

Significant Reduction in Length of Stay Following DIEP Flap Breast Reconstruction with Implementation of a Multimodal ERAS Protocol: An Eight-year Single-institution Retrospective Analysis

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Background

- **DIEP flap** remains the most reliable microvascular breast reconstruction free flap, with significant **lower revision rates**.
- Multiple studies have found that **compromise** happens in the **first 24 to 48 hours** post op.
- Shorter monitoring duration would ultimately lead **to shorter inpatient hospital** stay.
- ERAS protocols have been associated with significantly lower opioid requirements, less antiemetic use, less pain in the recovery room, earlier return to normal diet, and significant cost savings.

Objectives

- We sought to analyze the **trends in patient LOS** undergoing **DIEP** reconstruction at a high-volume microsurgery center single institution prior to and following implementation of a novel ERAS protocol.
- we propose a standardized ERAS protocol for DIEP flap patients which may serve as a guide for institutions that have yet to define their own post-operative protocols.

Methods

- Retrospective single-institution cohort study of patients undergoing unilateral or bilateral DIEP breast reconstruction (immediate and delayed) from 2017–2025.
- Outcomes before and after ERAS implementation (July 2020) were compared.
- **Demographics, length of stay (LOS)**, and **complications** were analyzed.
- Unadjusted comparisons used t-tests, and multivariable linear regression with robust standard errors assessed the association between ERAS implementation and LOS, adjusting for relevant clinical covariates.

Protocol

Table 1. Fox Chase Cancer Center DIEP ERAS protocol

DIEP ERAS Protocol Fox Chase Cancer Center	POD 0 Preop	POD 0 Post Op	POD 1	POD ≥ 2
Patient Location	PACU: Review patient education and set up expectations. Optimize risk factors. Notify case management for home enoxaparin and Jackson-Pratt (JP) care	PACU for recovery then transfer to floor	Floor: clear for discharge to home Confirm home Enoxaparin and VNS for JP care arranged	Floor: clear for DC to home Confirm home Enoxaparin and VNS for JP care arranged
Pain Control	Acetaminophen (1000mg), Ibuprofen (400mg), Gabapentin (300mg), Cyclobenzaprine (5mg) 1hr Prior to surgery Preoperative Transabdominal Plane Block	Scheduled: Acetaminophen (1000mg Q8), Ibuprofen (400mg Q8), Gabapentin (300mg Q8), Cyclobenzaprine (5mg Q8) PRN: Tramadol 50–100 mg (Pain: 2–4), oxycodone 5–10 mg (Pain: 5–7), IV narcotics (Pain: 8–10)	Continue scheduled: Acetaminophen, Ibuprofen, Gabapentin, Cyclobenzaprine PRN: Tramadol 50–100 mg (Pain: 2–4), oxycodone 5–10 mg (Pain: 5–7), IV narcotics (Pain: 8–10)	Continue scheduled: Acetaminophen, Ibuprofen, Gabapentin, Cyclobenzaprine PRN: Tramadol 50–100 mg (Pain: 2–4), oxycodone 5–10 mg (Pain: 5–7), IV narcotics (Pain: 8–10)
Medications	Chlorhexidine skin prep + Preoperative and Intraoperative Antibiotics (Cefazolin	Antiemetics as needed (Ondansetron + Dexamethasone 3rd line Intra operative as needed) Only Preoperative and Intraoperative Antibiotics Enoxaparin 40 mg (Preop dose)	Antiemetics as needed No Antibiotics Enoxaparin 40 mg	Antiemetics as needed No Antibiotics Enoxaparin 40 mg
	2g / Clindamycin for allergic patients) Enoxaparin 40 mg (Preoperative dose)		QAM × 2 weeks Docusate 100 mg BID	QAM × 2 weeks Docusate 100 mg BID
Fluids	Intravenous Fluids: D5 Lactate Ringer based on weight	Intravenous Fluids: D5 Lactate Ringer based on weight	Discontinue fluids when tolerating diet	None
Diet	2 hours fast for clear liquids (+/- Oral electrolyte solution 400ml 2 hours prior to surgery) 6 hours Fast for solid foods	Clears	As tolerated	As tolerated
Activity	Ambulate as tolerated Preoperative CTA for perforator mapping in previous surgical history of injured the vasculature Deep venous	Bedrest Incentive spirometry HOB > 45, knees flexed O2 via nasal cannula as needed	OOB to chair and ambulate in AM Incentive spirometry HOB >45, knees flexed Wean O2 to Room Air	OOB to chair and ambulate in AM Incentive spirometry HOB >45, knees flexed No O2 Ok to shower

DIEP ERAS Protocol Fox Chase Cancer Center	POD 0 Preop	POD 0 Post Op	POD 1	POD ≥ 2
	thrombosis prophylaxis: SCDs applied prior to induction			
Wound Care	N/A	JP to bulb suction Record JP output every 4 hours Bra on breast Foley to gravity Warming blanket	JP to bulb suction Record JP output every 4 hours JP Teaching Bra on breast Discontinue Foley in AM Warming blanket	JP to bulb suction Record JP output every 4 hours JP Teaching Bra on breast
Flap Checks (Color, temperature, Capillary refill, Doppler Signal)	N/A	Q15 minutes × 1 HR, then Q30 minutes × 1 HR, then continue Q1 HR	Q2H flap checks in AM and Every 4 hours 24hours post anastomosis	Q4 HR

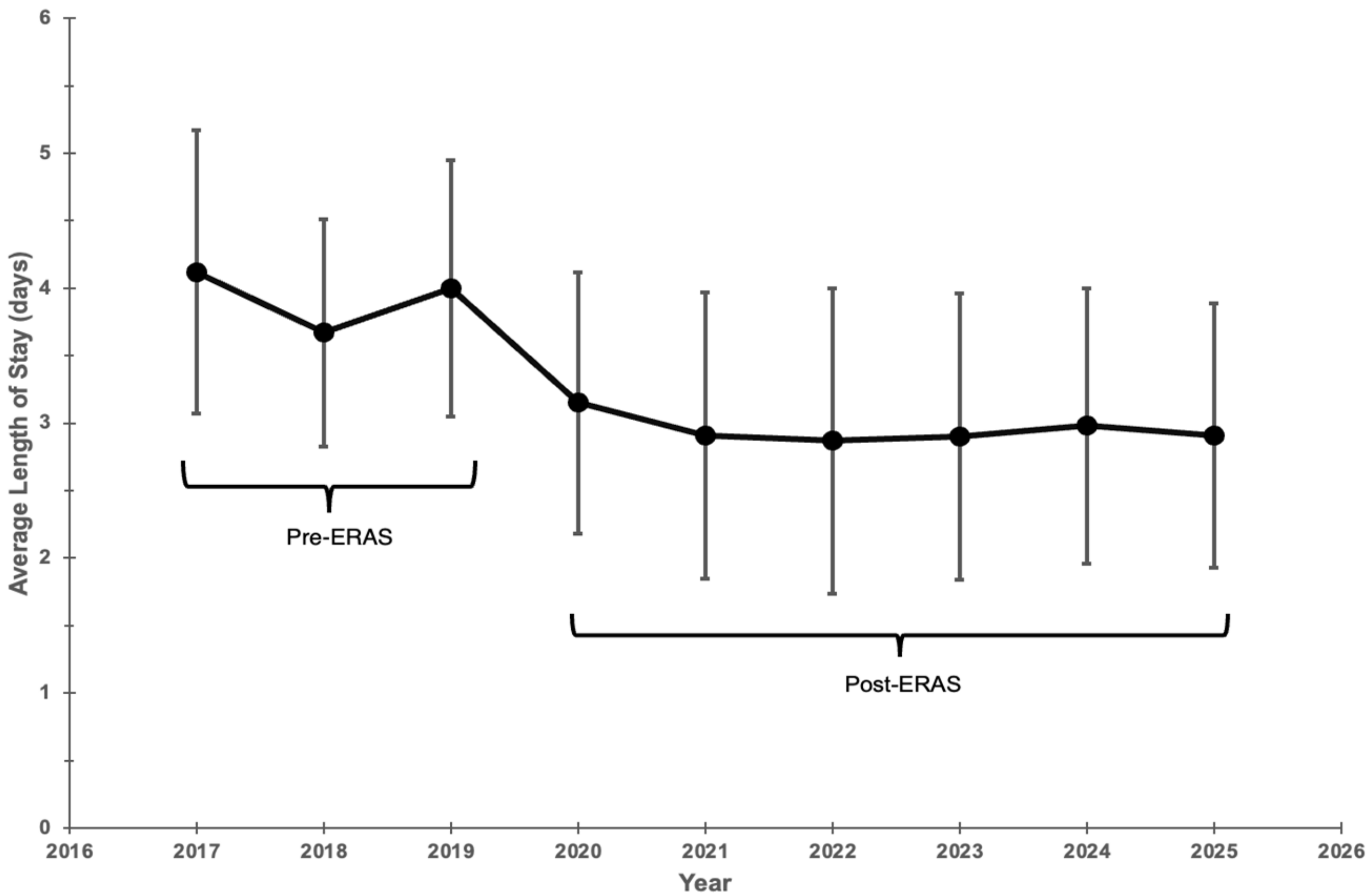


Figure 1. Length of stay for pre- and post-ERAS procedures

Results

- A total of **358 patients** underwent DIEP reconstruction.
- Following **ERAS implementation, LOS decreased by 1.02 days** (p<0.001). Mean LOS improved from 4.17 days in 2017 to 2.6 days in 2025.
- In 2025, **75% of patients were discharged within ≤3 days**, compared to 75% requiring ≥4 days in 2017.
- Two flap failures were observed.

Discussion

- Initiating a **preoperative schedule of analgesics** allows for adequate baseline pain control in the patient
- **Patient expectations are a fundamental** aspect of an earlier discharge date. Patients should be reassured at their initial visit that early discharge as early as POD 2 is feasible and safe.
- Post-ERAS implementation was associated with **reduced opioid use**, including **elimination of PCA pumps**, likely related to incorporation of TAP blocks

Conclusion

- **Implementation of ERAS protocol** for DIEP free-flap breast reconstruction has **reduced LOS** when compared with contemporary literature
- This protocol can be adopted in microsurgical DIEP breast reconstruction to achieve **shorter LOS without jeopardizing patient outcomes**

References

1. van Mulken et al. Plast Reconstr Surg 2022
2. Temple-Oberle et al. The Breast 2021