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Resident Participation and Directed Electronic Medical Record Programming Can Decrease Peri-Operative Complications and Improve Surgical Quality, NSQIP Quality Metrics

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Abstract- The National Surgical Quality Improvement Program (NSQIP) is a data collection system used to track hospital and surgical performance and to compare hospital and surgical quality. Improvement in quality metrics, both over time in the same institution and against peer hospitals, is rewarded by financial incentives with improved Medicare payments. As such physicians may be interested in the quality metrics of their specific practice and performance improvement not only because of the possibility of improved care provision but also because reimbursement may become dependent on such data. We hypothesized that involvement of general surgery residents would be a useful modality to improve NSQIP data and possibly improve patient care. The residents were incorporated into our hospital performance committee and directly assisted with the overhaul of surgical quality assurance over an eight-month period. Data from the antecedent eight-month period was compared to data from the eight months after general surgery resident oversight was initiated. Statistically significant improvement in hospital performance was demonstrated in five of the eight measured categories. We believe that this finding could be reproducible in other institutions; additional studies are necessary to determine this.

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Abstract- The National Surgical Quality Improvement Program (NSQIP) is a data collection system used to track hospital and surgical performance and to compare hospital and surgical quality. Improvement in quality metrics, both over time in the same institution and against peer hospitals, is rewarded by financial incentives with improved Medicare payments. As such physicians may be interested in the quality metrics of their specific practice and performance improvement not only because of the possibility of improved care provision but also because reimbursement may become dependent on such data. We hypothesized that involvement of general surgery residents would be a useful modality to improve NSQIP data and possibly improve patient care. The residents were incorporated into our hospital performance committee and directly assisted with the overhaul of surgical quality assurance over an eight-month period. Data from the antecedent eight-month period was compared to data from the eight months after general surgery resident oversight was initiated. Statistically significant improvement in hospital performance was demonstrated in five of the eight measured categories. We believe that this finding could be reproducible in other institutions; additional studies are necessary to determine this.

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I. INTRODUCTION

The National Surgical Quality Improvement Program (NSQIP) is used in many hospitals around the United States to compare quality of surgical care in order to continually strive for quality improvement [1]. Originally started in the early 1990s, NSQIP's predecessor, The National Veterans Administration Surgical Risk Study, was the first large scale surgical quality index by which data points were collected regarding both surgical outcomes as well as risk information [2]. After several years, the data collected by the VA system was very robust and included reliable, valid information on patient pre-surgical risk factors, process of care during surgery, and 30-day morbidity and mortality rates [3].

Today, NSQIP is used by many private and government-based hospital systems and is one of the largest databases of clinical information for surgical care

[1]. NSQIP data can be used to compare hospital performance to peer hospitals as well as audit performance for internal improvement. Improvement in quality metrics, both over time in the same institution and against peer hospitals, is rewarded by financial incentives with improved Medicare payments [4,5]. This "pay for performance" model is rapidly gaining acceptance both with hospital and physician payers and the general public [6]. As a result, physicians are becoming more interested in the quality metrics of their specific practice and performance improvement, not only because of the possibility of improved care provision, but also because reimbursement may become dependent on such data.

Our hospital system participates in the surgical care improvement project (SCIP) and maintains detailed records of important surgical care metrics which we use for internal quality tracking. We are always striving to improve our quality of care; therefore, we decided to include general surgery residents in the performance improvement process to see if this would alter our quality outcomes. It was felt that if the residents were aware of NSQIP / SCIP, and were included in departmental performance improvement projects, they could potentially contribute by identifying problems or shortcomings in surgical patient care. Historically, however, resident participation has been shown to correlate with inferior performance outcomes in trauma, higher complication rates in general surgery patients, and overall no net effect in plastic surgery patients [7,8,9]. Despite these previous findings, we elected to determine if resident involvement in the performance improvement process could improve our institution's NSQIP / SCIP data and overall patient care.

II. METHODS

The general surgery residents at our institution were placed on the performance improvement committee and attended committee meetings monthly during the study period. The residents were familiarized with the NSQIP / SCIP protocol and subsequently major areas of deficiency were identified. The areas noted were: appropriate time frame of Foley catheter removal,

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inappropriate continuation of antibiotic therapy, and lack of beta-blocker continuation on applicable patients. Deep vein thromboembolic (DVT) prophylaxis as well as pre-operative antibiotic therapy were also included.

These SCIP measures were appropriately outlined and a dot phrase template was created within our electronic medical record system. This phrase was included within the notes of each surgical patient at our institution. As a result, to sign the note, the SCIP measures for each patient had to be acknowledged.

After thorough review, IRB approval was not deemed necessary by our institution's IRB committee as no patient identifiers were included nor were any experimental treatments rendered with this study. The research involved improving the process by which standard of care interventions were administered.

The data for eight months prior to the implementation of the new progress notes were compared to corresponding data for the eight months following implementation. All SCIP data collected by the hospital were reviewed for that time frame. All exclusion criteria were applied based on the criteria set forth by the Specifications Manual for National Hospital Inpatient Quality Measures per the Center for Medicare and Medicaid Services (Appendix A).

III. RESULTS

During the study time frame, a total of 594 eligible cases were performed at our institution that qualified for the study prior to resident involvement and 739 eligible cases were performed after resident involvement was initiated. The data reported were the same as were collected and reviewed by the hospital performance improvement committee and Centers for Medicare and Medicaid Services. In Table 1, the total number of eligible cases were broken into compliant and non-compliant categories for each of eight NSQIP / SCIP parameters. These are further delineated by both pre- and post-resident involvement. The resulting

proportions relative to each subcategory are also displayed.

Statistical analysis was performed using SAS[®] PROC FREQ, v. 9.2. A chi square analysis was used to compare the proportions and the corresponding significance of the range improvement. In instances where the data collected was insufficient to ensure validity of Chi Square testing, a Fisher's Exact test was utilized. Our null hypothesis was that there would be no improvement and the corresponding research hypothesis was that an improvement would be obtained (upper tailed alternative). The reported p-values reflect this convention. The conventional level of $p < 0.05$ was used to ascribe significance.

The core measures that were investigated and reported below are: antibiotic administration within one hour of incision, appropriate antibiotic selection, antibiotic discontinuation within 24 hours of procedure, appropriate hair removal, urinary catheter removed by post-operative day 1-2, applicable beta-blocker administration in the perioperative period, DVT prophylaxis, and timing of DVT prophylaxis administration.

In these eight categories, statistically significant improvement was noted in: antibiotic administration within one hour of incision (p -value = 0.0022), appropriate antibiotic selection (p -value = 0.0118), antibiotic discontinuation within 24 hours of procedure (p -value = 0.0007), urinary catheter removed by post-operative day 1-2 (p -value = 0.0229), applicable beta-blocker administration in the perioperative period (p -value = 0.0033). Appropriate hair removal was determined to have 100% compliance before and after resident involvement with quality measures; therefore, no analysis was necessary. DVT prophylaxis and timing of DVT prophylaxis administration was not deemed to have statistically significant improvement (p -values = 0.0819 and 0.0582).

Table 1: N = Total number of eligible cases, n = Number of compliant cases, P_{Before} = Proportion of compliant cases prior to resident involvement, P_{After} = Proportion of compliant cases after resident involvement. BEFORE = 8 months prior to resident involvement, AFTER = 8 months after resident involvement. All p-values derived from Chi-Square test except as denoted by * (utilized Fisher's Exact test).

PARAMETER	BEFORE			AFTER			$\frac{P_{\text{After}}}{P_{\text{Before}}}$	p VALUE
	N	n	P_{Before}	N	n	P_{After}		
Antibiotic Within 1 Hour of Incision	580	563	97.07	503	500	99.40	2.33	0.0022
Antibiotic Selection	579	568	98.10	504	502	99.60	1.50	0.0118
Discontinuation of Antibiotic Within 24 Hours of Procedure	565	537	95.55	490	483	98.57	3.53	0.0007
Hair Removal	761	761	100.00	642	642	100.00	0	N/A
Foley Catheter Removal By POD #1-2	197	176	89.34	178	169	94.94	5.60	0.0229
Peri-Operative Beta-Blocker Use	256	244	95.31	206	205	99.51	4.20	0.0033
DVT Administration	598	593	99.16	387	387	100.00	0.84	0.0819*
DVT Timing	599	592	98.83	503	502	99.8	0.97	0.0582*

IV. DISCUSSION

Our data demonstrates that statistically significant improvement in SCIP compliance can be achieved with the addition of general surgery resident involvement. We do not know if this is reproducible in other institutions or in other healthcare settings. We have not been able to correlate SCIP data to actual complication rates in our institution at this time. This would be an important focus for a future study. We did not compare this data to hospital and physician reimbursement as a result of improved performance metrics; however, this would be another area of future examination.

V. CONCLUSION

We conclude that general surgery residents are a useful adjunct that should be considered as an asset and not a hindrance to the provision of quality care in the hospital setting. Residents should be incorporated into other such committees and the long-term results studied to see if these findings are reproducible.

Conflict of Interest:

No conflicts of interest.

Funding:

There are no sources of funding to declare.

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APPENDIX A

Exclusion criteria for initiation of pre-operative antibiotics within one hour of incision time were: documented evidence of pre-existing infection, administration of vancomycin which was allowed a 2-hour window for administration pre-operatively, patients less than 18 years of age, length of stay > 120 days, patients who had a hysterectomy or cesarean section during the same hospitalization, patients enrolled in clinical trials, patients who were on antibiotics more than 24 hours before surgery (except for elective colon resections and patients who had another procedure with 3 days prior to the index procedure).

For hair removal, the exclusion criteria were: less than 18 years of age, length of stay > 120 days, patient performed their own hair removal, patients in clinical trials, or patients whose procedures occurred prior to the hospital admission.

Exclusion criteria for the post-operative Foley catheter removal within 24-48 hours were: patients less than 18 years of age, length of stay > 120 days, patients enrolled in clinical trials, patients who had a urological, gynecological or perineal procedure performed, patients whose principal procedure occurred prior to the date of admission, patients who expired perioperatively, patients whose length of stay was less than two days post-operatively, patients who did not have a catheter in place post-operatively, patients who had physician/ APN/PA documentation of a reason for not removing the urinary catheter post-operatively, patients who had a urinary diversion or a urethral catheter or were being intermittently catheterized prior to hospital arrival.

Exclusion criteria for selection of appropriate antibiotic as well as discontinuation of antibiotics within 24 hours were: patients less than 18 years of age, length of stay > 120 days, patients who had a principal diagnosis suggestive of pre-operative infectious disease, patients enrolled in clinical trials, patients whose principal procedure occurred prior to the date of admission, patients with physician/APN/PA documented

infection prior to surgical procedure of interest, patients who expired perioperatively, patients who had other procedures requiring general or spinal anesthesia that occurred within 3 days (4 days for CABG or other cardiac surgery) prior to or after the procedure of interest (during separate surgical episodes) during this hospital stay, patients who were receiving antibiotics more than 24 hours prior to surgery (except colon surgery patients taking oral prophylactic antibiotics), patients who did not receive any antibiotics before or during surgery, or within 24 hours after *Anesthesia End Time* (i.e., patient did not receive prophylactic antibiotics), patients who did not receive any antibiotics during this hospitalization.

Exclusion criteria for patients getting DVT prophylaxes were: patients less than 18 years of age, length of stay < 2 days and > 120 days, patients with *Comfort Measures Only* documented on day of or day after hospital arrival, patients enrolled in clinical trials, patients who are direct admits to intensive care unit (ICU), or transferred to ICU the day of or the day after hospital admission with ICU length of stay > 1 day, patients with principal diagnosis code of mental disorders or stroke, and patients with principal diagnosis code of obstetrics or VTE.