE, Capeci CM, et al.** Operative experience in an orthopedic surgery residency program: the effect of work-hour restrictions. *J Bone Joint Surg Am* 2008;90:924-7.
15. **Strongwater AM.** Transition to the eighty-hour resident work schedule. *J Bone Joint Surg Am* 2003;85-A:1170-2.
16. **Ranawat AS, Dirschl DR, Wallach CJ, et al.** Potential strategies for improving orthopaedic education strategic dialogue from the AOA Resident Leadership Forum Class of 2005. *J Bone Joint Surg Am* 2007;89:1633-40.
17. **Farley FA, Weinstein JN, Aamoth GM, et al.** Orthopaedic Workforce Taskforce to Board of Directors, American Academy of Orthopaedic Surgeons, 2005-2006. Workforce analysis in orthopaedic surgery: how can we improve the accuracy of our predictions? *J Am Acad Orthop Surg* 2007;15:268-73.
18. **Committee on Optimizing Graduate Medical Trainee (Resident) Hours and Work Schedule to Improve Patient Safety, National Research Council.** Impact of Duty Hours on Resident Well-Being. In: Ulmer C, Miller Wolman D, Johns MME (eds). *Resident Duty Hours: Enhancing Sleep, Supervision, and Safety* Washington, DC: The National Academies Press, 2008:159-178.
19. **Baldwin K, Namdari S, Donegan DJ, et al.** Early effects of work hour restrictions on patient safety: a systematic review and plea for improved studies. *J Bone Joint Surg Am* 2011;93:e5.
20. **Kamath A, Baldwin K, Meade LK, et al.** The increased financial burden of further proposed orthopaedic resident work hour reductions. *J Bone Joint Surg Am* 2011;93:e31.
21. **Cook C, Heath F, Thompson R.** A meta-analysis of response rates in web- or internet-based surveys. *Educ Psychol Meas* 2000;60:821-36.
22. **Nuthalapaty FS, Carver AR, Nuthalapaty ES, et al.** The perceived impact of duty hour restrictions on the residency environment: a survey of residency program directors. *Am J Obstet Gynecol* 2006;194:1556-62.
23. **Dozois EJ, Holubar SD, Tsikitis VL, et al.** Perceived impact of the 80-hour workweek: five years later. *J Surg Res* 2009;156:3-15.
24. **Schlueter ME, Phan PH, Martin CS, et al.** Understanding accreditation council for graduate medical education (ACGME) guidelines: resident and program director interpretation of work-hour restrictions. *J Surg Educ* 2009;66:374-8.
25. **Yaghoubian A, Kaji AH, Putnam B, et al.** Trauma surgery performed by "sleep deprived" residents: are outcomes affected? *J Surg Educ* 2010;67:449-51.
26. **Gohar A, Adams A, Gertner E, et al.** Working memory capacity is decreased in sleep-deprived internal medicine residents. *J Clin Sleep Med* 2009;5:191-7.
27. **Accreditation Council for Graduate Medical Education.** Number of Residents, by Specialty and Subspecialty, Resident Year, and Position Type. *Graduate Medical Education Data Resource Book, Academic year 2009-2010.* Chicago, IL: Department of Applications and Data Analysis, 2010:43-45.