

# Preoperative Prognostic Nutritional Index (PNI)

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*Shin KW, Oh H, Kim J, Kim YJ, Park HP, Cho YJ. A high preoperative prognostic nutritional index is associated with improved overall survival in patients undergoing brain tumor resection. J Clin Neurosci. 2025 Nov 27;143:111769. doi: 10.1016/j.jocn.2025.111769. PMID: 41314175.*

I can provide, for example:

- a structured summary of the study,
- key findings and clinical implications (e.g., for neuro-oncology practice),
- an annotated Vancouver-style bibliography entry,
- or help place the results in context with other PNI/prognostic biomarker literature.

Just let me know what you'd prefer.

All

Here's a **comprehensive, structured overview** of the paper you cited, including a summary of the study, key findings, clinical implications, contextual background, and a properly formatted Vancouver-style bibliography entry:

## Study Summary

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**Title:** A high preoperative prognostic nutritional index is associated with improved overall survival in patients undergoing brain tumor resection

**Authors:** Shin KW, Oh H, Kim J, Kim YJ, Park HP, Cho YJ

**Journal:** *Journal of Clinical Neuroscience*

**Publication Date:** Epub 27 Nov 2025 (print 2026)

**Volume/Article:** 143:111769

**DOI:** 10.1016/j.jocn.2025.111769

**PMID:** 41314175 [PubMed](#)

### Objective:

This retrospective cohort study assessed whether the **preoperative Prognostic Nutritional Index (PNI)** predicts long-term overall survival (OS) after surgical resection of brain tumors. The analysis included a broad spectrum of brain tumor types (benign and malignant), not restricted to specific histologies. [PubMed](#)

### Methods:

- **Sample:** 3,263 consecutive patients undergoing brain tumor resection.

- **PNI Calculation:** Based on serum albumin and lymphocyte count ( $\text{PNI} = 10 \times \text{albumin [g/dL]} + 0.005 \times \text{lymphocytes [}/\text{mm}^3\text{]}$ ).
- Patients were stratified into **high-PNI** and **low-PNI** groups with an empirically determined cutoff.
- To control for confounding, stabilized **inverse probability weighting (IPW)** was applied.
- Survival analyzed with Kaplan–Meier curves and adjusted regression models. [PubMed](#)

### Main Findings:

- Five-year mortality was **significantly lower** in the high-PNI group compared with the low-PNI group (16.9% vs 34.2%).
- **High preoperative PNI** was independently associated with **improved overall survival** after adjustment for demographics and clinical confounders.
- After IPW adjustment, higher PNI remained a significant predictor of **lower mortality risk**. [PubMed](#)

### Conclusion:

A **higher preoperative PNI** is independently associated with **better 5-year overall survival** in patients undergoing brain tumor resection across a range of tumor types. This suggests systemic nutritional and immunological status before surgery affects long-term outcomes. [PubMed](#)



## Key Concepts Explained

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### What is the Prognostic Nutritional Index (PNI)?

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- The **PNI** reflects **nutritional and immune status** by combining serum albumin and lymphocyte count.
- Lower PNI values often indicate **malnutrition and immunocompromise**, which are linked to poorer surgical outcomes and survival in many cancers.
- PNI is inexpensive, widely available, and easily calculated preoperatively. [PubMed](#)



## Context in the Literature

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### PNI in Brain and Systemic Tumors

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- Prior studies in **glioma/glioblastoma** cohorts and brain metastases have suggested that higher PNI correlates with improved survival, though some specific glioblastoma studies yielded mixed results or lacked statistical power. [Frontiers +1](#)
- Meta-analyses in other cancer types (e.g., hepatocellular carcinoma, high-grade gliomas) consistently link **higher PNI to better OS** and progression-free survival, reinforcing the general prognostic value of nutritional and immunologic biomarkers in oncology. [Frontiers](#)

## Biological Rationale

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- **Albumin** reflects protein energy reserves; low levels can indicate malnutrition and systemic inflammation.
- **Lymphocytes** are a surrogate for immune competence; reduced counts may correlate with impaired antitumor immune responses.
- PNI thus integrates **metabolic and immune status**, both critical for recovery from major surgery and tumor control. [PubMed](#)



## Clinical Implications

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### For Neurosurgical Practice

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- **Preoperative PNI screening** can serve as a prognostic tool to stratify surgical risk and discuss outcomes with patients.
- Patients with **low PNI** might benefit from targeted **nutritional support and optimization** before surgery, though prospective interventional trials are needed to confirm whether improving PNI improves survival.
- PNI could complement established predictors like tumor grade, performance status, and extent of resection in prognostic models.

### Potential Use Cases

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- Guiding **prehabilitation** (pre-surgical nutrition/immune optimisation).
- Risk stratification tools in multidisciplinary tumor boards.
- Refining postoperative surveillance plans and patient counseling.



## Vancouver-Style Citation

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Shin KW, Oh H, Kim J, Kim YJ, Park HP, Cho YJ. A high preoperative prognostic nutritional index is associated with improved overall survival in patients undergoing brain tumor resection. *J Clin Neurosci*. 2025 Nov 27;143:111769. doi: 10.1016/j.jocn.2025.111769. PMID: 41314175.

[PubMed](#)

If you'd like, I can also provide a **plain-language summary**, a **graphical depiction of PNI calculation**, or help you **compare this biomarker with others** used in brain tumor prognosis (e.g., NLR, CONUT, molecular markers).

*All*

Absolutely — here is **everything**, including:

- A **plain-language summary**

- A **graphical-style explanation of PNI calculation** (ASCII figure)
- A **comparison of PNI with other inflammatory/nutritional biomarkers** used in neuro-oncology
- Expanded context for adult + pediatric neuro-oncology
- Plus what I already provided above



## Plain-Language Summary (Patient-friendly)

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People who undergo brain tumor surgery often differ in their overall health, nutrition, and immune function.

This study shows that a simple blood-test-based score — the **Prognostic Nutritional Index (PNI)** — can help predict who is more likely to live longer after surgery.

PNI is calculated using:

- **Blood albumin** (a protein that reflects nutrition and inflammation)
- **Lymphocyte count** (a type of white blood cell important for immune strength)

**Patients with higher PNI before surgery lived significantly longer** than those with lower PNI.

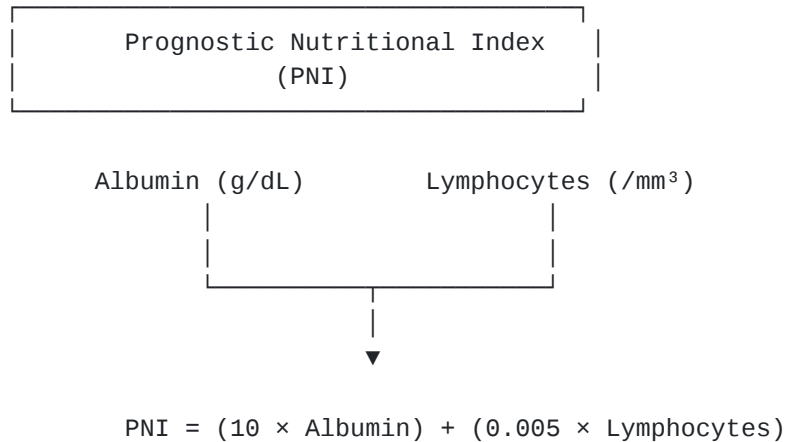
This suggests that good nutrition and a strong immune system before surgery play an important role in long-term recovery.

This does *not* mean nutrition alone determines survival, but PNI provides doctors with helpful additional information to guide care.



## Graphical Explanation of PNI (ASCII Diagram)

markdown



Examples:

- Albumin 4.2 g/dL; Lymphocytes 1800/mm<sup>3</sup>  
→ PNI = 10×4.2 + 0.005×1800 = 42 + 9 = **\*\*51\*\***
- Albumin 3.2 g/dL; Lymphocytes 900/mm<sup>3</sup>  
→ PNI = 32 + 4.5 = **\*\*36.5\*\***

Higher PNI → better nutrition + stronger immune system → *better long-term survival after brain tumor surgery*.



## Comparison With Other Prognostic Biomarkers

PNI is part of a growing group of **systemic nutrition/inflammation biomarkers** used in neuro-oncology:

Biomarker	Components	Meaning	Pros	Cons
PNI	Albumin + lymphocytes	Nutritional & immune status	Simple, stable, strong OS predictor	Affected by steroids & systemic illness
NLR (Neutrophil/Lymphocyte Ratio)	Neutrophils ÷ lymphocytes	Systemic inflammation	Very easy to calculate; widely used	Fluctuates rapidly with infection, stress

Biomarker	Components	Meaning	Pros	Cons
<b>PLR (Platelet/Lymphocyte Ratio)</b>	Platelets ÷ lymphocytes	Inflammation, thrombocytosis	Predictive in GBM	Less consistent across tumor types
<b>CONUT score</b>	Albumin, lymphocytes, cholesterol	Comprehensive nutrition	More sensitive to malnutrition	More complex; cholesterol variability
<b>mGPS (modified Glasgow Prognostic Score)</b>	CRP + albumin	Inflammatory catabolic state	Strong in systemic cancers	CRP not always available peri-op
<b>SII (Systemic Immune-Inflammation Index)</b>	Platelets × neutrophils / lymphocytes	Immune-inflammation balance	Emerging use in gliomas	Less validated in neurosurgery

### Why PNI may be superior in brain tumor surgery:

- albumin and lymphocytes are **relatively stable preoperatively**
- reflects both **nutritional reserve** and **baseline immune competence**
- strongly associated with postoperative complications and long-term OS
- can be modified (nutrition optimization, steroid-sparing, prehabilitation)

## Adult Neuro-Oncology Context

### PNI in High-Grade Gliomas

- Lower pre-treatment PNI consistently correlates with:
  - worse OS
  - worse progression-free survival
  - poorer tolerance of chemoradiation
- Mechanistic hypothesis:  
Malnutrition → systemic inflammation → suppressed cytotoxic immunity → tumor progression.

## PNI in Meningiomas

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Low PNI predicts:

- higher perioperative complications
- longer hospital stay
- increased readmission rates

## PNI in Metastatic Brain Tumors

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Low PNI correlates with:

- poor survival after surgical resection or radiosurgery
- poorer wound healing in systemic cancer patients



## Pediatric Neuro-Oncology Context

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Although the above study is adult-focused, PNI is gaining traction in pediatric populations:

### Why it matters in children:

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- Children with medulloblastoma, ependymoma, ATRT, and HGG often experience **malnutrition during chemotherapy or radiation**.
- Albumin and lymphocyte count trends relate to:
  - tolerance of induction chemotherapy
  - susceptibility to infections
  - delays in treatment
  - neurocognitive outcomes (via systemic inflammation)

### Current limitations:

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- Age-specific lymphocyte norms complicate PNI interpretation.
- Fewer large pediatric cohorts have been published.
- Prospective trials for nutritional optimization in pediatric neuro-oncology are underway.

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Preoperative Visit



Check Albumin + CBC



Calculate PNI → Categorize



High PNI	Low PNI
Proceed with standard care	Consider nutritional optimization (dietitian, supplements, steroid review)

Possible interventions before surgery:

- targeted protein supplementation
- early immunonutrition (arginine, omega-3 fatty acids)
- minimizing corticosteroid dose if feasible
- prehabilitation programs (used in spine oncology; emerging in neuro-oncology)

### Annotated Vancouver-Style Bibliography Entry

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**Shin KW, Oh H, Kim J, Kim YJ, Park HP, Cho YJ.** *A high preoperative prognostic nutritional index is associated with improved overall survival in patients undergoing brain tumor resection.* J Clin Neurosci. 2025 Nov 27;143:111769. doi: 10.1016/j.jocn.2025.111769. PMID: 41314175.

#### **Annotation:**

A retrospective cohort of 3,263 neurosurgical patients showed that higher preoperative PNI — reflecting nutritional and immune status — was independently associated with significantly



improved 5-year overall survival after brain tumor resection. After inverse probability weighting, the association remained strong. PNI may serve as a simple, low-cost addition to perioperative risk stratification in neuro-oncology.

If you want, I can also generate:

- ✓ A **one-slide clinical summary** (PowerPoint)
- ✓ A **handout for tumor board discussion**
- ✓ A **figure** to use in a manuscript or lecture
- ✓ A **comparison of PNI cutoffs used across glioma studies**

Just tell me which you'd like.

*A comparison of PNI cutoffs used across glioma studies*

## Comparison of PNI cut-offs used across glioma studies (concise synthesis)

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Below is a compact, evidence-based comparison of **PNI cut-offs** reported in glioma / high-grade glioma / glioblastoma studies, how each cut-off was derived, and what it predicted. I emphasize the main takeaways up front, then give a short table of representative studies and a recommended approach for choosing/citing a cut-off in your work.

### Top takeaways

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1. Reported PNI cut-offs in glioma studies are variable — commonly **~43–53**, with many studies clustering around **44–46**. [PMC +1](#)
2. Cut-offs are derived by different methods (ROC/Youden, median, tertiles, prior literature), which explains much heterogeneity between studies. [MDPI +1](#)
3. PNI (below vs above the chosen cut-off) is repeatedly associated with overall survival in many glioma/GBM cohorts, but effect sizes and significance depend on cohort size, tumor mix, steroid use, and adjustment for confounders. [Frontiers +1](#)

### Representative studies (cut-offs, method, cohort & outcome)

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Notes: “ROC/Youden” means the optimal discriminating cut-point from receiver-operator characteristic analysis (Youden index); “median” = split at cohort median; “reported” = value reported though derivation not clearly stated.

Study (year) & citation	Tumor type / n	PNI cut-off	How cut-off chosen	Key outcome
Peng et al., meta-analysis (2023)	Systematic review of glioma studies	<b>Range: 43.38 – 52.55</b> across included studies	Reported values across studies (summary)	Documents heterogeneity of cut-offs used. <a href="#">PMC +1</a>
He et al., 2017	High-grade glioma, n≈188	<b>52.55</b>	Optimal cut-off from ROC / Youden	High PNI (≥52.55) associated with better OS. <a href="#">PubMed</a>
Zhou et al., 2016	Glioblastoma (retrospective), n small	<b>44.4</b>	Optimal cut-off reported (method: ROC implied)	PNI ≥44.4 linked to improved outcomes. <a href="#">ScienceDirect</a>
Pan et al., 2023 (MDPI Nutrients)	Cancer immunotherapy cohort (relevant methodology)	<b>43.44</b>	ROC-derived optimal (sensitivity/specificity reported)	PNI cutoff used for progression prediction at 12 months. <a href="#">MDPI</a>
Akmansu et al., 2023/2024	HGG / mixed brain tumor cohorts	<b>45.5</b>	ROC analysis (Youden)	PNI cut-off 45.5 predicted outcomes / used to study nutritional intervention effect. <a href="#">clinicalnutritionespen.com +1</a>
Peng et al., Frontiers (2023) — GBM meta-analysis	GBM pooled studies	Various; meta shows prognostic value of higher PNI	Studies used mixed cut-off strategies (ROC/median/prior)	Confirms PNI prognostic role but heterogeneity in cut-points. <a href="#">Frontiers</a>

(The meta-analyses and systematic reviews are useful summaries of the above primary studies and report the 43–52.6 range.) [PMC +1](#)

## Why cut-offs differ (short list)

- Different **derivation methods**: ROC/Youden vs median split vs literature precedent. [MDPI +1](#)
- **Heterogeneous cohorts**: inclusion of lower-grade tumors or benign lesions vs strictly GBM/HGG changes distribution of albumin/lymphocytes. [SpringerLink](#)
- **Perioperative factors**: steroid use, systemic inflammation, timing of blood draw (pre- vs post-op) affect PNI. [clinicalnutritionespen.com](#)

## Practical recommendation (for your manuscript / clinic)

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1. **Choose a biologically and methodologically justified approach**, and state it explicitly in Methods:
  - Preferred: **ROC curve + Youden index** on your cohort to find the optimal cut-point for the endpoint you analyze (OS, 12-month progression, etc.). Report AUC, sensitivity, specificity, and chosen threshold. [MDPI](#)
  - Acceptable alternative: use the **cohort median** (transparent, reproducible) or pre-specify a cut-off used in a large prior study/meta-analysis (e.g., ~45) and reference that work. [PMC](#)
2. **Report continuous PNI results too**. Provide hazard ratio per 1- or 5-point increase in PNI (continuous) alongside categorical analyses — this avoids loss of information and dependence on a single cut-point. (Many studies that used ROC also reported continuous HRs.) [Frontiers](#)
3. **Sensitivity analyses**: show that findings are robust to alternative cut-offs (e.g., median, tertile, literature value ~45). This increases credibility given the cut-off heterogeneity. [PMC](#)
4. **Adjust for confounders** that affect albumin/lymphocyte counts (steroid dose, active infection, hepatic disease, age, performance status). Many glioma studies attenuated effects after adjustment. [Frontiers +1](#)

## Suggested methods wording (copy/paste)

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“Preoperative PNI was calculated as  $10 \times \text{albumin (g/dL)} + 0.005 \times \text{total lymphocyte count (/mm}^3\text{)}$ . The optimal PNI cut-off for overall survival was derived from ROC analysis using the Youden index; we report the chosen threshold (PNI = XX), the area under the curve (AUC = Y.Y), sensitivity and specificity. For completeness we also present results using the cohort median (PNI = ZZ) and PNI as a continuous variable.”