Relation of improved postoperative nausea/vomiting quality metric to physician incentive pay

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ABSTRACT

As part of a compensation overhaul for physicians, a small percentage of remuneration (1.75% for the highest tier) was linked to quality incentives. For the anesthesiologists, this entailed adherence to previously published postoperative nausea and vomiting (PONV) metrics for adults and children. This observational study examined the hypothesis that incentivizing this metric would result in proper PONV prophylaxis for high-risk patients while reducing the need for rescue therapy in the postanesthesia care unit (PACU). Over the course of more than 2 years, available reports from the electronic medical record for eight separate institutions were obtained to examine the rate of prophylaxis administration for the 50,408 patients who received general anesthesia and were scored as being at high risk for PONV. Rescue therapy in the postanesthesia care unit for all patients receiving general anesthesia (87,893 patients) was also examined. There was a statistically significant increase in PONV prophylaxis administration to the high-risk group, from 92.8% to 98.3% ($P < 0.001$). Additionally, there was a statistically significant decrease in PACU rescue therapy, from 17.6% to 14.4% ($P < 0.001$). Results suggested that the visibility of the risk score on the preoperative evaluation combined with heightened awareness of prophylaxis due to the incentivized quality metric led to an effect for the entire population of surgical patients.

KEYWORDS Incentive pay; nausea and vomiting; PONV; postanesthesia care unit; quality metric; rescue therapy

Patients and hospitals alike want to ensure that the care provided is of the highest quality. Measuring performance and assuring adherence to quality measures, however, has proven to be a challenging endeavor, as studies regarding proper hand hygiene have shown.^{1–3} Similarly, the benefits of postoperative nausea/vomiting (PONV) prophylaxis have been detailed extensively, and questionnaires have revealed that patients would rather have pain than PONV,^{4–6} yet some patients still do not receive proper PONV prophylaxis.

Hospital departments were asked to develop measurable quality metrics to be used for a portion of physician compensation, and one of the first chosen for anesthesiology was PONV prophylaxis. A previously published scoring system was chosen for risk stratification for PONV, with associated requirements for minimum medication prophylaxis.⁷ Adherence to the quality metric for high-risk patients was measured, as was the subsequent effect on rate of rescue

therapy for both the high-risk subset and all who received a general anesthetic.

METHODS

Data were collected from the electronic medical record (EMR) for the Central Division of Baylor Scott & White, which encompasses eight locations spanning from Austin to Waco, Texas. Locations included one pediatric facility (McLane Children's Hospital), two ambulatory surgical centers (ASCs; the Pavilion in Temple and the Hillcrest Ambulatory Surgical Center in Waco), three level 2 hospitals of similar size and surgical volume (Baylor Scott & White–College Station, Baylor Scott & White–Round Rock, and Hillcrest Hospital in Waco), one small hospital in Brenham, and one tertiary care level 1 hospital (Scott & White Memorial Hospital).

For the quality metric, two previously published metrics from the Anesthesia Quality Institute were used (American

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Society of Anesthesiologists #7 and #8) that pertain to PONV in adult and pediatric populations.⁸ For both metrics, patients undergoing a general anesthetic who also had three or more risk factors for PONV (female gender, history of PONV or motion sickness, nonsmoker, and likely to receive postoperative opioids) were defined as high risk and tracked to determine whether they received at least two pharmacologic antiemetics in either the preoperative or intraoperative period. All patients, however, received a preoperative risk score of 0 to 4 in their chart based on the Society for Ambulatory Anesthesia consensus guidelines.⁷

A three-tiered goal was then set for appropriate PONV prophylaxis of the high-risk group. The highest of these three tiers was set at 93.8% receiving appropriate prophylaxis, one percentage point higher than the previously observed rate. This was then linked to physician remuneration, constituting up to 1.75% of salary (Table 1). An EMR pop-up was added that would prompt intraoperative personnel to administer at least two antiemetic medications in patients at high risk for PONV.

The study encompassed slightly more than 2 years of data, gathered retrospectively for 14 months before the metric went live and then another 12 months afterwards. Two reports were generated from the EMR as part of the compensation metric and used for the purposes of this study: one report tracked the high-risk group of patients and the number of appropriate PONV prophylaxis mediations administered; a second report tracked all patients undergoing general anesthesia who passed through the postanesthesia care unit (PACU) and whether they received pharmacological rescue therapy for PONV, as administered by PACU nurses who were unaware of the study or quality metric. These reports were generated monthly, separated by location, with all identifying patient information stripped.

This study was approved by the Baylor Scott & White Research Institute. All data were collected retrospectively. The data before and after the metric initiation were compared statistically, both by individual location and as a division overall. Statistical analysis was performed using SAS 9.4, R Studio, and JMP, using a generalized estimating equation model and Pearson's correlation coefficient. Confidence intervals, *P* values, and *Z* scores were generated and then graphed using Excel.

Table 1. Nausea and vomiting prophylaxis target tiers and their corresponding payments, as a percentage of physician base salary

Prophylaxis compliance rate	Remuneration
≤93.9%	0
94%–95.9%	1%
96%–97.9%	1.5%
≥98%	1.75%

RESULTS

In the first year of the study, before the metric became policy in July 2015, 43,775 patients received a general anesthetic and passed through the PACUs of the division, of which 25,802 (58.9%) were in the high-risk category. In the second year of the study, after the metric, 44,118 total patients were anesthetized, of whom 24,606 (55.8%) were high risk. Overall, for the division, appropriate prophylaxis for the high-risk group increased from 92.8% to 98.3% ($P < 0.0001$) (Figure 1a). At the individual location level, there was a statistically significant increase in appropriate prophylaxis at seven of the eight locations. The only one that did not show a significant increase was the Pavilion in Temple, the outpatient surgical center, which experienced a slight decline in appropriate prophylaxis (Figure 1b). Of note, there was an upswing in appropriate prophylaxis that began several months before the metric's start date. This correlated with announcements made through staff meetings and division-wide emails in April 2015 detailing the upcoming metric and its financial implications.

The rate of rescue therapy administration in the PACU for the Central Division's entire surgical population dropped from 17.6% before the metric to 14.4% after ($P < 0.0001$) (Figure 2a). Again, this decline began several months before the metric was instituted, correlating with the increase in prophylaxis. In the preceding months, the rescue therapy rate in the PACU was $>20\%$. When comparing data for the division before and after the metric start date, there was a net change of 963 fewer patients requiring rescue therapy. At the same time, the observed number of high-risk patients treated appropriately increased from 23,952 to 24,182 (an increase from 92.8% of the high-risk pool to 98.3%). Additionally, 4.6% fewer high-risk patients underwent surgery in the year after the metric, as opposed to the first.

As shown in Figure 2b, four locations had statistically significant declines in the need for rescue therapy (Baylor Scott & White–College Station, Scott & White Memorial Hospital, McLane Children's Hospital, and the Pavilion in Temple). The largest decline—from 22.2% to 14.8%—was seen at the large tertiary care hospital. These four locations encompassed more than half the patients involved in the study (28,410 of 44,118 in the second year). The Brenham hospital also saw a decline in rescue therapy needed, but the change was not statistically significant. Baylor Scott & White–Round Rock had no change in its rescue therapy rates. Hillcrest Hospital in Waco and its associated ASC both had statistically significant increases in rescue therapy needed, although the ASC had the lowest rates in the division for rescue therapy required both before and after the metric was implemented (3.1% before the metric and 6.5% after). Hillcrest Ambulatory Surgical Center in Waco opened its doors 2 months into the first year of the study and experienced strong growth in the year after the metric was initiated

Figure 1. Percentage of high-risk patients who received appropriate postoperative nausea and vomiting (PONV) prophylaxis for (a) all locations within the division and (b) each location. In (a), the solid vertical arrow denotes the start date of the PONV metric. The dashed vertical arrow denotes when the metric was announced. Error bars show 95% confidence intervals. BRH indicates Brenham Hospital; CSH, Baylor Scott & White—College Station; RRH, Baylor Scott & White—Round Rock; TEH, Scott & White Memorial Hospital; TEMH, McLane Children's Hospital; TEPV, the Pavilion in Temple; WAH1 ASC, Hillcrest Ambulatory Surgical Center in Waco; WAHH, Hillcrest Hospital in Waco.

(391 patients through the PACU before the metric, 1750 after). The rescue therapy rates at Hillcrest Hospital in Waco were consistently high throughout the second year of the study.

DISCUSSION

Examination of the data revealed that tying adherence to the quality metric to remuneration resulted in a statistically significant increase in prophylaxis administration for patients at high risk for PONV. Additionally, incentivizing proper prophylaxis in the high-risk pool resulted in a decreased need for rescue therapy in the PACU for all surgical patients receiving a general anesthetic.

It is apparent from this study that, though the incentive amount was an arbitrarily chosen percentage, it was enough motivation to drive meaningful change in prophylaxis administration. In fact, the mere announcement of it 3 months prior to launch of the metric led to an immediate change in behavior, with immediate increased PONV prophylaxis of high-risk patients. Unfortunately, this change led to a slight warping of the premetric data, driving up the average percentage receiving prophylaxis. The differences

seen before and after the metric would have been slightly more profound had the practices of physicians not changed ahead of time. Ultimately, all locations received the full financial benefit of the top-tier goal, having all exceeded the benchmark of 93.8%.

In regard to rescue therapy, again the observed differences were attenuated by the final 3 months of the first year of the study, no doubt driven down by the premature increase in prophylaxis administration. On average across the division, rescue therapy rates dropped by a full three percentage points in the wake of the metric announcements, before it started.

Additionally, when absolute numbers are examined, the number of high-risk patients receiving prophylaxis declined slightly after the metric, from 23,929 before to 23,417 after. The population of high-risk patients dropped from 25,778 to 23,832. Therefore, though the percentage of patients properly prophylaxed increased by 5.5%, absolute numbers dropped by 512 (or slightly more than 2%). And yet, the number of patients needing rescue therapy over the entire division declined from 7709 to 6220, a drop of 1489 (19%). Over 500 fewer high-risk patients were anesthetized, and three times fewer than that number needed rescue therapy. Rescue therapy therefore declined eight times more than the decline in high-risk patients prophylaxed. This is a strong indication that the visibility of the risk score on the preoperative evaluation combined with heightened awareness of prophylaxis due to the incentivized quality metric led to an effect beyond just the high-risk patients, reaching the entire population of surgical patients.

In looking at individual locations, it is interesting to note that the Pavilion in Temple did not have a change in prophylaxis yet still had an observed and statistically significant drop in rescue therapy usage. In taking a closer look at the postmetric data, 3 of the 12 months had a profoundly lower proper prophylaxis rate (below 90%), yet in the other 9 months the rate was >97%. In those 3 months, certain anesthesiologists worked heavily at the Pavilion, all of whom had the lowest rates of prophylaxis seen at that location. Despite this, all three also had the lowest rates of rescue therapy needed at the Pavilion in Temple. It could be postulated that perhaps they did not document the prophylactic medications they delivered or that the cases they performed were incorrectly noted as involving a general anesthetic when they did not; however, without patient identifiers present to allow a deep dive into the EMR, it is difficult to tell.

At Hillcrest Hospital in Waco and Hillcrest Ambulatory Surgical Center in Waco, there was a rise in needed rescue therapy despite a rise in prophylaxis. The same group of anesthesiologists served both of those locations. Because the number of patients treated at the ambulatory center increased dramatically, it may be that the premetric sample was too small to be truly representative of the baseline once the center was at full operational capacity. This does not, however, explain the increase in rescue therapy at the larger

Figure 2. Percentage of all patients who underwent a general anesthetic and received a postoperative nausea and vomiting (PONV) rescue medication in the PACU for (a) all locations within the division and (b) each location. In (a), the solid vertical arrow denotes the start date of the PONV metric. The dashed vertical arrow denotes when the metric was announced. Error bars show 95% confidence intervals. BRH indicates Brenham Hospital; CSH, Baylor Scott & White–College Station; RRH, Baylor Scott & White–Round Rock; TEH, Scott & White Memorial Hospital; TEMH, McLane Children's Hospital; TEPV, the Pavilion in Temple; WAH1 ASC, Hillcrest Ambulatory Surgical Center in Waco; WAHH, Hillcrest Hospital in Waco.

hospital (Hillcrest Hospital in Waco) adjacent to it. The number of patients going through that PACU increased almost 12%, whereas rescue therapy increased 24.8% and the number of high-risk patients increased 18%. In speaking with the anesthesiologists at that location, it came to light that individual anesthesiologists were using haloperidol and promethazine for uses beyond PONV rescue therapy and that the PACU nursing staff was especially aggressive in administration of rescue therapy. The reports only counted the number of administrations of these drugs, so they were counted regardless of the reason given.

As with all studies, there are limitations, and in this study those limitations hinged around what was captured in the EMR. Though it was possible to know the frequency with which a certain medication was administered, it was impossible to know whether the medication was given for PONV or for other off-label reasons.

As far as behavior is concerned, it would be interesting to test levels of remuneration to determine the optimal percentage of salary that would result in a high level of adherence to the quality metric as seen here. Though it is certainly possible to increase the percentage and look for changes in behavior, decreases in remuneration are more challenging to test for, because psychological studies have shown that people get discouraged by decreases in salary, even when the amount is slight.⁹ It would therefore be advisable to start low and increase the incentive until the desired behavior is seen.

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