Reclassification of Physiological Risk Using the Updated European Respiratory Society and European Society of Thoracic Surgeons Cardiopulmonary Exercise Testing Guideline

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Background

Cardiopulmonary exercise testing (CPET) has been central to preoperative risk assessment before lung cancer surgery since publication of the European Respiratory Society and European Society of Thoracic Surgeons guideline in 2009. The guideline has recently been updated, incorporating ventilatory efficiency expressed as the ventilation to carbon dioxide production slope (VE/VCO_2 slope) and revised thresholds for risk stratification (Figure 1a). We aimed to determine how application of the 2025 CPET algorithm reclassifies physiological risk compared with the 2009 version, and to assess clinical consequences in terms of major postoperative complications across risk categories.

Methods

We retrospectively analysed 506 patients who underwent CPET during evaluation for suspected or confirmed lung cancer between 2008 and 2020. Risk categorisation was applied according to both the 2009 and 2025 European Respiratory Society and European Society of Thoracic Surgeons CPET algorithms. In patients proceeding to lobectomy (n = 138), we compared discrimination and predictive values for major pulmonary complications or death within 30 days.

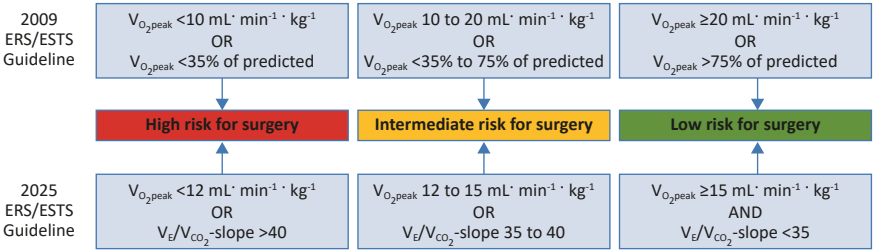
Results

Risk distribution changed substantially after application of the updated algorithm (Figure 1b). Among those classified as high risk by the 2025 algorithm (n = 127), 91% were newly identified, primarily due to VE/VCO_2 slope greater than 40. In the lobectomy subset, the area under the receiver operating characteristic curve was 0.61 for the 2025 algorithm and 0.57 for the 2009 algorithm (p = 0.998). Sensitivity, specificity and positive/negative predictive values are presented in table 1.

Conclusions

The updated guideline substantially redistributes patients across risk categories and identifies a larger group of physiologically vulnerable individuals, largely driven by ventilatory inefficiency. Overall discrimination between low and intermediate risk remained modest and similar to the 2009 algorithm. The broader high risk category may support perioperative planning, although its calibration and clinical interpretation warrant careful consideration.

1a


2009 ERS/ESTS Guideline
V_{O_2peak} <10 mL· min^{-1} · kg^{-1} OR V_{O_2peak} <35% of predicted
V_{O_2peak} 10 to 20 mL· min^{-1} · kg^{-1} OR V_{O_2peak} <35% to 75% of predicted
V_{O_2peak} ≥20 mL· min^{-1} · kg^{-1} OR V_{O_2peak} >75% of predicted
High risk for surgery
Intermediate risk for surgery
Low risk for surgery
2025 ERS/ESTS Guideline
V_{O_2peak} <12 mL· min^{-1} · kg^{-1} OR V_E/V_{CO_2}-slope >40
V_{O_2peak} 12 to 15 mL· min^{-1} · kg^{-1} OR V_E/V_{CO_2}-slope 35 to 40
V_{O_2peak} ≥15 mL· min^{-1} · kg^{-1} AND V_E/V_{CO_2}-slope <35

1b

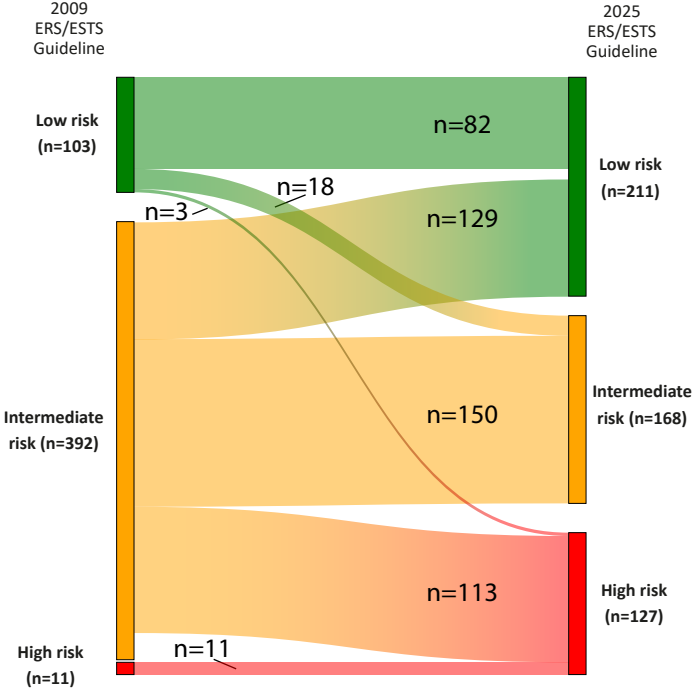

2009 ERS/ESTS Guideline
2025 ERS/ESTS Guideline
Low risk (n=103)
Intermediate risk (n=392)
High risk (n=11)
Low risk (n=211)
Intermediate risk (n=168)
High risk (n=127)
n=82
n=18
n=3
n=129
n=150
n=113
n=11

Table 1. Diagnostic classification performance of CPET-based guidelines in relation to 30-day major pulmonary complications or death

	Risk category					
	Low risk		Intermediate risk		High risk	
	2009 (n=33)	2025 (n=61)	2009 (n=105)	2025 (n=50)	2009 (n=0)	2025 (n=27)
Sensitivity	0.13	0.35	0.87	0.27	-	0.39
Specificity	0.74	0.54	0.26	0.62	-	0.84
Positive predictive value	0.09	0.13	0.19	0.12	-	0.33
Negative predictive value	0.81	0.81	0.91	0.81	-	0.87

CPET, cardiopulmonary exercise testing.