The Effects of Work-Hour Limitations on Resident Well-being, Patient Care, and Education in an Internal Medicine Residency Program

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Background: The Accreditation Council for Graduate Medical Education work-hour limitations (WHLs) were implemented in July 2003. Effects on resident well-being, patient care, and education are not well understood. We investigated these effects of WHLs.

Methods: Self-administered survey of internal medicine residents in a university-based residency program in Seattle, Wash. Part of this survey was identical to one completed at our institution in 2001, permitting comparison of burnout, career satisfaction, and depression before and after WHLs. We surveyed 161 internal medicine residents, with 118 respondents (response rate, 73%). We measured resident well-being using the Maslach Burnout Inventory, a validated screening questionnaire for depression, and a previously described questionnaire for career satisfaction. We developed questions about overall agreement with implementation of WHLs and effects on resident well-being, patient care, and education.

Results: Comparison with the 2001 survey demonstrated an increase in the proportion of residents satisfied with their career (66% to 80%; \( P = 0.02 \)) and a decrease in the proportion meeting criteria for emotional exhaustion (53% to 40%; \( P = 0.03 \)). Slightly more residents reported a negative effect of WHLs on patient care (37%) than they did a positive (29%) or a neutral (34%) effect, and more reported a negative effect on their education (47%) than they did a positive (32%) or a neutral (21%) effect. Overall, most residents (65%) approved of WHLs.

Conclusions: Internal medicine residents approve of WHLs overall and report benefits to their well-being. However, they also report negative effects on patient care and resident education.

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ties these concerns.21-26 More recent surveys before the implementation of WHLs (in 2001) allowed longitudinal comparison of resident well-being at our institution.27-29 A recent review of the literature concerning system changes designed to affect resident workload concluded that evidence on patient safety is insufficient to inform the process of reducing resident work hours at this time.29

We surveyed residents at an internal medicine program in the spring of 2004 to determine perceived effects of the ACGME WHLs on resident well-being, patient care, and education. A previous survey3 conducted before the implementation of the WHLs (in 2001) allowed longitudinal comparison of resident well-being at our institution.

METHODS

PARTICIPANTS

All residents in the University of Washington Affiliated Hospitals Internal Medicine Program, Seattle, except for 1 of us (C.G.S.), were eligible to participate. The University of Washington Human Subjects Institutional Review Board approved the study. The WHLs were in effect at the University of Washington as of July 2003 in accord with ACGME requirements. In contrast, the Internal Medicine Residency Review Committee’s 80-h/wk requirement was exceeded on some services in 2001, despite program efforts, and the requirements of 24 consecutive hours off and 10 hours off between shifts were not in practice. Both cohorts had at least 1 day off per week, took call every fourth night on most ward rotations, and received a 1-hour session on depression and stress in residency at the beginning of each academic year.

Program changes made during the interval between the 2 surveys included the addition of a night float to several services, expansion of hospitalist services, reduction of call frequency, and stricter enforcement of admission caps, with a resultant decrease in patient census.

DATA COLLECTION

We mailed an 85-item, anonymous, self-administered survey to residents’ homes in February and again in March 2004. As an incentive to participate, residents who returned a separate postcard indicating that they had completed a survey were eligible for a drawing for 1 of 3 $100 gift certificates. Topics included (1) effects of WHLs on patient care; (2) effects on resident education, including frequency of missed educational activities; and (3) questions about resident well-being, including measures of career satisfaction, depression, and professional burnout. The Maslach Burnout Inventory (MBI)30 was used to measure burnout; the MBI includes subscales on emotional exhaustion, depersonalization, and personal accomplishment. According to convention, burnout was considered a high score on the depersonalization or emotional exhaustion subscale for this and the 2001 study. The depression and burnout questionnaires are well-validated; these and the career satisfaction questions were identical to questions in the 2001 survey and are described in detail elsewhere.3,31,32

New questions were developed to investigate educational activities that residents may miss or cut short because of WHLs. Certain patient care activities of high educational content were considered educational activities. Wherever possible, questions were formatted to gauge the frequency of experiences (0 indicated never; 1, once; 2, monthly; 3, 2-3 times per month; 4, weekly; and 5, more than weekly) rather than qualitative perceptions. To minimize survey bias, questions that were not amenable to responses on a frequency scale were framed in neutral terms with a linear scale that permitted residents to imply the change was neutral, negative, or positive or in equal numbers of positively and negatively phrased items. Residents were asked to try to isolate the effects of WHLs from other factors that might cause similar effects. These items included questions about perceptions of the effects of WHLs on resident education and patient care using 5-point Likert scales describing agreement (1 indicates strongly disagree; 2, somewhat disagree; 3, neutral; 4, somewhat agree; and 5, strongly agree) or the nature of the effect (1 indicates strong negative effect; 2, somewhat negative effect; 3, little or no effect; 4, somewhat positive effect; and 5, strong positive effect). Finally, the questionnaire included summary questions about the overall effect of WHLs on patient care, education, and resident well-being using the 5-point scales for positive and negative effect.

The survey was pilot tested twice (on 8 pulmonary fellows and on 5 medicine chief residents) to test questions for clarity and answerability and to solicit input on survey content from groups who had only recently completed residency training and continued to work closely with residents. Questionnaire modifications were made after each pilot test.

STATISTICAL ANALYSIS

Analyses compared all responses between the interns and other residents (hereafter referred to as R1s and R2/3s, respectively). For 3 summary questions about the overall effects of WHLs, we performed bivariate analyses by marital status and sex using the χ2 or the Fisher exact test to determine statistical significance. We used forward stepwise logistic regression to evaluate for independent associations between agreement with the implementation of WHLs (‘Overall it is good that ACGME resident WHLs were put in place’) and residency year, marital status, and sex.

RESPONDENT CHARACTERISTICS

Table 1. Characteristics of Participants

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. (% of Participants)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All respondents</td>
<td>118 (100)</td>
</tr>
<tr>
<td>Women</td>
<td>62 (53)</td>
</tr>
<tr>
<td>Married</td>
<td>48 (41)</td>
</tr>
<tr>
<td>Year of residency</td>
<td></td>
</tr>
<tr>
<td>R1</td>
<td>52 (44)</td>
</tr>
<tr>
<td>R2</td>
<td>32 (27)</td>
</tr>
<tr>
<td>R3</td>
<td>34 (29)</td>
</tr>
</tbody>
</table>

Abbreviations: R1, intern; R2, second-year resident; R3, third-year resident.

RESULTS

EFFECTS OF WHLs ON RESIDENT WELL-BEING

Most of the residents (84%) reported that the WHLs had had a positive effect on their well-being. This claim is sup-
ported by a comparison of measures of resident well-being with a 2001 survey at our institution before WHLs, performed at the same time of year (Table 2). There were no significant differences between the 2 groups in sex or residency year, and the response rates were nearly identical (76% in 2001 vs 73%).

The proportion of residents who met criteria for emotional exhaustion on the MBI in 2004 was significantly lower than in 2001 (40% vs 53%; P=.05). Mean scores on the emotional exhaustion subscale were also lower (24.0 vs 26.4; P=.05). No significant differences in depersonalization or personal accomplishment were observed. Because of the reduction in emotional exhaustion, the proportion of residents who met criteria for burnout on the MBI in 2004 was lower than in 2001, but this difference was not statistically significant (58% vs 76%; P=.18). The proportion of residents who were happy with their career choice was significantly higher in 2004 than in 2001 (80% vs 66%; P=.02). The subset of these who were very happy nearly doubled (33% vs 18%; P=.01). There was no statistically significant difference in the frequency of a positive depression screen result.

**EFFECTS OF WHLs ON PATIENT CARE**

When asked about the overall effect of the WHLs on patient care, responses were fairly evenly divided, with slightly more residents reporting a negative effect (37%) than a positive (29%) or a neutral (34%) effect. Responses to statements about the effects of WHLs on the quality of patient care are shown in Table 3. On balance, residents agreed that because of the WHLs they approached patient care with more energy and were less likely to make errors. Most residents did not believe that they had a lower commitment to the care of individual patients (a shift mentality), or that they did not get to know their patients’ medical details as well because of WHLs.

Most residents agreed, however, that the increased cross-cover associated with WHLs translates into less active management of patients’ medical problems. In addition, when asked about the frequency of patient care events caused by WHLs (Table 4), 47% of residents reported that at least twice a month they were required to go home when they would have preferred to stay because they believed they could take better care of their patients than could cross-covering physicians. Twenty-five percent reported that they needed to cut corners in patient care at least twice a month to comply with WHLs.

### Table 2. Resident Well-Being in Present Study and Historical Control Study

<table>
<thead>
<tr>
<th>Variable</th>
<th>Present Study</th>
<th>Historical Control Study</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maslach Burnout Inventory subscales</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High score for emotional exhaustion†</td>
<td>45 (40)</td>
<td>61 (53)</td>
<td>.05</td>
</tr>
<tr>
<td>High score for depersonalization</td>
<td>72 (63)</td>
<td>74 (64)</td>
<td>.88</td>
</tr>
<tr>
<td>Low score for personal accomplishment</td>
<td>33 (30)</td>
<td>36 (31)</td>
<td>.87</td>
</tr>
<tr>
<td>Met burnout criteria</td>
<td>75 (68)</td>
<td>87 (76)</td>
<td>.17</td>
</tr>
<tr>
<td>Career satisfaction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Happy with career choice†</td>
<td>94 (80)</td>
<td>76 (66)</td>
<td>.02</td>
</tr>
<tr>
<td>Not sure would choose to become a physician again</td>
<td>18 (15)</td>
<td>25 (22)</td>
<td>.17</td>
</tr>
<tr>
<td>Positive result on depression screening</td>
<td>65 (56)</td>
<td>52 (45)</td>
<td>.09</td>
</tr>
</tbody>
</table>

*Indicates 2001 study of residents in the same internal medicine program (Shanafelt et al*). †P<.05.
Responses to patient care items differed by residency year. The R2/3s were more likely than the R1s to believe that WHLs caused residents to have a lower commitment to the care of individual patients or a shift mentality (38% vs 14%; P = .004). The R1s were more likely than the R2/3s to agree with the view that WHLs made residents less likely to make medical errors (56% vs 32%; P = .009).

**EFFECTS OF WHLs ON RESIDENT EDUCATION**

When asked about the overall effect of the WHLs on resident education, more residents reported a negative effect (47%) than a positive (32%) or a neutral (21%) effect. Responses to statements about the effects of WHLs on aspects of education are shown in Table 5. Only 37% of residents thought that they were more receptive to learning because of the WHLs. Most (70%) believed that WHLs made residents less likely to make medical errors (56% vs 32%; P = .009).

Most of the residents (65%) agreed with the statement, “Overall, it is good that the ACGME WHLs were put in place.” The R1s were more likely than the R2/3s to agree with this statement (83% vs 50%; P<.001). In multivariate logistic regression for agreement with the statement, including the variables of residency year, sex, and marital status, only residency year retained significance. Compared with the R2/3s, the R1s had an odds ratio of 4.2 (95% confidence interval, 1.7-10.6) for agreeing with the implementation of the WHLs.

The Figure shows the perceived overall effects of WHLs on resident well-being, patient care, and education for the R1s and R2/3s. The R2/3s were significantly more likely than the R1s to report a negative effect on resident education (58% vs 35%; P = .01) and less likely to report a positive effect on resident well-being (76% vs 94%; P = .01). There was a trend toward more R2/3s reporting a negative effect on patient care (45% vs 27%; P = .06). There was no significant difference by sex or marital status for these 3 items.

**COMMENT**

The implementation of the ACGME WHLs represents a profound change in the structure of resident education. Our findings suggest that WHLs have had a positive effect on resident well-being. Most of the residents reported this improvement. In addition, the proportion of residents reporting career satisfaction significantly increased from 2001 to 2004, and there was a reduction in emotional exhaustion, one aspect of burnout. No difference in symptoms of depression, depersonalization, or personal accomplishment was observed. These findings suggest emotional exhaustion is the aspect of resident distress most affected by the WHLs.

The WHLs were intended to reduce resident fatigue, enhance resident education, and improve patient safety. Our findings suggest partial success, with most residents reporting that they approach patient care with more energy and the plurality agreeing that WHLs make medi-

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**Table 5. ACGME WHLs and Perceived Effects of ACGME WHLs on Quality of Resident Education**

<table>
<thead>
<tr>
<th>Effect of WHLs</th>
<th>Agree (%)</th>
<th>Neutral (%)</th>
<th>Disagree (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am more receptive to learning</td>
<td>44 (37)</td>
<td>41 (35)</td>
<td>33 (28)</td>
</tr>
<tr>
<td>There is not enough time for teaching by attending physicians</td>
<td>82 (70)</td>
<td>9 (8)</td>
<td>26 (22)</td>
</tr>
<tr>
<td>Attending rounds are often more focused on getting work done than on teaching</td>
<td>67 (57)</td>
<td>17 (14)</td>
<td>34 (29)</td>
</tr>
<tr>
<td>I am better able to teach (eg, medical students, other residents)</td>
<td>27 (23)</td>
<td>42 (36)</td>
<td>49 (42)</td>
</tr>
</tbody>
</table>

Abbreviations: ACGME, Accreditation Council for Graduate Medical Education; WHLs, work-hour limitations.

*Percentages reflect percentage of respondents; unless otherwise indicated, n = 118.

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**Table 6. ACGME WHLs and Perceived Effects of ACGME WHLs on Frequency of Educational Events**

<table>
<thead>
<tr>
<th>Effect of WHLs</th>
<th>At Least Twice a Month</th>
<th>At Least Weekly*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational event missed or cut short</td>
<td>94 (81)</td>
<td>58 (50)</td>
</tr>
<tr>
<td>Reviewing studies/tests in person</td>
<td>70 (60)</td>
<td>39 (33)</td>
</tr>
<tr>
<td>Attending rounds</td>
<td>53 (45)</td>
<td>32 (27)</td>
</tr>
<tr>
<td>Getting informal teaching</td>
<td>61 (52)</td>
<td>28 (24)</td>
</tr>
<tr>
<td>Teaching medical students/other residents</td>
<td>62 (53)</td>
<td>25 (21)</td>
</tr>
</tbody>
</table>

Abbreviations: ACGME, Accreditation Council for Graduate Medical Education; WHLs, work-hour limitations.

*Percentages reflect percentage of respondents; unless otherwise indicated, n = 118.

*Represents a subset of the column "at least twice a month."
cal errors less likely. However, many residents also reported negative consequences of the WHLs, such as frequently needing to cut corners in patient care, to pass off patients to other residents before adequate stabilization, and to leave the hospital when they preferred to stay because they believed they could provide better care than a cross-covering resident. In the minds of the residents surveyed, these negative effects may to some extent mitigate the benefits of the WHLs, with slightly more residents reporting an overall negative effect of the WHLs on patient care than a positive or neutral effect.

The reported effects of WHLs on resident education paint a more uniformly negative picture. Most of the residents (70%) believed that because of the WHLs, there was not enough time for teaching by attending physicians, and a high proportion reported frequently missing or cutting short a wide range of educational activities because of the WHLs. Activities most directly related to patient care (taking a history, performing an examination, or performing a procedure for a patient) were truncated least frequently, followed by teaching likely to happen on the wards, which suggests that under time pressure, residents may prioritize those activities most likely to directly benefit their patients. Fewer residents agreed that because of the WHLs they were more receptive to learning.

Overall, the R2/3s were significantly less likely than the R1s to approve of WHLs and more likely to report negative effects on patient care and resident education. The relatively negative perceptions of the R2/3s could reflect a better understanding of the consequences of WHLs owing to experience with the system before the WHLs went into effect. This difference might also reflect resistance to change or even resentment of younger colleagues’ “easier” training.

Few published data address the effects of the ACGME WHLs, and a recent review concluded that this literature has been compromised by suboptimal study design and the use of nonvalidated instruments. To our knowledge, only 1 previous study has examined resident burnout using the MBI before and after their implementation. Those authors did not find the decrease in emotional exhaustion reported herein; however, the study was small and confined to surgery residents. Several surveys of surgery residents have yielded mixed findings regarding resident perceptions of the effects of WHLs on patient care, operative caseload, and education. To our knowledge, no published study has addressed the specific effects of the ACGME WHLs on resident well-being, education, or patient care in an internal medicine program. A recent prospective study suggested a strong benefit to patient care by limiting work hours (although it did not specifically test the transition to the ACGME WHLs). Those authors demonstrated that medicine interns in an intensive care unit working a traditional schedule (with a goal of 80 h/wk) made more medical errors than interns working an intervention schedule with fewer hours (goal of 60 h/wk) and shorter on-call shifts. This is consistent with our finding that, during a 3-year time span is complicated by other changes in program structure during this interval, such as stricter enforcement of caps on the number of admissions per call night, additional night float coverage, and expanded services covered by non–house staff. These changes, however, were primarily implemented to comply with the WHLs, and most programs have made similar changes; therefore, we believe our results remain broadly relevant.

Our study supports the theory that the WHLs have improved resident well-being and, in conjunction with the study of medical errors, implies that the WHLs may offer real benefits to patient care, such as a decrease in medical errors caused by exhaustion. In our opinion, these findings suggest that some form of reduction in work hours is welcome. However, our results also point to new problems in patient care that may, in part, offset the ben-
effects of reduced exhaustion. In addition, our results strongly suggest that the WHLs have resulted in a number of negative consequences in resident education. These issues warrant further study in efforts to identify how resident well-being, quality of patient care, and education can be promoted simultaneously.

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