Best Practices for Guideline-Concordant Lymph Node Sampling In Lung Cancer Surgery (3+1 Standard)

BACKGROUND

Accurate lymph node sampling is essential to proper staging, treatment planning, and outcome optimization for patients undergoing curative-intent lung cancer surgery. The American College of Surgeons (ACS) Commission on Cancer (CoC) Operative Standard 5.8 requires sampling of ≥3 distinct mediastinal (N2) lymph node stations and ≥1 hilar (N1) station during all curative-intent pulmonary resections. This station-based "3+1" approach replaces earlier total-node-count metrics and is now a nationally recognized benchmark for high-quality oncologic surgery.

Guideline-concordant sampling matters because:

- Systematic lymph node sampling enables more accurate staging and reduces both under- and over-staging.
- Studies show improved outcomes, such as:
  - Higher nodal upstaging rates with guideline-concordant 3+1 sampling.
  - Reduced recurrence risk in sublobar resections using 3+1 strategies.
  - Strong performance correlation with surgeon experience, procedural approach, and standardized workflows.
- Consistent adherence across institutions supports more equitable and evidence-based care.

PURPOSE

This document synthesizes all MSTCVS participating hospital interventions, strategies, barriers, and improvements implemented across 2024–2025 to support improved performance. While these practices reflect successful approaches used across multiple institutions, not all interventions may be appropriate or feasible for every hospital. Each site should use these examples as guidance and adapt or tailor them to fit their local resources, workflows, patient populations, and organizational culture.

Preoperative Best Practices

Clinician Education

- Provide continuing education for surgeons, pulmonologists, OR staff, and pathology teams focused on:
  - The rationale and evidence supporting the CoC 5.8 "3+1" standard.
  - The clinical impact of inadequate sampling on staging accuracy and downstream treatment decisions.
- Incorporate updates from NCCN, ACCP/CHEST, and CAP synoptic reporting protocols into education sessions.

Preoperative Planning:

- Standardize documentation of expected lymph node stations for each case during surgical planning and team huddles.
- Display anticipated nodal stations on the OR whiteboard to align team expectations.
- Use a procedure-specific preoperative lymph node checklist (paper or digital) to ensure all required stations (≥3 mediastinal, ≥1 hilar) are planned for sampling.
  Evidence shows that structured planning tools, such as checklists, improve compliance with nodal sampling guidelines.

Intraoperative Best Practices

Specimen Handling and Surgical Team Communication:

- Pass lymph node specimens individually to the circulating nurse.
- Verbally confirm lymph node station and laterality at each handoff to support accurate pathology documentation.
- Proper OR-pathology communication is emphasized in ACS Standard 5.8 compliance requirements.

Specimen Organization:

- Use separate, pre-labeled containers for each station (e.g., 2R, 4R, 7, 10R).
- When available, use a pre-labeled compartmentalized tray ("ice cube tray system") to facilitate visual confirmation of completeness.
- These structured methods align with recommendations for systematic node harvesting and documentation.

Verification Before Case Completion

- Implement a dedicated "lymph node sampling time-out" before final closure or robotic undocking.
- Cross-check sampled stations against the preoperative checklist.
- Evidence supports that multidisciplinary verification processes improve compliance with the 3+1 standard.

Postoperative & Interdisciplinary Best Practices

Pathology Collaboration

- Ensure pathology incorporates all nodal specimens, including those obtained during prior procedures (mediastinoscopy, EBUS, VATS).
- Require synoptic pathology reporting, consistent with CAP templates, to standardize terminology and completeness.
- ACS compliance explicitly requires that nodal stations be documented by station number in synoptic format.

Case Review and Quality Improvement

- Conduct monthly multidisciplinary reviews of cases that do not meet 3+1 criteria ("fallouts").
- Reviews should include surgeons, pathology, OR leadership, and QI team members to identify:
  - Documentation gaps
  - Missed stations
  - Workflow or communication issues
- National qualitative assessments show that feedback loops and performance monitoring are key drivers of increased compliance.

Continuous Improvement and Feedback

- Operating surgeons should lead reviews and promote:
  - Standardization of technique
  - Reinforcement of best practices
  - Local protocol adjustments
- High-compliance centers demonstrate strong leadership engagement, structured review processes, and interdisciplinary accountability.

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