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ORIGINAL RESEARCH

Financial Incentive, in Place of Nonclinical Time, Increases Faculty Involvement and Improves Resident Didactic Evaluation Scores in an Anesthesiology Residency Training Program

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INTRODUCTION

Academic anesthesiology departments face many constraints. Among these are the goals of adequately educating the next generation of clinical anesthesiologists. In addition to clinical training in the clinic, ICU, and operating rooms, regularly occurring didactic sessions are nearly universally used to systematically build the medical knowledge necessary for competent practice and subsequent passing of board examinations, and to discuss other topics to prepare residents for a broad range of practice environments.

Albeit in unrelated medical specialties, other studies have shown how incentivizing with an extrinsic motivational factor such as continuing medical education credit, departments in radiation oncology and emergency medicine were able to improve faculty involvement in resident lecture series.^{1,2}

The study presented here is a quantitative look at data from all resident didactic sessions for the year before and 2 years after making the switch in faculty compensation for didactic sessions from time to money. We compared the period before the switch with the period after it, expecting that the number of faculty participating as presenters would increase in the period with a financial incentive. Our secondary aim was to show that didactic quality would not suffer as a result, by comparing resident evalu-

ation scores of the sessions between these 2 periods. We had also calculated in advance that this shift in incentive would result in cost savings to the department.

MATERIALS AND METHODS

Study Setting

The study occurred in a large academic institution consisting of 18 hospitals and 220 physician anesthesiologists. Our didactic sessions occur on weekdays (late afternoon), which mandates clinical coverage for faculty and residents alike. Not only do residents need to be relieved by other hands-on providers in order to attend the session, but also a faculty member must be available to lead these sessions. Until recently, faculty were compensated with a nonclinical day that was used to prepare and present each didactic session. This model comes with a significant cost to the department. For the past few years, our didactic program included approximately 140 to 150 sessions. At our institution, one assumes 230 workdays in the year (this is based on a 5-day work week with a 6-week-per-year vacation time). This total of nonclinical time represents over half of a full-time equivalent faculty member. Readers can calculate this cost relative to salaries and benefits at their own institution to get a sense of overall cost of faculty time in facilitating resident didactics.

Furthermore, some faculty spent significantly more than 1 workday preparing or updating their didactic material, depending on the complexity or novelty of the topic. Others with longstanding lectures on relatively static topics could spend an hour of preparatory time before a 1-hour lecture. In that case, the remainder of the nonclinical day, while possibly used for other worthwhile academic or administrative activities, may have been underused.

Starting in academic year (AY) 2017, in light of significantly reduced nonclinical time, our department switched to financially incentivizing faculty for resident didactic sessions. Since this switch, the department no longer considers preparing and presenting resident didactic sessions for the distribution of nonclinical time. Rather, faculty work on developing these materials and presented the session using their normally scheduled time off. Clinical schedules are thus arranged by the individual to allow for their attendance at the scheduled session. Faculty members typically use an early-out, post-call, vacation, or similar assignments to coincide with lecture days. This financial incentive was implemented to reduce cost and to recruit faculty members to give lectures. The stipend per didactic session was initially set at \$500.

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Study Design

Data were obtained from the educational records of the Department of Anesthesiology, University of Pittsburgh Medical Center, a large multihospital academic residency training program. This deidentified retrospective study was deemed as exempt from institutional review board oversight. The lecture evaluation scores and names of faculty presenting didactics were tabulated by an honest broker (an employee in the residency education office who would otherwise have access to lecture evaluation data), such that the number of distinct participants could be calculated for each of the years under study prior to deidentification, and data shared to investigators. As part of our normal quality control strategy, residents routinely evaluate all formal didactic sessions using an anonymous electronic evaluation system. These didactic sessions include weekly lectures for individual classes of clinical anesthesiology residents postgraduate year 2 through 4, as well as problem-based learning sessions that include a subset of all these classes together in 1 bimonthly large-group discussion setting. Notably, this series does not run in the summer months of June, July, and August. Other departmental lectures such as Grand Rounds, Journal Club, or the small-group lectures residents receive while on a subspecialty rotation were not included in the incentive program and were thus excluded from this study.

Each session was rated overall using a Likert scale of 1 to 5. The Likert scale numbers were associated with the following descriptors; 1: *serious deficiency*, 2: *needs improvement*, 3: *acceptable*, 4: *above average*, 5: *superior*. A score 0 was reserved for *unable to evaluate*, but none of the analyzed evaluations contained a score of 0. Residents also answer *yes* or *no* to indicate whether they felt the presenter should return to give the lecture again. An additional question in this standard evaluation asked whether the sessions' topic should be repeated, however this question was not included in the current analysis. All 3 of these questions must have been answered in order to submit the evaluation. There was also an optional free-text item for comments that residents were encouraged to complete. Immediately after

a lecture was completed, the lecture evaluation was made available to residents via our institution's online resident management system to complete at their leisure. Despite an email reminder being sent after the lecture on the same day, submission of a completed evaluation was neither tracked nor mandatory. There was no mandatory time frame for completion.

For this study, didactic data for 3 years were examined. For each year, averaging across all didactic sessions, the median Likert score as well as the 75th and 25th quartile ranges were calculated. As expected, the Likert scale rating data were left-skewed (towards higher score). Several transformations were explored including natural and common logarithm and square root. It was found that squaring the data gave a normal distribution. A 1-way ANOVA was performed on the transformed Likert data, with post hoc *t* tests performed to compare differences between years. The mean percentage of positive responses (for lecturer returning) were also calculated for each academic year. This data was analyzed similar to the Likert data. For both tests, a Bonferroni-corrected significance threshold of $P < .01$ was considered statistically significant. Data manipulation was done in Microsoft Excel 2016 (Microsoft, Redmond, WA, USA); statistical analysis was done using SPSS version 25 (IBM, Armonk, NY, USA).

Lastly, we generated a list of presenters for the study period via our department educational portal, which is accessible by all department members. By this list we were able to assess which faculty presented each year of the study, unlinked to lecture evaluation data. This allowed identification of those who participated all years of the study, those who did not continue to participate after AY 2016, new presenters who began in AY 2017, and all other variations.

RESULTS

A summary of the number of lectures and number of presenters facilitating those lectures are shown in Table 1. The 2015-2016 academic year (AY 2016) preceded the switch. Notably, data from years before 2015 are no longer available because of a switch in electronic evaluation system. The data from the 2016-2017 (AY 2017) and 2017-2018 academic years (AY 2018) were after the switch. The number of sessions

that were included varied slightly from year to year because of the occurrence of holidays and other breaks. There was no overall trend toward increasing or decreasing number of didactics over the study period. The number of faculty presenting sessions in the last year of the time-based incentive was 52, compared with 61 and 63 for AY 2017 and AY 2018, respectively. By evaluating presenter lists from the 3 academic years, which has been summarized in Figure 1, we found that 38 presenters participated in resident didactics all 3 years, regardless of incentive type involved. There were 11 presenters who did not continue to present after the change from nonclinical time to money incentive. In contrast, there were 17 new faculty presenters who started after the institution of a money incentive in AY 2017 and continued for AY 2018. There were a total of 27 new presenters after the switch to a financial incentive.

Didactic evaluation scores improved over the study period. The untransformed median scores increased each year from AY 2016 to AY 2018 (4.16, 4.18, and 4.40 respectively); this is displayed in Figure 2. Though the statistical analysis was done on transformed data, the untransformed data is shown in the figure for conceptual clarity. Median score and 25th and 75th interquartile ranges within each academic year are displayed in the figure. Likert scores did not significantly increase in the first year after the transition was made from a time incentive to a money incentive ($P = .09$). However, significant increases were seen in AY 2018, compared with scores in both AY 2016 and AY 2017 (both $P < .001$). Figure 3 shows the percentage of positive responses in response to the evaluation question of whether the presenting faculty should return again. Comparing each consecutive year under review, increases were statistically significant ($P < .001$).

DISCUSSION

Ensuring that motivated clinical faculty are available and willing to present high-quality graduate medical didactic sessions is a challenge for academic departments that host residency training programs. Examples of approaching this problem likely include varying levels of faculty involvement in leading the sessions and varying abilities

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to relieve residents from clinical duties. As a large academic anesthesiology department, we have developed a regularly occurring high-quality faculty-led didactic series over the past decade. However, this educational initiative came with a significant burden of faculty nonclinical time. To our knowledge, no one has studied the impact of offering faculty a financial incentive in place of nonclinical time for presenting resident didactic sessions.

Two somewhat related studies were found, in which faculty were incentivized to attend resident-driven conferences by making category 1 continuing medical education credit available through self-assessment modules.^{1,2} Though these come from clinically disparate specialties of radiation oncology¹ and emergency medicine,² both showed an increase in faculty participation once the continuing medical education credit incentive was implemented. The mere involvement of more faculty in resident-led sessions resulted in increased quality, as well as the amount of time residents spent preparing their lectures.¹ Interestingly, despite the increase in attendance, emergency medicine faculty did not report the continuing medical education credit as a motivating factor for their behavior change.² They did, however, report that other clinical and administrative duties were a barrier to being involved in resident didactic sessions.² At our institution, a financial incentive was chosen because of the ease of implementation and the fact that it would not interfere with current hospital staffing models.

Our anesthesiology residency, hosted in a large academic department, implemented a change in the type of incentive for faculty-led didactic sessions starting in AY 2017. We then analyzed resident evaluations of the didactic sessions from the year preceding and the 2 years following this change. This was done to confirm that didactic quality did not suffer, as well as to ensure that the pool of faculty participating was not reduced. Comparing didactic session data from before the incentive change to the same data after the change, we observed several important differences that confirmed our expectations.

First, the number of faculty who were leading sessions increased after the incentive change from 52 to 61 and 63. Of the 52 presenters in AY 2016, 38 continued to present each year regardless of incentive type offered. However, we saw a cohort of 17 new presenters in AY 2017 after implementation of a financial incentive who also continued into AY 2018. After including a cohort of 10 new presenters in AY 2018, we can see the financial incentive recruited an additional 27 presenters, which makes up the increase in new presenters after financial incentive implementation.

Second, we observed an increase in resident ratings of the didactic sessions. We have implemented a simple 4-question didactic evaluation form, with brevity anticipated to increase the submission rate of the evaluations. The evaluation questions examined in this investigation were the overall session rating and the percentage of positive responses to the yes/no question on whether the presenter should return to give the lecture again. The overall ratings on the unanchored Likert scale were skewed positively, as might be expected. Despite this potential challenge of a ceiling effect, we were able to detect a statistically significant increase in these scores on the resident didactic evaluations between time incentive and money incentive years. It must be noted however, that the most significant increase in resident evaluations came in the second year after the money incentivization began. Due to not having access to electronic evaluations prior to AY 2016 for more data on time incentive years, it is hard to differentiate the trend seen from one that may have already been occurring. Also, with the increase in the number of faculty participating in the didactic series, there was a significant increase in the percentage of favorable responses that the faculty presenters should return. Taken together, this indicates an increase in lecture quality, as viewed by the residents in attendance.

Of note, during the study period there were not other specific departmental measures taken to improve overall didactic quality (such as mandatory faculty workshops or lectures). Returning faculty would, however, have the benefit of being able to implement change suggested by the resident evaluations for their subsequent lectures.

There are several important limitations of our findings. Most notably, the benefits of this approach may not generalize to other graduate medical education programs. Factors that may influence the value of such an approach include size of the faculty, number of faculty-led didactic sessions, and the faculty participation rate in these sessions. If a significant pool of faculty not involved in leading resident didactics exists, a revised incentive structure may yield similar improvements in didactic evaluations. Further, some specialties may be able to effectively overlap clinical duties with the didactic session itself, and our findings would have reduced impact in these settings. A characteristic example is the noon conference, common in many clinical specialties, in which any attending physician working clinically at a site can attend the didactic session during their lunch break. This schedule is not possible in more procedural and shift-based specialties (including anesthesiology), or in multisite training programs, such as ours. It is also worth noting that overlapping a formal didactic session with a faculty's clinical workday does not compensate the faculty member for any time spent in preparing materials for the session.

Another important limitation is that the cohorts of residents completing the evaluations inherently change from year to year because the senior class graduates and a new class of postgraduate year 2 residents enters the clinical anesthesiology program. This bias of the groups performing the evaluation each academic year could confound the results. This limitation is unavoidable in longitudinal studies of residents using evaluation data because each class consists of a finite number of residents, each with unique opinions, biases, etc., and 2 of the classes of residents change each year. Also unavoidable is that while lecture attendance is mandatory for residents, vacations, meetings, unavoidable conflicts, and the fact that attendance sheets were not available in the data makes it impossible to know how many evaluations could have been collected for each lecture.

Although not the focus of this paper, our change to a financial incentive for resident didactics also resulted in substantial cost

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savings for the department. The initial faculty incentive offered was \$500 per session. We estimated the cost savings using an average of 150 lectures per year. This results in \$75,000 in didactic incentive cost per year. Although this amount is not insignificant, it was actually accounted as a cost savings for the department's educational budget. To calculate the total cost of nonclinical time under the previous didactic system, we used an estimate of \$1750 per day out of the operating room because this is our cost to fill a 10-hour clinical shift in our operating rooms within our current salary structure where the majority of our faculty members practice. Multiplying this cost per nonclinical day by the number of days previously

distributed gives a cost of \$262,500. Thus, the change in didactic incentive from nonclinical time to financial reimbursement was associated with an annual cost savings of \$187,500 to our department. For applicability to other graduate medical education programs, these figures would have to be scaled based on the number of didactic sessions offered and compensation rates that are specialty specific and geographically specific.

In conclusion, we recently switched the compensation for our faculty for presenting resident didactic sessions from time to money with favorable results. Formerly, faculty received 1 nonclinical day for each didactic session presented. After the switch,

presenting faculty received \$500 in compensation but no additional nonclinical time. This resulted in an increased number of faculty participating in the resident didactic program and an improvement in the didactic quality, as measured by residents' evaluations of the sessions.

References

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Abstract

Background: Providing clinical faculty to lead high-quality resident didactic sessions remains a challenge for academic departments that host graduate medical education training programs. In an effort to both reduce costs and to continue to recruit faculty to give lectures, our department began to incentivize clinicians with a \$500 stipend in place of a nonclinical day to present didactics. Our hypothesis is that with financial incentive, more attendings would present didactics and the quality would improve.

Methods: Residents routinely evaluate all didactic sessions using a Likert scale of 1 to 5. Residents also answer yes or no to indicate whether the presenter should return. We compared academic year (AY) 2016, in which faculty were incentivized with nonclinical time, with AY 2017 and AY 2018, in which incentive came in the form of a \$500 stipend. For each, the mean Likert score and percentage of positive responses for lecturer returning were calculated. A 1-way ANOVA and post hoc t tests were performed to determine significant changes.

Results: Comparing AY 2016 (before the incentive switch) with AY 2017 and AY 2018, there was more faculty involvement in resident didactic after implementing the financial incentive. The quality of lectures also improved after the incentive switch, according to resident evaluations. There were higher overall Likert scores in AY 2018 and a higher percentage of positive responses to the question of whether presenters should return in AY 2017 and AY 2018, compared with AY 2016.

Conclusions: After implementation of a financial incentive in place of nonclinical time, more faculty became involved in lectures and overall lecture quality improved as measured by resident evaluations.

Keywords: Didactics, incentive, nonclinical, anesthesiology, residency

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Figures

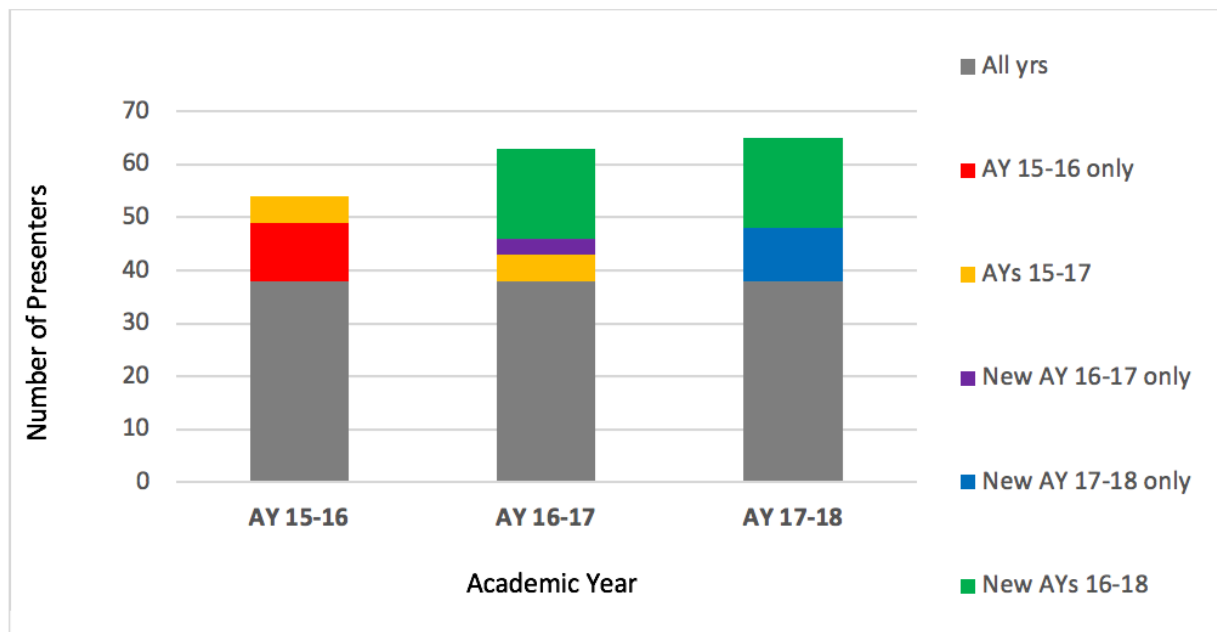
Table 1. Type of Incentive, Number of Lectures, and Number of Presenters by Year Over the Study Period

Academic Year	Type of Incentive ^a	Number of Lectures	Number of Presenters
2015-2016	NC Time	146	52
2016-2017	Money	154	63
2017-2018	Money	147	61

Abbreviation: NC, nonclinical.

^a Nonclinical time is defined as dedicated time outside of clinical duties to prepare and present lectures. Money is defined by receiving a \$500 stipend to prepare and present lectures.

Figure 1. Number of faculty presenters, organized by participation pattern, versus academic year (AY).



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Figures continued

Figure 2. Grand median (of mean scores per session) of Likert data from resident evaluations for all sessions in the years under study. Error bars represent the 25th and 75th interquartile ranges for scores.

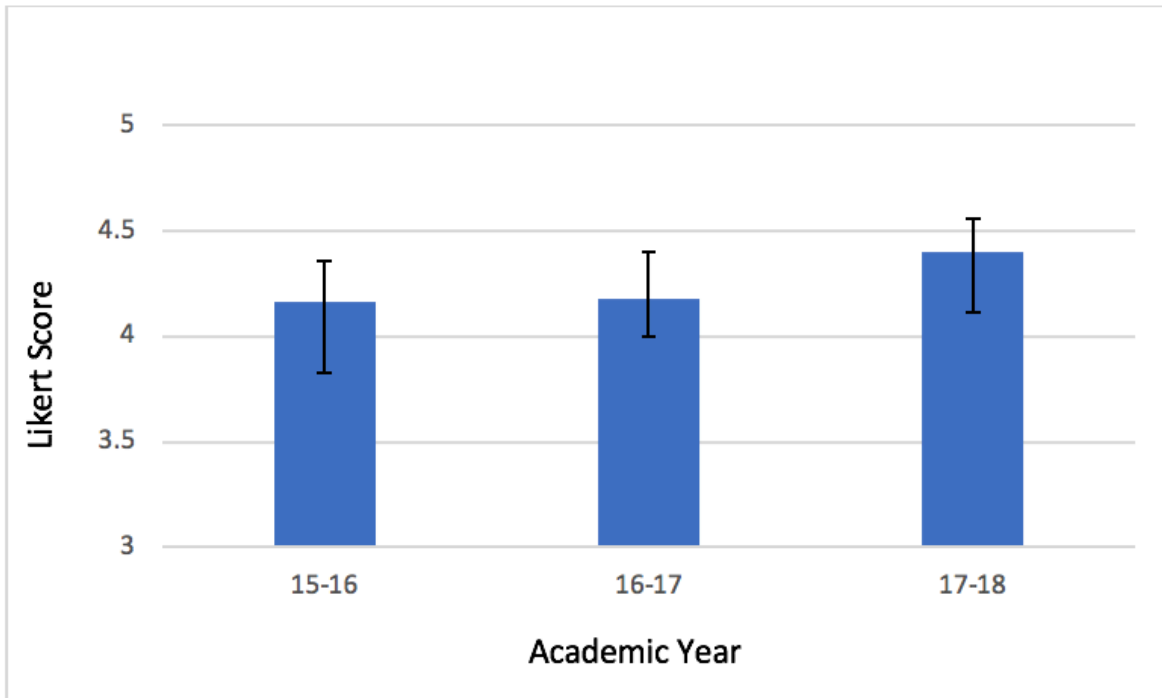


Figure 3. Proportion of positive responses to the question about whether the presenter should return to give the session again. Error bars represent the 25th and 75th interquartile ranges for yes responses.

