

Endolymphatic Sac Tumor Masquerading as a Vestibular Schwannoma

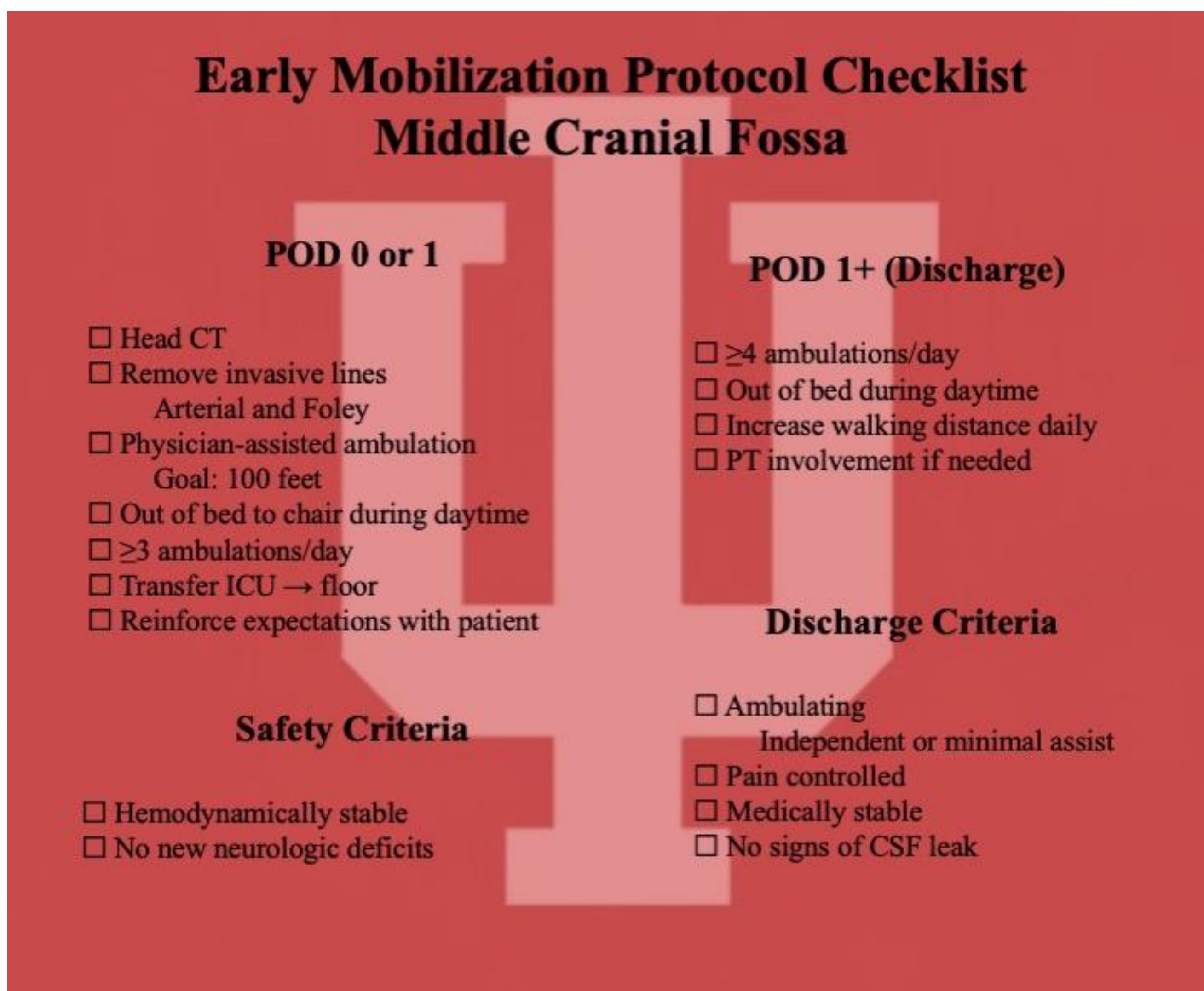
Douglas J Totten, MD, MBA;¹ Hunter L Elms, MD;¹ Evan C Cumpston, MD;¹ Charles W. Yates, MD;^{1,2} Rick F Nelson, MD, PhD^{1,2}

¹Department of Otolaryngology—Head & Neck Surgery, ²Department of Neurological Surgery, Indiana University, IN, USA

Introduction

Rates of spontaneous cerebrospinal fluid leaks (sCSFLs) requiring repair have increased approximately 10% annually for more than two decades, paralleling the obesity epidemic. Middle cranial fossa (MCF) craniotomy repair of lateral skull base (LSB) defects is a safe and durable technique, but prolonged postoperative hospitalization remains a common critique. This study evaluates the impact of an enhanced ambulation protocol on postoperative length of stay (LOS) and early (post-operative day [POD] 1) discharge after MCF sCSFL repair.

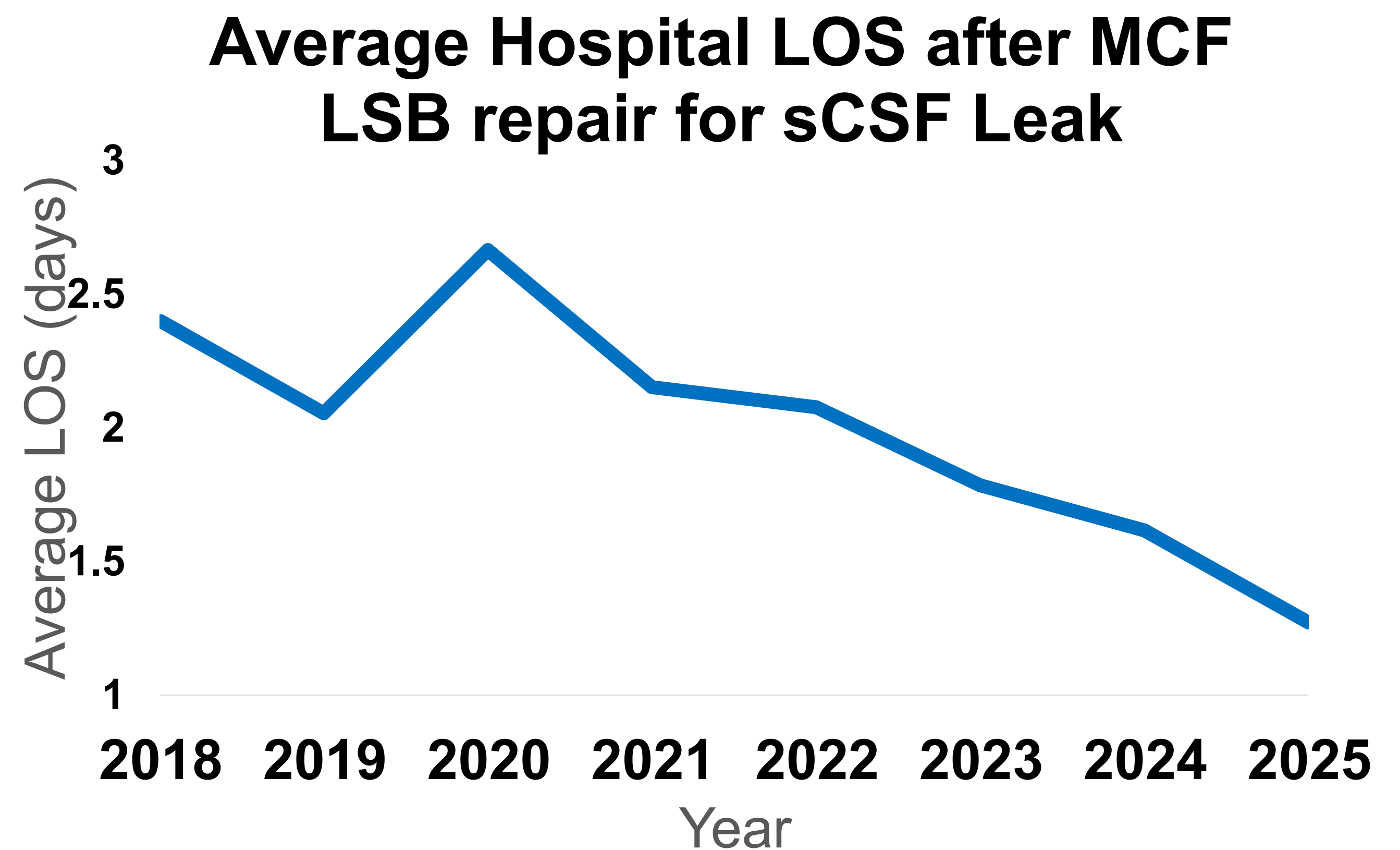
Figure 1. Early Mobilization Protocol postoperatively for patients undergoing Middle Cranial Fossa repairs of spontaneous cerebrospinal fluid leaks at Indiana University/Indiana University Health Hospitals. This protocol has contributed to a significant reduction in postoperative length of stay without patient falls or increased complication rates.



Methods

Patients undergoing routine MCF repair of an encephalocele or sCSFL from 2018–2025 were retrospectively reviewed. The postoperative pathway included mobilization within 8–12 hours of extubation with the physician care team, postoperative CT of the internal auditory canal, and maintaining out-of-bed status during daylight hours following initial ambulation. Patients unable to participate in the standardized protocol due to comorbidities or functional limitations were excluded. LOS and POD 1 discharge rates were analyzed. Cost estimates used \$3,000 per inpatient day. T-tests were used for statistical comparison.

Figure 2. Average hospital length of stay (LOS) by year after middle cranial fossa (MCF) surgery for spontaneous cerebrospinal fluid (sCSF) leaks. Note the significant and continuous reduction in LOS from 2020–2025.



Results

A total of 143 patients underwent MCF craniotomy and LSB repair from 2018–2025. Between 2018–2020, 32 patients had an average (standard deviation) LOS of 2.3 (1.0) days, with no POD 1 discharges. In 2025, 33 patients had an average LOS of 1.3 (0.5) days ($p < 0.0001$), and **73% were discharged on POD 1**. No increase in adverse events was observed. There were no patient falls.

	Mean	SD	Gender	N	%
Age	56.7	12.6	Female	86	61%
Year	Mean LOS	SD LOS	Cases	POD 1 DC	POD 1 DC%
2018	2.4	0.9	5	0	0%
2019	2.1	0.2	18	0	0%
2020	2.7	1.7	9	0	0%
2021	2.2	0.2	23	1	4%
2022	2.1	0.3	26	0	0%
2023	1.8	0.4	14	3	21%
2024	1.6	0.5	13	5	38%
2025	1.3	0.5	33	24	73%

Table 1. Mean and standard deviation (SD) age of patients at time of operation, gender ratio of patients, and annual summary of middle fossa craniotomies performed for spontaneous cerebrospinal fluid leaks, mean length of stay (LOS), and post-operative day (POD) one discharges.

Conclusion

A standardized postoperative pathway including early ambulation reduced LOS by 0.8 days (43%) and increased POD 1 discharge rates from 0% to 73%. Early mobilization and high-volume center experience appear central to minimizing postoperative LOS. Additionally, with an estimated \$2,400 savings per patient, centers performing 25 annual cases may achieve approximately \$60,000 in yearly system-level savings.

REFERENCES

- Alwani MM, Saltagi MZ, MacPhail ME, Nelson RF. Middle Cranial Fossa Repair of Temporal Bone Spontaneous CSF Leaks With Hydroxyapatite Bone Cement. *Laryngoscope*. 2021 Mar;131(3):624-632. doi: 10.1002/lary.28761. Epub 2020 May 19. PMID: 32427386.
- Elms HL, Totten DJ, Schneider WR, Yates CW, Cumpston EC, Nelson RF. Association of Obesity with Safety and Efficacy of Middle Cranial Fossa Repair of Spontaneous Cerebrospinal Fluid Leaks. *Otol Neurotol*. 2026 Jan 1;47(1):201-206. doi: 10.1097/MAO.0000000000004621. Epub 2025 Aug 25. PMID: 40900431.
- Patel TR, Piracha AZ, Roy AS, Byrne R, Jhaveri M, Michaelides E, Wiet RM. Comparing Outcomes and Billing Costs of Middle Cranial Fossa and Transmastoid Approaches for Otogenic Encephalocele and Cerebrospinal Fluid Leak Repair. *Otol Neurotol*. 2022 Aug 1;43(7):e753-e759. doi: 10.1097/MAO.0000000000003576. Epub 2022 Jul 7. PMID: 35802896.
- Curry SD, Hatch JL, Surdell DL, Gard AP, Casazza GC. Frailty in middle cranial fossa approach for encephalocele or cerebrospinal fluid leak repair. *Laryngoscope Investig Otolaryngol*. 2022 Nov 16;7(6):2043-2049. doi: 10.1002/liv.2.946. PMID: 36544962; PMCID: PMC9764798.

CONTACT

Douglas J. Totten, MD, MBA
Ent.Totten@gmail.com