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Comparison of Initial Treatments for Primary Spontaneous Pneumothorax in Patients Younger Than 21 Years: A Network Meta-Analysis

Ku, HC; Huang, FH.

Corresponding author:
Hsiao-Chien Ku

213020@h.tmu.edu.tw

Author Affiliation:
Taipei Medical University Hospital.

ADMINISTRATIVE INFORMATION

Support - No sponsors are included in this study.

Review stage at the time of initial registration - Completed but not published.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 24 November 2026 and was last updated on 24 November 2026.

INTRODUCTION

Review question / Objective Among patients younger than 21 years with primary spontaneous pneumothorax, how do initial non-operative and operative treatments compare for ipsilateral recurrence? Secondary objectives are to compare recovery, healthcare use, and complications where suitable data are available.

Rationale Previous pediatric reviews have compared operative and non-operative care and considered the timing and technique of surgery. This review addresses the choice at first presentation by comparing specific initial treatment options within a network meta-analysis, where the evidence supports indirect comparisons.

Condition being studied Primary spontaneous pneumothorax occurs without preceding trauma, a medical procedure, or known underlying lung disease. This review focuses on the initial management of a first episode in children, adolescents, and young adults younger than 21 years.

METHODS

Search strategy PubMed, Cochrane, and Embase databases were searched from database inception through 31 October 2026. Searches combined terms for primary, idiopathic, or spontaneous pneumothorax with terms for children, adolescents, and young adults. No language, publication-date, outcome, or study-design filters were applied.

Participant or population Patients younger than 21 years were diagnosed with the first episode of primary spontaneous pneumothorax.

Intervention Ten initial treatments:

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Conservative treatments: observation, supplemental oxygen, needle aspiration, and tube thoracostomy as the primary treatment.
Surgical interventions: Thoracotomy and video-assisted thoracoscopic surgery (VATS). VATS nodes distinguish blebectomy alone, mechanical abrasion, chemical pleurodesis, pleurectomy, and combined procedures.

Comparator Indirect comparisons among all interventions based on the data extracted from the included studies through frequentist network meta-analysis by using MetaInsight.

Study designs to be included Randomized controlled trials and prospective or retrospective comparative observational studies with at least two eligible initial-treatment groups.

Eligibility criteria Eligible studies must compare distinct initial treatments for the first PSP episode and report extractable arm-level data for at least one review outcome. Exclude traumatic, iatrogenic and secondary pneumothorax, single-arm reports, and reports without separable eligible data. Exclude patients undergoing rescue surgery after failed initial nonoperative treatment from eligible comparisons. Exclude comparisons when those patients or overlapping arms cannot be separated. Classify surgery as an initial treatment only when it was the initial definitive strategy.

Information sources PubMed, Cochrane Library, and Embase were searched.

Main outcome(s) Ipsilateral recurrence after resolution of the index episode, measured as the number of patients with at least one recurrence out of the number with evaluable follow-up in each eligible treatment arm.

Additional outcome(s) Hospital length of stay, chest drainage duration, treatment-related complications, ER revisits, hospital readmissions, and index hospitalization costs.

Data management Data extraction and analysis were conducted through frequentist network meta-analysis using MetaInsight software.

Quality assessment / Risk of bias analysis The Risk of Bias 2.0 (RoB 2.0) tool was used to assess the risk of bias in the included randomized clinical trials (RCTs), and the Newcastle-Ottawa Scale (NOS) for assessing the quality of non-randomized studies.

Strategy of data synthesis Frequentist network meta-analysis with a random-effects model.

Subgroup analysis If data permit, examine differences by study design and recurrence follow-up duration. Explore differences by age or baseline pneumothorax severity if comparative data are available within strata.

Sensitivity analysis Where data permit, repeat the recurrence analysis after excluding studies with high risk of bias, unclear initial treatment or escalation, or substantial follow-up differences. Examine whether changing which report represents a potentially overlapping cohort materially changes the estimates.

Language restriction No language limits were applied in the database searches.

Country(ies) involved Taiwan.

Other relevant information This is the first network meta-analysis to comprehensively compare the initial treatments for primary spontaneous pneumothorax.
Current review status: Completed but not published.

Keywords Primary spontaneous pneumothorax; Initial management; Ipsilateral recurrence; Pediatric surgery; Network meta-analysis.

Dissemination plans The findings will be submitted for peer-reviewed publication. The intended journal is the Journal of Pediatric Surgery.

Contributions of each author

Author 1 - Hsiao-Chien Ku. Drafted the study design, analysis and interpretation, data collection, writing of the article, statistical analysis, and critical appraisal of the studies included.
Email: 213020@h.tmu.edu.tw
ORCID: 0009-0009-7692-6962
Author 2 - Fu-Huan Huang. Provided the study concept, results interpretation, statistical analysis, and critical appraisal of the studies included.
Email: d13443@gmail.com
ORCID: 0000-0002-2747-2900

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