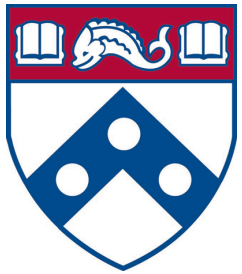
Enhanced Recovery After NeuroSurgery: Opioid Management in Spinal Surgery

Michigan Spine Surgery Improvement Collaborative

August 2, 2019



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- **No relevant disclosures**

Revised: April 20, 2018

PA Prescribing Guidelines for Pennsylvania

TREATING

CHRONIC NON-CANCER PAIN

JAMA Internal Medicine | Original Investigation

Incidence of and Risk Factors for Chronic Opioid Use Among Opioid-Naive Patients in the Postoperative Period

Eric C. Sun, MD, PhD; Beth D. Darnall, PhD; Laurence C. Baker, PhD; Sean Mackey, MD, PhD

IMPORTANCE Chronic opioid use imposes a substantial burden in terms of morbidity and economic costs. Whether opioid-naive patients undergoing surgery are at increased risk for chronic opioid use is unknown, as are the potential risk factors for chronic opioid use following surgery.

OBJECTIVE To characterize the risk of chronic opioid use among opioid-naive patients following 1 of 11 surgical procedures compared with nonsurgical patients.

DESIGN, SETTING, AND PARTICIPANTS Retrospective analysis of administrative health claims to determine the association between chronic opioid use and surgery among privately insured patients between January 1, 2001, and December 31, 2013. The data concluded 11 surgical procedures (total knee arthroplasty [TKA], total hip arthroplasty, laparoscopic cholecystectomy, open cholecystectomy, laparoscopic appendectomy, open appendectomy, cesarean delivery, functional endoscopic sinus surgery [FESS], cataract surgery, transurethral prostate resection [TURP], and simple mastectomy). Multivariable logistic regression analysis was performed to control for possible confounders, including sex, age, preoperative history of depression, psychosis, drug or alcohol abuse, and preoperatice use of benzodiazepines, antipsychotics, and antidepressants.

EXPOSURES One of the 11 study surgical procedures.

MAIN OUTCOMES AND MEASURES Chronic opioid use, defined as having filled 10 or more prescriptions or more than 120 days' supply of an opioid in the first year after surgery, excluding the first 90 postoperative days. For nonsurgical patients, chronic opioid use was defined as having filled 10 or more prescriptions or more than 120 days' supply following a randomly assigned "surgery date."

RESULTS The study included 641 941 opioid-naive surgical patients (169 666 men; mean [SD] age, 44.0 [12.8] years), and 18 011 137 opioid-naive nonsurgical patients (8 849 107 men; mean [SD] age, 42.4 [12.6] years). Among the surgical patients, the incidence of chronic opioid in the first preoperative year ranged from 0.119% for Cesarean delivery (95% CI, 0.104%-0.134%) to 1.41% for TKA (95% CI, 1.29%-1.53%) The baseline incidence of chronic opioid use among the nonsurgical patients was 0.136% (95% CI, 0.134%-0.137%). Except for cataract surgery, laparoscopic appendectomy, FESS, and TURP, all of the surgical procedures were associated with an increased risk of chronic opioid use, with odds ratios ranging from 1.28 (95% CI, 1.12-1.46) for cesarean delivery to 5.10 (95% CI, 4.67-5.58) for TKA. Male sex, age older than 50 years, and preoperative history of drug abuse, alcohol abuse, depression, benzodiazepine use, or antidepressant use were associated with chronic opioid use among surgical patients.

CONCLUSIONS AND RELEVANCE In opioid-naive patients, many surgical procedures are associated with an increased risk of chronic opioid use in the postoperative period. A certain subset of patients (eg, men, elderly patients) may be particularly vulnerable.

JAMA Intern Med. 2016;176(9):1286-1293. doi:10.1001/jamainternmed.2016.3298
Published online July 11, 2016. Corrected on August 8, 2016.

Penn Neurosurgery ERAS Protocol

Pre-op

- Surgical Education & Expectation Management
- Surgical Site Education
- Nutrition Optimization
- Diabetes Management
- Smoking Cessation
- Narcotic/Alcohol Use
- Obstructive Sleep Apnea
- Discharge Planning

Peri-op

- Metabolism Management
- Multimodal Analgesia
- Surgery Checklist
- Early Mobilization
- Wound Care Management

Post-op

- Clinical Team Communication
- Wound Care Management
- Post Acute Care Resource Utilization

Penn Neurosurgery ERAS – Pre-op

Pre-op

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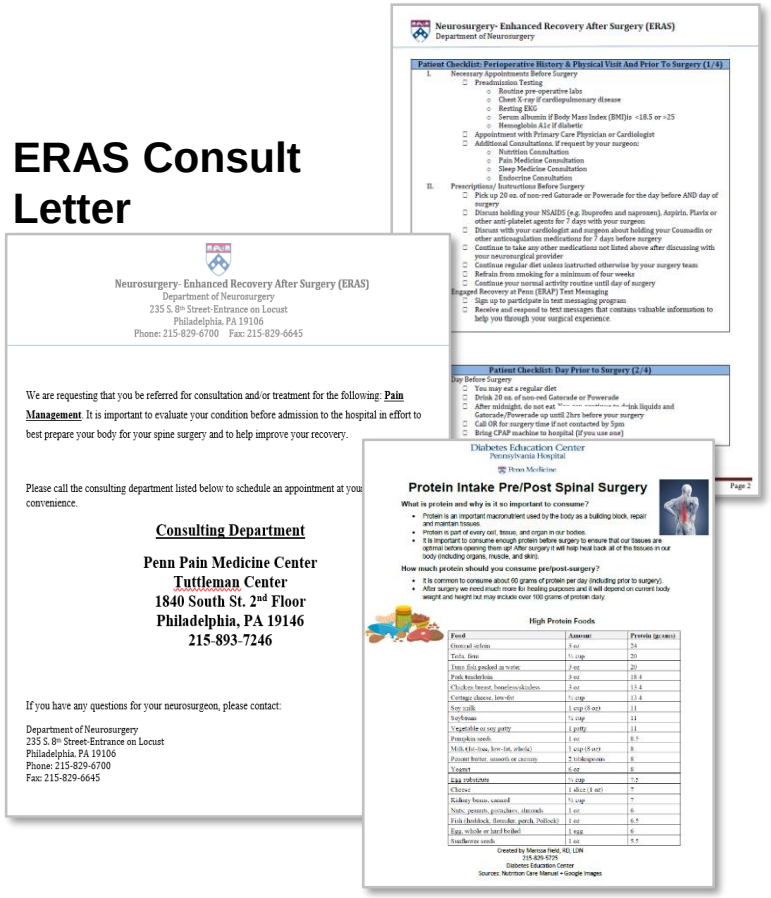
ERAS Consult Letter



Neurosurgery- Enhanced Recovery After Surgery (ERAS)
Department of Neurosurgery
235 S. 8th Street-Entrance on Locust
Philadelphia, PA 19106
Phone: 215-829-6700 Fax: 215-829-6645

We are requesting that you be referred for consultation and/or treatment for the following: **Pain Management**. It is important to evaluate your condition before admission to the hospital in effort to best prepare your body for your spine surgery and to help improve your recovery.

Please call the consulting department listed below to schedule an appointment at your convenience.

Consulting Department

Penn Pain Medicine Center
Tuttleman Center
1840 South St. 2nd Floor
Philadelphia, PA 19146
215-893-7246

If you have any questions for your neurosurgeon, please contact:

Department of Neurosurgery
235 S. 8th Street-Entrance on Locust
Philadelphia, PA 19106
Phone: 215-829-6700
Fax: 215-829-6645

Neurosurgery- Enhanced Recovery After Surgery (ERAS)
Department of Neurosurgery

Patient Checklist: Perioperative History & Physical Visit And Prior To Surgery (1/4)

Patient Checklist: Day Prior to Surgery (2/4)

Diabetes Education Center
Pennsylvania Hospital
Penn Medicine

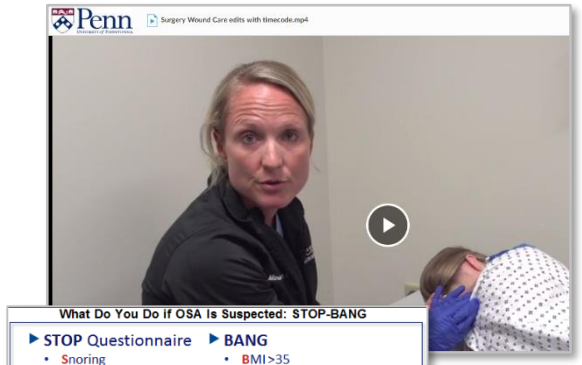
Protein Intake Pre/Post Spinal Surgery

What is protein and why is it so important to consume?

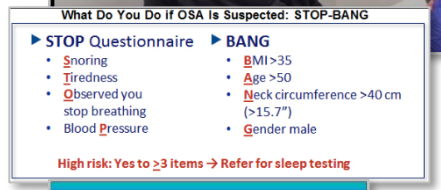
How much protein should you consume pre/post-surgery?

High Protein Foods

Patient Education



Penn Surgery Wound Care edits with timecode.mp4



What Do You Do if OSA Is Suspected: STOP-BANG

STOP Questionnaire
- Snoring
- Tiredness
- Observed you stop breathing
- Blood Pressure

BANG
- BMI>35
- Age >50
- Neck circumference >40 cm (>15.7")
- Gender male

High risk: Yes to ≥3 items → Refer for sleep testing

Quit Smoking
Before Your Operation

SURGICAL PATIENT EDUCATION PROGRAM
Prepare for the Best Recovery

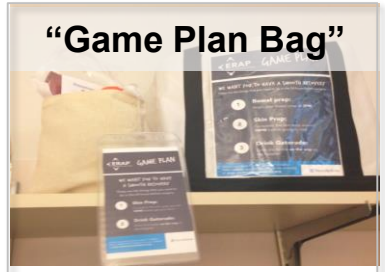
Did you know that before surgery is the best time to quit smoking?

Do your part and quit now! Your surgical team is here to help.

Smoking Increases Your Risk of Heart and Breathing Problems*

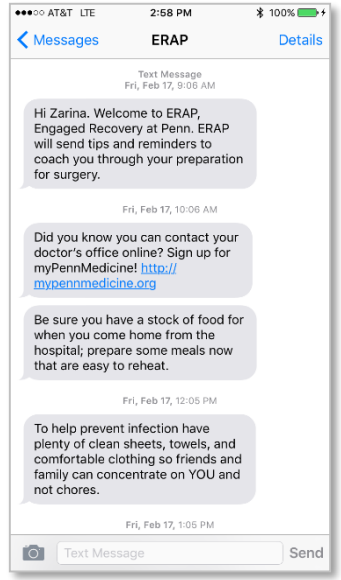
AMERICAN COLLEGE OF SURGEONS | DIVISION OF EDUCATION

ERAP
Engaged Recovery at Penn



"Game Plan Bag"

Patients receive text reminders about the critical ERAS behaviors



AT&T LTE 2:58 PM 100%
Messages ERAP Details

Text Message
Fri, Feb 17, 9:06 AM

Hi Zarina. Welcome to ERAP, Engaged Recovery at Penn. ERAP will send tips and reminders to coach you through your preparation for surgery.

Fri, Feb 17, 10:06 AM

Did you know you can contact your doctor's office online? Sign up for myPennMedicine! http://mypennmedicine.org

Be sure you have a stock of food for when you come home from the hospital; prepare some meals now that are easy to reheat.

Fri, Feb 17, 12:05 PM

To help prevent infection have plenty of clean sheets, towels, and comfortable clothing so friends and family can concentrate on YOU and not chores.

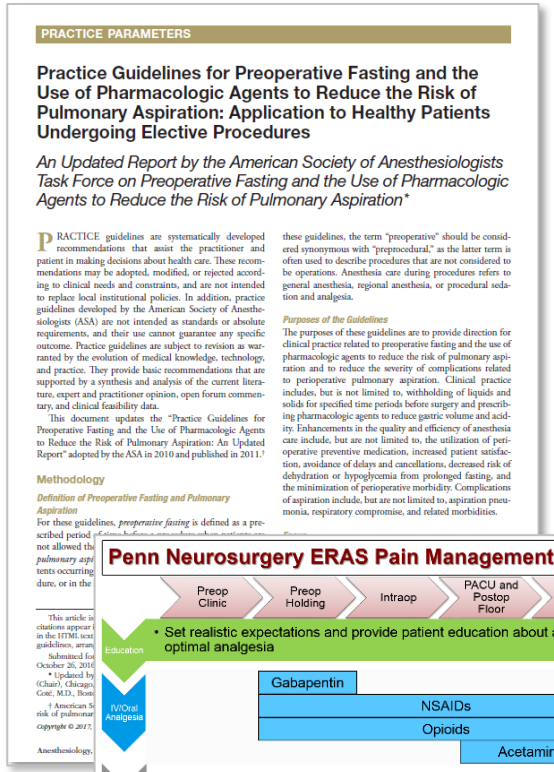
Fri, Feb 17, 1:05 PM

Text Message Send

Penn Neurosurgery ERAS – Peri-op

Peri-op

- Metabolism Management
- Multimodal Analgesia
- Surgery Checklist
- Early Mobilization
- Wound Care Management



PRACTICE PARAMETERS

Practice Guidelines for Preoperative Fasting and the Use of Pharmacologic Agents to Reduce the Risk of Pulmonary Aspiration: Application to Healthy Patients Undergoing Elective Procedures

*An Updated Report by the American Society of Anesthesiologists Task Force on Preoperative Fasting and the Use of Pharmacologic Agents to Reduce the Risk of Pulmonary Aspiration**

PRACTICE guidelines are systematically developed recommendations that assist the practitioner and patient in making decisions about health care. These recommendations may be adopted, modified, or rejected according to clinical needs and constraints, and are not intended to replace local institutional policies. In addition, practice guidelines developed by the American Society of Anesthesiologists (ASA) are not intended as standards or absolute requirements, and their use cannot guarantee any specific outcome. Practice guidelines are subject to revision as warranted by the evolution of medical knowledge, technology, and practice. They provide basic recommendations that are supported by a synthesis and analysis of the current literature, expert and practitioner opinion, open forum commentary, and clinical feasibility data.

This document updates the "Practice Guidelines for Preoperative Fasting and the Use of Pharmacologic Agents to Reduce the Risk of Pulmonary Aspiration: An Updated Report" adopted by the ASA in 2010 and published in 2011.†

Methodology

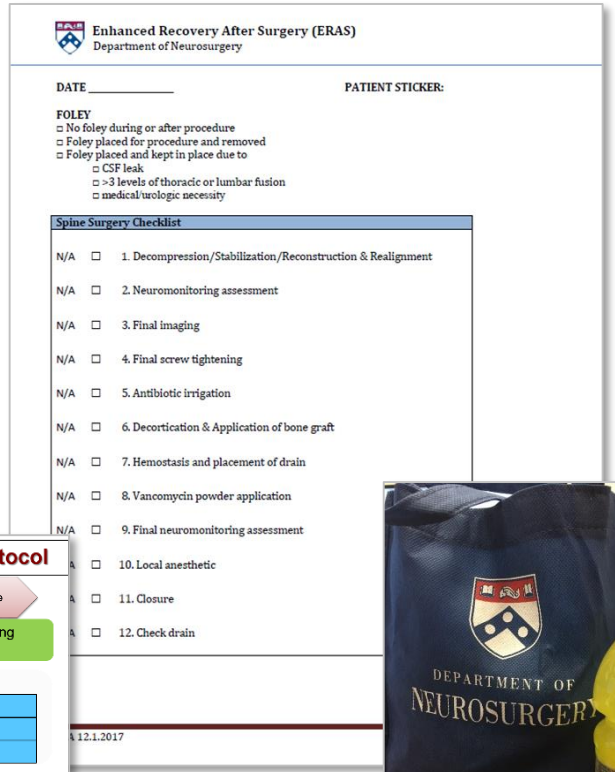
Definition of Preoperative Fasting and Pulmonary Aspiration

For these guidelines, *preoperative fasting* is defined as a pre-

these guidelines, the term "preoperative" should be considered synonymous with "preprocedural," as the latter term is often used to describe procedures that are not considered to be operations. Anesthesia care during procedures refers to general anesthesia, regional anesthesia, or procedural sedation and analgesia.

Purposes of the Guidelines

The purposes of these guidelines are to provide direction for clinical practice related to preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration and to reduce the severity of complications related to perioperative pulmonary aspiration. Clinical practice includes, but is not limited to, withholding of liquids and solids for specified time periods before surgery and prescribing pharmacologic agents to reduce gastric volume and acidity. Enhancements in the quality and efficiency of anesthesia care include, but are not limited to, the utilization of perioperative preventive medication, increased patient satisfaction, avoidance of delays and cancellations, decreased risk of dehydration or hypoglycemia from prolonged fasting, and the minimization of perioperative morbidity. Complications of aspiration include, but are not limited to, aspiration pneumonia, respiratory compromise, and related morbidities.



Enhanced Recovery After Surgery (ERAS)
Department of Neurosurgery

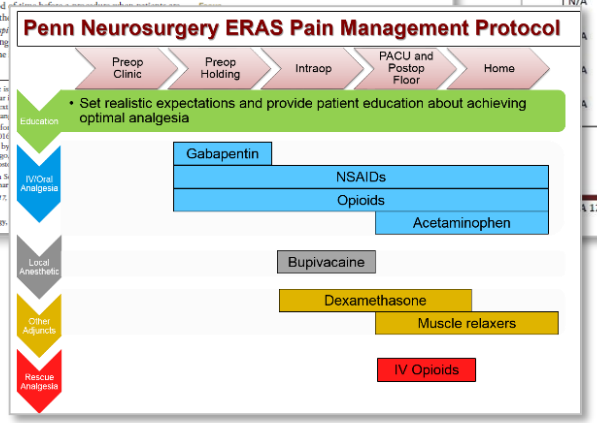
DATE _____ PATIENT STICKER:

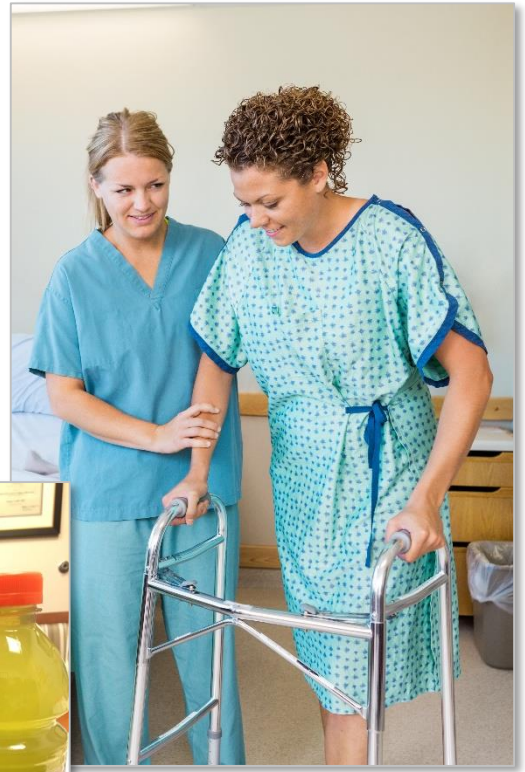
FOLEY
- ☐ No foley during or after procedure
- ☐ Foley placed for procedure and removed
- ☐ Foley placed and kept in place due to
  - ☐ CSF leak
  - ☐ >3 levels of thoracic or lumbar fusion
  - ☐ medical/urologic necessity

Spine Surgery Checklist

N/A	☐	1. Decompression/Stabilization/Reconstruction & Realignment
N/A	☐	2. Neuromonitoring assessment
N/A	☐	3. Final imaging
N/A	☐	4. Final screw tightening
N/A	☐	5. Antibiotic irrigation
N/A	☐	6. Decortication & Application of bone graft
N/A	☐	7. Hemostasis and placement of drain
N/A	☐	8. Vancomycin powder application
N/A	☐	9. Final neuromonitoring assessment
	☐	10. Local anesthetic
	☐	11. Closure
	☐	12. Check drain

12.1.2017





Penn Neurosurgery ERAS – Post-op

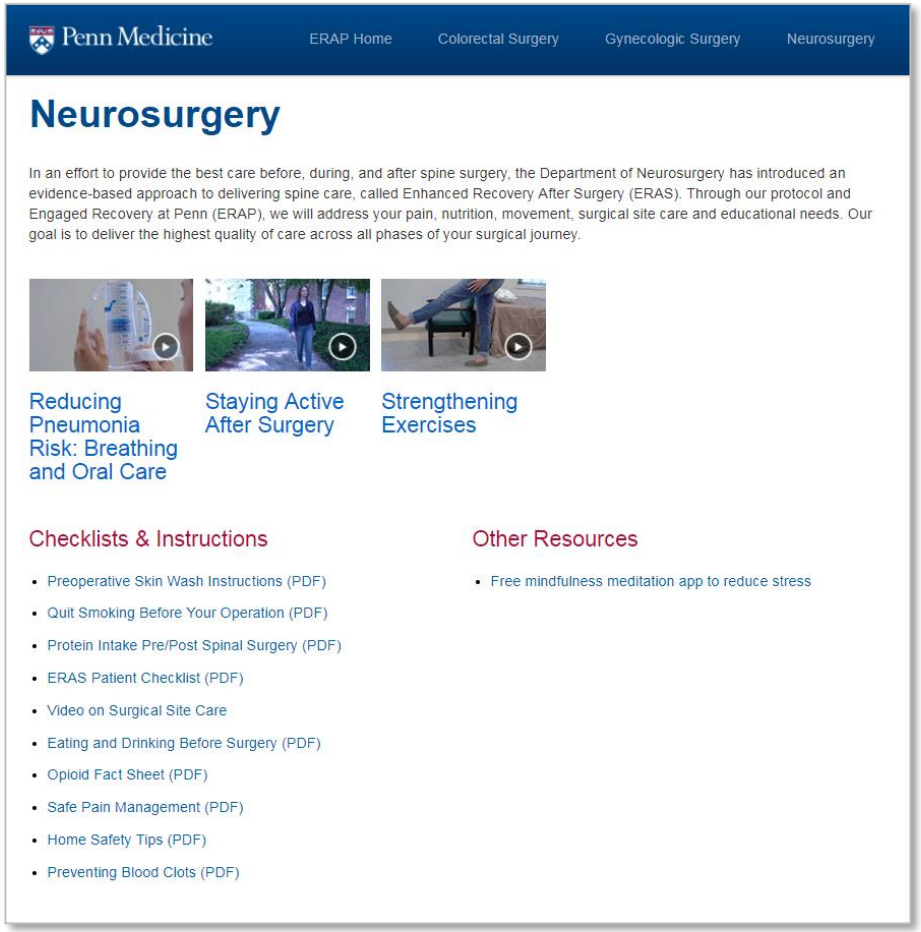
Post-op

- **Clinical Team Communication**
- **Wound Care Management**
- **Post Acute Care Resource Utilization**

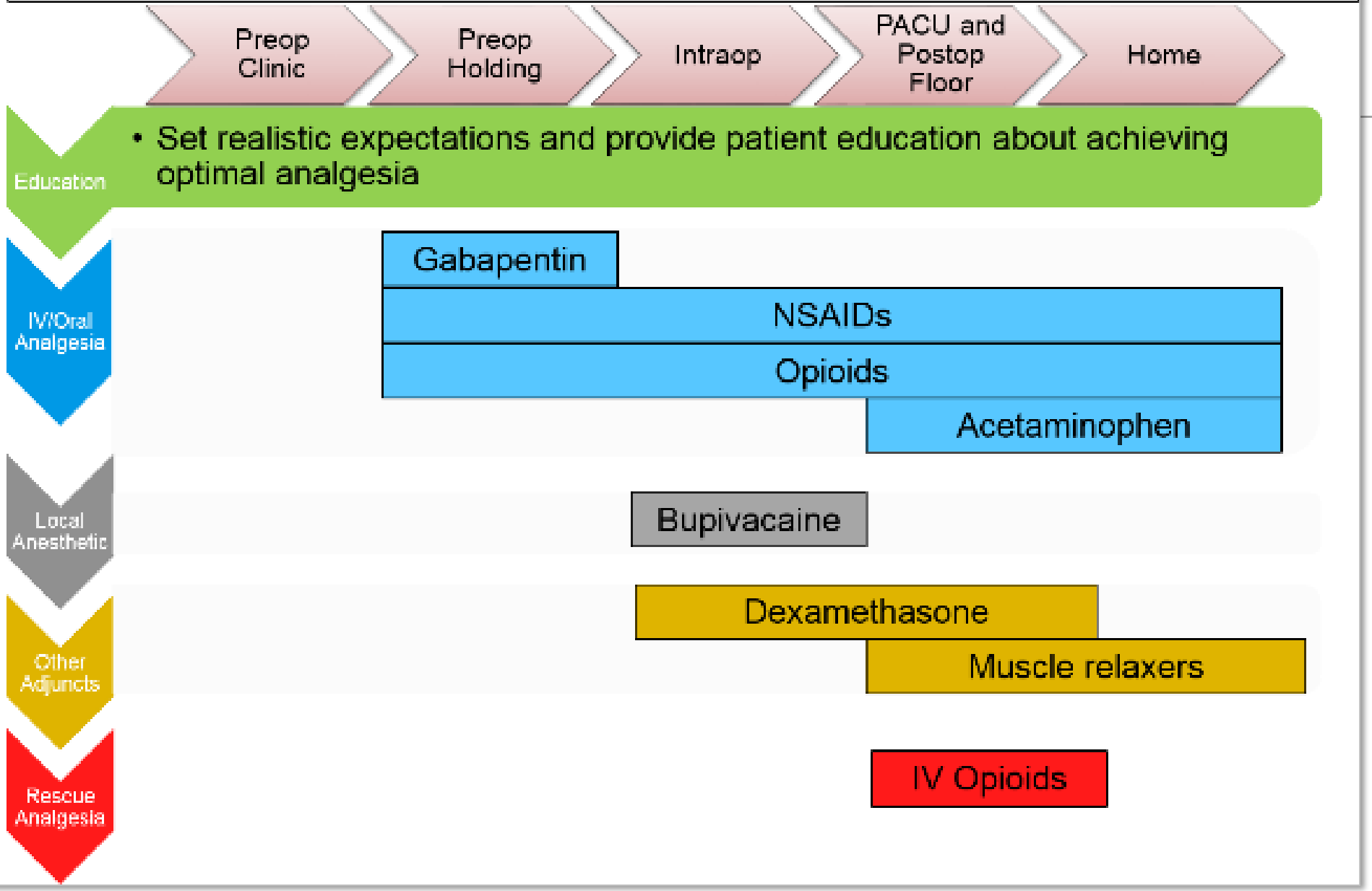
PAH Postop Spine Triage Protocol

Department of Neurosurgery
235 S. 8th Street-Entrance on Locust
Philadelphia, PA 19106
Phone: 215-829-6700 Fax: 215-829-6645

Routine Care	Routine Contact
• Medication management or refill • Physical or Occupational Therapy Orders • Schedule Routine Post-Op Visits • Requesting Office Notes or Discharge Summaries to be faxed • Non-urgent patient-related questions	Neurosurgery Main Number: **215-829-6700**
Urgent Care	**Urgent Care Contact**
Patients showing worsening symptoms related to: • Wound drainage or dehiscence • Warm, Red, Swollen site • Fever (≥101.5) • Uncontrollable pain	• Call **215-829-6700** to speak to a nurse right away to address serious patient concerns related to surgery • Hours: **24/7** • You may be asked to send the patient to the Emergency Room for evaluation ***Use for clinical staff only**
Emergent Care	**Emergency: Call 911**
• Abnormal / difficulty breathing • Confusion • Unrelieved chest pain • Loss of consciousness	**Call 911 right away**



Penn Neurosurgery ERAS Pain Management Protocol



Penn Neurosurgery ERAS Study: Patient Inclusion and Exclusion Criteria/Outcomes

Inclusion Criteria:

- Have a clinical history and diagnostic imaging supporting the need for elective spine or peripheral nerve surgery
- Be over 18 years of age
- Ability to understand and actively participate in the program as deemed by the attending neurosurgeon

Exclusion Criteria:

- Contraindications to elective spine or peripheral nerve surgery
- Diagnosis of liver disease
- Pregnancy

Primary Outcomes:

- Opioid and non-opioid consumption on POD 1
- Need for opioid use at one month post-operatively
- Patient-reported pain scores

Secondary Outcomes:

- Length of stay (days)
- Need for ICU admission
- Discharge status
- Re-admission within 30 days
- Re-admission within 90 days

Statistics:

- Independent two-sample t-tests for continuous variables and Fisher's exact test for categorical variables
- All data for the study were collected and analyzed by independent observers in collaboration with a biostatistician

Penn Neurosurgery ERAS Study: One Year Data

- **Prospective enrollment of 805 ERAS patients (April 2017 – June 2018)**

- **PAH Historical Control n=149 (September – December 2016)**
  - Traditional surgical care at the discretion of the attending neurosurgeon in a non-standardized fashion, including routine post-operative pain management with patient-controlled analgesia (PCA) from POD 0-1

Baseline Demographics

PAH Controls vs. PAH ERAS

Preoperative Characteristics	PAH Controls (n=149)	PAH ERAS (n=805)	p-value
Age (years)	61.9	61.7	0.86
BMI	30.3	29.9	0.53
Males	51.70%	53.90%	0.66
History of Spinal/Peripheral Nerve Surgery	47.00%	37.50%	**0.035**
History of Sleep Apnea	18.80%	16.90%	0.56
CPAP Use	10.70%	9.70%	0.66
Smoking Status			0.16
Current	17.40%	12.20%	
Former	38.90%	37.90%	
Never	43.60%	49.90%	
Diabetes	18.80%	17.30%	0.64
Hypertension	61.70%	57.30%	0.32
COPD	2.00%	3.90%	0.34
Mental Health Disorder	26.20%	23.00%	0.40
Substance Abuse Disorder	6.00%	3.10%	0.09
Glucose (mg/dL)	102.8	106.3	0.11
HbA1c (mg/dL)	9.0	7.1	0.64
Albumin (mg/dL)	4.4	4.4	0.71
Lag Time (days)	44.6	42.8	0.70
Preoperative Working Status			0.17
Yes	43.40%	49.70%	
No	56.60%	50.30%	
Disabled	27.20%	20.30%	0.17
Retired	60.50%	70.90%	
Due to reason other than the condition being treated	11.10%	6.40%	
No reason given	1.20%	2.30%	

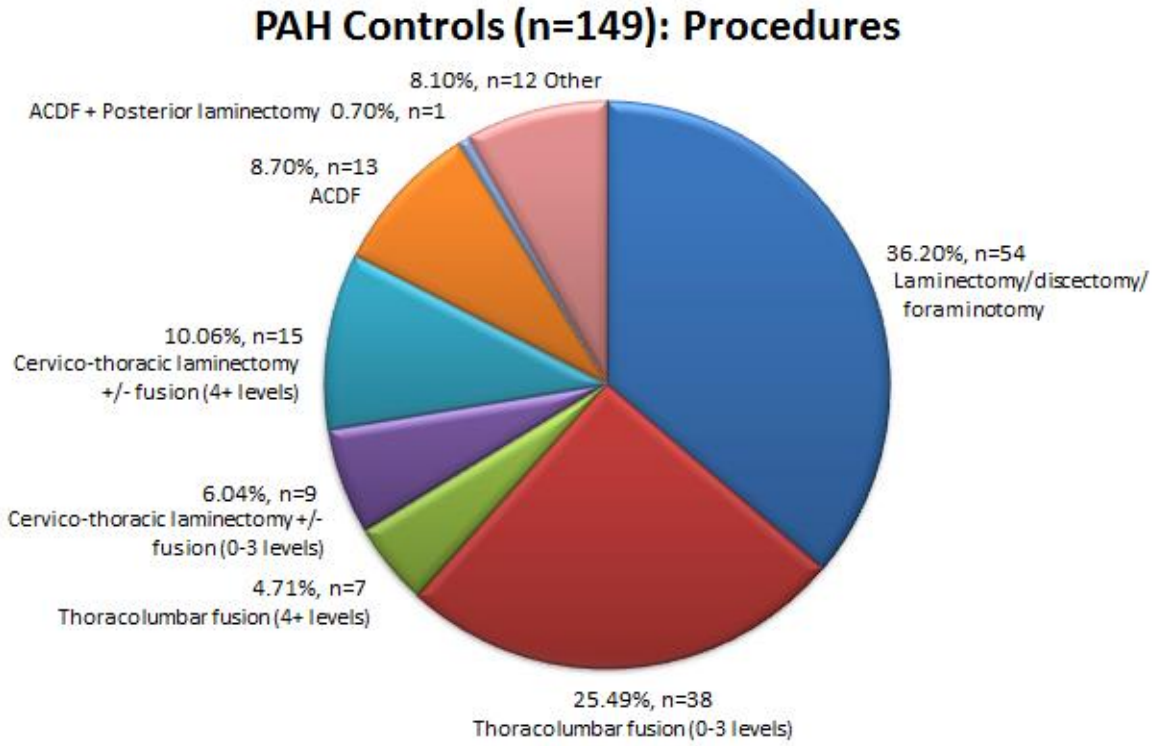
Procedures

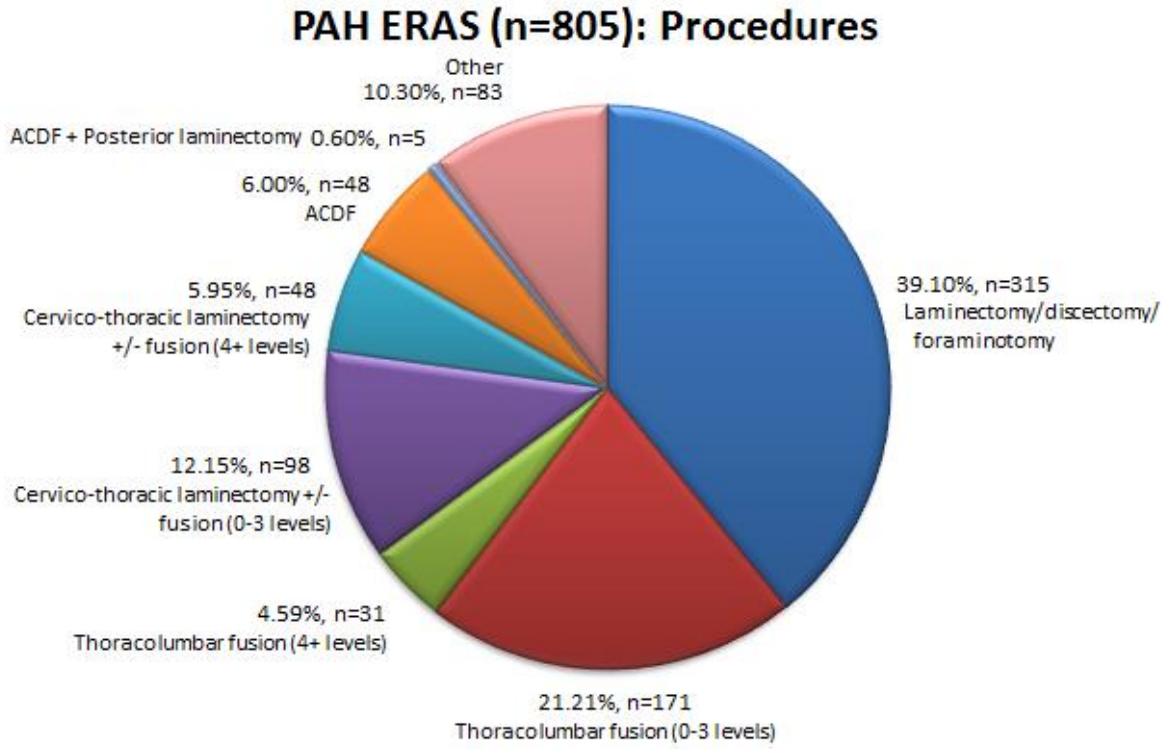
PAH Controls vs. PAH ERAS

Procedures	PAH Controls (n=149)	PAH ERAS (n=805)	p-value
Laminectomy/discectomy/foraminotomy	36.20%	39.10%	0.56
Thoracolumbosacral fusion (0-3 levels)	25.49%	21.21%	
Thoracolumbosacral fusion (4+ levels)	4.71%	4.59%	
Cervico-thoracic laminectomy +/- fusion (0-3 levels)	6.04%	12.15%	
Cervico-thoracic laminectomy +/- fusion (4+ levels)	10.06%	5.95%	
ACDF	8.70%	6.00%	
ACDF + Posterior Laminectomy	0.70%	0.60%	
Other	8.10%	10.30%	

Procedures

PAH Controls vs. PAH ERAS



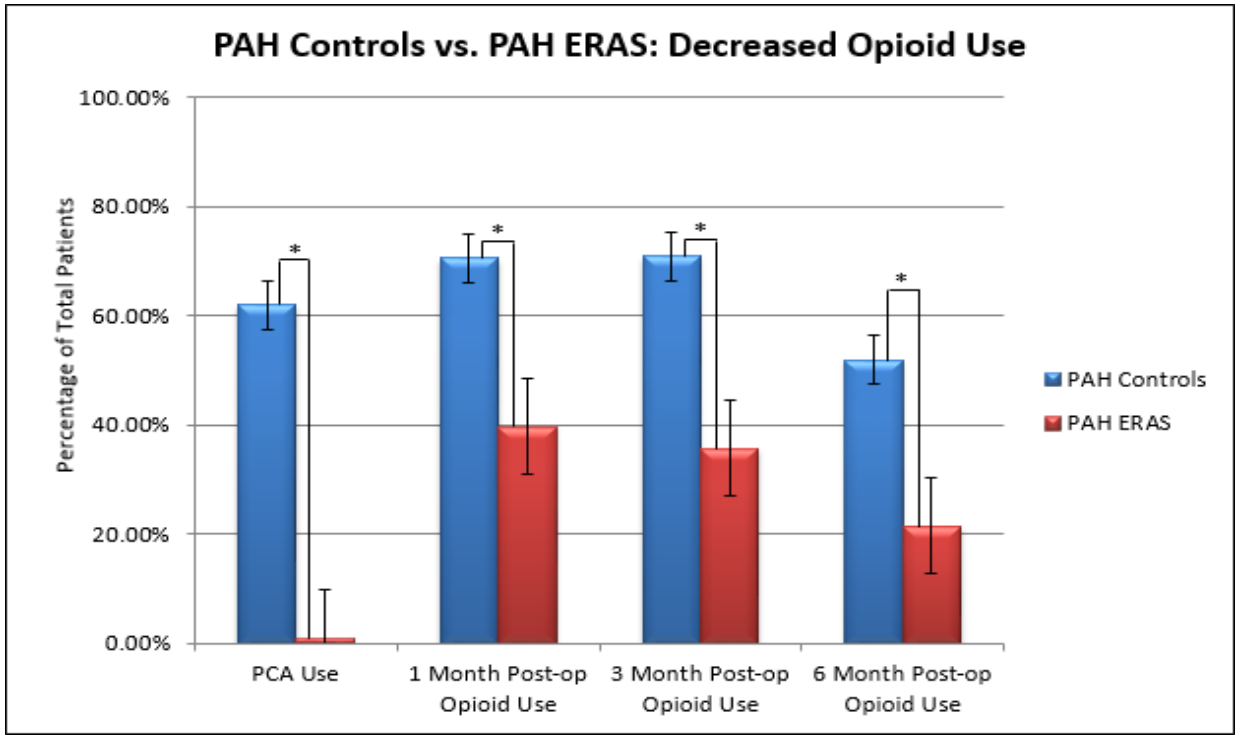


p=0.56

Decreased Opioid Use

PAH Controls vs. PAH ERAS

	PAH Controls	PAH ERAS	p-value
PCA Use (n=149/805)	62.00%	1.00%	**<0.001**
1 Month Post-op Opioid Use (n=139/772)	70.50%	39.60%	**<0.001**
3 Month Post-op Opioid Use (n=55/168)	70.90%	35.70%	**<0.001**
6 Month Post-op Opioid Use (n=27/103)	51.90%	21.40%	**0.003**



Pain Scores

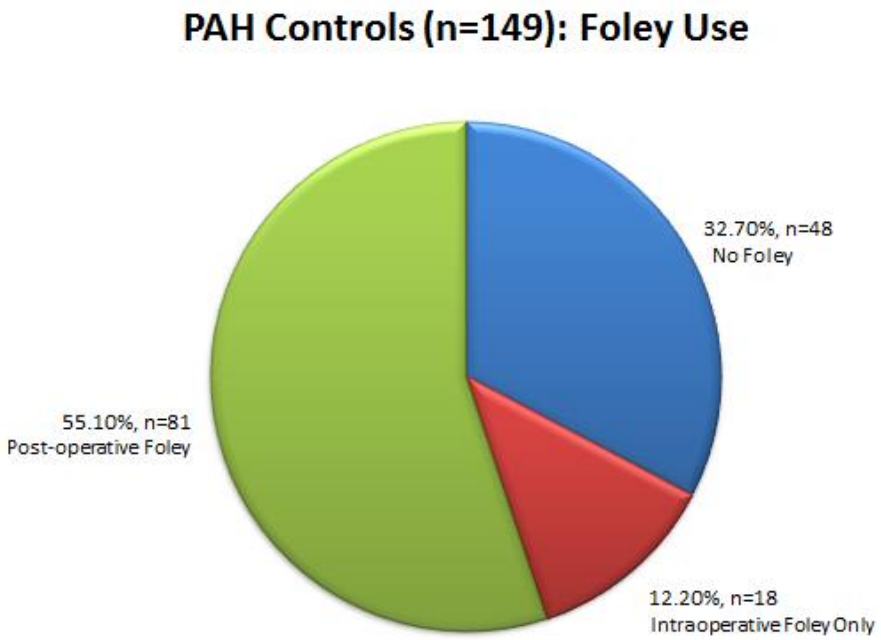
PAH Controls vs. PAH ERAS

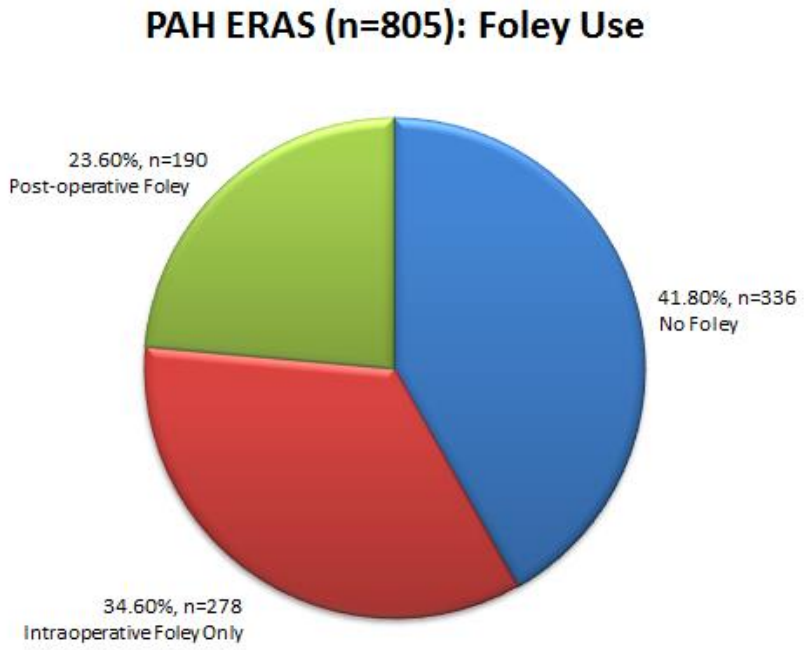
Post-op Day	PAH Controls	PAH ERAS	p-value
POD0 (n=141/793)	4.4	4.1	0.20
POD1 (n=106/686)	5.6	5.6	0.87
POD2 (n=87/505)	5.6	5.6	0.99
POD3 (n=56/309)	5.4	5.3	0.57

Decreased Foley Use

PAH Controls vs. PAH ERAS

Use of Foley/Straight Catheter	PAH Controls (n=149)	PAH ERAS (n=805)	p-value
No Foley	32.70%	41.80%	**<0.001**
Intra-operative Foley Only	12.20%	34.60%	
Post-operative Foley	55.10%	23.60%	
Straight catheterization	9.40%	10.30%	0.88

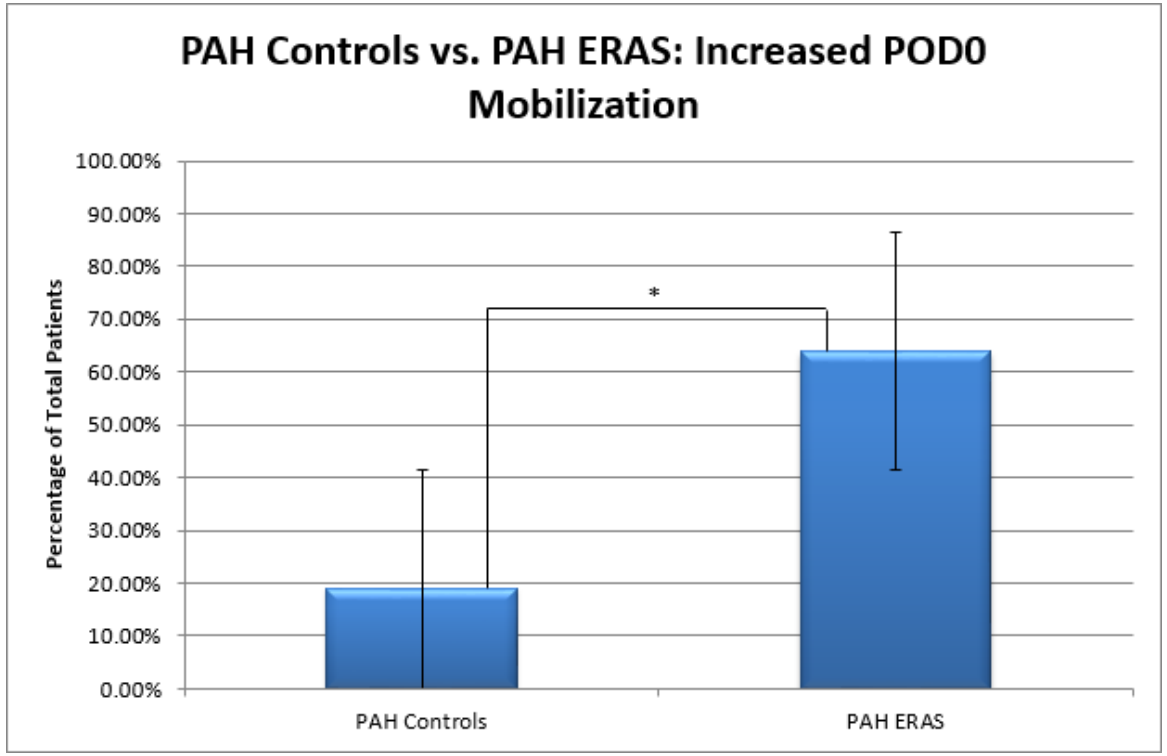


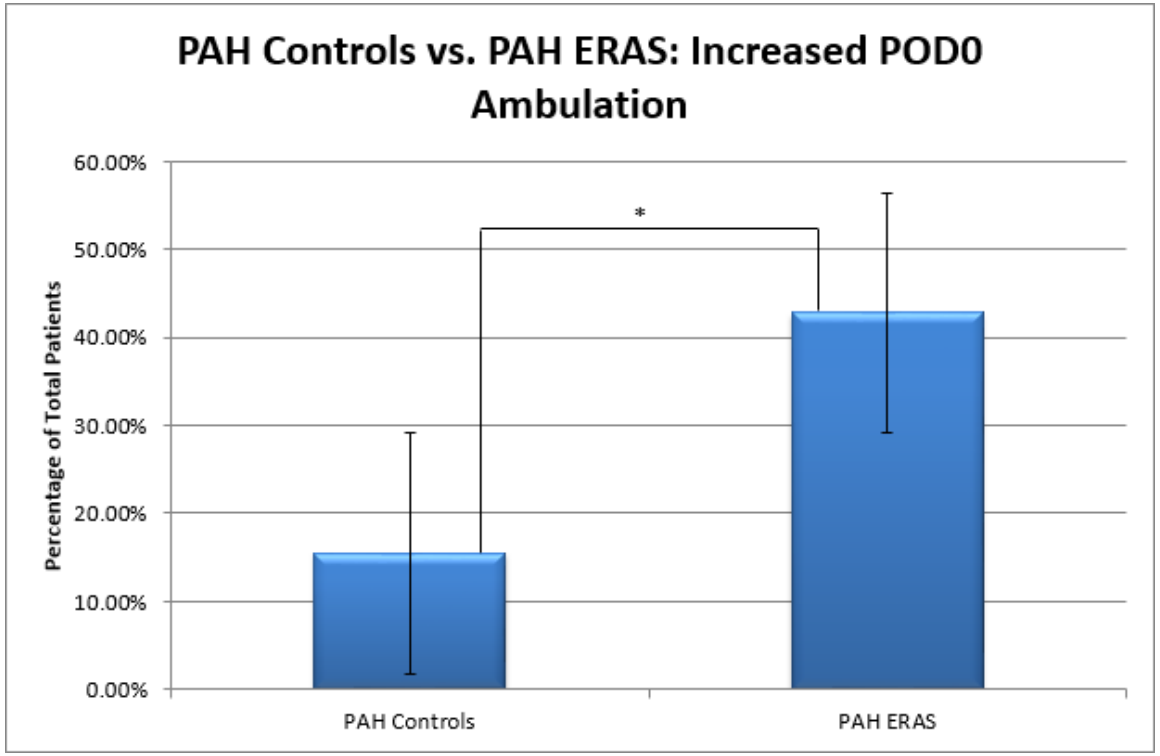


Increased POD0 Mobilization/Ambulation

PAH Controls vs. PAH ERAS

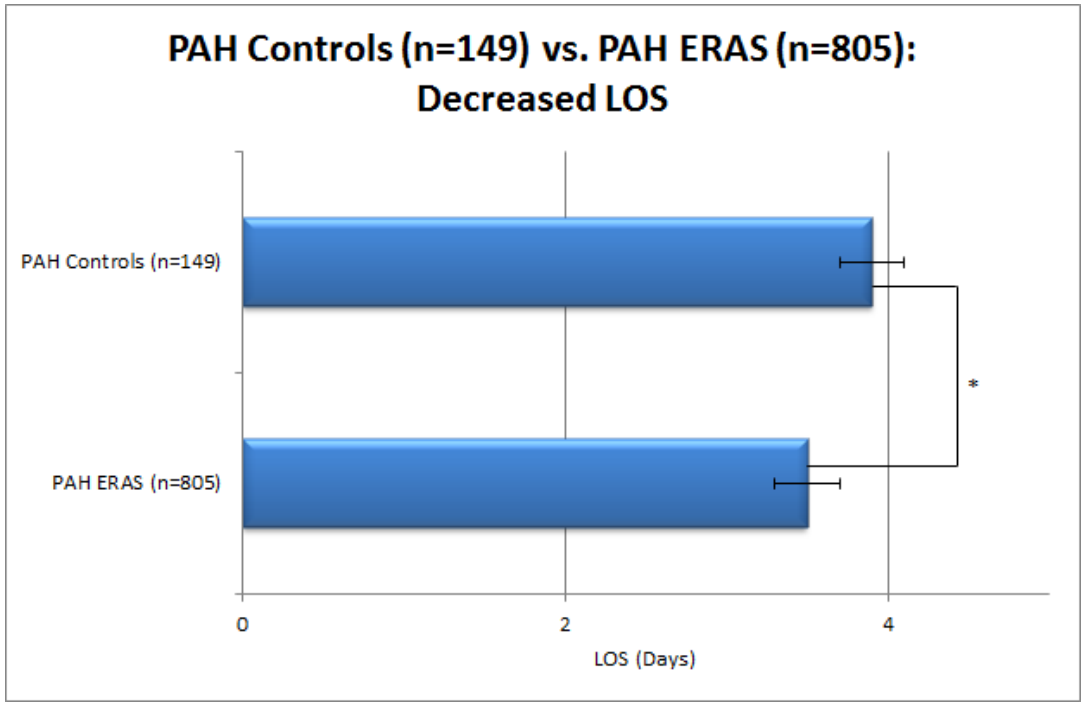
	PAH Controls	PAH ERAS	p-value
POD0 Mobilization (n=116/783)	19.00%	63.90%	**<0.001**
POD0 Ambulation (n=116/782)	15.50%	42.80%	**<0.001**





Resource Allocation
PAH Controls vs. PAH ERAS

	PAH ERAS (n=805)	PAH Controls (n=149)	p-value
Total LOS (days)	3.5	3.9	**0.043**



Conclusions

- ERAS engages each aspect of the patient's surgical journey in order to improve outcomes in a multi-disciplinary, multi-modal approach.
- In the elective spinal and peripheral nerve surgical patient, ERAS is feasible and necessary.
- The present study has shown that our ERAS protocol, and, in particular, our ERAS pain management protocol has the potential to safely reduce opioid use both in the peri-operative period as well as at one, three, and six months after surgery.
- ERAS patients demonstrated reduced hospital length of stay.
- Re-admission rates at 30 and 90 days were not found to be significantly different.

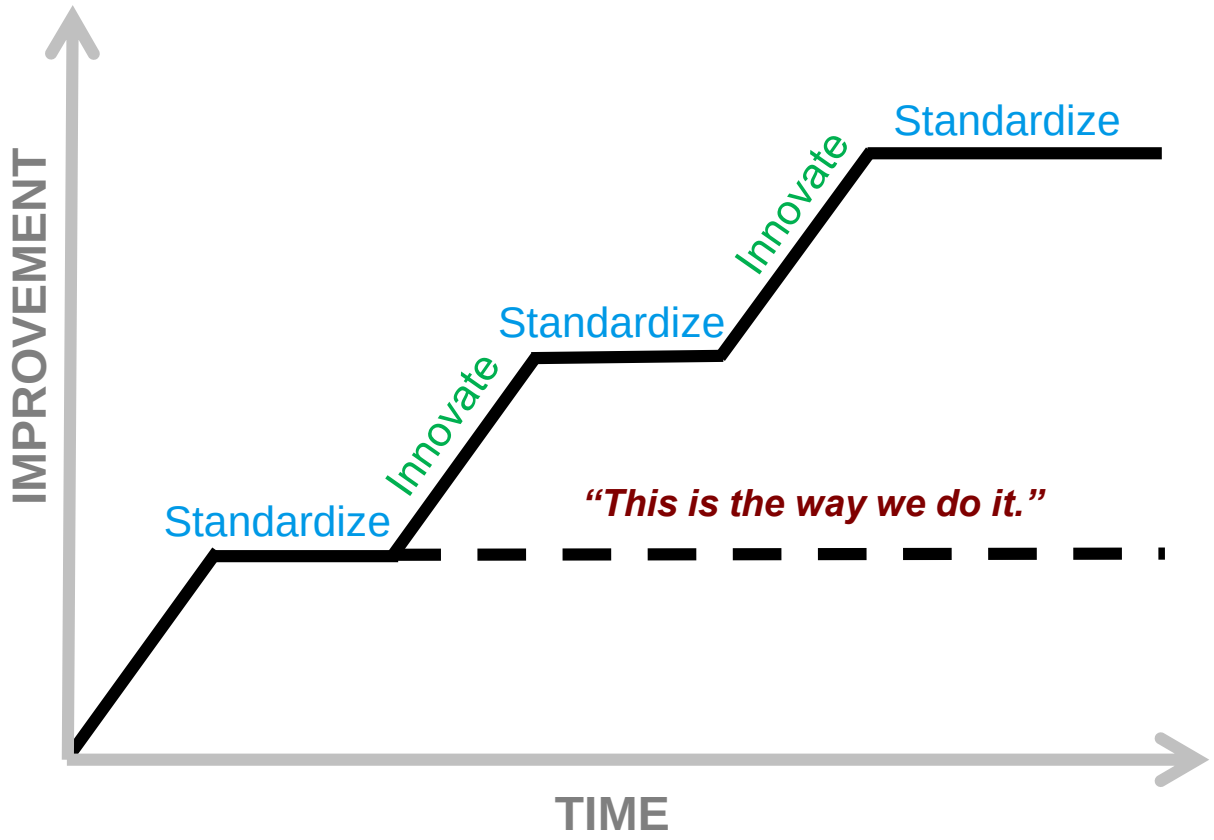
Limitations

- Opioid data monitoring
- Retrospective data analysis, randomization and blinding not performed

……Penn Neurosurgery ERAS Randomized Clinical Trial

ERAS:

An Iterative Process of Quality Improvement, From Bench to Bedside and BEYOND



Clifford Ko, MD; ACS Director of NSIQP

Acknowledgements

- M. Sean Grady, Chair
- William C. Welch, Vice-Chair
- Neurosurgery co-faculty
  - Neil Malhotra, Vice-Chair, Quality and Operations
- Neurosurgery Advanced
- Practice Providers
- Neurosurgery Clinical Research Division
- Neurosurgery Residents
- Neurosurgery Clinical and Operating Room Staff
- Neurosciences Service Line
- Penn Innovation Center
- Penn Leonard Davis Institute of Health Economics
- Center for Clinical Epidemiology and Biostatistics
  - Michael Kallan, MS

Thank you

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