



## Using an anonymous, resident-run reporting mechanism to track self-reported duty hours

Nader Zamani, Sara C. Fallon, Allyson Bremer, Eric J. Silberfein, Todd K. Rosengart, Bradford G. Scott\*

Michael E. DeBakey Department of Surgery, Baylor College of Medicine, Houston, TX, 77030-3411, USA

### ARTICLE INFO

#### Article history:

Received 22 March 2018  
Received in revised form  
20 December 2018  
Accepted 31 December 2018

Parts of this work were presented on April 19, 2017 as an oral presentation at the 2017 Association of Program Directors in Surgery Annual Meeting in San Diego, California.

#### Keywords:

Duty hours  
Work hours  
Tracking  
Self-reporting  
Resident education

### ABSTRACT

**Background:** Implementation of resident duty hour policies has resulted in a need to document work hours accurately. We compared the number of self-reported duty hour violations identified through an anonymous, resident-administered survey to that obtained from a standardized, ACGME-sanctioned electronic tracking system.

**Methods:** 10 cross-sectional surveys were administered to general surgery residents over five years. A resident representative collected and de-identified the data.

**Results:** A median of 54 residents (52% male) participated per cohort. 429 responses were received (79% response rate). 111 violations were reported through the survey, while the standardized electronic system identified 76, a trend significantly associated with PGY-level ( $p < 0.001$ ) and driven by first-year residents ( $n = 81$  versus 37,  $p = 0.001$ ).

**Conclusions:** An anonymous, resident-run mechanism identifies significantly more self-reported violations than a standardized electronic tracking system alone. This argues for individual program evaluation of duty hour tracking mechanisms to correct systematic issues that could otherwise lead to repeated violations.

© 2019 Elsevier Inc. All rights reserved.

### Introduction

The 2003 and 2011 Common Program Requirements enumerated by the Accreditation Council for Graduate Medical Education (ACGME) marked a paradigm shift in resident education.<sup>1–3</sup> Though the policies strove to improve resident well-being and patient safety, outcomes and subjective perceptions of the duty hour restrictions have been mixed.<sup>4–10</sup> After the Flexibility in Duty Hour Requirements for Surgical Trainees (FIRST) trial prospectively studied these issues and found no significant difference in patient outcomes, the ACGME revised the requirements, in part reflecting these results.<sup>10,11</sup>

As the topic of duty hours becomes increasingly important, it is critical for surgical residency programs to accurately track their residents' work hours in order to modify clinical rotations and

maximize resident training experiences within the confines of work hour restrictions. Many programs across the country depend on some form of self-reporting to monitor work hours.<sup>12–14</sup> Some studies have found self-reporting to be as accurate as objective data gathered from electronic medical records,<sup>15</sup> swiping in and out of hospitals,<sup>16</sup> and time-stamped parking data.<sup>17</sup> Others, however, have shown that residents tend to underreport their duty hours to program directors and have highlighted the inaccuracy of current reporting mechanisms.<sup>18,19</sup>

As a result, priority should be placed on developing more accurate and informative duty hour tracking methodologies. Though manual and electronic self-reporting strategies have been described, a novel, resident-driven methodology may represent a system by which more complete data can be obtained. The objective of this study was to compare the number of duty hour violations identified by a single institution's standardized electronic tracking system to that identified by an anonymous, resident-administered survey.

\* Corresponding author. Baylor College of Medicine, Office of Surgical Education, One Baylor Plaza, Suite 404D, Houston, TX, 77030-3411, USA.

E-mail addresses: [zamani@bcm.edu](mailto:zamani@bcm.edu) (N. Zamani), [scchildr@bcm.edu](mailto:scchildr@bcm.edu) (S.C. Fallon), [allyson.bremer@bcm.edu](mailto:allyson.bremer@bcm.edu) (A. Bremer), [ejs@bcm.edu](mailto:ejs@bcm.edu) (E.J. Silberfein), [todd.rosengart@bcm.edu](mailto:todd.rosengart@bcm.edu) (T.K. Rosengart), [bgscott@bcm.edu](mailto:bgscott@bcm.edu) (B.G. Scott).

## Material and methods

### Anonymous survey and study subjects

To identify ACGME duty hour policy violations, the Michael E. DeBakey Department of Surgery implemented a periodic, resident-administered, anonymous survey of the general surgery resident cohort, starting in April 2013. The voluntary survey has been developed collaboratively between residents and department leadership. Though the survey items have been iteratively revised, the most recent version includes the core questions that have been consistently asked since the 2012–13 academic year (Table 1).

A given resident has traditionally been charged with maintaining the survey, administering it periodically through institutional email, and compiling the data in a completely de-identified, aggregate format before reporting the results to program leadership. In this manner, no identifiable resident information was available to department faculty or administration. For statistical purposes, individual, resident-level data was also tracked during a five-month period from July–November 2016 in which both resident names and the number of duty hour violations they respectively reported through each tracking system were recorded. Regardless of whether or not resident names were documented for statistical purposes, this did not change the anonymous, de-identified nature in which the data was presented to the department for review. The resident body was assured of this anonymity and encouraged to report their work-related violations accurately. The data was directly compared against duty hour reports generated through E\*Value (MedHub; Minneapolis, MN), a standardized electronic tracking system also utilized by other institutions.

The anonymous survey was administered to clinically active general surgery and preliminary residents between 4/2013 and 11/2016. The primary outcome of interest was the total number of self-reported duty hour violations captured by both the anonymous survey as well as the standardized electronic tracking system. Our program has traditionally identified and confirmed a significant number of false positive violations through the standardized system specifically related to having an average of one day off per week. Therefore, all data related to this violation category was excluded. The study protocol was approved by the Baylor College of Medicine Institutional Review Board.

### Statistical analysis

Data distributions were plotted and visualized. Variables that were not normally distributed were described using medians and interquartile ranges (IQR). The numbers of duty hour violations were reported as counts, with significant differences among binary groups reported using the Pearson chi-square test or the Fisher exact test. The association between the proportions of individuals

reporting duty hour violations was analyzed with a two-sample test for binomial proportions for matched-pair data (McNemar's test), and the reproducibility of the two tracking methods was formally assessed using Cohen's kappa statistic. A two-tailed  $p$ -value  $<0.05$  was considered statistically significant. All analyses were performed using Intercooled Stata version 14.2 (StataCorp; College Station, TX).

## Results

### Resident cohort and survey response rates

The study spanned five academic years, with a median of 54 residents per year (52% male), including nearly 15 (28%) preliminary residents in each cohort (Table 2). In total, 10 surveys were administered to the resident body, gathering data from a total of 20 individual months. The time periods of each survey are delineated in Table 3. As the institution mandates full resident participation in the standardized electronic tracking system, participation through this method was 100%. Of 543 possible survey responses, 429 responses were received, making the overall resident response rate to the voluntary duty hour survey 79%.

### Aggregate-level data

The survey identified a greater number of duty hour violations ( $n = 111$ ) as compared to the standardized electronic system ( $n = 76$ ), a difference significantly associated with resident training level ( $p < 0.001$ , Table 4). When stratified by PGY-level, this difference is primarily attributed to greater reporting by first-year residents ( $n = 81$  vs  $n = 37$ ,  $p = 0.001$ ). Junior-level categorical residents (PGY2–3), however, had a higher propensity to report violations through the standardized electronic system instead.

By tracking the rate of monthly duty hour violations among all residents over time, there has been an overall decrease in the number of reported violations since the 2014–15 academic year (Fig. 1). Based on the standardized electronic tracking system, violations decreased from 7 violations per month among all residents in 2014–15, to 3.6 in the 2016–17 academic year. Though the anonymous survey also captured this trend, it consistently identified more violations per month, decreasing from an average of 8 violations per month to 4.4 over the same time period.

### Resident-level data

A series of individual-level data was collected by the last two surveys administered between July–November 2016. Data prior to this time period was collected only as aggregate counts without recording resident identities. From July–November 2016, however, rather than looking at entire PGY-levels, the unit of analysis was the

**Table 1**  
Survey items designed to identify duty hour violations among general surgery residents.

Item	Question
1)	Service name and hospital:
2)	Did you exceed duty hour restrictions during that rotation? (yes or no)
3)	If so, what was the circumstance of the violation? - >80 h (hrs) per week - <4 days off averaged per 4-week period - Exceeded maximum shift length (>16 h for interns, >24 h for all other residents) - <8 h off between shifts - More than 6 consecutive nights
4)	If you exceeded duty hours, was action taken to correct the situation or improve the rotation while you were on service?
5)	If you exceeded duty hours, is there a fundamental problem with the rotation that will make this a recurrent issue?
6)	Any suggestions to improve the service? Any other comments?

**Table 2**

Residents participating in the survey across each academic year.

Academic Year	Preliminary Residents	Categorical PGY1	Total PGY1	PGY2	PGY3	PGY4	PGY5	Total
2012–2013	11	8	19	10	8	7	7	51
2013–2014	16	7	23	8	8	7	8	54
2014–2015	14	8	22	9	9	7	7	54
2015–2016	15	7	22	8	8	8	7	53
2016–2017	18	8	26	9	8	8	7	58
OVERALL, Median (IQR)	15 (14–16)	8 (7–8)	22 (22–23)	9 (8–9)	8 (8–9)	7 (7–8)	7 (7–8)	54 (53–54)

individual resident. The number of violations reported by each resident and the mechanism each used to report those violations was documented. As an individual resident participated in both the anonymous survey as well as the standardized electronic system, each served as his/her own control for the purposes of a matched-pairs analysis.

The surveys spanned five months, accounting for 18 (24%) of the duty hour violations identified by the standardized electronic system, and 22 violations (20%) identified by the survey. With respect to the standardized tracking system, 10 violations (55%) were attributed to exceeding the 80-h work week, 7 (39%) related to having less than 8 h between consecutive shifts, and 1 (6%) was due to exceeding shift length limits. On the other hand, of the 22 violations identified by the anonymous survey, 12 (55%), 4 (18%) and 6 (27%) were attributed to these respective causes. Overall, regarding the total number of violations identified, there was 76% agreement between the two tracking methods with a kappa statistic of 0.43.

The 18 violations identified by the standardized electronic system were reported by 13 unique residents, while 19 residents accounted for the 22 violations described by the survey. Matched-pairs analysis revealed a trend toward significance with respect to the difference between the proportion of residents that self-report duty hour violations among the two methods (exact  $p = 0.092$ ).

## Discussion

Since the implementation and subsequent iterations of the ACGME duty hour policies,<sup>1–3,11</sup> an increased need to accurately monitor resident duty hours has emerged. Though literature has revealed complex relationships between maintaining duty hour standards and truthfully reporting hours worked,<sup>20</sup> self-reporting mechanisms have been considered accurate by some when compared against objective data approximating the amount of time residents spend at work.<sup>15–17</sup> Clearly, however, self-reported data is far from perfect as it is prone to recall and selection bias that can either under- or overestimate the true number of hours worked.<sup>13,14,19,21</sup> This study aimed to identify a method by which more complete and accurate self-reported data can be collected.

Only two of the studies discussed here explicitly indicated that duty hour data was reported in a de-identified manner.<sup>13,17</sup> By using a resident-run survey in which only anonymous, de-identified data is presented to program leadership, this study has shown that such a resident-maintained initiative performs well when compared to a standardized electronic system with respect to participation, the number of violations identified, as well as the proportion of individual residents that report exceeding duty hour limits. The survey itself was brief, asked only essential questions, and was able to generate more useful information than a standardized time tracking mechanism. Further, it was easily administered via institutional email, only required 2–3 periodic reminders to the resident cohort, and resulted in a respectable overall response rate of 79%.

The fact that one of the residents' own peers is responsible for collecting and de-identifying the results instills a level of trust and confidence into the system that assists in capturing a 26% violation rate (111/429), as compared to 14% (76/543) through the standardized system (Table 4). This is consistent with prior literature indicating that up to 50% of residents intentionally underestimate their hours worked,<sup>18</sup> a figure that may be partly explained by an underlying fear of retaliation. This same concern has similarly been linked to decreased self-reporting rates of medical errors<sup>22</sup> and was anecdotally found to be the case in this resident cohort. Interestingly, confidence in the fact that the survey was truly anonymous seemed to be more important to first-year residents, a perception that may explain the significantly higher reporting by this cohort. However, given that junior categorical residents (PGY2–3) appear to prefer reporting adherence through the standardized tracking system, the role of the anonymous survey may be seen as a valuable adjunct to current tracking methods.

Though the number of violations captured by PGY-level significantly differs among the two tracking systems, they remain similar in several important ways. Of the violations identified, both methods reveal that the majority of violations are related to exceeding the 80-h work week. Similar to the results reported here, the FIRST trial indicates that interns are also more likely to report these types of violations in the setting of flexible duty hour

**Table 3**

Administration of the duty hour survey and subsequent response rates.

Survey Number	Time period	Number of Months (n)	Survey Respondents (n)	SETS Respondents (n)	Survey Response Rate
1	Apr–May 2013	2	50	51	0.98
2	Aug 2013	1	40	54	0.74
3	Sept 2013	1	41	54	0.76
4	Oct–Nov 2013	2	45	54	0.83
5	Dec 2013–Feb 2014	3	36	54	0.67
6	Sept 2014	1	41	54	0.76
7	July–Aug 2015	2	39	53	0.74
8	Sept–Nov 2015	3	37	53	0.70
9	July–Aug 2016	2	53	58	0.91
10	Sept–Nov 2016	3	47	58	0.81
<b>TOTAL</b>	<b>Apr 2013 – Nov 2016</b>	<b>20</b>	<b>429</b>	<b>543</b>	<b>0.79</b>

Abbreviation: SETS – standardized electronic tracking system.

**Table 4**  
Duty hour violations identified over a 20-month period by PGY-level across both tracking systems.

PGY-Level	Survey, n (%)	SETS, n (%)	Total	p-value
1	81 (69)	37 (31)	118	<b>0.001</b>
2	6 (38)	10 (62)	16	0.063
3	6 (22)	21 (78)	27	<b>&lt;0.001</b>
4	12 (67)	6 (33)	18	0.507
5	6 (75)	2 (25)	8	0.476
<b>TOTAL</b>	<b>111 (59)</b>	<b>76 (41)</b>	187	<b>&lt;0.001</b>

Abbreviation: SETS – standardized electronic tracking system.

requirements.<sup>23</sup> This has significant implications considering the ACGME's recent revision of the Common Program Requirements allowing interns to adopt the 28-h duty period limit as of the 2017-18 academic year.<sup>11</sup>

Additionally, both the survey and the standardized electronic system reveal overall similar downward trends in duty hour violations since the 2014-15 academic year (Fig. 1). Interestingly, the survey continued to identify a greater rate of monthly violations as compared to the standardized system throughout this time period. This increased sensitivity may be due to the resident body's confidence in the ability of the survey to keep their responses and comments anonymous.

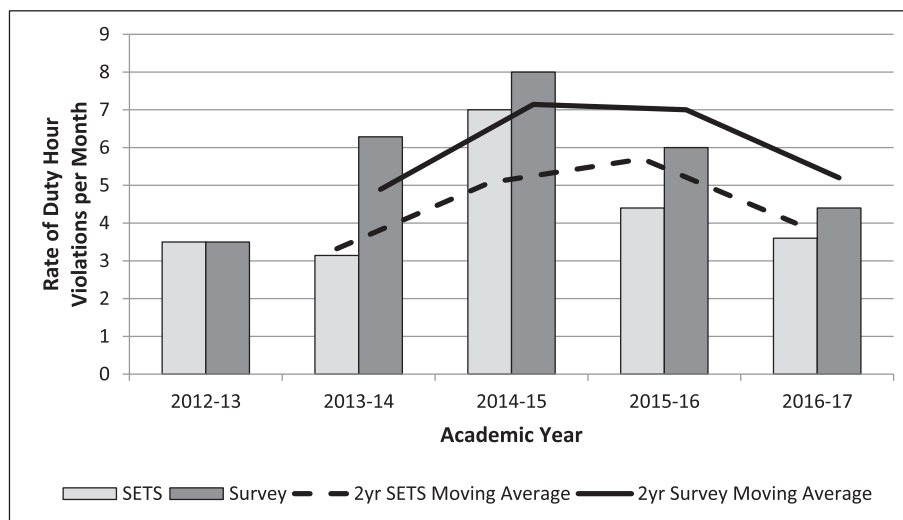
Further, the steady decrease in duty hour violations observed over time is attributed to a number of interventions that have been implemented based on the comments obtained through the anonymous survey. To illustrate, daily schedules are no longer made by program leadership, but have rather been delegated to senior residents on service who are better able to create schedules that maximize resident productivity while maintaining compliance with work hour policies. Also, the number of mid-level providers has been significantly expanded in order to increase day-to-day workflow efficiency. Further, by having consistent resident representation at monthly education meetings, residents have a direct method of voicing concerns regarding rotation schedules. These efforts effectively combine to promote a culture of trust and collaboration between residents, program administration, and department leadership.

There are several limitations that must also be discussed. Given

the retrospective nature of the survey, recall bias may influence residents' abilities to accurately report duty hour violations. Its voluntary nature also invites selection bias with respect to the residents that choose to participate. *Post hoc* power analysis with our total number of observations and a two-sided alpha level of 0.05 indicates that the study was able to detect a 7% difference in duty hour violation rates with a power of 80%. Though this is adequate for our primary outcome of interest, the study was underpowered to detect subtler differences that may be present among smaller PGY strata. Further, given our historically high rate of false positives from the standardized system regarding days off per week, this violation category was excluded from the analysis. Additionally, as survey responses are documented and reported in an aggregate manner to ensure resident confidentiality, individual-level data was only available for the last five months of the study, as previously described. Therefore, each violation reported prior to the 2016-17 academic year was treated as an independent event.

The self-reporting aspect of both tracking systems assessed in this study may result in either under- or overestimations of the true rate of duty hour violations. However, this likely affects the survey to a lesser degree as its results are reported in an anonymous manner which eliminates the potential for the fear of retaliation from truthful reporting. Also, standardized electronic systems are in some ways more prone to differential misclassification bias since residents can easily click their way through the program and even record hours months in advance. Conversely, as the survey includes open-ended items, residents are actively engaged in the quality improvement process.

As the newly revised ACGME duty hour policies continue to emphasize physician well-being,<sup>11</sup> future work includes incorporating wellness and quality-of-life items into the survey. Data from future surveys will continue to be used in the persistent effort to improve existing rotations while simultaneously designing new educational experiences for both junior and senior-level residents. Even though this tracking mechanism cannot be used to address individual residents because of its anonymous nature, the PGY-level specific data can be used to facilitate collaborative discussions regarding improvements with respective residency classes. Interestingly, the application of this self-reporting quality improvement system also has application beyond the scope of duty hours. To



Abbreviation: SETS – standardized electronic tracking system

**Fig. 1.** Rate of monthly duty hour violations over five academic years with overlying two-year moving averages. Abbreviation: SETS – standardized electronic tracking system.

address and improve medical errors, for example, such an anonymous, survey-based initiative can easily be implemented across an institution to better track self-reported errors and system-based issues.

## Conclusions

Surgical residency programs have the responsibility of developing novel methodologies that accurately reflect the hours worked by their residents. An anonymous, resident-driven effort to collect and present duty hours in a culture without fear of retaliation represents a practical and sustainable strategy that can engage more residents and generate more complete data than traditional electronic methods alone. This provides critical information that can be used to better inform the reorganization of resident education and patient safety.

## Conflict of interest

The authors declare they have no competing interests.

## Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Acknowledgements

The authors declare they have no competing interests.

## References

- Philibert I, Friedmann P, Williams WT. New requirements for resident duty hours. *J Am Med Assoc.* 2002;288(9):1112–1114. PubMed PMID: 12204081.
- Accreditation Council for Graduate Medical Education. Resident Duty Hours in the Learning and Working Environment: Comparison of 2003 and 2011 Standards. <https://www.acgme.org/Portals/0/PDFs/dh-ComparisonTable2003v2011.pdf>. Accessed February 7, 2018.
- ACGME Task Force on Quality Care and Professionalism. *The ACGME 2011 Duty Hour Standards: Enhancing Quality of Care. Supervision: and Resident Professional Development*; 2011. [http://www.acgme.org/Portals/0/PDFs/jgme-monograph\[1\].pdf](http://www.acgme.org/Portals/0/PDFs/jgme-monograph[1].pdf). Accessed February 7, 2018.
- Stamp T, Termuhlen P, Miller S, et al. Before and after resident work hour limitations: an objective assessment of the well-being of surgical residents. *Curr Surg.* 2005;62(1):117–121. PubMed PMID: 15708162.
- Durkin ET, McDonald R, Munoz A, Mahvi D. The impact of work hour restrictions on surgical resident education. *J Surg Educ.* 2008;65(1):54–60. PubMed PMID: 18308282.
- Lee DY, Myers EA, Rehmani SS, et al. Surgical residents' perception of the 16-hour work day restriction: concern for negative impact on resident education and patient care. *J Am Coll Surg.* 2012;215(6):868–877. PubMed PMID: 23040454.
- Drolet BC, Sangisetty S, Tracy TF, Cioffi WG. Surgical residents' perceptions of 2011 accreditation Council for graduate medical education duty hour regulations. *JAMA Surg.* 2013;148(5):427–433. PubMed PMID: 23677406.
- Ahmed N, Devitt KS, Keshet I, et al. A systematic review of the effects of resident duty hour restrictions in surgery: impact on resident wellness, training, and patient outcomes. *Ann Surg.* 2014;259(6):1041–1053. PubMed PMID: 24662409. Pubmed Central PMCID: PMC4047317.
- Harris JD, Staheli G, LeClere L, et al. What effects have resident work-hour changes had on education, quality of life, and safety? A systematic review. *Clin Orthop Relat Res.* 2015;473(5):1600–1608. PubMed PMID: 25269530. Pubmed Central PMCID: PMC4385350.
- Bilimoria KY, Chung JW, Hedges LV, et al. National cluster-randomized trial of duty-hour flexibility in surgical training. *N Engl J Med.* 2016;374(8):713–727. PubMed PMID: 26836220.
- Accreditation Council for Graduate Medical Education. ACGME Common program requirements: section VI with background and intent. [http://www.acgme.org/Portals/0/PFAssets/ProgramRequirements/CPRs\\_Section%20VI\\_with-Background-and-Intent\\_2017-01.pdf](http://www.acgme.org/Portals/0/PFAssets/ProgramRequirements/CPRs_Section%20VI_with-Background-and-Intent_2017-01.pdf); 2017. Accessed February 7, 2018.
- Chang LW, Vidyarthi AR, Kohlwees RJ. Baseline duty hours recorded with timecards: a pre-regulation study of internal medicine residents. *Med Educ.* 2006;40(7):662–666. PubMed PMID: 16836539.
- Buum HA, Duran-Nelson AM, Menk J, Nixon LJ. Duty-hours monitoring revisited: self-report may not be adequate. *Am J Med.* 2013;126(4):362–365. PubMed PMID: 23507207.
- Gilleland M, Komis K, Chawla S, et al. Resident duty hours in the outpatient electronic health record era: inaccuracies and implications. *J Grad Med Educ.* 2014;6(1):151–154. PubMed PMID: 24701327. Pubmed Central PMCID: PMC3963775.
- Shine D, Pearlman E, Watkins B. Measuring resident hours by tracking interactions with the computerized record. *Am J Med.* 2010;123(3):286–290. PubMed PMID: 20193841.
- Todd SR, Fahy BN, Paukert JL, et al. How accurate are self-reported resident duty hours? *J Surg Educ.* 2010;67(2):103–107. PubMed PMID: 20656607.
- Chadaga SR, Keniston A, Casey D, Albert RK. Correlation between self-reported resident duty hours and time-stamped parking data. *J Grad Med Educ.* 2012;4(2):254–256. PubMed PMID: 23730452. Pubmed Central PMCID: PMC3399623.
- Carpenter RO, Spooner J, Arbogast PG, et al. Work hours restrictions as an ethical dilemma for residents: a descriptive survey of violation types and frequency. *Curr Surg.* 2006;63(6):448–455. PubMed PMID: 17084777.
- Gonzalo JD, Yang JJ, Ngo L, et al. Accuracy of residents' retrospective perceptions of 16-hour call admitting shift compliance and characteristics. *J Grad Med Educ.* 2013;5(4):630–633. PubMed PMID: 24455013. Pubmed Central PMCID: PMC3886463.
- Szymczak JE, Brooks JV, Volpp KG, Bosk CL. To leave or to lie? Are concerns about a shift-work mentality and eroding professionalism as a result of duty-hour rules justified? *Milbank Q.* 2010;88(3):350–381. PubMed PMID: 20860575. Pubmed Central PMCID: PMC3000931.
- Saunders DL, Kehoe KC, Rinehart VH, Berg BW. Self-reporting of internal medicine house staff work hours. *Hawaii Med J.* 2005;64(1):14–16. PubMed PMID: 15751754.
- Krouss M, Alshaiikh J, Croft L, Morgan DJ. Improving incident reporting among physician Trainees. *J Patient Saf.* 2016;1–3. PubMed PMID: 27617963. Pubmed Central PMCID: PMC5344764.
- Bilimoria KY, Quinn CM, Dahlke AR, et al. Use and underlying reasons for duty hour flexibility in the flexibility in duty hour requirements for surgical Trainees (FIRST) trial. *J Am Coll Surg.* 2017;224(2):118–125. PubMed PMID: 27884805.



Reproduced with permission of copyright owner. Further reproduction prohibited without permission.