Implementation of a Standardized Multimodal Post-Operative Pain Protocol Reduces Post-Operative Pain Among Neurosurgical Patients

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Introduction

It is well established that postoperative pain has far reaching effects including patient physiology and length of stay. Increasingly, patients' perceptions of postoperative pain are being tracked and tied to reimbursements through mechanisms such as the Hospital Consumer Assessment of Healthcare Providers and Systems survey (HCAHPS). What remains to be seen is whether an interdepartmental, quality improvement initiative can be used to reduce postoperative neurosurgical pain.

Methods

A Multimodal Pain Contol Initiative (MMPCI) was performed with vested members from Neurosurgery, Anesthesia, Nursing, Pain Management, and Pharmacy. The intervention consisted of ...

- **Preopertive Improvements: i**ncreased documentation of pain, anxiety, depression, and preoperative analgesia usage. As well as scripting of postoperative pain expectations
- **Intraoperative Improvements:** Preoperative dosing of gabapentin, intraoperative use of multimodal analgesia, and standardization among neuroanesthesiologists.
- **Postoperative Pain Recognition:** Setting a goal of "6 must be fixed" for postop pain, protocol of notifying housestaff for uncontrolled pain, and automatically improving pain scores into daily rounding notes.
- **Postoperative Pain Control:** Development of a standardized analgesia dosing and escalation protocol, improvements to standard order sets, as well as nursing and housestaff education on pain management.

Process measures consisted of compliance with the analgesia protocol, postoperative analgesia regimens, as well as preoperative and postoperative pain documentation. Outcomes measures were the visual analog pain scale (VAS) on postoperative day #1 and postoperative day #3 (POD#1, POD#3), postoperative surveys, and HCAHPS scores. Narcan doses were tracked as a counter measure.

To determine the effect of the intervention, a time series trial of systematically randomly sampled patients from this postoperative neurosurgical population was performed (n=96). Analysis was performed using a multivariant linear regression model.

Results

There was no significant difference between the pre and post intervention populations with regards to gender, age, BMI, type of surgery, preoperative analgesia usage, depression or anxiety. Depression and anxiety were measured by the PROMIS computer adaptive testing inventory.

After implementation of the Multimodal Pain Control Initiative, significant improvements were made in preoperative documentation of pain ($p<0.0001$). Furthermore, increased use of postoperative acetamenophen ($p=0.05$), NSAIDs ($p<0.009$) and gabapentin ($p<0.05$) was observed. Overall compliance with the pain protocol increased significantly ($p<0.0001$).

Table 1. Process Measures

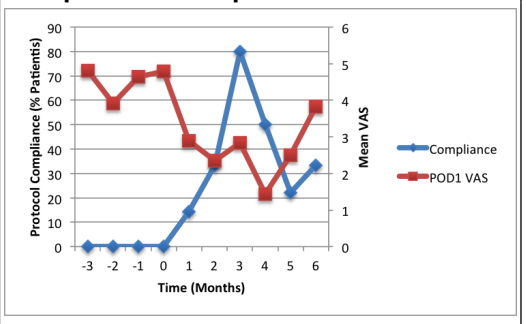
	Pre-Intervention	Post-Intervention	p-value
Pain Documented in HPI	6 (12.5%)	23 (47.9%)	.000
Pain Documented in Daily Note	4 (8.3%)	48 (100%)	.000
POD #1	n=48	n=48	
Tylenol	27 (56.3%)	36 (75%)	.055
Benzodiazepine	5(10.4%)	10(20.8%)	.170
NSAID	4(8.3%)	15 (31.3%)	.009
Muscle Relaxant	9 (18.8%)	5 (10.4%)	.386
Gabapentin	6 (12.5)	16 (33.3%)	.027
PCA Use	18 (37.5%)	14 (29.2%)	.390
OME	55.7±100.6	63.2±58.5	.655
Compliance with Protocol	0(0%)	17 (35.4%)	.000
POD #3	n=19	n=22	
Tylenol	4(20.0%)	11(47.8%)	.050
Benzodiazepine	4(8.3%)	8(16.7%)	.466
NSAID	1(2.1%)	4 (8.3%)	.393
Muscle Relaxant	8 (16.7%)	3 (6.3%)	.133
Gabapentin	3 (6.3%)	9 (18.8%)	.176
PCA Use	0	2(9.1%)	.490
OME	72.29±70.7	39.17±36.5	.062

After the intervention, patients' visual analog pain scores were significantly reduced on postoperative day #1 ($p=0.05$) with the most improvement being seen among spine patients. Further multivariate regression analysis showed that the greatest predictors of postoperative pain were the type of surgery ($p<0.0001$), patient age ($p<0.05$), and inclusion after the pain control initiative ($p<0.05$). Adverse events were tracked with no increase in naloxone use or patient length of stay.

Table 2. Outcome Measures

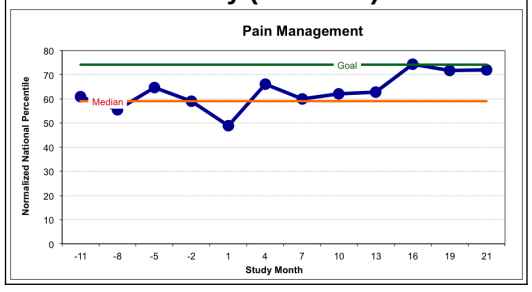
	Pre-Intervention	Post-Intervention	p-value
	n=48	n=48	
Aggregate Pain Score POD #1	4.31 (3.7-4.9)	2.94 (2.04-3.85)	.000
Cranial Surgery	2.78 (1.79-3.77)	2.20(1.08-3.32)	.036
Spinal Surgery	5.45 (4.64-6.25)	3.10 (2.37-3.83)	
	n=18	n=20	
Aggregate Pain Score POD #3	3.218 (1.972-4.465)	2.386 (1.382, 3.391)	.058
Cranial Surgery	1.543 (-.991, 4.076)	1.390 (-.300, 3.080)	.402
Spinal Surgery	4.894 (3.838, 5.949)	3.383 (2.451, 4.314)	
How much relief has your pain treatments or medication provided? (0-100%)	74.310 (66.7-81.93)	66.26 (58.30-74.22)	.663
Length of Stay	2.981 (2.211-3.751)	2.874 (2.096-3.652)	.851
Naloxone Doses per Month	1.5±1.0	1.0±0.8	

Fig 1. Correlation of pain scores and protocol compliance over time.



Note the temporal correlation between increased protocol compliance and decreasing pain.

Fig 2. Hospital Consumer Assessment of Healthcare Providers and Systems Survey (HCAHPS)



Using statistcal process control methods, significant improvements were seen among this population's HCAHPS scores in the areas of Pain Management and Assistance with Pain.

Conclusions

A multimodal pain control initiative can be developed and implemented among neurosurgery patients. Furthermore, the initiative correlated with an increased use of multimodal analgesia, improved pain documentation, and reduced postoperative pain scores without an increase in adverse events.