

Incentive Payments to Academic Anesthesiologists for Late Afternoon Work Did Not Influence Turnover Times

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BACKGROUND: Anesthesiologists are often paid extra for hours worked in the late afternoon and evening. Although anesthesiologists have little influence on their operating room (OR) assignments and workloads late in the afternoon, they can influence turnover times.

METHODS: OR turnover times on workdays were reviewed for $n = 30$ mo before there was incremental pay, for $n = 15$ mo with incremental pay for work past 3:30 PM, and for $n = 8$ mo with pay for work past 4:00 PM. The end point was the percentage of turnovers that were prolonged, defined as longer than 1 h. Turnovers straddling 3:30 PM ($n = 3945$), 4:00 PM ($n = 3602$), and 5:00 PM ($n = 2834$) were studied, as were those straddling 2:00 PM ($n = 4407$) as a control. In addition, qualitative (survey) assessment of $n = 30$ anesthesiologists was performed the last month to learn about their opinions on working late on weekdays.

RESULTS: Most respondents considered an OR to run late if it finished after a specific time of day (87%, $P < 0.001$), unrelated to the room's type of procedures (90%, $P < 0.001$) or to the payment for working after 4:00 PM (100%, $P < 0.001$). There was no significant effect of implementation or changes to the incentive program on the incidences of prolonged turnover times at each of the studied times in the afternoon (all $P > 0.14$).

CONCLUSION: Our results suggest that hospital administrators, deans, and other executives need not be especially concerned about disincentives produced by methods of internal compensation of anesthesiologists on highly visible OR turnover times late in afternoons.

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Financial incentive programs are used by many academic anesthesia groups in the United States.¹ When compensation is adjusted to be based on billable hours, anesthesiologists may increase their heterogeneity in compensation.² When compensation is changed to be based on American Society of Anesthesiologists' Relative Value Guide Units plus units for call coverage, anesthesiologists may increase their mean American Society of Anesthesiologists' Relative Value Guide units and compensation.³ When paid to prevent delays in operating rooms (ORs), anesthesiologists may increase the percentage of first case of the

day patients entering the OR on-time and reduce the incidence of long anesthesia-controlled times.⁴

The most common type of incentive pay for anesthesiologists is increased pay for hours worked in the late afternoon and evening, when compared with increased pay for working a shift regardless of when finishing for the day.¹ Payment based on hours worked may create an incentive for individual anesthesiologists to work slower to increase personal compensation.

Hospital agreements with anesthesia groups affect group decisions that influence how early cases get done (e.g., numbers of providers to hire).⁵ Agreements also influence how decisions are made on the day of surgery at the OR and anesthesia control desks (e.g., moving cases and assigning relief).^{5,6} Although individual anesthesiologists have little influence on their OR assignments and workloads late in the afternoon, they can influence turnover and anesthesia controlled times. Thus, the group's method of internal compensation may indirectly affect surgeons, who generally care about these turnover and anesthesia controlled times.^{7,8}

We examined turnover times at a hospital at which the anesthesia group started to provide incremental compensation after 3:30 PM. From surgeons' qualitative reports (i.e., official complaints to the Director of Perioperative Services and to the Dean of the College

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of Medicine), we expected statistically significant increases in the incidences of prolonged turnover times. However, from prior scientific studies, we expected the increases to be too small to be financially important.^{9,10}

METHODS

This project was performed as a quality improvement initiative to adjust an anesthesia group's incentive program. Publication of the results was approved by the State University of New York Upstate Institutional Review Board.

The attending anesthesiologists at the studied hospital are salaried employees. From January 2004 through September 2006, there was no incremental pay on workdays. From October 2006 through December 2007, incremental pay was given for each minute worked past 3:30 PM. The 3:30 PM was chosen based on its being 8 h after the 7:30 AM scheduled start of the OR workday. The incremental (bonus) pay was \$150 per hour calculated to the nearest 1 min. Starting January 2008, the incremental pay started after 4:00 PM to align better with OR shifts. The incentive pay was guaranteed regardless of the decisions and work of other anesthesiologists.¹¹ Payment was the same regardless of the number of cases medically directed simultaneously.¹² The \$150 amount was chosen based on anesthesia group's clinical receipts, paid from that income, and kept the same throughout the period studied.

OR turnover times (wheels out to wheels in) were determined for $n = 55,237$ cases performed on workdays January 2004 through August 2008. Least squares linear regression was used to analyze the time series of turnovers. The turnovers were pooled in 1 mo epochs to eliminate correlations.¹³ Turnovers straddling 3:30 PM ($n = 3945$), 4:00 PM ($n = 3602$), and 5:00 PM ($n = 2834$) were studied, as were those straddling 2:00 PM ($n = 4407$) as a control.* The dependent variable was the percentage of turnovers that were prolonged, defined as longer than 1 h. Thus, for each of the $n = 56$ mo there were four studied dependent variables. Independent variables were successive month and two indicator variables representing changes in policy (i.e., 0 being the period before the policy change and 1 being the period afterwards). Analysis was performed using SYSTAT 12 (Systat Software, San Jose, CA).

The analysis tested turnovers overlapping with specific times of the day and did not differentiate by specialty, because anesthesiologists medically directed residents caring for patients of multiple specialties.

*We used 2:00 PM as a control for two reasons. First, 2:00 PM and 5:00 PM were equidistant from the threshold time of 3:30 PM. Second, because afternoons were studied, most of the to-follow cases studied were add-on cases (e.g., mean \pm standard error = 64% \pm 0.2% add-on at 3:30 PM). Earlier in the day, most of the to-follow cases were elective (e.g., 32% \pm 0.1% add-on at 11:00 AM). The 2:00 PM was the dividing point, with 50% \pm 0.2% add-on.

The analysis would detect an influence of compensation on behavior provided that most anesthesiologists: 1) perceived specific times as thresholds for differentiating between regular hours versus working late, 2) perceived that the threshold time was unaffected by the types of procedures being performed, and 3) perceived that the threshold time was unaffected by presence of payment for working late. Results of qualitative analysis provided insight into the validity of the assumptions.

A qualitative (survey) assessment was performed on September 2008. Thirty of the 34 anesthesiologists at the hospital were available for the survey during the study period. Each of the 30 anesthesiologists was asked his or her opinion about working late on weekdays and all chose to participate. These interviews continued as long as the anesthesiologist wanted to discuss the topic. The interview lengths varied from a few minutes to almost half an hour. The discussions were transcribed. Content analysis was used to determine patterns and themes in the responses. Several categories of information emerged, including the specific time threshold for working late and perceptions of the compensation program.

RESULTS

There was no significant effect of implementation or changes to the incentive program on the incidence of prolonged turnover times at several specific times in the late afternoon (all $P > 0.14$) (Table 1).

Most respondents considered an OR to run late if it finished after a specific time of day (87%, $P < 0.001$), unrelated to the room's type of procedures (90%, $P < 0.001$) or to the payment for working after 4:00 PM (100%, $P < 0.001$) (Table 2).^{14,15}

DISCUSSION

Our findings are consistent with prior results that clinicians make decisions to increase their personal clinical work during the hours that they are assigned.^{16,17} This bias results in behavior that produces greater intangible cost for the individual than had to occur.¹⁷ Anesthesiologists perceive their professional work as including coordination with the other health care providers to complete each assigned list as quickly as possible.¹⁸ The resulting bias to increase work when present may simply be stronger than any incentive the individual has to work late (i.e., the opportunity to increase compensation). On the other hand, our findings are also consistent with anesthesiologists having minimal influence on turnover times in the late afternoons relative to other causes such as unavailability of the surgeon and/or patient.¹⁹ Regardless of the explanation, the managerial implications of our results are the same. Incentive programs for individual anesthesiologists appear to have no practical influence on the efficiency of use of OR time.

Table 1. Prolonged Turnovers Overlapping Certain Times in Afternoons

	2:00 PM*	3:30 PM	4:00 PM	5:00 PM
Turnovers per 4-wk period (mean ± SD)	79 ± 9	70 ± 10	64 ± 11	51 ± 9
Percentage ^a of turnover times, from each month, that lasted longer than 1 h				
Mean ± SE of value ^a	71% ± 1%	79% ± 1%	81% ± 1%	84% ± 1%
Linear trend (% of turnovers per month) over all 56 mo				
Coefficient ^b	0.0% ^b	0.0%	0.4%	0.0% ^b
P value	0.48	0.28	0.59	0.94
Lower 95% CI	-0.2%	-0.2%	-1.0%	-0.1%
Upper 95% CI	0.1%	0.1%	1.8%	0.2%
Contribution to % turnovers that were prolonged of incentive pay for work after 3:30 PM				
Coefficient ^{c,d}	1.4% ^c	1.7%	0.5%	-0.5% ^d
P value	0.55	0.44	0.82	0.83
Lower 95% CI	-3.2%	-2.6%	-4.2%	-5.7%
Upper 95% CI	6.0%	5.9%	5.2%	4.6%
Contribution to % turnovers that were prolonged of starting pay 30 min later				
Coefficient ^{c,d}	-3.2% ^c	-1.4%	-3.0%	-0.6% ^d
P value	0.14	0.48	0.17	0.82
Lower 95% CI	-7.5%	-5.4%	-7.4%	-5.3%
Upper 95% CI	1.1%	2.6%	1.3%	4.2%

CI = confidence interval; SD = standard deviation; SE = standard error of the mean.

^a The observed percentages are typical for other hospitals late in the workday, just presented in an unconventional manner that is appropriate for interpretation of the study results. We calculated turnovers as described and validated in Ref. 13 for benchmarking (e.g., excluded turnovers preceded or followed by a nonelective case and turnovers longer than 90 min). The mean was 36 min (N = 20,720), matching that of the two (different) hospitals studied in detail in Ref. 13 and typical among the other 29 hospitals' means shown in Figure 3 of that article.

^b Coefficients for linear trend are the changes per month. For example, the two 0.0% values marked with a superscript "b" show that there was no linear trend over time in the percentages of turnovers that were prolonged among the turnovers overlapping 2:00 PM and 5:00 PM.

^c At 2:00 PM, there initially seemed to be a nonsignificant trend for the percentage of prolonged turnovers to be 1.4% higher on an absolute basis than before the incentive program was started. However, later there seemed to be a nonsignificant monthly 3.2% absolute decrease in the percentage. Together, the last 11 mo had a nonsignificant 1.9% smaller absolute percentage of prolonged turnovers than did the first 36 mo (P = 0.50).

^d The results at 2:00 PM can be compared with those at 5:00 PM.* At 5:00 PM, the last 11 mo had a nonsignificant 1.2% smaller absolute percentage of prolonged turnovers than did the first 36 mo (P = 0.69). The 1.2% ≠ 0.5% + 0.6%, principally because of rounding but also because of how the least squares estimate of the coefficient is calculated.

Table 2. Qualitative Survey of Meaning of Working Late

Categorization of responses	No. 30 respondents	Percentage
"Late" depends on types of procedures	3	10
"Late" depends on start time (e.g., 7:00 AM)	3	10
"Late" relates to compensation program	0 ^a	0
Included a specific time (e.g., 3:00 PM)		
Specific time on the hour or half hour	26	87
3:00 PM	2	
3:30 PM or 4:00 PM	2	
4:00 PM	10	
4:00 PM or 4:30 PM	2	
4:00 PM or 5:00 PM	1	
4:30 PM or 5:00 PM	2	
5:00 PM	3	
5:00 PM or 6:00 PM	2	
6:00 PM	2	
Specific time neither on hour nor half hour	0	0

^a To interpret the 0, n = 30 anesthesiologists were asked their opinion about working late on weekdays and could discuss the topic as long as they wanted. All (100%) of the anesthesiologists both received the compensation and did not mention it. This result is not inconsistent with estimates of relative differences in long-term labor costs for anesthesiologists working frequent long workdays versus only regular hours,^{10,14,15} because all respondents chose to take and keep on working at a job as a salaried anesthesiologist at the studied facility with many cases performed in the late afternoons and evenings.

Although surgeons' qualitative reports of turnover times motivated our study, those reports differed from our quantitative findings. Eappen et al.⁸ previously reported similar findings. Eappen et al.⁸ speculated that the reason for differences is that surgeons' perceptions of turnover times are influenced less by turnover times *per se* than by their seeing or not seeing anesthesia providers actively caring for their patients. If so, then OR times may also need to be studied, because regional blocks⁸ and IV catheters, etc., can be placed outside of ORs, contributing to turnover times, or in ORs, contributing to OR times.²⁰ Table 3 shows that implementation of the incentive program was not associated with increases in OR time.

Our qualitative assessment demonstrated that anesthesiologists perceive job satisfaction to be a component of "efficiency."²¹ Control over their work and time impacts their job satisfaction.²² Our survey suggests that among anesthesiologists working at a hospital with frequent long hours, monetary compensation for working late is less salient than the lifestyle impact of unpredictable schedules (see footnote "a" in Table 2). For example, two of the respondents stated that they do not make appointments for days that they are scheduled to work, because it is "always possible" that the appointment will be missed due to working later than expected. As found qualitatively by Larsson et al.,²³ respondents accepted this uncertainty as a

Table 3. Operating Room Times of Cases Overlapping Certain Times in Afternoons

	2:00 PM*	3:30 PM	4:00 PM	5:00 PM
Cases per 4-wk period (mean \pm sd)	216 \pm 24	182 \pm 21	170 \pm 20	142 \pm 18
Mean operating room times each month				
Mean \pm SE of value (h) ^a	4.2 \pm 0.1	4.2 \pm 0.1	4.2 \pm 0.1	4.2 \pm 0.1
Linear trend (h/mo) over all 56 mo				
Change per period	0.00	0.00	0.00	0.00
P value	0.62	0.79	0.64	0.67
Lower 95% CI	-0.01	-0.01	-0.01	-0.01
Upper 95% CI	0.00	0.01	0.01	0.01
Contribution to mean operating room time (h) of incentive pay for work after 3:30 PM				
Coefficient	-0.09	-0.20	-0.24	-0.23
P value	0.36	0.06	0.03	0.05
Lower 95% CI	-0.29	-0.41	-0.46	-0.47
Upper 95% CI	0.11	0.01	-0.02	0.00
Contribution to mean operating room time (h) of starting pay 30 min later				
Coefficient	-0.45	-0.40	-0.37	-0.41
P value	<0.001	<0.001	<0.001	<0.001
Lower 95% CI	-0.63	-0.59	-0.57	-0.62
Upper 95% CI	-0.27	-0.21	-0.17	-0.19

CI = confidence interval; sd = standard deviation; SE = standard error.

The coefficients and their interpretations are described in the legend ("b," "c," and "d") of Table 2. For *, see bottom of page 1623.

^a The means and standard errors are the same with rounding. Over the 56 mo, the mean \pm SE of all the hospital's operating room times was 2.5 \pm 0.1 h.

condition of their work. Nonetheless, fully one quarter of the respondents in the present study considered this reality frustrating. Until we better understand these relationships and their elasticity to the hourly compensation, we do not know to what extent our results apply to other anesthesia groups. However, we expect lack of effect of compensation for working late when anesthesiologists like those studied have no choice between working late versus payment. We expect that compensation matters when and if the anesthesiologists have a decision to make: sign up to work late in exchange for more pay?¹

In summary, financial incentives to anesthesia groups can influence group and individual behavior sufficiently to affect other OR providers (e.g., surgeons).^{5,24} We detected no such effect of incentive pay on prolonged turnover times. Our case study suggests that hospital administrators, deans, and other executives need not be especially concerned about potential disincentives produced by methods of compensating anesthesiologists for OR work late in afternoons.

REFERENCES

- Abouleish AE, Apfelbaum JL, Prough DS, Williams JP, Roskoph JA, Johnston WE, Whitten CW. The prevalence and characteristics of incentive plans for clinical productivity among academic anesthesiology programs. *Anesth Analg* 2005;100:493-501
- Miller RD, Cohen NH. The impact of productivity-based incentives on faculty-based compensation. *Anesth Analg* 2005;101:195-9
- Reich DL, Galati M, Krol M, Bodian CA, Kahn RA. A mission-based productivity compensation model for an academic anesthesiology department. *Anesth Analg* 2009;107:1981-8
- St Jacques PJ, Patel N, Higgins MS. Improving anesthesiologist performance through profiling and incentives. *J Clin Anesth* 2004;16:523-8
- Dexter F, Epstein RH. Calculating institutional support that benefits both the anesthesia group and hospital. *Anesth Analg* 2008;106:544-53
- Dexter F, Epstein RD, Traub RD, Xiao Y. Making management decisions on the day of surgery based on operating room efficiency and patient waiting times. *Anesthesiology* 2004;101:1444-53
- Vitez TS, Macario A. Setting performance standards for an anesthesia department. *J Clin Anesth* 1998;10:166-75
- Eappen S, Flanagan H, Lithman R, Bhattacharyya N. The addition of a regional block team to the orthopedic operating rooms does not improve anesthesia-controlled times and turnover time in the setting of long turnover times. *J Clin Anesth* 2007;19:85-91
- Dexter F, Abouleish AE, Epstein RH, Whitten CW, Lubarsky DA. Use of operating room information system data to predict the impact of reducing turnover times on staffing costs. *Anesth Analg* 2003;97:1119-26
- McIntosh C, Dexter F, Epstein RH. Impact of service-specific staffing, case scheduling, turnovers, and first-case starts on anesthesia group and operating room productivity: tutorial using data from an Australian hospital. *Anesth Analg* 2006;103:1499-516
- Lubarsky DA. Incentivize everything, incentivize nothing. *Anesth Analg* 2005;100:490-2
- Feiner JR, Miller RD, Hickey RF. Productivity versus availability as a measure of faculty clinical responsibility. *Anesth Analg* 2001;93:313-8
- Dexter F, Epstein RH, Marcon E, Ledolter J. Estimating the incidence of prolonged turnover times and delays by time of day. *Anesthesiology* 2005;102:1242-8
- Abouleish AE, Dexter F, Epstein RH, Lubarsky DA, Whitten CW, Prough DS. Labor costs incurred by anesthesiology groups because of operating rooms not being allocated and cases not being scheduled to maximize operating room efficiency. *Anesth Analg* 2003;96:1109-13
- Abouleish AE, Dexter F, Whitten CW, Zavaleta JR, Prough DS. Quantifying net staffing costs due to longer-than-average surgical case durations. *Anesthesiology* 2004;100:403-12
- Dexter F, Willemssen-Dunlap A, Lee JD. Operating room managerial decision-making on the day of surgery with and without computer recommendations and status displays. *Anesth Analg* 2007;105:419-29
- Dexter F, Lee JD, Dow AJ, Lubarsky DA. A psychological basis for anesthesiologists' operating room managerial decision-making on the day of surgery. *Anesth Analg* 2007;105:430-4
- Larsson J, Holmström I, Rosenqvist U. Professional artist, good Samaritan, servant and co-ordinator: four ways of understanding the anaesthetist's work. *Acta Anaesth Scand* 2003;47:787-93
- Wright MC, Phillips-Bute B, Mark JB, Stafford-Smith M, Grichnik KP, Andregg BC, Taekman JM. Time of day effects

- on the incidence of anesthetic adverse events. *Qual Saf Health Care* 2006;15:258–63
20. Harders M, Malangoni MA, Weight S, Sidhu T. Improving operating room efficiency through process redesign. *Surgery* 2006;140:509–16
 21. Arakelian E, Gunningberg L, Larsson J. Job satisfaction or production? How staff and leadership understand operating room efficiency: a qualitative study. *Acta Anaesthesiol Scand* 2008;52:1423–8
 22. Kinzl JF, Traweger C, Trefalt E, Riccabona U, Lederer W. Work stress and gender-dependent coping strategies in anesthesiologists at a university hospital. *J Clin Anesth* 2007;19:334–8
 23. Larsson J, Rosenqvist U, Holmström I. Enjoying work or burdened by it? How anaesthetists experience and handle difficulties at work: a qualitative study. *Br J Anaesth* 2007;99:493–9
 24. Schuster M, Standl T, Reissmann H, Kuntz L, Am Esch JS. Reduction of anesthesia process times after the introduction of an internal transfer pricing system for anesthesia services. *Anesth Analg* 2005;101:187–94