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ORIGINAL PAPER

# Automated Emails to Improve Evening Staffing for Anesthesiologists

Amy C. Robertson[1] · Yaping Shi[2] · Matthew S. Shotwell[2] · Leslie C. Fowler[1] · Vikram Tiwari[1,2,3] · Robert E. Freundlich[1,3]

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## Abstract

Scheduling flexibility and predictability to the end of a clinical workday are strategies aimed at addressing physician burnout. A voluntary relief shift was created to increase the pool of anesthesiologists providing end of the day relief. We hypothesized that an automated email reminder would improve the number of evening relief shifts filled and increase the number of anesthesiologists participating in the program. An automated email reminder was implemented, which selectively emailed anesthesiologists without a clinical assignment one day in advance when the voluntary relief shifts were not filled, and anticipated case volume past 4:00 PM was expected to exceed the capacity of the on-call team. After implementation of the automated email reminder, the median number of providers who worked the relief shift on a typical day was 2.6, compared to 1.75 prior to the intervention. After the initial increase in the number of volunteers post-intervention, the trend in the weekly average number of volunteers tended to decrease but remained higher than before the intervention. A total of 22 unique anesthesiologists chose to participate in this program after the intervention. An automated email reminder increased the number of anesthesiologists volunteering for a relief shift. Leveraging automation to match staffing needs with case volume allows for recruitment of additional personnel on the days when volunteers are most needed. Increasing the pool of anesthesiologists available to provide relief is one strategy to improve end of the day predictability and work-life balance.

**Keywords** Scheduling · Operating room staffing · Automated email · Physician burnout

## Introduction

The lifetime risk of burnout for anesthesiologists is approximately 50% [1–3]. Working more than 40 h per week has been reported to be an independent risk factor for burnout among anesthesiologists in the United States [2]. Lack of control over scheduling is also associated with decreased physician job satisfaction and burnout [4]. Therefore, organizational-based strategies aimed at improved scheduling flexibility and predictability in hours worked are critical to addressing this important issue [1, 5].

To create a more predicable finish time for anesthesiologists working in the operating room, a voluntary evening relief shift was implemented. The primary intent of the shift was to increase the pool of anesthesiologists providing end of the day relief to those not on the call team, with the goal of all non-call physicians receiving relief by 5:00 PM and thus having a more predictable finish time to their clinical workday. Any anesthesiologist not assigned to a clinical role on a given day had the ability to participate in this program. As opposed to our traditional overtime compensation, beginning at 5:00 PM, anesthesiologists were incentivized by receiving overtime pay starting at 4:00 PM for this relief shift plus an additional stipend for volunteering.

One of the major challenges proved to be the variability in the number of shifts filled on a day-to-day basis, with some days having no volunteers, while other days filling the maximum number of shifts. To address this, an automated email reminder was created. This email reminder

✉ Amy C. Robertson
Amy.robertson@vumc.org

[1] Department of Anesthesiology, Vanderbilt University Medical Center, The Vanderbilt Clinic, 1301 Medical Center Dr, 4648, 37232-5614 Nashville, TN, USA

[2] Department of Biostatistics, Vanderbilt University School of Medicine, Nashville, TN, USA

[3] Department of Biomedical Informatics, Vanderbilt University Medical Center, Nashville, TN, USA

was selectively sent one day in advance to anesthesiologists who did not have a clinical assignment when the shifts were not filled and anticipated case volume past 4:00 PM was expected to exceed the capacity of the on-call team.

We hypothesized that an automated email reminder would improve the number of evening relief shifts filled, as well as increase the number of anesthesiologists in our department participating in the incentive program.

## Methods

This study was approved by the Vanderbilt University Medical Center Human Subjects Protection Program (#201,959) with a waiver of informed consent. This manuscript adheres to the SQUIRE 2.0 (Standards for Quality Improvement Reporting Excellence) guidelines [6].

An automated job was created using structured query language (SQL) in Microsoft SQL Server Studio and set to run at 7:00 AM every Sunday through Thursday. First, the number of surgeries that would still be in progress at 4:00 PM the next day was estimated from case schedules. On days when this number would equal or exceed 16 (the maximum number of cases that can be performed by the on-call providers), a second query was performed, accessing data from the electronic scheduling system (OpenTempo, Burlington, Vermont) to identify anesthesiologists without a clinical assignment the next day. Scheduled roles for these physicians included academic or administrative time, educational leave, vacation, and post-call. Next, an automated email was sent to available anesthesiologists, offering them the opportunity of working in the operating room starting at 4:00 PM (budgeted for four positions per day Monday through Thursday and two positions on Friday). These positions were filled by the first respondents. Overbooking beyond the budgeted positions was occasionally allowed at the discretion of department leadership.

### Statistical Analysis

Data was summarized at week-level and day-level using median (interquartile range [IQR]: 25th, 75th percentile) for continuous variables and frequency (percentage) for categorical variables. For each variable we calculated the average value across the week (Monday through Friday) and defined it as the data on a "typical" day (i.e., the week-level data). Descriptive statistics stratified by whether the automated email started on October 22, 2020 were reported.

To examine whether the odds of filling more slots changed after implementing the automated email we fit a proportional odds logistic model on the number of anesthesiologists volunteering to work the shift [7]. We included a time (in days) by intervention (an indicator of whether the automated email started) interaction in the model to take care of the potential secular time trend. The nonlinear effect of time was examined using the restricted cubic spline with 3 knots (the 10th, 50th, 90th percentiles as default knot locations). A chunk test of the nonlinear interaction effect was performed. Weekday (Monday through Friday) may be associated with different staffing and therefore was considered for adjustment. The effect estimates using the odds (odds ratio, 95% confidence interval [CI], p value) of greater number of providers filling slots was reported. All statistical analyses were implemented using the statistical software package "R" version 3.6.3 (http://www.r-project.org) and package "rms" [8, 9].

**Table 1** Characteristics on a typical day of the week summarized before and after the automated email started on October 22, 2020

| Characteristics | N | Automated Email | | | Overall n=68 |
|---|---|---|---|---|---|
| | | Pre n=40 | Initial Post n=14 | Final Post n=14 | |
| Number of shifts available on a typical day | 68 | 3.5 (3.5, 3.6) | 3.6 (3.6, 3.6) | 3.6 (3.6, 3.6) | 3.6 (3.5, 3.6) |
| Number of shifts filled by providers prior to the email being sent* | 26 | - | 1.8 (1.6, 2.2) | 1.2 (1.2, 1.4) | 1.4 (1.2, 2.0) |
| Number of remaining shifts not filled prior to the email being sent* | 22 | - | 1.6 (1.6, 1.8) | 2.3 (2.3, 2.4) | 2.0 (1.7, 2.4) |
| Number of additional shifts filled by providers after the email reminder being sent* | 26 | - | 1.0 (0.6, 1.4) | 1.0 (0.6, 1.2) | 1.0 (0.6, 1.4) |
| Number of providers who actually worked the shifts | 68 | 1.8 (1.3, 2.2) | 2.9 (2.6, 3.2) | 2.1 (2.0, 2.6) | 2.0 (1.6, 2.8) |

For each variable we calculated the average value across the week (Monday through Friday) and defined it as the data on a "typical" day of the week. There were 68 weeks in the study period. Data were summarized using Median (25th, 75th percentile) for continuous variables, and frequency (percentage) for categorical variables

N is the number of non-missing values

Initial Post: 10/22/2020–01/24/2021

Final Post: 01/25/2021–04/28/2021

* These variables were collected after the automated email started. Therefore, no data was available in 'Pre' study period

## Results

Table 1 shows week-level data summaries of available slots, number of slots filled prior to and after the email being sent, number of providers who actually worked the shift and new providers participating before and after implementing the automated email. We consider data as descriptive on a 'typical' day or an 'average' day in a week by averaging it across

**Table 2** Characteristics summarized at day-level stratified by whether the automated email was sent on that day

| Characteristics | N | Email Status | | Overall n = 283 |
|---|---|---|---|---|
| | | Email Sent n = 82 | No Email Sent n = 201 | |
| Email sent to leadership only, n (%) | 283 | 0 (0%) | 22 (11%) | 22 (7.8%) |
| Study period, n (%) | 283 | | | |
| Pre | | 0 (0%) | 152 (76%) | 152 (54%) |
| Post | | 82 (100%) | 49 (24%) | 131 (46%) |
| Number of available shifts, n (%) | 283 | | | |
| 2 | | 0 (0%) | 59 (29%) | 59 (21%) |
| 4 | | 82 (100%) | 142 (71%) | 224 (79%) |
| Number of shifts filled by providers prior to the email being sent* | 130 | 1.0 (1.0, 2.0) | 2.0 (1.0, 2.0) | 2.0 (1.0, 2.0) |
| Number of remaining shifts not filled prior to the email being sent* | 124 | 2.0 (2.0, 3.0) | 0.0 (0.0, 3.0) | 2.0 (1.0, 3.0) |
| Number of additional shifts filled by providers after the email reminder being sent* | 130 | 1.0 (1.0, 2.0) | 0.0 (0.0, 0.0) | 1.0 (0.0, 2.0) |
| Number of providers who actually worked the shifts | 283 | 3.0 (2.0, 4.0) | 2.0 (1.0, 2.0) | 2.0 (1.0, 3.0) |
| Number of anticipated cases running late* | 124 | 23.0 (19.0, 26.0) | 16.5 (14.0, 22.8) | 21.0 (18.0, 26.0) |
| Anticipated cases running late*, categorical, n (%) | 124 | | | |
| 16 and above | | 82 (100%) | 22 (52%) | 104 (84%) |
| Below 16 | | 0 (0%) | 20 (48%) | 20 (16%) |
| Number of new participants*, n (%) | 130 | | | |
| 0 | | 62 (77%) | 46 (94%) | 108 (83%) |
| 1 | | 19 (23%) | 3 (6.1%) | 22 (17%) |

Data were summarized using Median (25th, 75th percentile) for continuous variables, and frequency (percentage) for categorical variables

N is the number of non-missing values

* These variables were collected after the automated email started. Therefore, no data was available in 'Pre' study period

weekdays (Monday through Friday). In general, there were four slots available on Monday through Thursdays and two slots available on Fridays. The median number of available slots was 3.6 overall. After the automated email started on October 22, 2020, the median number of slots filled before sending email on a 'typical' day was 1.4 (IQR: 1.2, 2.0), the median number of additional slots filled after sending email was 1.0 (IQR: 0.6, 1.4). The median number of anesthesiologists who actually worked the shift on a 'typical' day was 1.8 (IQR: 1.3, 2.2) before intervention, and 2.6 (IQR: 2.2, 3.1) after the intervention. A total of 22 unique anesthesiologists chose to participate in this incentive program after implementation of an automated email reminder.

Among 131 workdays after the automated email started, there were 104 days with greater than 15 anticipated cases running late, and 82 days with greater than 15 anticipated cases running late, and slots incompletely filled. An email was sent in these 82 days. The median number of shifts filled was 2 (IQR: 1, 2) on 'No Email Sent' days and 1 (IQR: 1, 2) on 'Email Sent' days before sending email. The median number of additional shifts filled after sending email on 'Email Sent' days was 1 (1, 2). The median number of anesthesiologists who worked the shifts was 2 (IQR: 1, 2) on 'No Email Sent' days, and 3 (IQR: 2, 4) on 'Email Sent' days (Table 2).

The week-level average number of providers who actually worked the shift over time is depicted in Fig. 1. Each dot represents number of providers worked the shift on a 'typical' day in a week, and the color scale denotes the email intensity in a week where we defined it as the number of weekdays automated email was triggered and sent divided by the total number of weekdays in a week. The average number of providers exhibited a decreased trend before April 2020, and then began to gradually increase after June 2020. The trend kept increasing during the first 2 months after the start of the automated email and began to fall off in mid-January 2021.

In the regression analysis, there was a significant nonlinear effect of day, and a significant day by intervention (pre- versus post-email period) interaction on the odds of having greater number of providers to work the shift ($p < 0.001$). Similar to Fig. 1, a slight-U shape of the log odds of having more provides to work the shift was observed before the implementation of the automated email, while an inverse U was shown after the implementation of automated emails (Fig. 2). The odds of more providers increased during the first 2 months after intervention and then gradually declined. Wednesdays and Thursdays were significantly associated with larger number of providers who worked shifts compared to Mondays or Tuesdays ($p = 0.006$, $p = 0.001$), while no difference was observed among Mondays, Tuesdays, and Fridays (Fig. 3).

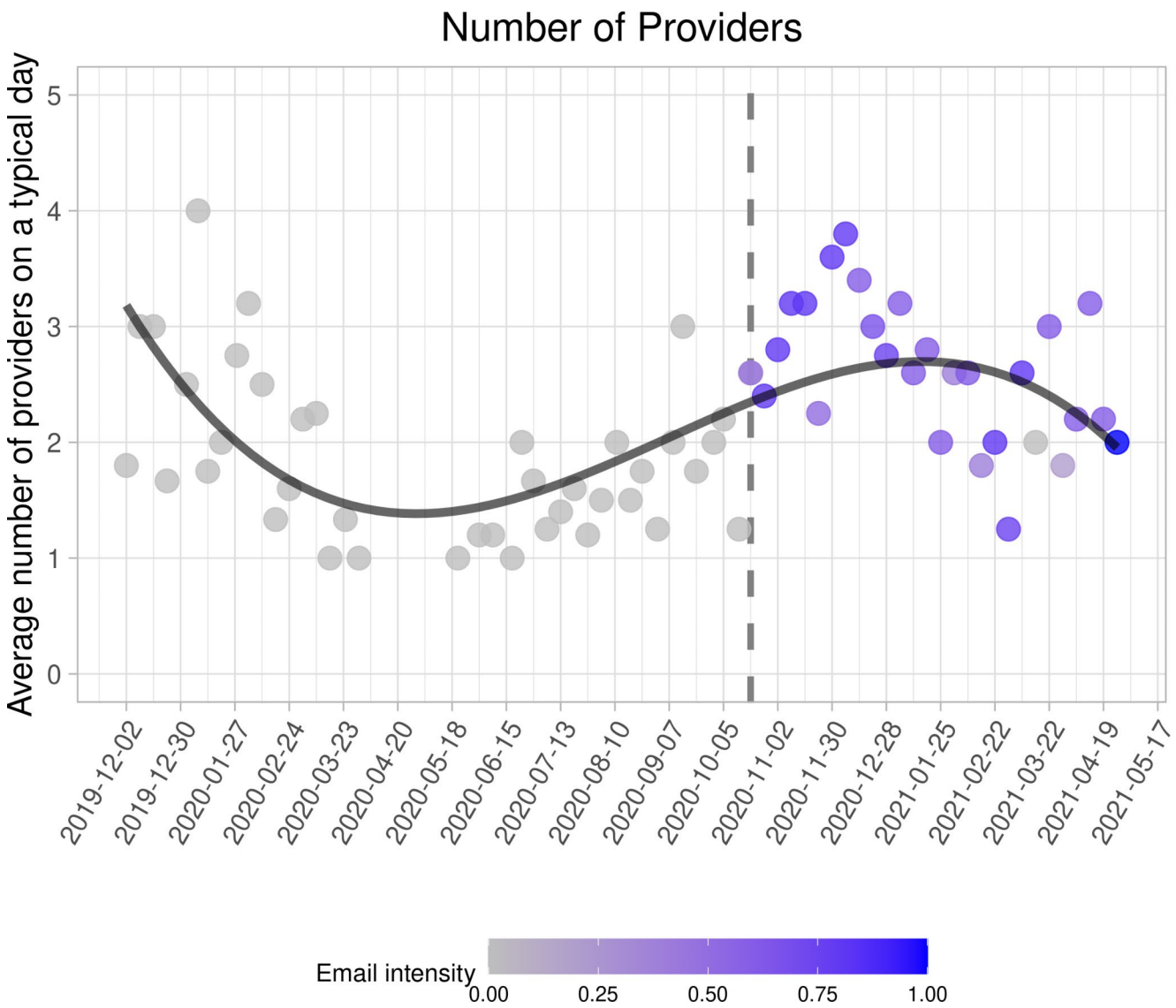


**Fig. 1** Number of providers who worked the shift estimated on a typical (or an average) day in each week over time

## Discussion

After implementation of an automated email reminder to improve evening staffing, there was an initial trend of more anesthesiologists volunteering for the evening relief shift. After the intervention, the median number who worked the relief shift on a typical day was 2.6 compared to 1.8 prior to the intervention. After the initial increase in the number of volunteers post-intervention, the trend in the weekly average number of providers did decrease but remained higher than prior to the intervention. The automated email reminder was successful in recruiting anesthesiologists to participate in this incentive program, with 22 unique anesthesiologists volunteering post-intervention.

We opted to implement the automated email reminder for several reasons. Reminders work by influencing the behavior of the recipient and providing motivation to act [10]. These nudges draw attention to a request or call to action and prompt the individual to respond [11, 12]. Timely notification is key so the individual has enough time to react without an excessive amount of time passing as memory can wane [12]. Thus, we elected to send the email reminder one day prior. Studies have shown that reminders are an effective means in changing behavior, from increasing adherence for cancer screening to compliance with appointment keeping [13, 14].

Within our department, key issues identified by an early career task force were the overall number of clinical hours worked and lack of predictability at the end of the day. These issues have implications on physician retention, and were reasons cited by several anesthesiologists who left our institution during their exit interviews. Scheduling and

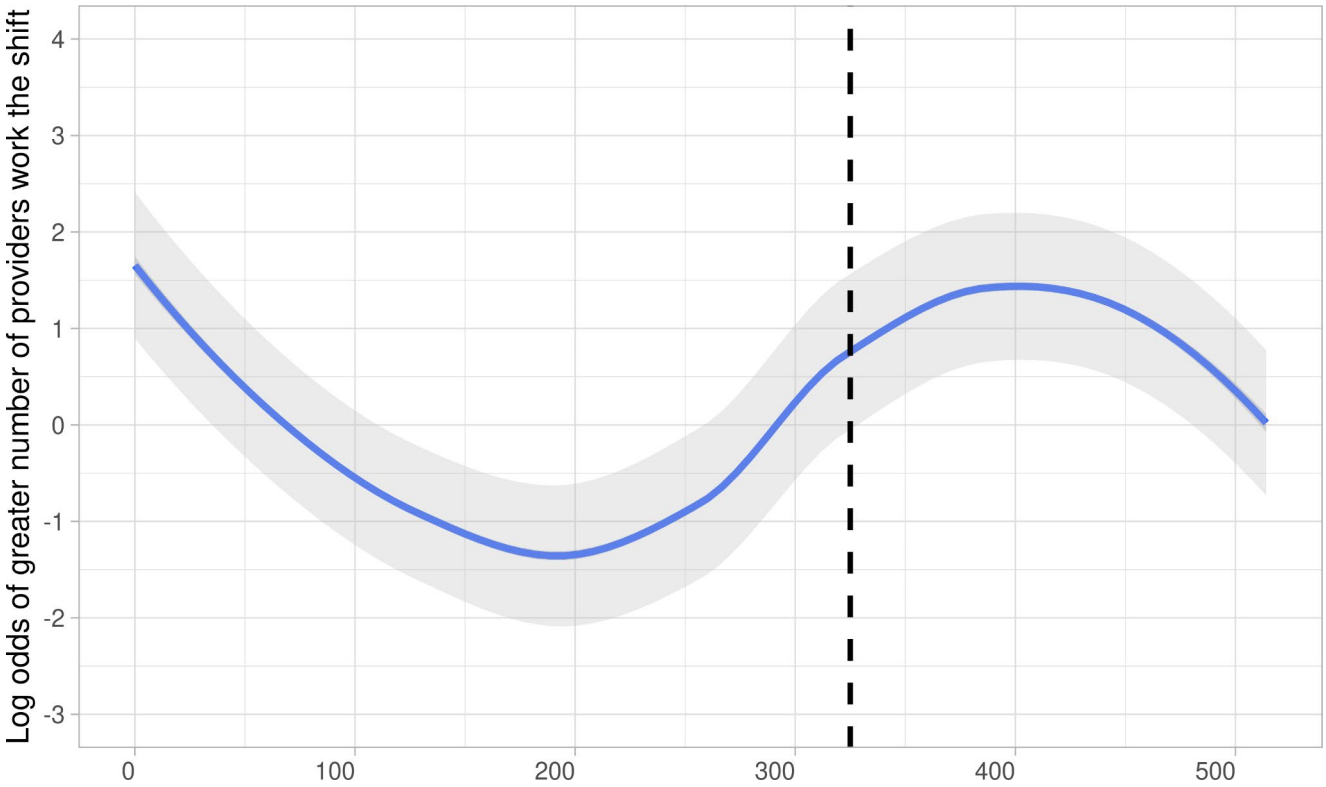


**Fig. 2** Predicted log odds and their 95% confidence bands of having more providers to work the shift over time using the proportional odds logistic model

workload have been reported to be factors associated with physician job satisfaction and retention [15–17]. As such, we felt this quality improvement project to be an important initiative to address predictability at the end of the day while also improving the overall workload and job satisfaction and retention. Our aim is to provide relief to those not on the call team no later than 5:00 PM. Increasing the pool of anesthesiologists available to provide relief is key to achieving this goal.

Working late hours when not on call can impact work-life balance and is a risk factor for burnout [2, 18]. Survey results published in 2021 reported that a reduced weekly workload (48 h or less per week) is an independent determinant of improved work-related quality of life [19]. It is often difficult to predict the completion time of a clinical day when working in the operating room, further impacting work-life balance. A study evaluating late work hours at a single institution reported the percentage of days in which anesthesiologists worked past 5:00 PM when not on call was 18% [20].

One strength of this quality improvement project is the use of an automated system to identify days when case volume would exceed the maximum number of cases for which the on-call team could provide coverage. The use of a customized automated decision support tool to improve equity in the end of the day workload and relief process for anesthesiologists and residents has been previously described [21, 22]. Leveraging automation to match staffing needs with case volume allows for recruitment on the days when volunteers are most needed.

Another strength is the potential impact on productivity and the economics of labor cost. It has been reported that 8–11% of ongoing cases after 5:00 PM are staffed by an anesthesiologist with only one operating room [23]. Decreased productivity late in the workday and increased labor cost per case are concerns often expressed by administrators. An advantage of utilizing an anesthesiologist without a clinical assignment is the potential for providing relief to two or more anesthesiologists who are covering only one operating room and thus increasing productivity and enabling more efficient use of personnel.

An important limitation is the uncertainty of the impact of the coronavirus disease 2019 (COVID-19) pandemic, as the start of the pandemic occurred during the post-intervention phase. During the initial phase of the pandemic, more physicians were performing academic and administrative work from home and may have been less inclined to volunteer. Furthermore, with a surge of COVID-19 cases, nonessential surgical case volume decreased, resulting in less need for volunteers to help with evening relief. This is suggested by the fact that there were no volunteers between April 1 and May 20, 2020.

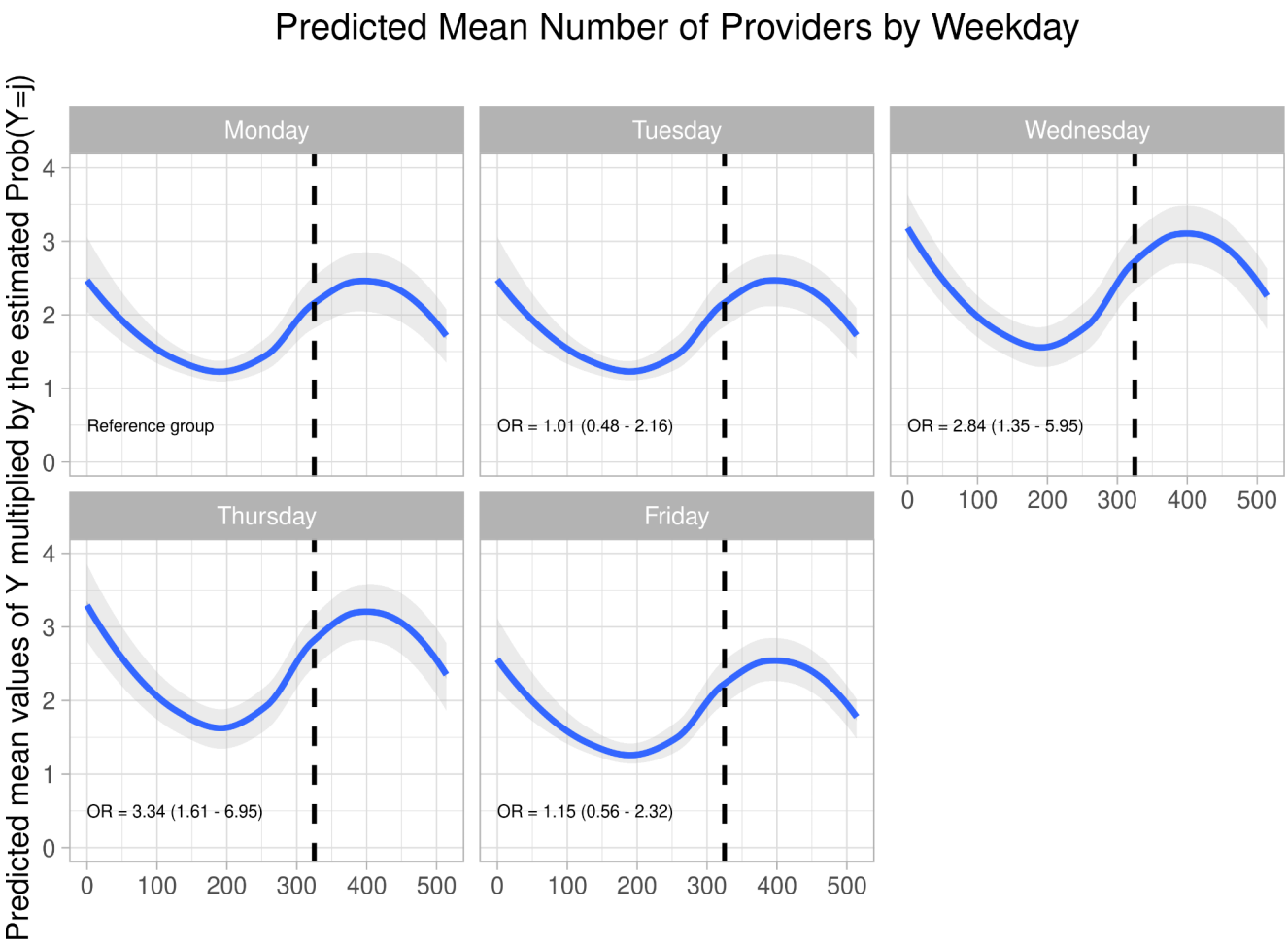


**Fig. 3** Estimated mean number of providers who worked the shift over time stratified by weekday (Monday through Friday)

Another limitation of utilizing relief personnel is the risk associated with intraoperative handovers. Various studies have demonstrated the risk of information loss and adverse outcomes with handovers [24–26]. Yet, others have reported that intraoperative are transitions are not associated with an increased risk of postoperative morbidity or mortality [27, 28]. Our project has the potential to negatively impact patient safety if it leads to unnecessary, unsafe handovers. However, our institution published a study in which intraoperative anesthesia care transitions were not associated with an increased risk of postoperative adverse outcomes, citing the impact of targeted education and the use of an electronic handover report form as safety adjuncts [27].

Finally, we did not analyze the change in clinical hours worked for those receiving relief. It must be recognized that receiving relief from the operating room by 5:00 PM does not necessarily represent the end of the workday. Anesthesiologists frequently devote time to other non-clinical commitments such as research, education, or administrative responsibilities [29].

One future direction is to effectively target emails to those most likely to participate in the incentive program while excluding those who are unlikely to volunteer. Utilizing the predicted case volume after 4:00 PM, we would like to also optimize the number of shifts per day rather than having a set number of shifts based upon the day of the week. Another future direction is to do a cost analysis of the long-term implementation of this intervention. Finally, it will also be important to determine if our incentive program could be implemented at other institutions.

Utilizing an automated email reminder increased the number of anesthesiologists volunteering for a relief shift. Increasing the pool of anesthesiologists available to provide relief is one strategy to ensure end of the day predictability and improve work-life balance. Leveraging automation to match staffing needs with case volume allows for recruitment of additional personnel on the days when volunteers are most needed.

## Abbreviations

| | |
|---|---|
| SQUIRE | Standards for Quality Improvement Reporting Excellence |
| SQL | Structured query language |
| IQR | Interquartile range |
| CI | Confidence interval |
| COVID-19 | Coronavirus disease 2019 |

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Yaping Shi MS - This author helped conceptualize the study, analyze the data, and write the manuscript.
Matthew S. Shotwell PhD - This author helped conceptualize the study, analyze the data, and write the manuscript.
Leslie C. Fowler Ed.D - This author helped write the manuscript.
Vikram Tiwari PhD - This author helped conceptualize the study and write the manuscript.
Robert E. Freundlich MD - This author helped conceptualize the study, collect data, and write the manuscript.
All authors have reviewed and approve the submitted version of the manuscript.

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## Declarations

**Conflict of Interest** Amy C. Robertson MD - No conflict of interest.
Yaping Shi MS - No conflict of interest.
Matthew S. Shotwell PhD - No conflict of interest.
Leslie C. Fowler Ed.D - No conflict of interest.
Vikram Tiwari PhD - No conflict of interest.
Robert E. Freundlich MD - stock in 3 M.

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## References

1. Sanfilippo F, Noto A, Foresta G, et al (2017) Incidence and Factors Associated with Burnout in Anesthesiology: A Systematic Review. Biomed Res Int. 2017:8648925. https://doi.org/10.1155/2017/8648925
2. Afonso AM, Cadwell JB, Staffa SJ, Zurakowski D, Vinson AE (2021) Burnout Rate and Risk Factors among Anesthesiologists in the United States. Anesthesiology 134:683–696. https://doi.org/10.1097/ALN.0000000000003722
3. Hyman SA, Card EB, De Leon-Casasola O, Shotwell MS, Shi Y, Weinger MB (2021) Prevalence of burnout and its relationship to health status and social support in more than 1000 subspecialty anesthesiologists. Reg Anesth Pain Med. 46:381–387. https://doi.org/10.1136/rapm-2020-101520
4. Glasheen JJ, Misky GJ, Reid MB, Harrison RA, Sharpe B, Auerbach A (2011) Career satisfaction and burnout in academic hospital medicine. Arch Intern Med. 171:782–785. https://doi.org/10.1001/archinternmed.2011.153
5. Romito BT, Okoro EN, Ringqvist JRB, Goff KL. (2021) Burnout and Wellness: The Anesthesiologist's Perspective. Am J Lifestyle Med. 15:118–125. https://doi.org/10.1177/1559827620911645
6. Ogrinc G, Davies L, Goodman D, Batalden P, Davidoff F, Stevens D (2016) SQUIRE 2.0 (Standards for QUality Improvement Reporting Excellence): revised publication guidelines from a detailed consensus process. BMJ Qual Saf. 25:986–992. https://doi.org/10.1136/bmjqs-2015-004411
7. Liu Q, Shepherd BE, Li C, Harrell FE (2017) Modeling continuous response variables using ordinal regression. Stat Med. 36:4316–4335. https://doi.org/10.1002/sim.7433
8. R Core Team (2020) R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. https://www.r-project.org. Accessed 1 February 2022
9. Harrell Jr, F. E. Regression Modeling Strategies (2020) https://cran.r-project.org/web/packages/rms/index.html. Accessed 1 February 2022
10. Cheung A, Weir M, Mayhew A, Kozloff N, Brown K, Grimshaw J (2012) Overview of systematic reviews of the effectiveness of reminders in improving healthcare professional behavior. Syst Rev.1:36. https://doi.org/10.1186/2046-4053-1-36
11. Thaler RH, Sunstein CR (2008) Nudge: Improving Decisions About Health, Wealth, and Happiness. Yale University Press
12. Ericson KM (2017) On the interaction of memory and procrastination: Implications for reminders, deadlines, and empirical estimation. Journal of the European Economic Association 15(3):692–719. https://doi.org/10.1093/jeea/jvw015
13. Fortuna RJ, Idris A, Winters P, et al (2014) Get screened: a randomized trial of the incremental benefits of reminders, recall, and outreach on cancer screening. J Gen Intern Med. 29(1):90–97. https://doi.org/10.1007/s11606-013-2586-y
14. Jones G, Goldsmith R, O'Donnell K (2018) Reminder systems during orthodontic treatment. Evid Based Dent. 19(4):109–110. https://doi.org/10.1038/sj.ebd.6401342
15. Darbyshire D, Brewster L, Isba R, Body R, Goodwin D (2020) Retention of doctors in emergency medicine: a scoping review protocol. JBI Evid Synth. 18:154–162. https://doi.org/10.11124/JBISRIR-D-19-00108
16. Dillon EC, Tai-Seale M, Meehan A, et al (2020) Frontline Perspectives on Physician Burnout and Strategies to Improve Well-Being: Interviews with Physicians and Health System Leaders. J Gen Intern Med. 35:261–267. https://doi.org/10.1007/s11606-019-05381-0
17. Mete M, Dickman J, Rowe S, et al (2022) Beyond burnout: Understanding the well-being gender gap in general surgery by examining professional fulfillment and control over schedule. Am J Surg. 223(4):609–614. https://doi.org/10.1016/j.amjsurg.2021.08.033.
18. Niconchuk JA, Hyman SA (2020) Physician Burnout: Achieving Wellness for Providers and Patients. Curr Anesthesiol Rep. Jul 3:1–6. https://doi.org/10.1007/s40140-020-00401-w
19. Gafsou B, Becq MC, Michelet D, Julien-Marsollier F, Brasher C, Dahmani S (2021) Determinants of Work-Related Quality of Life in French Anesthesiologists. Anesth Analg. 133:863–872. https://doi.org/10.1213/ANE.0000000000005397
20. Dexter F, Epstein RH, Marian AA (2021) Sustained management of the variability in work hours among anesthesiologists providing patient care in operating rooms and not on call to work late if necessary. J Clin Anesth. 69:110151. https://doi.org/10.1016/j.jclinane.2020.110151
21. Bhutiani M, Jablonski PM, Ehrenfeld JM, McEvoy MD, Fowler LC, Wanderer JP (2018) Decision Support Tool Improves Real and Perceived Anesthesiology Resident Relief Equity. Anesth Analg. 127:513–519. https://doi.org/10.1213/ANE.0000000000003479.

22. Wax DB, McCormick PJ (2017) A Real-Time Decision Support System for Anesthesiologist End-of-Shift Relief. Anesth Analg. 124:599–602. https://doi.org/10.1213/ANE.0000000000001515
23. Dexter F, Epstein R, Marian A (2022) Decision-making for end-of-day relief of anesthesiologists based on equity can decrease group productivity: historical cohort study from a hospital with both anesthesia residents and nurse anesthetists. Perioperative Care and Operating Room Management. 26:100244. https://doi.org/10.1016/j.pcorm.2022.100244
24. Jones PM, Cherry RA, Allen BN, et al (2018) Association Between Handover of Anesthesia Care and Adverse Postoperative Outcomes Among Patients Undergoing Major Surgery. JAMA. 319:143–153. https://doi.org/10.1001/jama.2017.20040
25. Hudson CC, McDonald B, Hudson JK, Tran D, Boodhwani M (2015) Impact of anesthetic handover on mortality and morbidity in cardiac surgery: a cohort study. J Cardiothorac Vasc Anesth. 29:11–6. https://doi.org/10.1053/j.jvca.2014.05.018
26. Choromanski D, Frederick J, McKelvey GM, Wang H (2014) Intraoperative patient information handover between anesthesia providers. J Biomed Res. 28:383–7. https://doi.org/10.7555/JBR.28.20140001
27. Terekhov MA, Ehrenfeld JM, Dutton RP, Guillamondegui OD, Martin BJ, Wanderer JP (2016) Intraoperative Care Transitions Are Not Associated with Postoperative Adverse Outcomes. Anesthesiology. 125:690–9. https://doi.org/10.1097/ALN.0000000000001246
28. Kannampallil T, Lew D, Pfeifer EE, Sharma A, Abraham J (2021) Association between paediatric intraoperative anaesthesia handover and adverse postoperative outcomes. BMJ Qual Saf. 30:755–763. https://doi.org/10.1136/bmjqs-2020-012298
29. Dexter F, Wachtel RE, Todd MM, Hindman BJ (2015) The "Fourth Mission": The Time Commitment of Anesthesiology Faculty for Management Is Comparable to Their Time Commitments to Education, Research, and Indirect Patient Care. A A Case Rep. 5:206 – 11. https://doi.org/10.1213/XAA.0000000000000149