Hypothesis: The 50-hour workweek limitation for surgical residents in Switzerland has a major effect on surgical training, resident quality of life, and patient care.

Design: Survey study.

Setting: Residencies in Switzerland.

Participants: Surgical residents and surgical consultants.

Main Outcome Measures: An anonymous survey was conducted in Switzerland. Of 93 surgical departments contacted, 52 (55.9%) responded; of their 281 surgical residents and 337 surgical consultants, 405 (65.5%) returned a completed survey.

Results: Residents and consultants indicated a negative effect of the 50-hour workweek limitation on surgical training (62.8% and 77.2%, respectively) and on quality of patient care (43.0% and 70.1%, respectively) ($P<.001$ for both). Most residents and consultants reported that operative time (76.9% and 73.4%, respectively) and overall operating room experience (73.8% and 84.8%, respectively) were negatively affected by the work hour limitation. Only 8.1% of residents and 4.9% of consultants perceived the work hour limitation as beneficial to surgical training. Conversely, 58.4% of residents and 81.5% of consultants considered that residents’ quality of life had improved ($P<.001$).

Conclusions: Most surgical residents and surgical consultants perceive the work hour limitation as having a negative effect on surgical training and on the quality of patient care. Despite somewhat improved resident quality of life, the work hour limitation for surgical residencies in Switzerland appears to be a failure.

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ON JANUARY 1, 2005, THE Swiss government implemented new work hour limitations for all residency programs in Switzerland, and the federal work law became effective for all medical and surgical residents throughout the country. For decades, the surgical profession and surgical training were strongly associated in the public mind with extensive work hours. In fact, for generations of surgeons, it was normal to be “married” to the profession. Traditionally, surgical skills are acquired during extended work shifts by observing and by assisting according to the Halsted paradigm of unconditional dedication to training. The potential negative effects of sleep deprivation on performance in general and on residents’ lives (such as stress and relationship-related stress), serious medical errors, and worse performance on simulated tasks in particular are well documented but often contradictory.

Lifestyle and career orientation have changed from those of previous generations. Many physicians are no longer willing to pay a high price for their career at the expense of their lifestyle. Patient safety and the new application of work-life balance to physicians were 2 arguments for implementation of a 50-hour workweek limitation for hospital-based residents and consultants in Switzerland. Daily day and night work time has to be limited to 14 hours, including all breaks. Daily rest time must equal or exceed 11 consecutive hours. This time may be reduced to 9 hours several times during any 1 week as long as the resting time amounts to 12 hours on a 2-week average. Overtime cannot exceed 2 hours per day per employee except for emergencies or work-free business days. Overtime cannot exceed 140 hours per year. Within any 4-week period, residents and consultants may perform on-call duty for a maximum of 7 days. After completing the last on-call duty, the employee cannot be on call during the following 2 weeks.
The implementation of the law and the possible shortage of surgical residents resulted in a heated discussion in the Swiss surgical community. Although the implications of the implemented work hour limitation for surgical residencies in Switzerland are major, the effect of the 50-hour workweek on surgical training, surgical resident quality of life, and patient care in Switzerland has not been evaluated to date. The objectives of this study were to assess and to compare the attitudes of surgical residents and surgical consultants in Switzerland regarding the implemented work hour limitation.

**METHODS**

**STUDY DESIGN**

In autumn 2005, all 93 directors of surgical departments in Switzerland were asked in writing to participate in this study. If they agreed, they were asked to provide the number of surgical residents and surgical consultants working in their surgical departments. Only residents who aspired to pursue a surgical career and surgical consultants were included in the study; off-service residents working on a surgical ward were excluded. The survey covered demographics of surgical residents and surgical consultants, as well as questions regarding the effect of the new work hour limitation on their training, quality of life, and overall patient care. The questionnaire was electronically mailed in 2006 with a cover letter of recommendation from one of us (D.O.) to the participating departments for subsequent electronic distribution to all hospital-based surgical residents and surgical consultants. The survey was anonymous, without any code, and was completely voluntary. To ensure participant anonymity, responses were sent electronically to a central administration office that was independent of the investigators. Eight weeks after sending out the survey, the directors of surgical departments were asked to remind and encourage their surgical residents and surgical consultants to participate in the study. The Cantonal Ethical Committee of Basel exempted the study from ethical approval.

**SURVEY INSTRUMENT**

The survey was divided into 3 parts. Part 1 included sociodemographic data (age, sex, marital status, number of children, organizational concerns, and professional activity). Part 2 consisted of 34 questions for surgical residents and 29 questions for surgical consultants concerning the effect of the new work hour limitations. The effect was evaluated on (1) quality of surgical training in general (10 questions), (2) residents’ surgical education (10 questions; these questions were omitted in the consultants’ survey), (3) residents’ quality of life (7 questions), and (4) quality of patient care (7 questions). The consultants’ survey consisted of 5 additional questions related to their assessment of residents’ knowledge and preparation for operations. All questions were scored on a 7-point Likert-type scale, with responses ranging from strongly disagree (1 point) to strongly agree (7 points). This part of the survey has been described elsewhere and was used by permission of the authors. Additional questions in part 3 of the residents’ survey addressed their current work hours and the change in work hours after January 1, 2005. Another 3 questions assessed satisfaction with life in medicine in general and specifically with the new 30-hour workweek, with responses to both based on a visual analog scale (0 representing extremely dissatisfied and 100 representing extremely satisfied). For the third question, agreement with the new 50-hour workweek limitation was based on the 7-point Likert-type scale as already described. The survey was pretested for comprehension among 10 surgical residents and surgical consultants at the University Hospital Basel, who were subsequently excluded from further study analysis.

**STATISTICAL ANALYSIS**

Continuous data with a normal distribution were expressed as mean (SD) or median (range), and dichotomous data were expressed as frequencies and percentages. Data were analyzed using the t test when normally distributed and the Mann-Whitney test when nonnormally distributed. Dichotomous variables were analyzed using the χ² test or Fisher exact test. Two-sided P < .05 was considered statistically significant. Statistical analyses were performed using commercially available software (SPSS 13.0; SPSS Inc, Chicago, Illinois).

**RESULTS**

Fifty-two of 93 (55.9%) directors of surgical departments in Switzerland agreed to participate (Figure). A total of 618 surveys to 281 surgical residents and 337 surgical consultants were sent out. After the first submission of the questionnaire by e-mail and a reminder to the directors of surgical departments, 423 physicians (68.4%) participated in the survey. Not all of the participants were included in the analysis because 18 respondents (4.3%) had insufficient work experience (<12 months) or lacked demographic data. Therefore, the study sample consisted of 405 participants, yielding a response rate of 65.5%. Participants included 140 male and 81 female residents (median age, 31 years; age range, 27-50 years) and 169 male and 15 female consultants (median age, 46 years; age range, 33-62 years). Most participants (62.0%) worked in a nonacademic hospital. Characteristics of the respondents are summarized in Table 1.
COMPLIANCE WITH THE NEW WORK HOUR LIMITATIONS

One year after introduction of the new work hour limitation, residents worked a mean of 55 hours (range, 44-83 hours) per week. A total of 67.9% (150 of 221) of the residents reported that they worked a mean of 5 hours (range, 0.08-20 hours) fewer per week than before January 1, 2005, and 21.3% (47 of 221) of the residents reported that their weekly hours worked had not changed. The remainder (10.8%) reported that they worked a mean of 2 hours (range, 0.08-10 hours) more per week than before. Based on a visual analog scale ranging from 0 (extremely dissatisfied) to 100 (extremely satisfied), residents indicated less satisfaction than consultants with a life in medicine in general (mean score, 74 [range, 41-95]; P = .001). Female respondents indicated a negative effect of the work hour limitation (73.8% of residents and 84.8% of consultants) and operating room experience (69.1% of residents and 79.6% of consultants) were more likely than consultants to slightly to strongly agree with the implemented work hour limitation (47.1% vs 38.0%; P = .03). Residents were more likely than consultants to slightly to strongly agree with the implemented work hour limitation (47.1% vs 38.0%; P = .03).

EFFECT ON RESIDENTS’ EDUCATION

A total of 62.8% of the residents and 77.2% of the consultants indicated that the work hour limitation had negatively affected surgical training (P < .001). Only 8.1% (18 of 221) of residents and 4.9% (9 of 184) of consultants perceived a benefit to surgical training.

On a 7-point Likert-type scale where 1 indicates strong disagreement and 7 indicates strong agreement, consultants assessed the effect of the work hour limitation on resident education more favorably than residents for operating room experience and for benefit to training (Table 2). Respondents from academic hospitals vs nonacademic hospitals similarly assessed the effect on operating room time and on operating room experience. All other answers of respondents from academic hospitals vs nonacademic hospitals did not differ significantly. Male and female respondents indicated a negative effect of the 50-hour workweek limitation on the following aspects of surgical education (data are given as mean [SD] points): operating room time (2.4 [1.5] for men vs 2.5 [1.5] for women, P = .44), operating room experience (2.2 [1.4] for men vs 2.4 [1.5] for women, P = .26), and overall knowledge (2.9 [1.4] for men vs 3.1 [1.4] for women, P = .21). However, men responded more negatively than women about whether the work hour limitation was beneficial to training (mean [SD], 2.5 [1.6] vs 2.9 [1.7] points; P = .03).

Although 39.8% of the residents reported increased time for study and preparation, only 17.9% thought that overall knowledge had improved as a result of the 50-hour workweek limitation. Residents and consultants agreed that operating room time (76.9% of residents and 73.4% of consultants) and operating room experience (73.8% of residents and 84.8% of consultants) were negatively affected by the work hour limitation.

Among consultants, 10.3% agreed that residents now prepared more often for operative cases by reading the literature, and 6.5% agreed that residents had a better understanding of the surgical plan. Sixty percent of consultants slightly agreed to strongly agreed that surgical residencies should be longer because of the work hour limitation.

Table 1. Respondent Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Surgical Residents (n=221)</th>
<th>Surgical Consultants (n=184)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, median (range), y</td>
<td>31 (27-50)</td>
<td>46 (33-62)</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Sex, No.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>140</td>
<td>169</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Female</td>
<td>81</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Married or with a partner, No. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of children, median (range)</td>
<td>99 (44.8)</td>
<td>153 (83.2)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>No. of years of training, median (range)</td>
<td>4 (2-10)</td>
<td>19 (5-37)</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Postgraduate level, No. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>48 (21.7)</td>
<td>Unavailable</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>48 (21.7)</td>
<td>Unavailable</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>41 (18.6)</td>
<td>Unavailable</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>38 (17.2)</td>
<td>Unavailable</td>
<td></td>
</tr>
<tr>
<td>≥6</td>
<td>46 (20.8)</td>
<td>Unavailable</td>
<td></td>
</tr>
<tr>
<td>Work setting, No. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic hospital</td>
<td>77 (34.8)</td>
<td>77 (41.8)</td>
<td>.15</td>
</tr>
<tr>
<td>Nonacademic hospital</td>
<td>144 (65.2)</td>
<td>107 (58.2)</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Perceived Effect of Work Hour Limitation on Surgical Resident’s Education

<table>
<thead>
<tr>
<th>Variable</th>
<th>Likert-Type Scale Score, Mean (SD)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Surgical Residents (n=221)</td>
</tr>
<tr>
<td>Residents spent more time reading</td>
<td>3.9 (1.6)</td>
</tr>
<tr>
<td>Increased operating room time</td>
<td>2.4 (1.5)</td>
</tr>
<tr>
<td>Improved operating room experience</td>
<td>2.4 (1.5)</td>
</tr>
<tr>
<td>Improved knowledge in basic science</td>
<td>3.3 (1.4)</td>
</tr>
<tr>
<td>Improved overall knowledge</td>
<td>3.2 (1.4)</td>
</tr>
<tr>
<td>Limitations are beneficial to training</td>
<td>2.8 (1.7)</td>
</tr>
<tr>
<td>Residents make better clinical decisions</td>
<td>3.2 (1.6)</td>
</tr>
<tr>
<td>Improved resident-faculty interaction</td>
<td>3.4 (1.5)</td>
</tr>
<tr>
<td>Improved resident-resident teaching</td>
<td>3.0 (1.5)</td>
</tr>
<tr>
<td>Improved faculty teaching</td>
<td>3.0 (1.4)</td>
</tr>
</tbody>
</table>

*Seven-point score, where 1 is strongly disagree, 2 is moderately disagree, 3 is slightly disagree, 4 is neither disagree nor agree, 5 is slightly agree, 6 is moderately agree, and 7 is strongly agree.
RESIDENT QUALITY OF LIFE

Most residents (58.4%) and consultants (81.5%) slightly agreed to strongly agreed that the work hour limitations had improved residents’ quality of life ($P<.001$). Compared with female respondents and nonacademic hospital respondents, male respondents and academic hospital respondents were significantly more likely to report that the limitation had improved the residents’ quality of life ($P=.01$ and $P=.03$, respectively) and had resulted in more-rested residents ($P=.02$ and $P=.045$, respectively). Residents and consultants alike believed that residents had increased their time spent socializing (Table 3).

QUALITY OF PATIENT CARE

Residents at all postgraduate levels and consultants thought that the work hour limitation did not benefit patient care, with consultants having a more negative perception (Table 4). Forty-three percent of the residents and 70.1% of the consultants indicated that the limitation had negatively affected the quality of patient care ($P=.10$ and $P=.03$, respectively) and had resulted in continuity of patient care ($P=.02$ and $P=.045$, respectively). Residents and consultants alike believed that residents had increased their time spent socializing (Table 3).

To our knowledge, this is the first study assessing the effect of the nationwide work hour limitation for surgical residencies introduced on January 1, 2005, in Switzerland. The present investigation demonstrates that the work hour limitation subjectively had a clear negative effect on patient care and on surgical training perceived by surgical residents and by surgical consultants. However, the weekly work hours decreased for most residents, and their quality of life slightly improved.

We found that most residents worked less than they did before January 1, 2005, but continue to work more than 50 hours per week. There are several reasons why the number of hours worked may still exceed the work hour limitation: First, clinics may not have redesigned their schedules because of limited expertise or resources due to insufficient government financial support. Second, appropriate provisions to reduce or realign paperwork to physician extenders (nurse practitioners or physician assistants) were inadequate, and the new work hour limitation forced the unaltered amount of administrative work to be performed in less time. Third, a violation of the new limitation could result from a clash with surgical culture; concerns about loss of continuity in patient care have been previously reported by others, and senior surgeons may resist a “shift worker” mentality.

Residents and consultants perceived an improvement in the residents’ quality of life after the work hour limitation had been implemented. Both groups reported increased chances for residents to maintain a social network and to rest. However, improved quality of life seems
to be a passive consequence of the new regulations in light of the clearly negative effect on surgical education and on patient care. Residents were ambivalent about the consequences of the workweek limitation on surgical training. Residents and consultants believed that residents’ training and quality of education had decreased. All aspects of surgical training were assessed as negatively affected.

Among the subjective opinions of respondents, the most striking and concerning finding was the perception of decreasing quality in patient care. Residents and consultants agreed about a negative effect of the 50-hour workweek limitation on quality of patient care (43.0% and 70.1%, respectively, P < .001), but it was considered negative significantly more frequently by consultants. This can be explained by the fact that consultants have much greater work experience than residents and can better appreciate changes in patient care (with some discontinuity in patient care due to residents’ shift working) compared with working conditions before introduction of the work hour limitation. Furthermore, consultants are ultimately responsible for the patients, and the perception of decreased quality of patient care by consultants may be worse than that by residents. These findings are consistent with several surveys in which resident perception of restricted work hours on quality of patient care was predominantly negative.13,18,19

However, other studies20,21 showed no evidence that reduced work hours affected patient mortality or morbidity or increased patient safety.

There was a pronounced difference between the residents’ and consultants’ perceptions of the work hour limitation. The effect on surgical education and patient care as assessed by consultants was worse than that by residents. It is somewhat surprising how negatively consultants judged the knowledge and decision-making capabilities of their residents. However, because of the cross-sectional design of our study, the consultants’ judgment reflects instant opinions rather than an evaluation over time. Furthermore, the improvement in resident quality of life resulting from the work hour limitation was perceived as more important by consultants than by residents. Other investigators report similar results.13 In the present study, neither residents’ training setting (academic vs nonacademic) nor sex substantially influenced the perceived effect of the work hour limitation.

Our study finding of overall improvement in residents’ quality of life is broadly consistent with results of previous studies14,17,18,22 designed to address the effect of the maximum 80-hour workweek that was mandated by the US Accreditation Council for Graduate Medical Education. This result is important given the high rates of burnout among residents.23 However, improved resident quality of life does not seem to correlate with greater satisfaction with their education or with a life in medicine.24 Potential negative effects of the work hour limitation on continuity of patient care and on resident education as a consequence of change toward a shift worker mentality have been described previously.15,25,26 However, the effects of work hour regulation on surgical education evaluated by Pape and Pfeifer19 in 21 studies remain unclear because of methodological inconsistency and problematic assessment of the quality in education. We found that implementa-

tion of the work hour limitation did not result in a better ability to learn. In contrast to our finding of a generally negative perception of the work hour limitation on residents’ education, US studies have shown that change in work hours has not necessarily reduced operative case-load27 but may have increased operative experience through higher case volumes of senior residents.17 However, the work hour limitation investigated in the US studies was 80 hours instead of 50 hours.

There are several limitations to our study. First, to ensure anonymity of study respondents, we were unable to assess nonresponse bias by identifying nonresponders. However, our response rate of 65.5% is high. Second, our data reflect the effect of the work hour limitation in an early phase. It is possible that our results partially reflect the lack of adaptation to a new system required by law. Time will tell how well surgical clinics have implemented the required work hour limitation and ensured the quality of patient care and surgical training. Third, the objective of this study was to capture residents’ and consultants’ views on the introduction of the work hour limitation, and we have no perceptions from patients or nurses to corroborate any lack of continuity in physician care. Fourth, it would be interesting to know how the number of residents per institution has changed after introduction of the work hour limitation and whether more administrative personnel were hired to reduce the workload of residents. Unfortunately, we did not prospectively collect such data. However, a follow-up study of the present investigation will prospectively collect such information.

In summary, most surgical residents and surgical consultants perceive the 50-hour workweek limitation as having a negative effect on surgical training and on quality of patient care. Although residents’ quality of life improved slightly, the work hour limitation for surgical residencies as instituted in Switzerland appears to be a failure. To optimize the present situation, resident paperwork should be reduced or assigned to physician extenders. Furthermore, it is imperative that surgical residents read and study during their time off duty.

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Author Contributions: Dr Oertli had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Businger and Guller. Acquisition of data: Businger and Oertli. Analysis and interpretation of data: Businger, Guller, and Oertli. Drafting of the manuscript: Businger and Guller. Critical revision of the manuscript for important intellectual content: Businger, Guller, and Oertli. Administrative, technical, and material support: Businger and Oertli. Study supervision: Oertli.

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REFERENCES


