Appendix 1 Supplementary methods

Search strategy (example for PubMed)

("lung nodule" OR "lung cancer" OR "non-small cell lung cancer" OR NSCLC) AND (lobectomy OR segmentectomy OR wedge OR "lung resection" OR thoracotomy OR VATS OR "video-assisted thoracic") AND (fatigue OR "cancer-related fatigue" OR "symptom burden" OR "patient-reported outcome" OR BFI OR "Brief Fatigue Inventory" OR MDASI OR "MD Anderson Symptom Inventory" OR "SF-36 vitality" OR PROMIS).

Definition harmonization

We prespecified clinically significant fatigue as moderate-to-severe fatigue when studies reported a validated cutoff. For 0–10 symptom intensity ratings, ≥4 is commonly used to represent at least moderate severity. For PSA-Lung, the published categorization (0–3 vs. >3) was used. For instruments in which higher scores indicate better vitality (e.g., SF-36 Vitality), we reverse-scored (100 – score) to harmonize direction for narrative comparisons; we did not dichotomize continuous vitality/fatigue scores unless a validated threshold and extractable numerator/denominator were reported. Studies reporting only continuous fatigue scores were synthesized narratively and were not pooled in the primary prevalence meta-analysis.

Additional outcomes extracted

Where available, we extracted (I) fatigue trajectories across time points; (II) co-occurring symptom clusters; (III) correlates such as pain, dyspnea, sleep disturbance, depressive symptoms, pulmonary function, and complications; and (IV) quality-of-life outcomes.

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Table S1 Data extractability matrix and harmonization notes

Study	Country/Region	Design	Population/Procedure	Sample size (n)	Follow-up	Fatigue instrument	Dichotomous fatigue data usable?	Used in prevalence meta-analysis?	Primary reason not pooled/notes
Huang *et al*. 2015 (PMC4468232)	China	Cross-sectional (survivorship)	Stage I NSCLC survivors after surgical resection	254	1–5 years post-surgery	Brief Fatigue Inventory (BFI, 0–10)	Yes (BFI ≥4: 57/254)	Yes	Extractable dichotomous prevalence with validated cutoff; included in meta-analysis
Sarna *et al*. 2008 (PMID 18776002)	USA	Prospective cohort	Lung cancer patients after thoracotomy	94	1 and 4 months	Schwartz Cancer Fatigue Scale	Partially (instrument-specific cutoffs; not pooled)	No	Dichotomous data available only at non-target time points or without numerator/denominator detail
Hong *et al*. 2025 (TLCR; doi 10.21037/tlcr-24-702)	China	Prospective cohort (comparative)	Resection of unilateral multiple pulmonary nodules (surgical decision-making)	550	Pre-op; POD 1–4; weekly up to 4 weeks	PSA-Lung (includes fatigue); PROMIS-Fatigue (subset)	Unclear (reported as trajectories; not pooled)	No	Fatigue was reported within PSA-Lung/PROMIS symptom profiles, but extractable dichotomous counts using validated clinical cutoffs for fatigue were not reported.
Haugøy *et al*. 2019 (BMJ Open; doi 10.1136/bmjopen-2018-028192)	Norway	Prospective cohort	Surgically treated lung cancer	196	Baseline to 5 months	Lee Fatigue Scale	No (continuous only)	No	Reported fatigue as continuous scores or HRQoL subscale without extractable dichotomous prevalence
Kenny *et al*. 2008 (J Clin Oncol; doi 10.1200/JCO.2008.18.3999)	USA	Randomized trial (perioperative intervention)	Thoracic surgery patients	152	4 weeks	SF-36 Vitality (0–100)	No (continuous only)	No	Reported fatigue as continuous scores or HRQoL subscale without extractable dichotomous prevalence
Hung *et al*. 2011 (J Pain Symptom Manage; doi 10.1016/j.jpainsymman.2010.04.019)	Taiwan	Cross-sectional (survivorship)	Lung cancer survivors after curative surgery	350	1–5 years post-surgery	BFI (0–10)	Yes (BFI ≥4: 59/350)	Yes	Extractable dichotomous prevalence with validated cutoff; included in meta-analysis
Lowery *et al*. 2014 (Support Care Cancer; doi 10.1007/s00520-013-1968-3)	USA	Cross-sectional (survivorship)	Post-surgical NSCLC survivors	183	1–6 years post-surgery	BFI (0–10)	Yes (BFI ≥4: ~25/183)	Yes	Extractable dichotomous prevalence with validated cutoff; included in meta-analysis
Liao *et al*. 2022 (J Cardiothorac Surg; doi 10.1186/s13019-022-01974-9)	China	Cross-sectional at discharge	Lung cancer surgery patients (mixed procedures)	366	At discharge	MDASI-LC (0–10)	Yes (≥4: 89/366)	Yes	Extractable dichotomous prevalence with validated cutoff; included in meta-analysis
Bendixen *et al*. 2016 (Lancet Oncol; doi 10.1016/S1470-2045(16)30075-2)	Denmark	Randomized trial (VATS vs. thoracotomy)	Stage I NSCLC (lobectomy)	206	12 months	SF-36 Vitality	No (continuous only)	No	Reported fatigue as continuous scores or HRQoL subscale without extractable dichotomous prevalence
Lim *et al*. 2022 (VIOLET; NEJM Evid; doi 10.1056/EVIDoa2100016)	UK	Randomized trial (VATS vs. open lobectomy)	Early-stage NSCLC (lobectomy)	503	Baseline; 5 weeks; 52 weeks	EORTC QLQ-C30 (fatigue subscale)	No (continuous only)	No	Reported fatigue as continuous QLQ-C30 subscale scores; dichotomous prevalence using validated clinical thresholds was not reported
Yang *et al*. 2022 (Curr Oncol; doi 10.3390/curroncol29100604)	Taiwan	Prospective cohort	Uniportal VATS lung surgery	104	4 weeks	PSA-Lung (fatigue item 0–10; categories 0–3 vs. >3)	Yes (>3: 15/104)	Yes	Extractable dichotomous prevalence with validated cutoff; included in meta-analysis

To improve auditability, we provide a study-by-study matrix describing which fatigue outcomes were extractable as dichotomous prevalence for the primary meta-analysis and why other studies could not be pooled (e.g., continuous-only reporting, non-aligned time points, or absence of validated thresholds).

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Table S2 Meta-analysis dataset

Study	Time window	Instrument	Definition	Events	N
Liao *et al.* 2022	Perioperative (discharge)	MDASI-LC fatigue (0–10)	Clinically significant fatigue ≥4	89	366
Yang *et al.* 2022	Perioperative (4 weeks)	PSA-Lung fatigue (0–10)	Clinically significant fatigue >3	15	104
Hung *et al.* 2011	Survivorship (1–5 years)	BFI (0–10)	Moderate-to-severe fatigue ≥4	59	350
Lowery *et al.* 2014	Survivorship (1–6 years)	BFI (0–10)	Clinically significant fatigue ≥4	25	183
Huang *et al.* 2015	Survivorship (1–5 years)	BFI (0–10)	Moderate-to-severe fatigue ≥4	57	254

Table S3 Sensitivity analyses for pooled prevalence (logit random-effects)

Analysis set	k	tau^2 estimator	CI method	Pooled prevalence (%)	CI low (%)	CI high (%)	I^2 (%)	tau2	Prediction interval low (%)	Prediction interval high (%)
Perioperative (≤1 month)	2	DL	normal	19.6	11.6	31.3	77.7	0.1618	8.2	40.1
	2	DL	t (HKSJ)	19.6	0.4	93.4	77.7	0.1618		
	2	ITERATED	t (HKSJ)	19.6	0.4	93.4	77.7	0.1618		
Survivorship (≥1 year)	3	DL	normal	17.7	13.4	23.0	66.6	0.0547	10.9	27.4
	3	DL	t (HKSJ)	17.7	9.5	30.6	66.6	0.0547		
	3	ITERATED	t (HKSJ)	17.7	9.3	31.0	66.6	0.0597		
Overall (all time windows)	5	DL	Normal	18.6	14.8	23.2	71.1	0.0673		
	5	DL	t (HKSJ)	18.6	13.4	25.3	71.1	0.0673		
	5	ITERATED	t (HKSJ)	18.6	13.4	25.3	71.1	0.0679		

We repeated the prevalence meta-analyses using a Hartung-Knapp-Sidik-Jonkman (t-based) adjustment and an iterated/REML τ^2 estimator to assess robustness when k is small. For the perioperative subgroup (k=2), t-based confidence intervals are expected to be extremely wide and are shown for transparency only.

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