



RESEARCH QUESTION

Do adults undergoing elective spine surgery in the two years following the implementation of the new ERAS protocol (July 2018 – March 2020) demonstrate better clinical outcomes, in comparison to patients who were treated using the original ERAS protocol? Furthermore, do these cohorts differ quantitatively in (1) hospital readmission rates, (2) infection rates, and (3) hospital length of stay?

BACKGROUND

The ERAS protocol was initially implemented in 2012 at our quaternary medical facility. Our original ERAS program was developed based on current standards in surgical ERAS research 2 and included four major sections: Preadmission, Preoperative, Intraoperative, and Postoperative guidelines. In addition, this protocol included guidelines for patient education, pre-anesthesia testing, preoperative diet, and medications (intraoperative and postoperative). Further modification of this ERAS protocol was made in May 2018 (Figure 1) with the addition of a preoperative high-carbohydrate drink (HCD) and multimodal analgesic regimen (MAR).

Nutrition is a significant independent, modifiable risk factor for unplanned re-admission within 30 days of discharge. 6 Blood glucose balance is critical as drops in blood glucose result in lower energy and a recovery capability. Additionally, a multi-modal analgesia approach was outlined to better modulate the post-surgical stress response than any single drug or modality. 7 With the addition of an HCD (the night before and 3 hours preoperatively) and a MAR, our old ERAS protocol was modified to reflect these two adoptions.

There have been ample studies evaluating the benefits of an ERAS protocol versus the control, non-ERAS protocol; however, there is a paucity of evaluating changes made to already established ERAS protocols. Our research serves as a preliminary study to evaluate changes made to an existing ERAS protocol and how those changes affect several endpoints. Only very recently has the need for a unified ERAS protocol in neurosurgery been formally discussed. We believe this framework can additionally serves as a starting point for a unified ERAS protocol for elective spine surgeries, and perhaps expanded to all of neurological surgery in the near future.

METHODS

This retrospective case-control study reviewed electronic medical records of neurosurgical patients at a quaternary referral center for trends and variances. The analysis focused on the recent changes (the addition of a multimodal analgesic regimen (MAR) and preoperative high-carbohydrate drink (HCD) to our ERAS protocol (July 2018- March 2020). Using IBM SPSS version 27, parametric and nonparametric analyses were conducted to assess for differences in infection rates, hospital length of stay (LOS), and readmission rates.

ERAS Protocols for Elective Spine Surgery: A **Retrospective Review**

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With the Addition of a High-Carbohydrate Drink (HCD) and Multimodal Analgesia **Regimen (MAR), there was a statistically** significant reduction in Length of Stay (LOS)

Figure 1: Current ERAS Protocol

	SPINE SURGERY ERAS	May 1, 2018	
TEXAS HEALTH HARRIS METHODIST HO	SPITAL FORT WORT S PROTOCOL	н	
PREOPERATIVE PHASE			
 Education in Surgical Clinic: Define Expectations – ERAS Guide Daily exercise Smoking cessation Healthy diet Reduction/elimination of alcohol Incentive spirometer education Carbohydrate drink education Attend spine surgery pre-op education class Define orthotic needs Define discharge plan Label the patient "ERAS PROTOCOL" when schedu Pre-anesthesia Testing CHG wipes or CHG liquid and education on use. Carbohydrate drink education Encourage hydration 2 days prior to surgery Dietary consultation for BMI > 30 Complete ODI functional assessment tool 	ling		
 Complete ODI functional assessment tool Labs: CBC, BMP, PCR MRSA, HgA1c (if diabetic) 			
One day prior to surgery: 1. No solid food 8 hours prior to surgery.			SI
 2. 100 gm clear carbohydrate drink before midnight. 3. Clear liquids up to 2 hours prior to surgery. DAY OF SURGERY <i>Pre-Op</i> Diet Orders: 50 gm clear carbohydrate drink 3 hours prior to surger No solid food 8 hours before surgery. Clear liquids up to 2 hours prior to surgery. Medications: Ofirmev 1 gm x 1 Gabapentin 600 mg po Midazolam 1-2 mg age adjusted for elderly per Anese 	ery 7 Nurs thesia	a. Ty b. Co 4. Neurontin 5. Zofran 4 r 6. 2 L oxyge 7. Laxative o sing Orders 1. Regular d 2. Oral hydra 3. Chewing 9 4. Incentive	Venol IV 1gm every 6 hours x 4 doses onsider Toradol 15 mg IV q6h x 3 doses for no 300mg TID x 3 days mg IV every 4 hours as needed on via nasal cannula x 6 hours of choice post op. liet POD #0 ation gum/mints spirometer use and education.
4. Consider scopolamine patch	Unle	 Nutrition of DC Foley DC Foley Smoking of Diabetic F per nursing OOB on F OOB on F Ambulate OOB for a Discharge Verify follo 	consult for BMI>30 by 7am POD #1 cessation education for active tobacco users Resource RN consults for HgA1c 8.5 or greate by staff. <i>directed</i> POD # 0 in hallways with assistance TID starting POD all meals starting POD #1 e Planning by CTM ow up appointment with surgeon



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Special thank you to the co-authors, the SPT team, and **Texas Health Resources**

5. DVT prophylaxis - SCDs 6. Abx as ordered by surgeon

Intra-Op – GENERAL SPINE CASES 1. Cefazolin 2 g IV

- a. Recommendation: 2 gm if < 120 kg, 3 gm if > 120 kg b. re-dose every 6 hours
- 2. PCN Alleray
- a. Clindamycin 900 mg IV, re-dose every 6 hours Dexamethasone 4 mg IV after induction.
- 4. Ketamine bolus 0.25 0.5 mg/kg at induction and every 4 hours 5. Consider judicious fluid administration when deemed euvolemic
- 6. Maintain normothermia a. Forced air body warmers
- b. Low flow anesthesia c. Fluid warmer
- d. Other warming and heat conservation methods Minimize tubes, lines, and drains
- a. Arterial lines or central lines not required unless specific indication b. No Foley catheters for ACDFs, discectomies, or surgeries anticipated to last less than 2 hours

SPINE SURGERY ERAS 📃 🛚

- 8. Utilize Lung Protective ventilation strategies 9. Maintain normoglycemia
- 10. Zofran 4 mg at end of surgery (30 min prior to closure) 11. Consider wound infiltrate with local anesthetic for all posterior spine approaches
- 12. Valium 2.5 10 mg IV or Robaxin 500-750 IV
- *itra-Op SPECIAL CONSIDERATIONS FOR COMPLEX SPINE CASES* Ketamine infusion of 4 mcg/kg/min
- 2. Lidocaine infusion: 1.5 mg/kg bolus, 2 mg/kg/hr infusion, continue up to 8 hours post-op. 3. Tranexamic acid 1 gm bolus and infusion dosing of 100 mg/min.
- 4. Methadone IV 0.05 0.10 mg/kg 5. Consider placing central line if indicated for fluid resuscitation or blood products.
- complex Spine Definition** 1. Surgery for correction of deformity (scoliosis, kyphosis, flat-back syndrome). 2. Surgery anticipated to last 6 or more hours.

OSTOPERATIVE

- 1edications
- 1. IV Fluids per surgeon and weight discretion 2. Pain Management per surgeon discretion 3. Minimize IV narcotics

otherwise diabetic education

E SURGERY ERAS May 1, 20



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ACKNOWLEDGEMENTS

The patients' ages ranged from 16 to 91 years, with an average age of 60. In addition, 1788 of the patients were females (53%), and 1582 were males (47%). Regarding race, the sample was pretty homogeneous, consisting of 2918 white patients (87%), 332 black patients (10%), and 120 patients with other races (3%).

A total of 3370 participants were included in the study—1901 in the BEFORE group (Controls) and 1469 in the AFTER group (Cases). The annual surgical volume at our facility was equivocal between 2016 and 2020. Whereas 110 patients were readmitted (within thirty days from surgery) in the BEFORE group, only 83 patients were readmitted in the AFTER group. Likewise, 18 patients had a postoperative surgical site infection (SSI) in the BEFORE group, while only 12 patients had an SSI in the AFTER group.

As readmission status and infection rate are nominal and dichotomously measured, chi-square tests of independence were computed to determine if there is a relationship between ERAS status and readmission rates and ERAS status and infection rates. Neither analysis was significant, X2 = .029, p = .866 and X2 = .159, p = .69, respectively.

A between-subjects t-test was conducted to compare the BEFORE group to the AFTER group on length of stay in hours. Results showed a statistically significant difference between the groups. The BEFORE group (M = 68.45, SD = 58.08) spent significantly more hours in the hospital than the AFTER group (M = 62.22, SD = 52.36), t (3264) = 3.19, p < .001. The effect of the difference was small (d = .18).

We are working on future directives to delineate our results as they apply to elective spine surgery subtypes FIGURE 1



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RESULTS

FUTURE DIRECTIONS